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Corruption and Competition in the Presence of Inequality and Market Imperfections

Indranil Dutta
University of Sheffield &
University of East Anglia
Email: i.dutta@shef.ac.uk
Ajit Mishra
University of Dundee
Email: a.mishra@dundee.ac.uk

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Indranil Dutta
Ajit Mishra

Abstract

We analyze the relation between corruption, competition and inequality in a developing economy context where markets are imperfect and there is wealth inequality. We consider an economy where different types of households (efficient and inefficient) choose whether to enter the production sector or not. Due to information asymmetry and wealth inequality, the market fails to screen out the inefficient types. In addition to the imperfect screening in the credit market, the inefficient type's entry is further facilitated by corruption in the product market. We analyze the market equilibrium and look at some of the implications. We show that a rise in inequality can lead to an increase in corruption along with greater competition. By endogenising the types, we also show how in the presence of corruption, initial wealth inequality will distort the incentives of the poor and lead to trap-like situations.

Keywords: Corruption, Competition, Credit Market, Inequality, Screening.

JEL Classification: D60, I20, R20.

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1 Introduction

Corruption has received a lot of attention from various quarters- especially in the context of developing economies[1]. Anti-corruption strategies have generally been based on the perception, both in academic and policy circles, that market forces through greater competition will lead to low levels of corruption (Rose-Ackerman, 1996; Ades and di Tella, 1999; World Bank, 1997)[2]. Therefore it was expected that deregulation, liberalization and large scale entry of private firms[3] will deter corruption. The experience of the transition countries and other developing countries, however, show that despite embracing considerable deregulation and liberalization over the last decade, corruption is on the rise (Leiken 1996-97, Kaufman and Siegelbaum 1997). In this paper we provide a new explanation to this apparent contradiction. We develop a rationale for why corruption and competition may coexist from a multi-market perspective. In doing so we explicitly bring in the role of wealth inequality in fostering corruption, which so far has not been examined fully in the literature.

Previous attempts in providing an explanation to this contradiction has mainly focussed on the implementation of the reforms and the role of the institutions(Kaufman 1997, Shleifer 1997, Levin and Satarov 2000)[4]. The

[1]The World Bank (2003) puts corruption as the 'single biggest obstacle to economic and social development'.

[2]Recently, however, this view has come under further scrutiny (Laffont and N'Guessan, 1999).

[3]In many transition countries the growth in the number of small private firms is quite noticeable.

[4]For a discussion of the existence of corruption and competition in different contexts please refer to Celentani and Ganuza (2002).

main argument, broadly speaking, was that because of institutional features true deregulation and liberalization had not taken place in many of these countries. Therefore we may see an increase in corruption even if there is more competition through privatization. Two countries are particularly picked up to make this point. It is shown that in Poland, where substantial deregulation has taken place, one can find more competition and hence less corruption; the Russian privatization has on the other hand spurred more regulatory bodies, stifled proper competition and increased corruption (Frye and Shleifer 1997). While this is no doubt a plausible explanation, the underlying thrust of the argument remains that 'proper' deregulation and privatization will reduce corruption. Our model on the other hand show that in the presence of standard market imperfections (such as informational problems) and wealth inequality we may find that increased number of firms and corruption may coexist. The east and south east Asian experience show that it is indeed possible to have a more competitive economy with high growth rate and still have increasing corruption [5].

In this context it is important to bear the nature of corruption in mind. Most of the literature adopt what we call a 'victimization' approach- agents pay bribes because of extortionary demand by the public officials[6]. Bribe paying agents are not viewed as the real beneficiaries. We don't deny this but we argue that the extortion view does not explain the whole picture. According to Hellman, Jones and Kaufman (2000) one of the main aspects

[5] Quite a few of the east and south east asian economies score below 5 in the Transparency International (2003) perception index out of a scale of 1 to 10 with 10 indicating lowest corruption.

[6] Most of the leading models i.e. Shleifer and Vishny (1993), Bliss and di Tella (1996) and the recent firm level studies discussed later, follow the extortion view. This is not true for the agency based models of corruption-i.e. Besley and McLaren (1993), Mookherjee and Png (1995), Laffont and N'Guessan(1999).

of corruption in transition countries is the "phenomenon of 'state capture' by the corporate sector". What it shows is that corruption also involves collusion between the government and private agents although agents may differ in terms of their benefits from corruption. This feature of corruption is key to the present paper.

It is quite clear from the extortion view of corruption that as extortion payments increase, profitability decreases and fewer firms stay in the market[7]. The causation can run in the reverse also. Fewer firms would mean higher profit (monopoly rent) and this leads to greater possibility of bribe extraction and more corruption. Firms with monopoly rents have the incentive to bribe officials to retain their monopoly profit. So in this case, corruption would imply that potential competitors are denied entry into the market, hence corruption helps reduce competition. On the other hand, if we take the collusion view and consider markets where efficient and inefficient firms can coexist, the opposite results may follow. It is possible that these highly inefficient firms thrive because of corruption and corruption allows the entry of these firms.

However, corruption alone may not be sufficient. Other forms of imperfections are also necessary for the presence of these firms. If these firms are inefficient (high risk and low return), how do they exist in the market? Won't market forces drive them out? Possibly yes, but as we show informational problems and wealth constraints in the credit market may contribute

[7]Bliss and diTella (1997) first addressed the relation between corruption and competititon. The same issue has been developed from different perspectives in Laffont and N'Guessan (1999), Ades and diTella (1999). This howerver is not related to other notion of competititon among public officials which might reduce corruption. Some would argue (see Rose-Ackerman (1996)) that any kind of competition would reduce corruption.

to these inefficient firms' existence. Hence, in some sense, corruption surfaces in the product market because of inequality and informational problems in the credit market. More specifically, we analyze how the credit market is not able to screen out inefficient firms. The screening mechanism breaks down because some households are wealth constrained. 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.

Although corruption manifests itself in many ways, here we only consider the problem of firms engaging in various acts of bribery to avoid legal costs of doing their business. These costs could include taxes, hiding of output, failure to meet standards and controls. In our framework, firms differ in terms of their benefits from corruption and only the inefficient (low profitability) end up paying bribes for various illegal activities[8]. It is not possible to verify this empirically, as firms are unlikely to report these collusive payments. Some of the recent exercises by Hellman et. al. (2000), Johnson et. al. (1999) and Svensson (2003) use questionnaire based survey to analyze the nature of bribe payments by firms. But all these reflect extortion payments rather than the whole range of bribery.

Our paper differs from other papers in the literature in three main aspects. First, the paper uses a multi-market framework to explore the link between corruption, competition and wealth inequality. In the literature[9], corruption

[8]This is opposite to view that firms hide and engage in illegal activities because they are subject to extortion, see Shleifer (1997). But as Johnson et.al. (1999) rightly point out, it is not possible to ascertain whether firms pay bribes because they hide or they hide beasue they are subject to extortion.

[9]See Bardhan (1997), Andvig and Fjeldstad (2001) for recent surveys on corruption.

is studied mainly in the context of problems in that particular market, be it informational asymmetries or incentive structure. While we do not doubt the merit of this, we feel that it is important to see if this problem is related to imperfections in other related markets. Here, our focus is on the link between corruption in the product market and wealth inequality and imperfections in the credit market. We argue that they reinforce each other and it may not be sufficient to look at corruption alone. The framework also allows us to ask how corruption affects the persistence of wealth inequality. Even though we don't have a dynamic framework, we can see how wealth inequality and corruption distort the choice of projects by wealth constrained households. Second, the collusion-view of corruption generates different implications compared to the extortion-view of corruption. We feel that both the features of corruption are important in understanding corruption in most developing economies. Third, to the best of our knowledge, ours is the first paper to provide a plausible explanation of how inequality may engender corruption. The few papers (Gupta et. al 2002, Li et. al. 2003) which discuss inequality in the context of corruption mainly look at how corruption leads to more inequality empirically.

