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Reputation and Credit without Collateral in Africa's Formal Banking

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Abstract:

The analysis of reputation as a contract enforcement instrument where legal institutions, especially commercial courts, fail to enforce commercial contracts has focused on informal credit markets. The literature centres on the argument that lenders or co-borrowers in group lending can easily monitor each borrower, given the small size of an individual lender's market. Verifiability allows the detection of opportunistic default and hence allows its punishment. This paper argues that in Africa, even formal credit markets rely on reputation. However, the modelling strategy is not based on monitoring and verifiability, given the potential for residual information asymmetry between a bank and a borrower after screening. Instead, the paper conceptualises the relationship between a bank and a borrower as an infinitely repeated game. The bank learns the type of the borrower through repeated interaction, a process by which a borrower builds his reputation as an honest partner. A defaulting dishonest borrower forfeits his access to future loans. The main result of the model is that the higher the reputation of a borrower, the lower his equilibrium payoff that is incentive compatible with debt repayment. Conversely, in the absence of any reputation, the payoff that is incentive compatible with repayment is equal to infinity meaning that credit trade is impossible without either a credible formal contract enforcement mechanism or some level of reputation.

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1. Introduction

The literature on the role of informal contract enforcement mechanisms in Africa's credit markets has widely covered informal credit [Udry (1990), (1994), (1995); Aryeetey and Udry (1997); Aryeetey, *et al.* (1997); Fafchamps (1999); Fafchamps (1992); Nissanke and Aryeetey (1998); Steel, *et al.* (1997)]. This interest stems from the recognition that informal borrowers lack collateral, implying that credit contracts are based on reputation and other collateral substitutes [Nagarajan and Meyer (1998)].¹ The literature centres on the argument that given the small size of an individual lender's market each borrower is easily monitored by either his lender or his co-borrowers in the case of group lending. Verifiability allows the detection of opportunistic default and hence its punishment.

This paper extends the concept of reputation to formal credit markets where formal legal institutions are unable or unwilling to enforce credit contracts. However, due to potential residual information asymmetry between a bank and a borrower even after screening, the modelling strategy is not based on monitoring and verifiability. Instead, the paper conceptualises the relationship between a bank and a borrower as an infinitely repeated game. The bank learns the type of the borrower through repeated interaction, a process by which a borrower builds his reputation as an honest partner. A defaulting dishonest borrower forfeits his access to future loans.

The main result of the model developed in this paper is that in the presence of reputation effects collateral is not a necessary condition for credit trade to take place. An increase in reputation reduces the level of equilibrium payoff that is incentive compatible with debt repayment. Conversely, with no reputation, the payoff that is incentive compatible

¹ Collateral is defined as any physical asset that has the following three attributes: (i) appropriability leading to ease of liquidation in case of default; (ii) absence of collateral-specific risks; and (iii) accrual of the returns to the borrower during the loan period either through direct economic returns from the use of the asset or indirect returns from the investments made with loans obtained using the asset as collateral [Nagarajan and Meyer (1998, p.133)]

with debt repayment is equal to infinity. As a result, credit trade is impossible without either a credible formal contract enforcement mechanism or some level of reputation.

Little has been written on contract enforcement in Africa's formal credit markets.² The limited interest may be due to the belief that these markets work in the same way as those in developed countries. This assumption recognises, implicitly, that Africa's 'modern' credit markets are based on collateral and that credit contracts are enforced by a reliable legal system as it is the case in more advanced economies [Bester (1985); Stiglitz and Weiss (1986); Hubbard (1998); Freixas and Rochet (1997); Ndikumana (1999); Bulow and Rogoff (1989b)].³ In these economies, collateral is the central determinant of credit. Hubbard (1998), for instance, shows that the supply of funds increases with firms' net worth, a proxy for firms' collateralisable assets. The logic is that the threat of liquidating the collateral of a defaulting borrower minimises his opportunistic behaviour.

In Africa, the deficiencies of formal legal institutions (see table 2.1) limit the usefulness of collateral and formal credit contracts when a borrower defaults. Enforcing the collateral clause may be either impossible or too costly [see Daumont, *et al.* (2004)]. This is suggested by the finding that despite the high levels of default in Africa, there are very few cases of defaulting borrowers taken to courts [Bigsten, *et al.* (2000); Fafchamps (1996); Fafchamps and Minten (1999)]. McMillan and Woodruff (1999a) and McMillan and Woodruff (1999b) also document the case of Vietnam where disputes are settled outside the court system.

Even in societies with developed economic institutions, lenders shy away from using courts to settle business disputes. In a study carried out in the early 1960s, Macaulay (1963) shows that manufacturing firms in America seldom used the legal system to settle disputes

² Bigsten, *et al.* (2000) is one of the few who have recently studied the subject.

³ By modern forms of credit, we understand credit from formal banking institutions, as opposed to informal forms of lending which are not intermediated by formal banks.

with their clients. Hence, it has been acknowledged that markets cannot function without a minimum of ethics that cannot be codified into a contract. Arrow, quoted in Platteau (1994b: 756) argues “There is an element of trust in every transaction [and] it is not adequate to argue that there are enforcement mechanisms such as police and the courts that can guarantee a proper functioning of markets”.

The paper is organised as follows. Section 2 motivates the importance of thinking beyond collateral-based models of credit trade in Africa’s modern credit market. Section 3 reviews the main features of the literature on sovereign debt, given its similarities with domestic debt without collateral. Section 4 develops a simple model where credit is sustainable based only on information exchange between a lender and a borrower. Section 5 concludes.

2. Collateral and Reputation in Africa’s Credit Trade

2.1. Credit and Collateral

The conception that collateral is an effective security against default is based on two major implicit assumptions [Bell (1989)]. Firstly, when default occurs, banks can effectively repossess the collateral from a defaulting borrower through court action, if necessary. The second assumption is that collateral can be auctioned at reasonable transaction costs, using revenue from the sale to cover the (remaining) amount of the debt. Stiglitz and Weiss (1986: 106), for example, note that “increasing the collateral requirements induces individuals to undertake safer projects”. In the same vein, Bester (1985) argues that collateral is used as a sorting device, where high collateral is associated with low levels of adverse selection and moral hazard. Are these assumptions reasonable in Africa’s credit markets?

Cadwell and Meagher (1996: 2) propose four conditions that must be met to have a well functioning collateral system. These are: “(i) clear allocation of property rights; (ii) non-

arbitrary enforcement of contracts; (iii) functioning and non-corrupt courts and registries and other systems of notice; and, (iv) political environment that gives lenders faith that these arrangements will outlast the terms of the credit. These conditions are not met in many African countries where, as a result, good sources of collateral are scarce [Besley (1995)]. What are the problems?

Cultural and political factors may make it difficult to appropriate collateral when a borrower defaults. For instance, the limitations imposed by family or clan ownership of land, the most common form of wealth in many rural African societies, have been documented [Platteau (1994a)].⁴ In Kenya, for instance, local authorities such as Land Control Boards have the discretionary power to decide whether or not a borrower has to give up his assets when he has defaulted. Moreover, the Kenyan legal system is known to be prone to political influences. As a result, lenders may substantially rely on self-enforcement mechanisms when they give credit [Isaksson and Wihlborg (2002)].

Furthermore, pervasive corruption in a number of countries makes formal legal institutions unpredictable. For instance, if a borrower is a powerful politician or an investor with political connections, it may be difficult to prosecute him and eventually seize his property put up as collateral [Biggs and Srivastava (1996)]. Furthermore, in some countries including Senegal, the judicial system may protect defaulting borrowers because a number of judges are bad debtors themselves [Daumont, *et al.* (2004)].

Additional shortcomings in the judicial system may explain why most lenders in Africa prefer settling their disputes with borrowers out of courts even when it is costly to do so [Bigsten, *et al.* (2000); Fafchamps (1996)]. These include administrative delays, high legal

⁴ The cultural dimension is illustrated, for instance, when society protects a defaulting borrower from being put in “inhuman” conditions should his collateral be repossessed. In Burundi where most collateral is in the form of houses in which the defaulters and their families live, banks find it socially difficult to “throw” families in the street to appropriate the houses. In Kenya, lenders have failed to appropriate land put up as collateral because land is a cultural asset and society does not tolerate a bank evicting a client from his land when he defaults [Platteau (1994a)]. In this light, Besley (1995) argues that better land rights would increase access to credit.

fees, shortage of qualified judges, difficulty in obtaining legal information, the lack of a functioning cadastral information and corruption [Daumont, *et al.* (2004)]. In addition, high political uncertainty and high levels of economic control in many countries introduce institutional instability with a detrimental impact on intertemporal trade, including credit trade.

Even when collateral is successfully appropriated, it may prove difficult to liquidate for economic reasons. The absence or thinness of secondary markets in physical assets in most African countries makes real estate transactions highly personalised. When the collateral is eventually auctioned, potential bidders shy away from expressing their interest fearing to be seen as accomplices of the ‘silly bankers’. Furthermore, bank loan officers often lack incentives to appropriately monitor and deal with defaulting borrowers. Low motivation and sometimes incompetence of loan officers, coupled with corruption, often make it cheaper to corrupt a bank loan officer in charge of collecting your debt rather than let him take away your collateral.⁵

The combination of these factors raises lenders’ transactions costs. Collateral, in the end, becomes a worthless contract enforcement instrument in spite of the fact that it is part of the debt contract. Therefore, contract enforcement must be analysed within the wider context of prevailing economic, social, cultural and political institutions [Greif (1993)].

⁵ The managing director of Barclays Bank, Uganda, acknowledges the incentive problem albeit on a different point. He remarks that some valuers employed by banks to value property put up as collateral have a tendency to overvalue given that their fees are based on the value of the property [see UNCTAD (2002)].