The plan of the paper is as follows. In section 2, we provide some empirical analysis to motivate our problem better and use the empirical results to highlight the role of inequality in understanding the link between competition and corruption. In the next section we provide a brief description and intuition of the basic model. We then describe the characteristics of the different agents and how they interact strategically in our model. Section 4 contains the results and analysis under different scenarios. We consider the complete information case and the incomplete information case with and without wealth constraints arising from inequality. In section 5, we discuss various implications and extensions of our model. In our basic model we assume that the distribution of different types of firms are exogenously given. Here we relax that assumption and see what happens to the link between corruption competition and inequality when the types of firms are endogenous. Further, we discuss implications for the persistence of inequality. Lastly, section 6 concludes with a few brief remarks and some directions for future research.

2 Some empirical observations

In this section we present some simple empirical observations which illustrate the link between corruption, competition and inequality. Our empirical analysis is based on the BEEPS survey by the World Bank (1999). For a set of 26 transition countries, the survey provides the percentage of firms engaged in corruption[10]. The firms have been asked specific questions about the reasons for engaging in corruption such as whether it was for tax purposes or for the provision of public services etc. Keeping with our basic framework (as explained in detail later), we have considered only those firms that have indulged in corruption for tax purposes. The BEEPS survey made consistent efforts to select a representative sample of firms from each country (Hellman et. al. 2000). We, therefore, take the number of firms surveyed in each of these countries as an indicator for the total number of firms in each country.

[10]For our analysis we have used 23 countries. Three countries (Albania, Bosnia and Republic of Serpska) have been dropped because recent gini indices for these countries were unavailable.

Since data on wealth inequality are extremely rare, previous years gini index for income inequality have been used as proxy; the intuition being that previous years income inequality will reflect on the current periods wealth inequality through savings and investments. We have used the most recent available gini index (of the past years) from the world development indicator and the WIDER data set on inequality for these countries for 1999.

We use three separate logit models to test the link between corruption, competition and inequality. Our dependent variable is the log of the ratio of corrupt firms to non-corrupt firms. As is standard for logit models, we name the ratio of corrupt firms to non-corrupt firms as the odds ratio. As we will demonstrate later, increase in corruption in our model comes from the increase in the number of corrupt firms in the economy relative to the number of non-corrupt firms. Hence the odds ratio allows us to measure the impact of a change in the exogenous variables on corruption. The first two specifications regresses the number of firms and the gini index separately on the log of the odds ratio. The last specification regress both inequality and number of firms together on the log of the odds ratio. Table 1 summarizes the results from the regressions.

Table 1: Regression on log of the odds ratio.

	Model 1	Model 2	Model 3
	Coefficients		
Number of firms	0.000[a]		-0.016*
	(0.000)[b]		(0.001)
Gini index		0.047**	0.052**
		(0.013)	(0.015)
Constant	-0.524*	-2.170**	-2.113
	(0.229)	(0.460)	(0.441)
R^2	0.000[c]	0.325	0.356
F-statistics	0.04	12.40**	6.61**
Observations	23	23	23

The numbers in the brackets are the (robust) standard errors. * Shows significance at 10% level. ** Shows significance at 1% level. a: The actual value is 0.0001248. b: The actual value is 0.000627. c: The actual value is 0.0002.

It is evident from Model 1 that the effect of competition on corruption is statistically insignificant. It validates the point that increase in number of firms may not necessarily lead to a decrease in corruption. This does not rule out, however, that for some countries competition may indeed decrease corruption. On the other hand, there may be countries where competition leads to increased corruption. We understand that the relationship between competition and corruption is a complex one and our empirical model may be too simplistic. One, however, can still use this observation to make the point that the link between competition and corruption is quite ambiguous. The low R^2 also prompts one to look for other variables that may explain corruption better.

Therefore, next we look at inequality as a factor in explaining corruption since it is an obvious variable of interest. Most empirical exercises in this context have regressed corruption on inequality, thus examining the case whether corruption worsens the income distribution (Gupta et. al. 2002, Li. et al. 2001)[11]. Model 2 on the other hand tests for whether inequality leads to an increase in corruption. Results from Table 1 indicate that it is indeed the case that as inequality increases the number of corrupt firms relative to non corrupt firms will increase. This aspect, where increased inequality leads to more corruption, has not been analyzed rigorously before and it will be one of our goals in this paper to provide an analytical explanation for the observed link from inequality to corruption. Although informational problems also play an important role in our analysis, as will be evident later, we have not been able to take that explicitly in to account in our empirical exercise due to lack of data. For most transition countries, however, in line with our model, such market imperfections remain pervasive (Svenjar, 2002; Berglof and Bolton, 2002).

Coming back to the link between competition and corruption, the most striking result of the empirical analysis comes from Model 3. When we control for inequality the coefficient for number of firms becomes negative. This implies that given inequality, as competition increases, we will see a higher proportion of non-corrupt firms entering the market thereby reducing cor-

[11] A paper by You and Khagram (2003), which has very recently come to our knowledge, empirically shows that for a cross section of countries inequality leads to corruption.

ruption. Therefore, it seems, implicit behind the assertion that competition reduces corruption, is the assumption that inequality remains unchanged. This paper on the other hand attempts to understand the link between competition and corruption when there is a change in inequality.

3 The model

3.1 A Summary

We consider an economy with different types of households[12] (potential firms) who may choose to undertake (entrepreneurial) production activities. Given non-convexity in the production process the households choosing production activity have go to the bank to borrow a certain amount say, K. Households staying out of the production sector don't need to borrow and they have some fixed outside income. Households are classified into basically two types: good (with low risk and high output projects) and bad (with high risk and low output projects). The latter type is assumed to be inefficient in the sense that its production plan fetches lower expected returns. Hence an optimal mix would seek to maximize the proportion of good type. Production also involves other costs like taxes, fees and costs of meeting standards and quality control. We denote these as simply tax T. Inspectors are supposed to ensure compliance by the firms, but they can collude with the firm and avoid reporting.

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

[12]We shall be using both terms 'households' and 'firm'. Households in the production sector will be referred to as firms.

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 referred to as the credit game determines the cost of capital and the second determines the effective tax payment. As in the previous empirical section, *the number of firms engaging in bribery relative to the total number of firms in the market will be taken as the level of corruption.*

Corruption facilitates the entry of the inefficient firms by raising the expected payoff. Households can calculate their expected payoff after taking into account the fact that they can bribe the inspector and save on their tax payment[13]. *Hence some households who would not have entered the production sector in the absence of corruption would find it profitable to do so in the presence of corruption.* The extent of corruption, however, depends on the outcome in the credit market. If the different types are completely screened in the credit market then it is difficult to sustain corruption in the tax collection because the efficient high profitable firms are less likely to engage in concealment and corruption. As is well known, under certain conditions these types can be separated even when there is informational asymmetry. This is where wealth inequality comes in to play. Because some households are wealth constrained, it is not possible to separate the different types completely. That means some good types get pooled with the bad types. This raises the cost of capital for these good types and lowers the cost of capital for the bad types. The bad types, in turn, engage in corruption and earn higher than their true profit. Both these factors contribute to a rise in the

[13]This is somewhat similar to the distortionary effect of corruption on occupational choice or technology choice in Acemoglu and Verdier (1998).

number of the bad types and fall in the number of the good firms.