Table 1: Regional Indices of Economic Institutional Performance

	Africa	Lat. America	ASEAN	OECD
Government repudiation of contracts (max=10)	4.8 (1.5)	5.7 (1.8)	6.9 (2.1)	9.0 (1.2)
Risk of expropriation (max=10)	5.6 (1.7)	6.2 (2.0)	7.4 (1.8)	9.3 (1.1)
Corruption (max=6)	2.7 (1.2)	2.9 (1.0)	3.1 (1.7)	5.2 (0.9)
Rule of law (max=6)	2.4 (1.1)	2.7 (1.3)	3.4 (1.5)	5.4 (0.9)
Bureaucratic quality (max=6)	2.5 (1.2)	2.3 (1.0)	3.2 (1.6)	5.4 (1.0)

Source: Computed by the author. Raw data is from University of Maryland. 2000. *State Failure Task Force (SFTF) Project*. Data file: Sort11v4.dat. The figures given are means and their respective standard errors in brackets. High values translate better performance.

Empirical findings on the role of collateral in Africa support the argument that it is not a useful contract enforcement device. In their analysis covering Ghana, Malawi, Nigeria and Tanzania; Aryeetey, *et al.* (1997) report that despite exceptionally high levels of collateral required on loans, formal lenders who enforce collateral agreements following default are rare.⁶ The authors argue that these exceptionally high ratios have little to do with the protection of lenders. Banks use them just to indicate that they satisfy government's banking regulations concerning portfolio risk profile.⁷ Isaksson and Wihlborg (2002: 98) also note that "the value of collateral against a loan can be seriously questioned" in the Kenyan context given the problems discussed above.

With respect to the limited number of defaulting borrowers taken to courts, Isaksson and Wihlborg (2002: 98) suggest it is due to "uncertain and costly legal processes involved" (p. 16). In the same connection, Fafchamps (1996: 5) notes that in developing countries, "the threat of court action is unlikely to perfectly deter opportunistic breach [of contract], either

⁶ Biggs and Srivastava (1996) report that the average ratio of collateral to debt is 6 in Kenya and 4 in Zimbabwe, very high levels by any standard.

⁷ It is also possible that collateral is used to signal good reputation. The signalling role of collateral is particularly important in high-risk credit markets. Similar to labour markets where workers over-invest in education to distinguish themselves from low performing candidates, good borrowers may also pledge exceptionally high amounts of collateral to distinguish themselves from bad borrowers. However, this signalling role is different from the security function of collateral, so high collateral does not necessarily mean better security for the lender.

because too many debtors are “judgement-proof” in the sense that they have insufficient assets to repay their debts; or because court action is too costly and unpredictable for a plaintiff to sue”. The author notes that in Ghana, not only do banks refrain from taking legal action against defaulting borrowers but as many as 85 percent of Ghanaian bank managers also accord fresh loans to defaulting firms to enable them restore their repayment capacity. This finding suggests that in practice, lenders put more emphasis on a borrower’s reputation than his collateral or the legal value of the credit contract.

Even in developed countries, the use of courts and other formal legal mechanisms is not necessarily the most rational way of settling business disputes. Warner (1977) provides an example in his study of the direct costs of corporate bankruptcy of railroad firms in America between 1933 and 1955. The use of lawyers, accountants, ‘expert’ witnesses and various other consultants by claimholders not only made the procedure too complex and long but also very expensive. Thirteen years were necessary, on average, to settle a bankruptcy case at an average cost of about \$ 2 million. The high costs and the delays could have been avoided if creditors had agreed to negotiate with their debtors. This was the strategy used by the American manufacturing firms studied by Macaulay (1963). Table 2 gives a five-country comparison of banking costs and other characteristics of the banking sector in Africa.

Table 2: Characteristics of the Banking Sector in Five African Countries

	Ghana	Malawi	Nigeria	Tanzania	Kenya
Licensed formal banking institutions (FBIs)	17	4	...	18	54
Total loans as % of GDP	9.1	4.2	...	3.3	31
Private sector credit to GDP (1987-92)	4.1	9.1	11.3	2.2	...
Bank lending to private sector in 93 (% total)	35.8	40.4	44.9	27.1	...
Loans and advances as share of assets of sector	0.3	0.2	...	0.2	0.5
Non-performing loans (% total loans)	20	7.7	...	7.9	20.5
Provisions as a share of non-performing loans	48.4
Adequate legal system protecting bank	no	no	...	no	no
Adequate legal provisions for company liquidation	yes	yes	...	yes	yes
Loan administration costs in 1991-93 (% loan)					
• Large-scale enterprises (> 30 workers)	...	17.6	18.9
• Small-scale enterprises	1.7	3.4	12.9	12.4	...
Average fixed deposit rate of FBIs*	15	10	7	8	17
Average lending rate of FBIs*	29	28	20	29	30
GDP deflator inflation rates*	13	13	10	19	15
Interest rate spreads*	14	18	13	21	13
Ratio of average spread to lending rate	0.5	0.6	0.6	0.7	0.4

Source: Compiled by the author based on information from Steel, *et al.* (1997); Mehran, *et al.* (1998) and World Bank (2000). The data refer to 1997 unless otherwise specified. * means data for Ghana is for 1991-93. The figures are indicative; some are unweighted averages.