So how can corruption and competition coexist in our model? From the previous discussion it is clear that wealth inequality and informational problems facilitates the entry of the bad types in the market while it may reduce the number of good types. Therefore in the presence of inequality and informational asymmetries we can have a situation where the increase in bad firms is greater than the exit of the good firms thereby increasing the total firms in the market. The bad firms are prone to corruption, which also acts as another facilitating factor for their entry. We will then have a case where the total number of firms have increased and at the same time corruption will have increased too.

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.

3.2 Inspectors

Inspectors are in charge of collecting taxes. However, they are corruptible and can collude with the firm in exchange for a bribe, d. We assume that there is, however, an anti-corruption system in place. The anti-corruption inspectors, presumed to be honest[14], monitor the firms and the tax inspectors. If the firm evades tax payment by bribing the tax inspector, the bribery is likely to be discovered with some probability q and both the evading firm and the corrupt inspector are penalized.

[14] We do not go into issues concerning the corruptibility of these super inspectors, see Basu et.al.(1992).

3.3 The Banks

The banks (B) 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 $(1-\mu_i)$ 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 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

$$\pi_B^i = (1-\mu_i).r_i.K + \mu_i.\delta.w_i \geq \pi_0, \tag{1}$$

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

$$\pi_B = \sum \theta_i.\pi_B^i \geq \pi_0. \tag{2}$$

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.

3.4 The Households

Households, in our model, can either undertake entrepreneurial activity and join the production sector (firms) or engage in some outside option. Households differ in terms of the payoff form 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 and in successful states they lead to higher output/gross profit as well. Let Y_i be the output produced by type-i. We assume for type i, where $i = g$, b, the output $Y_i = 0$ with probability μ_i and $Y_i > 0$ with probability $(1 - \mu_i)$. We assume that $\mu_g < \mu_b$ and $Y_g > Y_b$.

Households also differ in terms of their initial wealth. We assume that some households have no wealth. 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. So we have three groups, the rich household with good project (g), the poor household with good project (p) and the rich household with the bad project (b).

Households (firms) engaged in production have to pay various types of taxes. Some of these would depend on their output or profit and some are fixed in nature. These include various license fees, lump sum taxes, compliance costs of various kinds. In many developing economies, these would take the form of costs associated with safety laws, labour laws. We concentrate on these types of costs and treat the total cost of doing business to be fixed for all types of households. This is captured through a lump-sum tax T. In some ways this should also discourage the b-types from entering the market. However, as mentioned earlier, the households can bribe 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 taxes and the cost of borrowing funds from the bank. Let V_{ij} represent the expected income of the j^{th}-household within type-i where

$$V_{ij} = (1 - \mu_i).\{(Y_i - r_i.K) - X_i)\} - \mu_i.w_i \geq V_{ij}^0 \tag{3}$$

where X_i is the expected cost (which includes bribe or tax payment) and V_{ij}^0 is the outside option available to the j^{th}-household of type-i. Note when production takes place $V_{ij} = V_i$, $\forall j \in i$.

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

3.5 The game

After production has been undertaken, depending on the realization of Y_i , 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[15]. In the successful state, the firm makes the due repayment $r_i.K$ to the bank. It is in this state the firm is supposed to pay a tax.

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

[15] Here, we are simply following the standard interpretation of debt contracts under costly state verification.

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/firms (r_i, w_i).

3. The firm chooses a particular contract.

4. Once the output is realized the inspector and the firm decide whether to collude and the amount of bribe d to be paid. When $d = 0$, there is no corruption.

5. Following the inspector's report, taxes are paid and all bribe or incentive payments are also made.

For convenience, we shall label stages 2-3 as the credit market game and stages 4-5 as the bribe (tax and corruption) game. Clearly, the outcome in the bribe game will determine the outcome in the credit market. We shall be looking at equilibria satisfying backward induction and hence we shall always work with the bribe game first. Note that a precise definition of an equilibrium would require us to specify actions at each stage 2-5. This will necessitate introduction of more notation. Hence we shall simply focus on the household's decision to enter production, the credit market outcome and the bribe amount.

Definition 1 *An equilibrium is defined as a tuple $\{a_{ij}, (r_i, w_i), d_i\}$ such that given households' decision, the credit market is in equilibrium and given the credit contracts (r_i, w_i) and the bribe d_i, each household's decision is optimal. In addition, household's and the inspector's decison to collude or not ($d_i = 0, d_i > 0$) is also optimal.*

An equilibrium in the game stages 2-5 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 equilbrium, 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 λ_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 λ_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 $i = g$, b. The bribe d_i, as we shall show in the next section, will be completely pre-determined for each type of household through Nash Bargaining. Hence, the reduced form of the equilibrium will be the tuple, $\{\lambda_i, (r_i, w_i)\}$.

4 Results and analysis

4.1 Tax and Bribe

After output is realized, if the firm decides not to pay the required amount of tax T, it can approach the regulator for a bribe negotiation. If a bribe agreement is reached, the firm pays d to the inspector. However, with some probability q this bribe/ illegal transaction can be discovered. Then both the firm and the inspector are penalized. The inspector faces a fine f, which may be loosing the job or a promotion. The firm faces fine h, which may include a loss of production and loss of reputation in the market in addition to the penalty. We assume that $h_i = \beta.Z_i$, where $\beta > 0$ and Z_i is net profit $(Y_i - r_i.K)$.

It is clear that bribing occurs iff

$$T - q(f + \beta.Z) \geq 0, \tag{4}$$

which implies,

$$Z \leq \frac{T - q.f}{\alpha} = \frac{T}{q} - \frac{f}{\beta} = \overline{Z}. \tag{5}$$

where $\alpha = q.\beta$.

Remark 2 *There is a critical net income, $\overline{Z}$, such that all firms with net profit, $Z_i \leq \overline{Z}$, will engage in corruption.*

The intuitive interpretation of this result is that the benefit of corruption does not increase with income but the cost does. The high profit efficient firms stand to loose more from the illegal transaction. Alternatively, this could be interpreted as a situation where a firm looses its license or ceases to operate once its illegal behavior is detected. In that case only firms who do not have a long future in the market 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 loose 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 risky bribe transactions.

We can model the bribing process using the Nash Bargaining approach or a simple counter-offer model. Let each party make a take it-or-leave it offer with equal probability. In that case, with probability 1/2 the firm will offer $q.f$. This is the minimum amount the inspector will accept. On the other hand, with probability 1/2 the inspector will demand $(T - \alpha.Z)$, as this is the maximum the firm would be willing to pay. Hence the expected bribe would be given by

$$d = \frac{1}{2}\left[T + q.f - \alpha.Z\right]. \tag{6}$$

Hence the firm would bribe and evade tax iff

$$T \geq \frac{1}{2}\left[T + qf - \alpha Z\right] + \alpha Z. \tag{7}$$

This yields inequality (5) given earlier.