The Table shows that Kenya has the largest credit market, with total loans representing 31 percent of GDP and 54 banks in operation. However, the country has also the highest proportion of non-performing loans estimated at 20.5 percent of total loans. By 2000, this proportion had increased to 35 percent. The high proportion of non-performing loans implies a high cost in terms of provisions for such loans, resulting in high interest rates. It is also clear that none of the five countries has an adequate legal system protecting banks.

Given the “residual imperfect information which is present in loan markets after banks have evaluated loan applications” [Stiglitz and Weiss (1981: 393)] how do banks cope with the problem of information asymmetry and the weak protection from legal institutions? This issue is the subject of the next section.

2.2. *Credit and Reputation*

Economists acknowledge the existence of “generalised morality” to highlight the importance of informal institutions or norms for economic outcomes. However, Granovetter (1985: 491) argues that trust in economic life is produced by social relations rather than institutional arrangements or generalised morality. Beside moral considerations underpinned by the concept of generalised morality, there are two main reasons why debtors choose to repay their debts. First, borrowers may reimburse out of the fear that defaulting would expose them to direct sanctions from their lenders [Bulow and Rogoff (1989b)]. Such sanctions could include account offsets, the confiscation of borrowers’ assets in the hands of the creditors and their associates, and other forms of harassment. Second, borrowers may repay in order to build and preserve a good reputation if the credit market attaches a high value to reputation.

Reputation is a crucial asset for any firm operating on a regular basis. Tadelis (1999: 548) remarks that “One of the [firm’s] more important [intangible] assets is the firm’s name, or actually the reputation conveyed by its name.” Holmstrom and Tirole (1989) also note that reputation constitutes the soul of the firm. “Establishing and nurturing a good reputation is of much strategic significance [because] the more faith the firm’s trading partners have in the firm’s ability and willingness to fill in contractual voids in a reasonable (efficient) manner, the lower the cost of transacting” (p. 76). Hence, borrowers’ attributes and the knowledge of these attributes by lenders are important for credit trade. Borrowers with a high reputation have an advantage over those without it in mobilising credit, even without the use of collateral.⁸

Reputation-based transactions relying on impersonal exchange relations have been credited with the expansion of trade in medieval times. Milgrom, *et al.* (1990) discuss how

⁸ In some settings, interest rates charged by lenders decrease as reputation increases. Alternatively, larger loans are given when reputation increases [see Diamond (1989); Martinelli (1997); McMillan and Woodruff (1999)].

one of the pillars of the merchant courts at Champagne fairs in the 12th and 13th century in France was the keeping of records relating to transactions, business disputes and their resolution. Among the roles of the courts was the use these records to ensure that only traders in good standing remained at the fair, building a reputation that attracted more and more traders. As a result of this vetting mechanism, transactions expanded even between anonymous traders.

In the same vein, Greif (1989) and Greif (1993) describe how Jewish traders known as the ‘Maghribi traders’ expanded their trade in the 11th century in the Mediterranean region by entrusting overseas agents with the handling of their goods. The use of agents increased the possibilities of trading in different overseas markets at the same time. This organisation resulted in large efficiency gains for traders and the expansion of commerce.

At the heart of this mechanism was the understanding that future employment of an agent rested on his past conduct. The agents who were considered cheaters were simply ostracised. As a result, the agents found it more rewarding to forfeit the current gain of cheating in order to develop and sustain a good reputation among the group of merchants. This system worked well. Cases of cheating were rare, despite very high incentives to do so. Indeed, it was tempting for an agent, using someone else’s capital from faraway markets, to disappear with the capital and use it for his own gain. On the contrary, it was by continuing to behave honestly, meeting the merchants’ expectations that the agents’ reputation increased and they could continue to work for more traders.

Reputation has value only when it is used. Following Hirschman (1984: 93), reputation is one of those resources “whose supply may well increase rather than decrease through use; [and] these resources do not remain intact if they stay unused; like the ability to speak a foreign language or to play the piano, these moral resources are likely to become depleted and to atrophy if not used”. Therefore, reputation requires time to build up and

needs to be 'seen' by business partners in order to have value. This is why reputation is expected to be correlated with a firm's age especially when the firm operates in the same business sector for a long time.

Contemporary scholars have also underscored the importance of reputation in economic transactions. They posit that as long as there is reciprocity of interests in long-term repeated transactions between a borrower and a lender, reputation alone can sustain a credit relationship. For instance, Binmore (1992: 347-48) notes that "Everybody understands that [such] self-policing or incentive-compatible arrangements are important in ordinary life ... It is certainly true that many more ongoing relationships between human beings are buttressed by a reciprocity understanding than is generally acknowledged."

In a theoretical model, Fafchamps (2002) shows how markets emerge from relational contracting and how trust and reputation alone can sustain them. Fudenberg and Tirole (1991) also discuss extensively how reputation effects can be used to police long-term contract relationships. More examples where reputation plays an important role are discussed in the remaining part of the paper.

In the light of the preceding discussions, whether borrowers pay their debts to build and preserve their reputation or to avoid direct sanctions is a matter for empirical research. The next section reviews briefly the literature on sovereign debt and enforcement of such debt contracts given the similarity with domestic private debt without collateral.