Remark 3 *Notice that as q falls (or T rises), $\overline{Z}$ rises and more firms would be encouraged to engage in corruption.*

4.2 Credit market

In this section we discuss the credit market game. First we consider a benchmark case where there is no imperfection in the credit market. We will show that when the banks can identify the different types (good or bad) of households, the wealth inequality among the households does not matter. Wealth here is mainly in terms of collaterizable assets. Wealth inequality leads to a situation where some households can put up collateral and others cannot. The level of wealth does not affect a household's need to borrow K or income streams Y_i[16].

[16] A natural interpretation of this wealth would be various assets which can not be used in the production but households could borrow money against these. It is unlikely that one with more land would need less capital and borrow less.

4.2.1 Complete information benchmark

Note that under complete information, there is no need for collateral. This is a direct implication of the collateral cost. This can be seen in the figure 1 at page 38.

The figure 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. Notice that there is a cost associated with the collateral. This means that the banks will prefer not to have collateral to cover their loans completely. It can be checked that the slopes (absolute values) of the indifference curves and the iso-profit curve are given by

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

Since $1 > \delta > 0$, the household's indifference curve is steeper than the banks indifference curve. Under complete information, points D and E, in Figure 1, are the equilibrium contracts. Firms with a good projects will be offered contract E and firms with a bad projects will be offered D. The g-type firms will pay a lower interest rate where as the high risk b-type firms will pay a higher interest rate. Note that this situation will not change if there is wealth inequality. 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.

Let r_g and r_b denote the corresponding interest factors[17]. Let superscript c denote the outcome under complete information. Then the net income Z_i of the different types in the successful state would be $(Y_i - r_i.K)$. Clearly, $Z_b^c << Z_g^c = Z_p^c$. So according to our previous discussion, the b-types are likely candidates for engaging in corruption. We assume that

$$Z_b^c < \overline{Z} < Z_g^c = Z_p^c \tag{9}$$

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. Let V_{ij}^c be the expected income of the j^{th}-firm of type-i under complete information. As mentioned earlier, when production takes place $V_{ij}^c = V_i^c$, $\forall j \in i$. The following condition shows that under complete information, if the b-types pay the full tax, T, none of them decides to enter production, whereas the all of the g-types enter even if they pay the full tax.

$$V_b^c = (1-\mu_b)(Z_b^c - T) < V_{bj}^0, \ \forall j \in b. \tag{10}$$

$$V_g^c = (1-\mu_g)(Z_g^c - T) > V_{gj}^0, \ \forall j \in g. \tag{11}$$

On the other hand if the b-types enter production, the expected cost it incurs is

$$X_b^c = \frac{1}{2}\left[T + qf - \alpha Z_b^c\right] + \alpha Z_b^c,$$

which includes the bribe it pays and the expected fine if caught.

Given that $X_b^c < T$, some of the b-types may now find it profitable to enter production. We represent the condition as

[17]Since $r_g = r_p$ and $Y_g = Y_p$, we are suppressing the notation for the poor in this subsection.

$$\exists\ j \text{ such that } V_b^c = (1-\mu_b)(Z_b^c - T) > V_{bj}^0. \tag{12}$$

This is where corruption plays a vital role by allowing for few b-types to enter. Therefore, under complete information, we have all the g-types and some b-types in production and there is corruption in equilibrium.

Proposition 4 *In the complete information case, if (9) (11) and (12) hold, some bad projects are undertaken along with good projects and there is corruption. We have* $\lambda_g^c = 1$ *and* $\lambda_b^c > 0$.

4.2.2 Incomplete Information

Next, we study the case where the banks do not have information about the types of the households. However, the distribution of the different types of households is common knowledge. We analyze two situations under such incomplete information. First case is where the households do not suffer from any wealth constraints. The other case is where some of the households are wealth constrained and hence cannot put up any collateral.

4.2.3 Incomplete information with no wealth constraints

Now, since the banker cannot a priori distinguish between the different types, the banker uses the two instruments, r and w, at his disposal to screen the different types[18]. It is clear 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. As seen in Figure 1, we can find a pair D, F such that the incentive compatibility condition and the bank's zero profit

[18] See Bester (1985) for an early model of screening with collateral.

condition are satisfied. This mechanism allows for self selection of the types. The g-type chooses a contract where he pays a lower interest rate and a higher collateral. The b-type prefers to pay no collateral and the same interest rate as earlier. We represent the conditions under which screening will take place in the proposition below. The superscript I represents the incomplete information with no wealth constraints.

Proposition 5 *There exists a separating equilibrium in the credit market where the bank offers a pair of screening contracts* $[\{r_g^I, w_g^I\}; \{r_b^I, 0\}]$, $\lambda_b^I = \lambda_b^c$ *and* $\theta_g^I \leq \theta_g^c$; $\theta_b^I \geq \theta_b^c$. *The number of corrupt firms stays the same, though the level of corruption (as a relative measure) may be higher.*

Proof: The analysis is standard in the absence of the tax-corruption game. However, as discussed earlier, the tax-bribery game changes the incentive compatible constraints. We need to verify that the screening contract in fact does satisfy these constraints. The low risk type chooses a contract where he pays a lower interest rate and a higher collateral. The high risk type prefers to pay no collateral and the same interest rate as earlier.

Let $\underline{X}_b^I$ be the expected cost incurred when the b-types acts as the g-type and $\overline{X}_b^I$ is the cost incurred when it acts honestly. The b-type's incentive compatible condition is given by

$$(1 - \mu_b)(Y_b - r_b^I K - \overline{X}_b^I) \geq (1 - \mu_b)(Y_b - r_g^I K - \underline{X}_b^I) - \mu_b w_g^I. \tag{13}$$

Since, $r_b^I > r_g^I$, using (6) one can show that $\overline{X}_b^I > \underline{X}_b^I$. (13) is satisfied iff there exists w_g^I such that

$$w_g^I \geq \frac{(1 - \mu_b)}{\mu_b} \left[(r_b^I - r_g^I)K + (\overline{X}_b^I - \underline{X}_b^I) \right]. \tag{14}$$

Clearly the g-types are having to put a higher collateral now to avoid pooling with the b-type. So we have to also make sure that the g-types are not better off in a pooling equilibrium. A pooling equilibrium with zero profit for the bank would mean a pooled interest rate given by

$$\overline{r}^I = \frac{1}{[\theta_g.(1-\mu_g) + \theta_b.(1-\mu_b)]}.\frac{\pi_0}{K}. \tag{15}$$

For the screening outcome, described above, to be an equilibrium we need

$$(1-\mu_g)(Y_g - r_g^I.K - T) - \mu_g.w_g^I \geq (1-\mu_g)\left[(Y_g - \overline{r}^I.K) - X_g^I\right]. \tag{16}$$

Whether this will be satisfied or not depends on μ_g, μ_b, θ_g, θ_b. In general (16) will be satisfied[19] for high values of X_g^I,and $\overline{r}^I$.

It is evident from the figure that $V_g^I < V_g^c$. This can lead to exit of some g-type firms from the economy. Therefore the proportion of g-type firms in the market under the incomplete information can decrease compared to the complete information case. Hence, $\lambda_g^I \leq \lambda_g^c$. On the other hand since $V_b^I = V_b^c$, we have $\lambda_b^c = \lambda_b^c$. Consequently, the number of corrupt firms will stay the same. Even if the number of b-type firms stays the same, their relative proportion might be higher, $\theta_g^I \leq \theta_g^c$. 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. QED.

[19]Consider a case with $K = 20, \pi_0 = 20, Y_g = 200, Y_b = 150$,

$\mu_b = 3/4$, $\mu_g = 1/2$, $T = 10$, $\alpha = 1/2$, $q = 1/10$, $f = 300$. Then in the seprating equilibrium, $r_b^I = r_b^c = 4$, $r_g^I = 41/25$, $w_g^I = 59/3$. It can be checked that all the conditions are satisfied. Moreover, the g- types have a slighly lower payoff than the complete information case. In this equilibrium the g- type's payoff is $V_g^I = 68.76$. In the complete information case with $r_g^c = 2$, $w_g^c = 0$, we have $V_g^c = 75$. It can be checked that for the b-type $V_b^c = V_b^I = 16.87$.

4.2.4 Incomplete information and wealth inequality

In the presence of wealth inequality, effectively there are three types of firms, (i) b-types, (ii) g-types, and (iii) p-types (which are basically the collateral constrained g-type firms).

Recall that contracts E and F are offered under incomplete information without wealth constraints. 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[20]. 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 with no collateral. In that case, it is easy for the high risk b-types to act as the p-types. However, as seen in Figure 2 at page 39, a semi-separating equilibrium is possible, where the g-types are separated out and the b and p-types pool.

The g-types are offered 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. Then compared to 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.

We can rule out a complete pooling outcome if the pooled interest rate

[20] Screening can be achieved using loan size also but in the present case it is fixed.

lies above G. This also ensures that no bank can deviate and offer a pooled contract $[\overline{r}, 0]$ where

$$\overline{r} = \frac{\pi_0}{[(\theta_g + \theta_p).(1-\mu_g) + \theta_b.(1-\mu_b)].K}. \tag{17}$$

The probability that a borrower belongs to type-i household undertaking entrepreneurial activity, when the credit market outcome is a pooled one, is given by θ_i. Likewise, under the semi-separating equilibrium the pooled interest (partial pooling of b and p-types) is given by

$$\overline{r}^* = \frac{\pi_0}{(\phi_p.(1-\mu_g) + \phi_b.(1-\mu_b)).K}, \tag{18}$$

where ϕ_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 (17) and (18), it is easy to see that $\overline{r}^* > \overline{r}$. This implies that more b-types would enter the market under a completely pooled contract and it will not be profitable to offer such a contract in equilibrium.

As we have observed in the previous section, the b-types are more likely to be corrupt because $Z_b^c < \overline{Z}$. Now in the semi-separating case, $Z_b^s > Z_b^c$, because they end up paying a lower interest rate. However, if $Z_b^s < \overline{Z}$, the b-types will evade taxes and pay a bribe. We continue to assume that

$$Z_b^s < \overline{Z} < Z_p^s < Z_g^c. \tag{19}$$

The expected income of the b-types here would be given by

$$V_b^s = (1-\mu_b)(Z_b^s - X_b^s), \text{ where } X_b^s = \frac{1}{2}[T + qf - \alpha Z_b^s] + \alpha Z_b^s. \tag{20}$$

Clearly, $V_b^s > V_b^c$. Now it is more likely that for some b-types $V_{bj}^s > V_{bj}^0$. Hence more b-types are likely to enter. On the other hand some of the p-types may exit the market since $V_p^s < V_p^c$. There might also be a drop in the g-types but not of the same order. All this will depend on the distribution of the outside payoff. Suppose the following condition holds,

$$\overline{V} > V_b^s > \underline{V},\ V_g^s > \overline{V},\ V_p^s > \underline{V}. \tag{21}$$

This implies that despite the reduction in V_g, all the g-types continue to enter the production and $\lambda_g^s = 1$. The same need not be true for the poor households with good projects. On the other hand, compared to the incomplete information without wealth inequality case, more b-types also enter production sector. Therefore, $\lambda_b^s > \lambda_b^I$. This leads to the following proposition.

Proposition 6 *Under incomplete information and wealth inequality, there exists a semi-separating screening equilibrium* $[\{r_g^*, w_g^*\}, \{\overline{r}^*, 0\}]$ *where the b and p types pool at* $\overline{r}^*$ *and g type separates at* $\{r_g^*, w_g^*\}$. *We have* $\lambda_g^s = 1$, $\lambda_p^s \leq 1$ *and* $\lambda_b^s > \lambda_b^I = \lambda_b^c$.

Note that if condition (19) is not satisfied and we have $Z_p^s < \overline{Z}$; then the poor households with good projects will also find it worthwhile to engage in corruption. In this sense, corruption can spread because of the presence of the b-types in the market.

Proposition 7 *Corruption will be higher than the incomplete information with no wealth constraint case as a large proportion of the b-types will enter the production sector and engage in bribery.*

4.2.5 Changes in Inequality

Suppose there is a rise in inequality of wealth such that the number of wealth constrained poor households is higher. We can consider a redistribution of wealth such that n_b stays the same, n_g falls and n_p rises. Let us assume that, prior to redistribution, $\lambda_g^s = 1$, $\lambda_p^s = 1$ and $\lambda_b^s > 0$. This means that as n_p rises, the pooled interest rate will fall. At the pre-redistribution participation rates, rise in n_p will lead to a rise in θ_p and fall in θ_b. Since $(1-\mu_g) > (1-\mu_b)$, it is clear that (using (18)) $\overline{r}^*$ will fall. Consequently, $\{r_g^*, w_g^*\}$ will also change and V_g^s will rise, but it will make no change to their participation rates. On the other hand, V_b^s will increase and that would lead to more b-type households in the market. The rise in λ_b will in fact be the equilibrating force as this would lead to a rise in θ_b and arrest the fall in the pooled interest rate. But it is clear that in the new equilibrium, following the redistribution of wealth, λ_b is higher. Since the participation rates of the poor and the rich households with good projects do not change and the redistribution is confined only to them, a rise in the participation of the b-type households would lead to an increase in the number of firms in the production sector and a rise in the number of corrupt firms. We can state the following corrollary.

Corollary 8 *As the fraction of poor households increases following a rise in wealth inequality, more b-type households enter the production sector and there is a rise in corruption.*

This matches well with our earlier observation in section 2 that a rise in inequality is associated with greater incidence of corruption[21]. In terms of

[21] As mentioned earlier, a recent empirical exercise using cross-country regressions also find that income inequality increases corruption. See You and Khagram (2003).

the number of firms, the total number of firms can go up or down depending on the distribution of the outside option and the value of λ_p before the redistribution. For example, if $\lambda_p < 1$, then following the redistribution, λ_p goes up but the total number of firms in the market might go down. Irrespective of what happens to the total number, the number of b-type firms will always go up.

5 Discussion

5.1 Competition and Corruption

The b-type households benefit in two ways-their cost of funds is subsidized by the other households to some extent and they also manage to increase profitability by avoiding tax payments. Either of these factors alone may not be sufficient to encourage increased participation by the b-type households. In the text we showed that in the absence of imperfections in the credit market, there are very few b-type households engaged in production. One could make a similar claim concerning corruption also. In the absence of corruption, the $b - types$ will not find it profitable to enter the market even if they pay an interest rate lower than r_b. To consider an extreme case, suppose the government pursues a policy (q, β, T) such that corruption can be completely deterred and $(1 - \mu_b)[Y_b - r_g K - T] \leq V^0_{bj}$. In such a case, no b-type will choose to enter even when it can borrow funds at the most subsidized rate. In the credit market, both the g-type and p-type will be treated in identical fashion and will be offered r_g. Neither wealth inequality nor informational asymmetry will matter.