3. Enforcement of Sovereign Debt Contracts

For the last two decades, economists have been debating the reasons why countries pay back their debts. The argument is that since sovereign debt is, by definition, a debt without collateral, a country could easily renege on its obligations without exposing itself to retaliatory consequences. For this reason, contract enforcement of sovereign debt was

traditionally modelled based on the reputation argument. The seminal paper by Eaton and Gersovitz (1981) argued that countries reimburse their loans in order to keep their reputation intact, allowing them to preserve access to future lending. This view remained unchallenged until Bulow and Rogoff (1989b) published a theoretical model showing that reputation could not explain why countries pay back their debts. Instead, they demonstrated that countries might reimburse to avoid penalties from their creditors. Bulow and Rogoff (1989a) illustrated this view with casual examples of instances where direct sanctions were used by lenders to punish defaulters.

Most recently, Cole and Kehoe (1998) have revived the debate by distinguishing between partial and general reputations. Their conclusion confirms that Bulow and Rogoff (1989b) result holds in a partial reputation model where reputation in the credit arena does not have any impact on other relationships the country is involved in. However, in their model of general reputation, Cole and Kehoe show that if reputation-- or its lack-- in the credit relationship has implications on other sectors where trust is important, then sovereign debt can be supported by reputation alone. Given that a debtor country is usually involved in multiple relationships with its creditors, including trade, aid and diplomacy, the general reputation argument seems more appropriate.

Empirical econometric analysis of developing countries' sovereign debt by Ozler (1993) and evidence on US states' sovereign debt in the 19th century by English (1996) provide conclusive evidence: reputation played a significant role not only in increasing access to future lending but also in decreasing the cost of borrowing by non-defaulting states. Both authors insist that they found no evidence that direct sanctions contributed to the different states' repayment performance.

Well documented evidence provided by English and the rigorous econometric analysis carried out by Ozler spanning two centuries and covering about 60 countries,

including 21 African countries, support the reputation argument more convincingly than the casual examples of sanctions given by Bulow and Rogoff (1989a). Indeed, the latter do not pretend to have “killed” the partial reputation models in explaining sovereign debt as Cole and Kehoe (1998: 57) suggest. Bulow and Rogoff admit that empirical research is needed to determine whether it is direct sanctions or reputation factors that underpin sovereign debt; this is exactly Ozler and English contribution.

The controversy surrounding the role of reputation in credit markets is a reflection of the problem posed by modelling reputation in a game theoretic framework. This difficulty is stressed by Masso (1996: 69) who recognises that “the difficulties of modelling reputation as equilibrium behaviour in a game-theoretic context seem rather deep: reputation is a subtle phenomenon very sensitive to different alternative modelling decisions.” In this context, our contribution should be seen not as a definitive response to the intractable problem of modelling reputation, but rather as an attempt to understand how African credit markets overcome the problem of collateral discussed earlier.

Although models of sovereign debt provide interesting insights, there is a major difference with Africa’s credit markets. Ability to reimburse is not an issue in the case of sovereign debt since a country’s debt is usually a small proportion of its wealth. This is not the case with domestic credit. A firm's debts may be well over its net worth. Nevertheless, credit without collateral and sovereign debt share two characteristics. The first is that collateral does not play a significant role in both markets. Second, in both cases, debts are usually renegotiated when a debtor defaults. Lenders usually renegotiate when faced with borrowers who are willing but incapable to reimburse. Steel, *et al.* (1997) and Fafchamps (1996) suggest that the high rates of default in Africa are not just due to unwillingness but also to inability to repay.

There are two assumptions of the sovereign debt literature that may not fit the domestic credit context. First, domestic credit trade is characterised by asymmetric information between lenders and borrowers whereas sovereign debt models ignore asymmetric information [Bulow and Rogoff (1989b), Bulow and Rogoff (1989a); Fernandez and Rosenthal (1990)]. Bulow and Rogoff (1989b: 48) acknowledge that their model “does not apply directly to the case where lenders cannot directly monitor the country's actions.” Second, Bulow and Rogoff (1989b) assume that a country that defaults can still earn the market rate of return by investing in foreign interest bearing assets. However, explicitly or implicitly, the rest of the literature assumes that a country that defaults cannot save [Cole and Kehoe (1998)].

In the light of these discussions, African formal credit markets may be characterised as follows. Firstly, weak and unpredictable legal institutions make collateral a poor enforcement instrument. Secondly, when borrowers are unable to repay, lenders usually prefer to reschedule the debts instead of suing the debtors. Thirdly, severe information asymmetries resulting from the absence of credit rating agencies, and high screening costs due to adverse selection and moral hazard increase the risk and transactions costs in credit trade.

The result is that ‘clientelisation’ is used as a communication channel to reduce search costs [Geertz (1978)]. Obviously, the tendency to limit trade to a small group of clients narrows the credit market [Bose (1998)]. Fourthly, a borrower who defaults cannot save and earn the market rate of return.⁹ This characterisation shapes the model presented in section 4.