Depending on the distribution of the outside options (income from non entrepreneurial activity), increased participation by the b-types could lead to a overall rise in the number of households in the production sector. The rise in the b-type's participation can compensate for the drop in the households with good projects (mainly the p-types) participation. *In this sense, a higher number households in production can coexist with greater corruption.* This has been noted earlier in Laffont and N'Guessan (1999) in a different context. They point out that increased corruption can coexist with greater competition in an agency setting because it might be optimal to tolerate more corruption in equilibrium. Moreover, greater competition always raises welfare despite increase in corruption. We are making a separate point here. There is increased corruption in equilibrium because more households would choose to engage in it. Secondly, as more b-types participate, welfare might go down. This is because the presence of these types exert negative externalities and the b-types are more inefficient. Without adding more structure to the model, it is not possible characterize welfare in a precise way.

The entry of the b-type households has implications for the anti-corruption policy . Note that one crucial determinant of the anti-corruption policy is the probability of detection q. It is possible that q will fall as the number of households in the production sector increases. The same number of inspectors will have to monitor a larger population now. This would lead to a rise in $\overline{Z}$ implying that more households would find it profitable to engage in bribery. Similarly, a rise in T would also imply a rise in $\overline{Z}$. *However,there is a discontinuity in the rise of corruption here.* As T rises sufficiently, the b-type households might not enter the production sector even though they would have engaged in bribery had they entered. So we might see elimination of corruption for sufficiently high T. The rise in T can also be interpreted in various ways. It could mean that there are stricter quality controls and standards and non-subsidized inputs. In that case, a rise in T can be an welcome policy. But the feasibility and success of the policy would also depend on how profitable the g- type households are. A high T should not end up discouraging them too. On the other hand if T is due to high taxes, controls and red tapes, it would be ideal to reduce T.

5.2 Wealth Inequality, Corruption and Poverty

So far we have assumed that the different types of firms were pre-determined. This basically worked at two levels, with each household's endowment of (good or bad) projects and their level of wealth being exogenously given. In this section we relax the pre-determination of the kind of project each household can acquire. So given a distribution of wealth, we ask, how will firms make their choices of projects? In the presence of corruption will these imply a high or a low inequality? Our model has no immediate answer but extensions to the model can throw some light. Indeed what we intend to show here is that in equilibrium poor households may end up choosing bad projects and rich households may end up in good projects. This means that the initial inequality may lead to some kind of a trap situation for the poor households.

Suppose, nature does not decide the distribution of b and g types. Households (either poor or rich) have to make some investment (effort) e prior to the realization of their project type. This investment could be broadly interpreted as activities like searching for ideas, gathering of information, exploring networks and markets. Let the cost of this be given by $C(e)$ and $C' > 0$, $C'' \geq 0$. The probability ρ that the project would be g-type will depend on e, $0 \leq \rho(e) \leq 1$, $\rho' \geq 0$ and $\rho'' \leq 0$. Like before, let V_b, V_g denote the net payoffs associated with a bad and a good project respectively. V_p refers to the payoff associated with a good project by the poor household. Households choose e to maximize

$$[\rho(e)V_g + (1 - \rho(e))V_b] - C(e). \tag{22}$$

For our purpose let us assume that $C(0) = 0$, $C'' = 0$ and

$$\rho(e) = \begin{cases} 0 & \text{when} \quad e < e_1 \\ (0,1) & \text{when} \quad e_1 \leq e < e_2 \\ 1 & \text{when} \quad e \geq e_2 \end{cases} .$$

Given this, it is easy to see from Figure 3 at page 40 that the maximization will lead to two possible choices.

One outcome is at $e = 0$ and the other outcome is at $e = e_2 > 0$. Therefore if households decide to not to put any effort then they end up with a bad project and a lower V. On the other hand if they decide to put a lot of effort, they get a good project and therefore a higher V. We can easily augment our earlier notion of equilibrium by adding the choice of e at the beginning. The following proposition suggests that poor could indeed remain poor by choosing low effort in equilibrium.

Proposition 9 *Given market imperfections and corruption possibilities, there exists an equilibrium where the poor households will choose* $e = 0$ *, the rich* *households will choose* $e = e_2$ *and in the credit market banks would offer a pair of screening contracts* $[\{r_g^I, w_g^I\}; \{r_b^I, 0\}]$.

Proof: The credit market outcome is the same as the outcome in Proposition 5 since there are just good and bad types and good types are not collateral constrained. Hence, a poor household deviating from its choice of $e = 0$, will not be able to opt for the contract meant for the good types.

Note that we only need to consider the extreme values of effort ($e = 0$ and $e = e_2$) for showing the optimality of the households' decisions. If a poor household chooses low effort $e = 0$, then its expected payoff would be given by $V_b^s = (1 - \mu_b)(Y_b - r_b^I K - X_b)$. Recall that the bad types can engage in corruption and find it profitable to be in the market. On the other hand, if it chooses high effort, it still does pay the same interest rate and does not engage in corruption. Hence its expected payoff from choosing high effort $e = e_2$ will be given by $V_g^I = (1 - \mu_g)(Y_g - r_b^I.K - T)$. Therefore, choosing $e = 0$ is optimal if the following condition is satisfied

$$C(e_2) > (\mu_b - \mu_g)(Y_b - r_b^I K - X_b^I) + (1 - \mu_g)(\Delta - m). \tag{23}$$

where $\Delta = Y_g - Y_b$ and $m = T - X_b^I$.

On the other hand a rich household will choose a higher effort if $V_g^I - C(e_2) > V_b^I$. For a rich household, when it chooses a good project, it can easily separate itself out by paying the collateral. Hence its expected payoff is given by $V_g^I = [(1 - \mu_g)(Y_g - r_g^I.K - T) - \mu_g.w_g^I]$. On the other hand if it puts low effort and goes for a bad project, its expected payoff will be $V_b^I = (1 - \mu_b)(Y_b - r_b^I K - X_b)$. Therefore, for the rich type to choose a high effort it must be the case that

$$(\mu_b - \mu_g)(Y_b - r_b^I K - X_b^I) + (1 - \mu_g)(\Delta + \sigma.k - m) - \mu_g.w_g^I > C(e_2). \tag{24}$$

where $\sigma = r_b^I - r_g^I$. Both these conditions will be satisfied if

$$\underline{L} < C(e_2) < \underline{L} + \tau$$

where $\underline{L} = (\mu_b - \mu_g)(Y_b - r_b^I K - X_b^I) + (1 - \mu_g)(\Delta - m)$ and $\tau = (1 - \mu_g)\sigma.k - \mu_g.w_g^I$. For very low values of μ_g this condition will be satisfied. Hence we will get a situation where the poor are choosing low effort and hence bad projects where as the rich are choosing high effort and hence good projects. Q.E.D.

Remark 10 *It is possible that many other equilibria also exist. It is important to realize that in the absence of corruption such polarization will not occur in equilibrium. Since the bad types will not find it profitable to enter the market, only the good types will stay in the market and there will be no need for use of collaterals. This would mean the poor household can easily choose high effort and enter. The equilibrium in the previous proposition will not hold.*

We chose a special functional form for $\rho(e)$ to show the polarized nature of the equilibrium, but the arguments can be shown to carry over to a general case. Presence of wealth constraints creates disincentives for the poor to choose high effort as the poor types are prevented from fully benefitting from their high effort. Therefore under incomplete information, even when the poor have put e_2 amount of effort, they cannot be distinguished in the credit market since they cannot put up the collateral that rich good types can. Also in such situation the pay-offs of being the bad type increases due to corruption. Hence, with market imperfections and corruption, $V_p < V_g$ and V_b is higher. Therefore there is a strong incentive for the poor to choose low effort levels. The poor will always invest less than the rich households and will have bad projects more often. This could mean that inequality will be sustained. However, it is important to note that in the absence of any imperfections, $V_p = V_g$ and $(V_g - V_b)$ is also maximized. This will lead to both poor and rich households choosing same optimal levels of e.