⁹ This is a direct consequence of two factors: (i) financial repression and collusive practices of formal financial institutions in Africa; (ii) the limited number of financial instruments a defaulting borrower can purchase within the country, given the thinness of the financial sector and the controls on external resource transfers that limit investment in foreign assets [Ncube and Senbet (1997); Soyibo (1997)].

The scant empirical data on African formal credit markets suggests that it is reputation rather than direct sanctions that sustains credit. Reputation, built through a sustained long-term and repetitive interaction with a lender, might be even more important in formal than informal African credit markets. In informal markets, lenders know their clients personally and monitor them regularly at low cost, reducing information asymmetry to a minimum. However, in formal credit markets having such extensive information and monitoring would be too costly so information asymmetries are more acute.

Aryeetey and Udry (1997: 16) suggest that Africa's formal credit trade depends on reputation. They note that that "Whereas banks depended heavily on a client's track record and continuing relationship, consistent with game theory concerning repetitive interactions, the informal lenders surveyed appeared largely indifferent between new and repeat borrowers..." The authors also report that they did not find any evidence of aggressive contract enforcement, casting some doubt on the relevance of the direct sanctions hypothesis.

On the question whether or not defaulting borrowers can reinvest, the lack of appropriate empirical evidence does not allow to make a definitive judgement. However, the way financial institutions work in Africa suggests that defaulters may find it difficult to reinvest except those who are too powerful to be prosecuted.¹⁰ This is suggested by Ncube and Senbet (1997: 81) who underscore that banks in Africa collude to extract maximum rents from their customers: "Since the bank is the only source of lending the firm has no choice but to share the profits with the bank to ensure continued lending... in Zimbabwe banks had

¹⁰ Collateral from such clients would not play its normal role of protecting the lender, anyway.

a tendency to collude rather than compete ... So a borrower who is rationed by one bank cannot obtain credit from another bank”.¹¹

Soyibo (1997: 113) also finds that although Zaire (currently DRC) and Zambia have fairly profitable banking systems with a fair number of institutions, they operate as cartels. Even Kenya, despite having one of the highest numbers of formal financial institutions in Africa, has a highly concentrated banking sector. In 1983, almost 80 percent of all branches in the country belonged to four banks, namely the Kenya Commercial Bank, Barclays Bank, Standard Chartered and the National Bank of Kenya. There is no evidence that this picture has now significantly changed.

In addition, empirical data in Africa show that the lender-borrower relationship tends to be more exclusive than diversified. Most small and medium-size firms usually deal with only one formal lender, suggesting that they value exclusive long-term relationships. Collier and Gunning (1999) also note that the lack of modern contract enforcement institutions in Africa restricts business to only long-standing clients.

This evidence justifies the hypothesis that defaulting borrowers cannot reinvest to earn the market rate of return, contrary to Bulow and Rogoff central hypothesis used to reject the reputation hypothesis.¹² Hence, we show that if defaulters cannot reinvest, reputation can sustain high levels of debt. The model of credit enforcement we propose is

¹¹ Although some countries have developed informal lending mechanisms, evidence shows that their resource base is more limited than that of the formal banking sector. Their capacity to compete with formal banks in mobilising funding and lending to large borrowers is limited.

¹² Mechanisms are put in place to minimise the possibility that borrowers default and run away to open businesses under different names. In Burundi for instance, markets are so thin that they tend to be highly personalised so it is difficult to hide. If the investor wants to deal with banks or borrow again, he has to produce information on his liabilities with all financial institutions to prove that he has not defaulted with other banks. A list of major defaulting borrowers is kept updated at the central bank and every commercial bank is required to consult it before giving loans larger than some limit. Platteau (1994a: 565) reports a similar system in Belgium and notes that “the very fact of having their names [thus] publicised presumably prompts many potential cheaters to meet their obligations or to try and find an arrangement with the creditor.” He also draws attention to “information networks that banks maintain among themselves to keep record of all customers who default on loans taken from any of them.”

one explanation, possibly among others, why credit markets can be sustained without any formal external agency to enforce them.¹³

Existence of reputation equilibrium is known to be dependent on the information structure of the game. However, “when reputation is difficult to build and maintain (and hence when it is easy to lose), reputation equilibria seem more likely to exist” [Masso (1996: 68)] and enable some otherwise impossible transactions to take place [Kreps (1990: 766)]. This should be especially the case in underdeveloped economies characterised by high agency costs [Bernanke and Gertler (1989)]. As a result, rational players are interested in long-term trading because “The presence of myopic types in the population gives patient players a scarcity value ... a player who loses a non-myopic partner will find it somewhat difficult to find a new one” [Ghosh and Ray (1996)] so long-term credit relationships reduce the cost of trading [see also Geertz (1978)].

4. A Simple Model

This section presents a general description and assumptions of the analytical framework before deriving equilibrium payoffs both under full and asymmetric information.

4.1. *Assumptions and General Description*

The credit relationship is a three-stage game repeated infinitely (see figure 1).¹⁴ There are two agents in the credit market: a borrower (firm) and a lender (bank).¹⁵ The borrower needs

¹³We do not pretend that social norms or generalised morality [Granovetter (1985)] are not important determinants of repayment rates [see also Ngaruko (1999)]. Repayment rates may be also based on ‘anomalies’ rather than rational factors. Camerer and Thaler (1995) show that experimental results based on ultimatum and dictator games produce ‘anomalies’ (empirical results that are difficult to “rationalise” or which need implausible assumptions to explain within the paradigm) that do not conform to the maximisation principle. Noting the importance of “manners and etiquette” in some areas of economic decision making, they conclude that “attribution theory”, a psychological theory that describes how people attribute cause to events and how this influences people's reactions to events, should be incorporated into economic analysis to help understand a number of “anomalies.”

¹⁴ Infinity should be understood in terms of the game’s end being stochastic [Tirole (1995); Diamond (1989)].

capital K in each period to finance an investment project. He approaches the lender to mobilise these funds. The bank chooses to either give the loan or refuse. Its strategy set is $S_i = (-K, 0)$. The borrower does not have resources of his own¹⁶ so if the bank refuses to lend an amount exactly equal to K , the entrepreneur fails to invest and there is no credit relationship. If the bank lends, the borrower invests in a project that yields gross expected output $y_t = (1 + \theta)K$, where θ is the expected rate of return.¹⁷ It is assumed that y_t is a function of the level of effort exerted by the borrower. He enters into a debt contract with the bank and promises to pay $d = (1 + r)K$ after one period, where r is an exogenously determined interest rate.¹⁸ It is assumed that the contract is governed by limited liability provisions.

The fact that the borrower privately controls the decision over the actual level of effort e to exert creates an incentive problem. However, even if e were observed by both players, it may not be verifiable. In this case, even a properly functioning legal system would not be able to enforce a contingent credit contract [Bolton and Scharfstein (1990); Bulow and Rogoff (1989a)].¹⁹ Therefore, the design of contracts must rely on *reputation* and incentive-compatible mechanisms.²⁰ In other words, the contract must be designed in such a way that the payoff from opportunistic default is lower than the payoff from cooperation.

It is further assumed that the borrower does not accumulate savings and that both the borrower and the lender have positive consumption such that the loan and the debt are

¹⁵ Lender and bank, and borrower, firm, or entrepreneur, are used interchangeably. On the relevance of the “single, representative, investor-entrepreneur pairing” in a competitive economy, see Gale and Hellwig (1985). The ‘exclusive’ relationship in our case is also justified due to oligopoly or ‘cartelisation’ of the banking sector.

¹⁶ In Gale and Hellwig (1985) model, the entrepreneur contributes a portion of the investment. The two cases are qualitatively similar.

¹⁷ We assume that the firm incurs only financial costs.

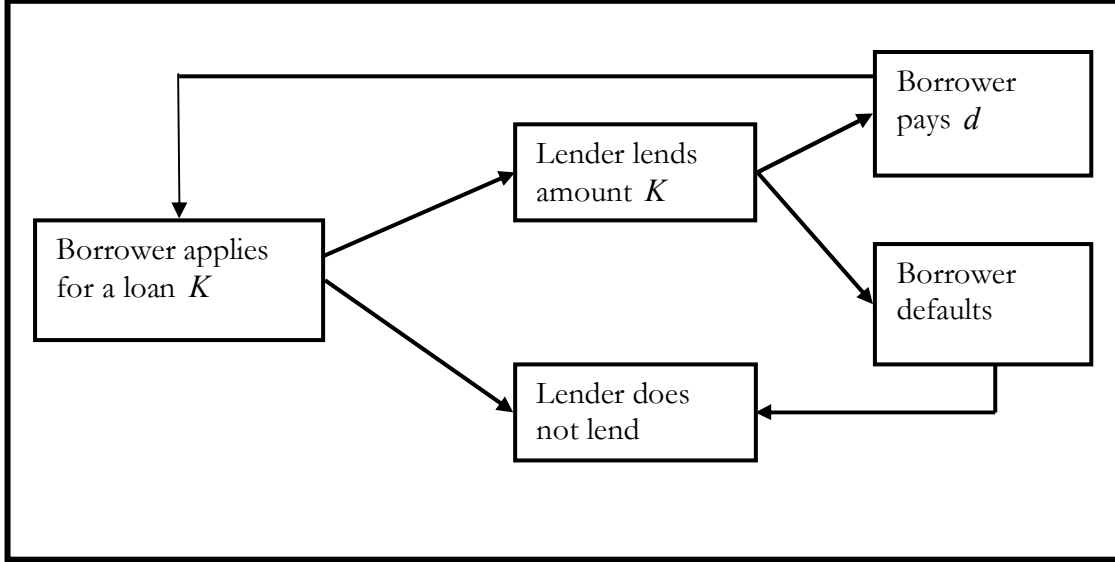
¹⁸ Diamond (1984) has shown that debt contracts are optimal when debtors can only be imperfectly monitored. However, as empirical results have shown, most credit contracts in African economies are entered into as debt contracts but executed as contingent contracts [Collier and Gunning (1999)].

¹⁹ Jaffee and Russell (1976) show how uncertainty and asymmetric information lead to credit rationing.