6 Conclusion

We have shown that when market imperfections exist, greater competition can coexist with greater corruption. The scope of corruption allows inefficient firms to survive in the market. As more and more inefficient firms enter the market, the total number of firms might rise but corruption also rises. It is not our intention to say which causes what, whether greater competition reduces corruption or corruption reduces competition. Both these can coexist because of several other factors- in our case wealth inequality and incomplete information in the credit market.

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 the other market. Policy intervention in the credit market, for example, will depend on the extent of corruption. In some cases, corruption makes it difficult to implement other policies aimed at addressing the credit market problems arising out of inequality. 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 this case tax collection). In the present case that would mean looking at tax reforms and system of incentives for the tax inspectors. Our paper, complementary to this approach, would point also in the direction of the credit market. This, we consider, is an important point to bear in mind while designing policies especially in developing countries where more than one market exhibit various kinds of imperfections. This view in a wider context is not new[22], but is worth emphasizing in the context of corruption.

Even though we do not model competition in the product market, our paper is similar to the studies looking at the relation between competition and corruption. Here also the number of firms in the production sector is being determined endogenously. As has been rightly pointed by Bliss and di Tella (1997), one would need to go beyond the simple measure of the number of firms to capture competition. But we don't have any alternative measure. Competition, in the sense of simply the number of firms, may not be a good outcome in our model context. If too many inefficient types enter the market at the cost of the efficient types then the total number of the firms might go up but the total expected output might be less. So the effect of corruption on competition is not quite straightforward. Corruption can lead to a rise in the total number of firms[23].

We have not modelled competition in an explicit way. Preliminary results show that this can be done to some extent. The interaction between the efficient (g-type) and inefficient (b-type) firms in the product market can be analyzed. This will allow us to make more definite welfare comparisons.

[22] To consider a recent example from the debate on child labour, many authors (see Basu 2000) would argue that the prescription does not necessarily lies in reforming labour laws or trade laws.

[23] Over-crowding due to market imperfections has been noted, see for example deMeza and Webb (1992).

Similarly, the relationship between wealth inequality can be explored further. As our analysis in the previous section suggests, we can analyze the extent to which corruption contributes to the persistence of inequality. The static framework in the paper can be extended to a fully dynamic model.

Wealth inequality and corruption are related in another important way. It is possible that wealthier households would spend more resources into buying power and access to politicians and bureaucrats. One can model a situation where the household, in addition to choosing whether to produce or not, also chooses how much to invest (monetary as well as non monetary resources such as effort) in buying access. This would be similar to the case where firms spend money on campaign contributions, buy contacts and spend effort in building political and bureaucratic network. A firm with access can evade taxes with a higher probability. This ex-ante choice of investment in access buying can replace the current framework where they bribe later. This way we can derive household's investment in access buying as a function of household wealth and the type of the project. We leave it for future work.

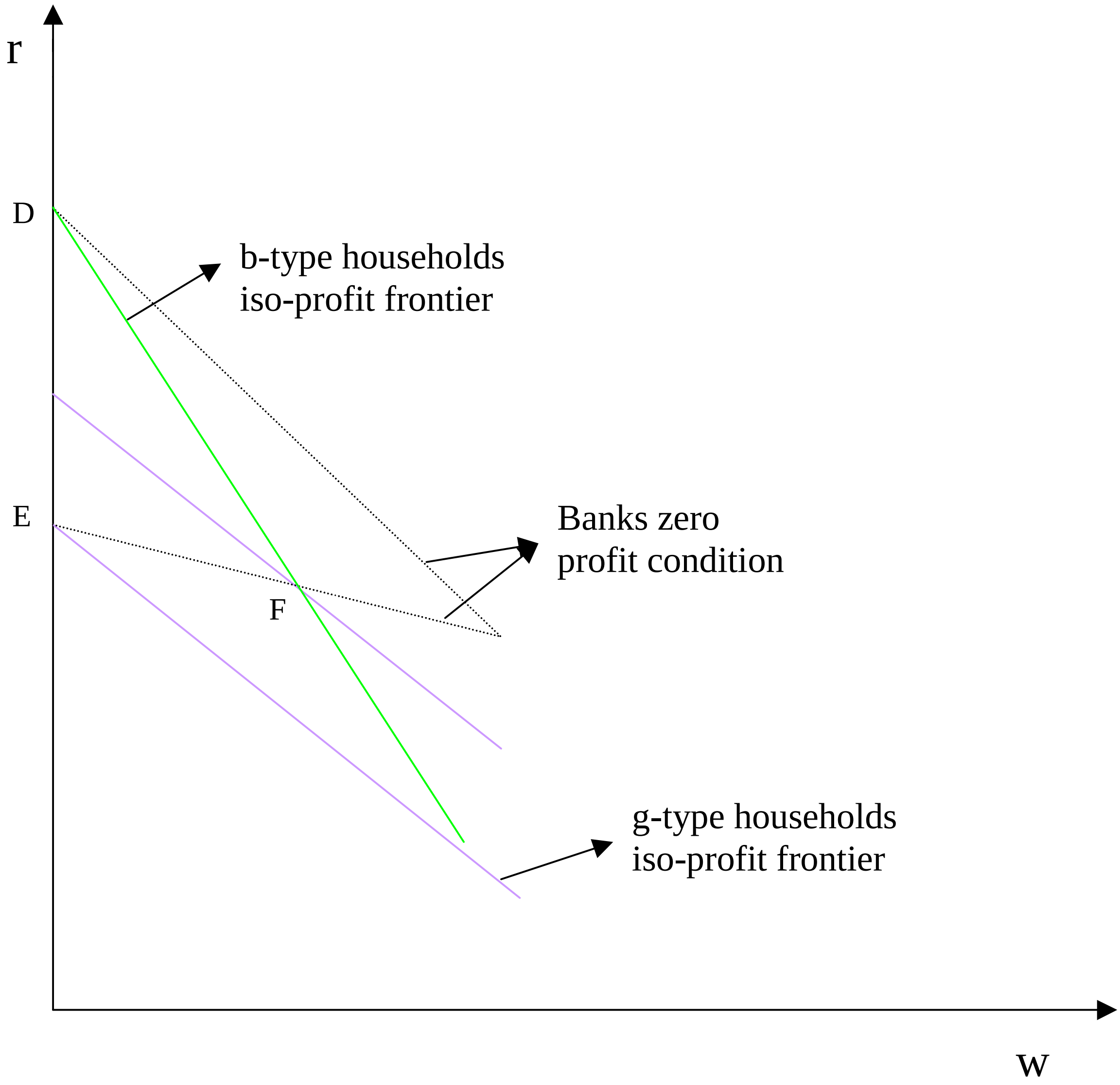
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Figure 1

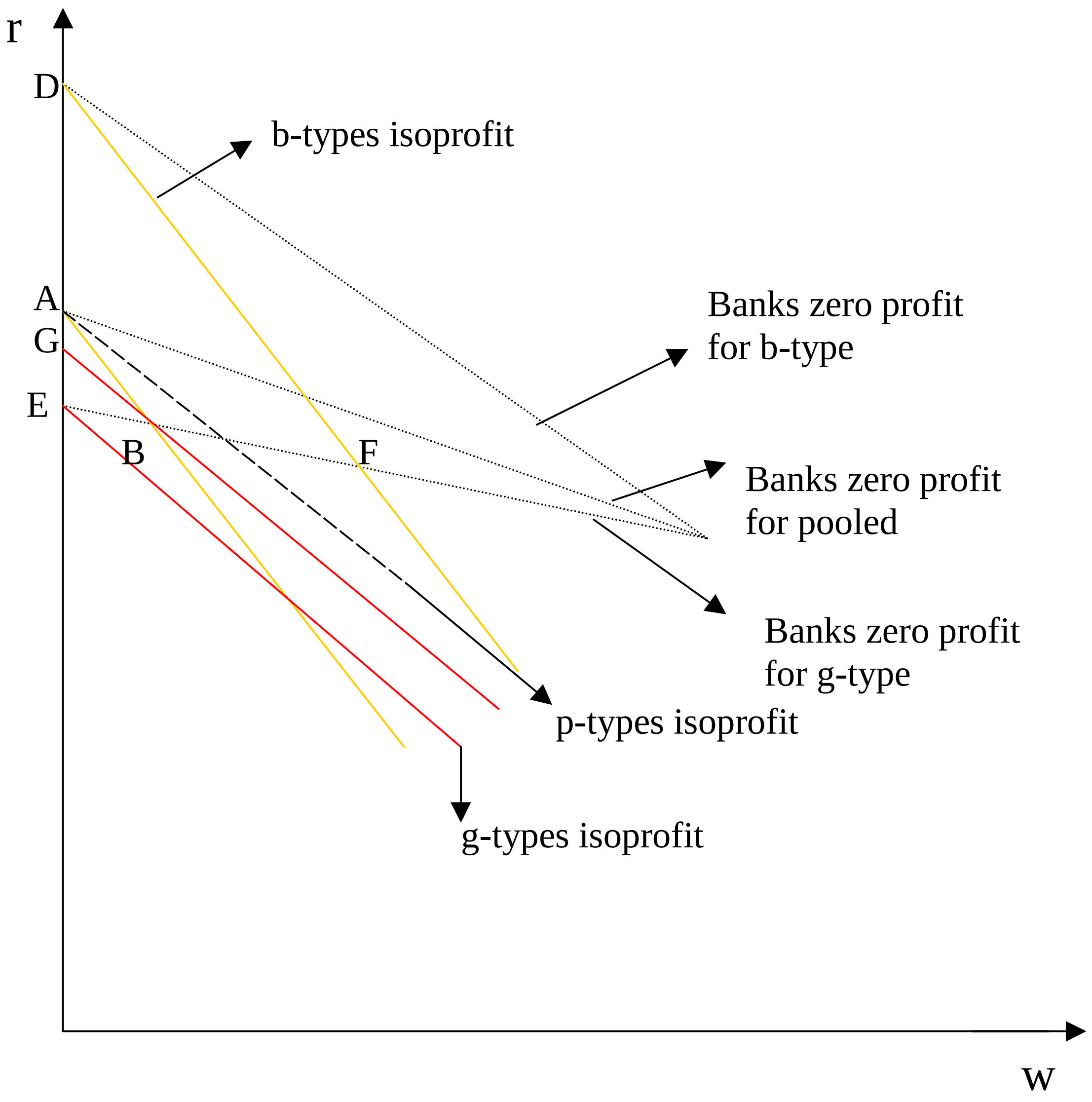
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Figure 2

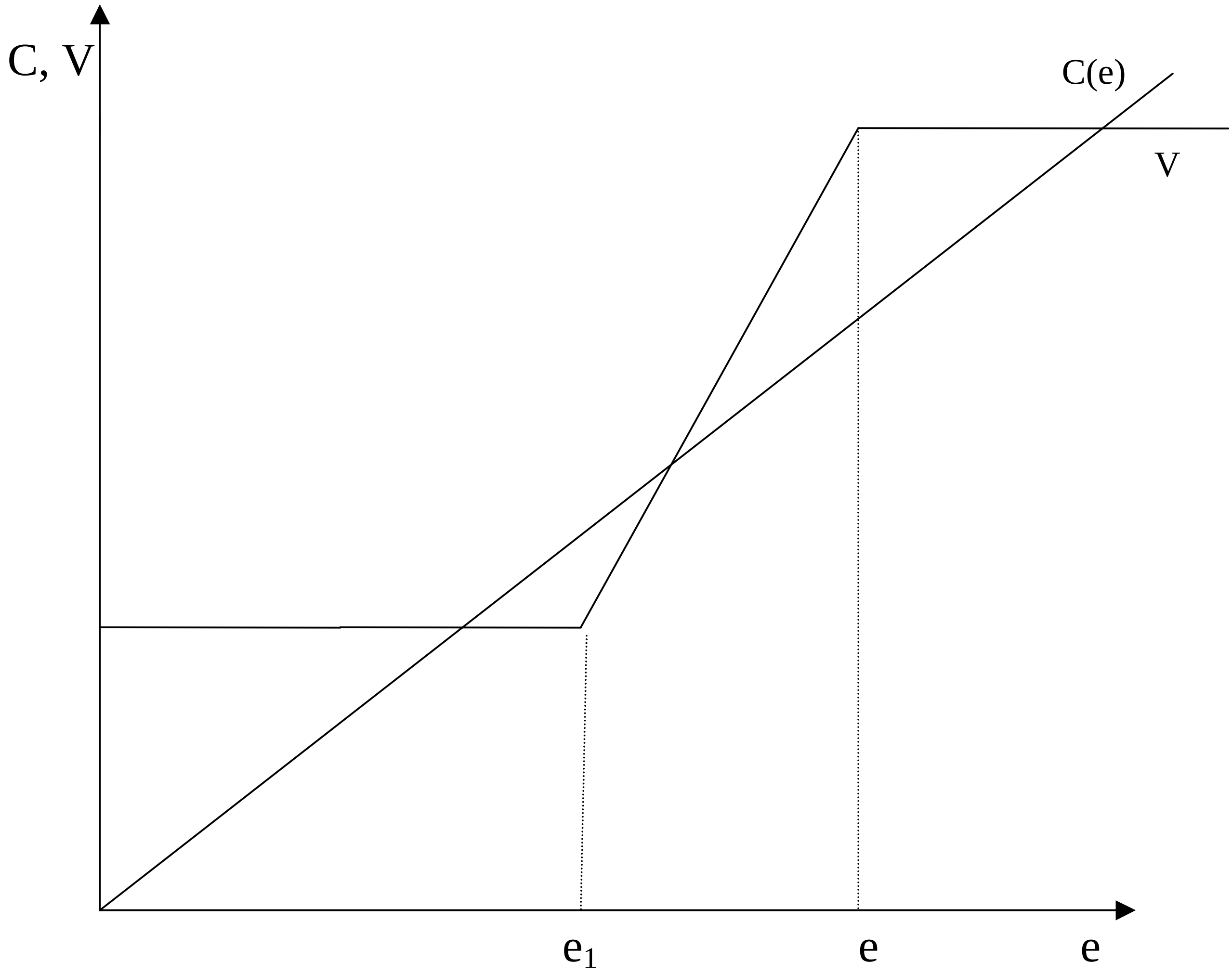

Figure 3

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