²⁰ Fudenberg and Tirole (1991) have an extensive theoretical treatment of reputation effects. Green and Porter (1984) and Kreps and Wilson (1982) use the concept of reputation to model firm entry and exit.

bounded at zero from below. Both the borrower and the lender are risk neutral and aim to maximise their discounted expected payoffs. Figure 2.1 presents the structure of the game.

Figure 1: The Credit Game Tree



The sequence of the game is as follows. In period $t-1$, a borrower applies for a loan of size K . If the loan is given, the borrower is able to invest. Investment matures after one period, producing output $y_t(e)$, a function of effort. The borrower decides to default or pays the lender $\pi^L = (1+r)K = d$. He keeps $(\theta-r)K$ that he consumes in the same period. The borrower re-applies for another loan K in the next period and the cycle goes on.

After a basic screening mechanism [see Ghosh and Ray (1996)], the problem facing a lender is whether the borrower is good enough to turn the investment into a fruitful project, given the prevailing and expected economic conditions. This information is contained in the project's expected rate of return θ . The net profit function of the borrower can be written as:

$$\pi = K(1+\theta) - K(1+r) = K(\theta - r) \quad (1)$$

As in Holmstrom and Tirole (1997) we assume that default is due to moral hazard: a borrower may decide to shirk, in which case the project returns a payoff that is lower than

that of a diligent borrower.²¹ Hence, the rate of return θ is attained with probability $0 < \gamma < 1$. Shirking results in the freezing of future loans for a period T which is long enough to inflict a net loss to the defaulting borrower but not too long to hurt the lender [see Tirole (1995)]. As Fudenberg and Maskin (1986) put it, punishers should punish only when it is in their interest to do so. In this model, we treat the problems of moral hazard and contract enforcement simultaneously given their relatedness [Ghosh, *et al.* (2001)].

Equilibria:

We distinguish different equilibria depending on whether the credit relationship is static or repeated. An opportunist borrower defaults early in the relationship whereas a diligent and honest borrower has an incentive to play repeatedly. We use the concept of sequential equilibrium developed by Kreps and Wilson (1982). They show that even in finite but repeated games, provided there is a “high enough probability of at least one more repetition” or when “there is some uncertainty about the motivations of one or more of the players” (p. 275), reputation effects have an important impact on the play of the game. The concept of sequential equilibrium has the same properties as the Perfect Bayesian Nash Equilibrium but the former imposes an additional restriction on the latter by requiring that even strategies off the equilibrium path be optimal.

Sequential equilibrium imposes the restriction that players’ strategies are optimal for the remainder of the game given the opponent’s hypothesised future moves and given all past moves by other players and by nature.²² The credit game is in sequential equilibrium if the strategy of the lender is optimal given past information on the borrower’s strategies

²¹ On the general use of shirking to conceptualise moral hazard, see Mas-Colell, *et al.* (1995).

²² The dynamic aspect of equilibrium in dynamic games distinguishes the equilibrium concept from a static optimisation problem.

(reflected in his reputation), economic conditions (captured in the rate of return) and the most likely strategies of the borrower in future periods.

4.2. *Lending in a One-period Game*

The problem of asymmetric information in lending raises two different issues. The first is the well-known problem of moral hazard. The lender does not know whether or not the borrower will work hard to make the project successful and be able to pay back the loan. The second problem is that of honesty. The borrower may decide not to pay back even when he has successfully run his project. The borrower's strategy, given his type, is summarised in the first proposition:

Proposition 1: *In a one-period game, repayment is an equilibrium strategy if the level of effort required to make the project successful is lower or equal to e^* , the reservation effort level.*

Proof: When the borrower does not shirk the parameter on which credit is based is the expected rate of return. The project K is funded only if the expected rate of return is greater than the interest rate demanded by the lender. Therefore, the lender's participation constraint is given by:

$$\alpha = \frac{1+r}{1+\theta} \leq 1 \quad (2)$$

Introducing moral hazard, the expected net payoff of the project when the borrower shirks is:

$$\pi_S = \gamma[K(1+\theta) - K(1+r)] = \gamma[K(\theta - r)] \quad (3)$$

If the borrower is diligent, the expected net payoff is:

$$\pi_D = K(1+\theta) - K(1+r) - e \quad (4)$$

where e is the cost of effort required to make the project successful, with $e > 0$. Diligence is an equilibrium strategy only if the cost of effort is low relative to γ such that $\pi_D \geq \pi_S$. The lender will require the level of effort that is incentive compatible with diligence. Equating (3) and (4) and solving for e , the incentive-compatible equilibrium effort level is:

$$e^* = (1 - \gamma)(\theta - r)K \quad (5)$$

Equation (5) means that e^* is the maximum effort level a borrower is willing to exert. However, there is a minimum effort level \bar{e} necessary to make the project successful. As long as $\bar{e} \leq e^*$, the borrower will choose to work to reimburse his loan. Low incentive compatible levels of effort are associated with low repayment probabilities and vice versa.²³ A low γ increases the incentive-compatible effort level so it increases shirking. Equation (5) shows also that high lending costs encourage shirking. **QED**

4.3. Lending in a Two-Period Game

When the credit relationship is renewed once, the strategy of the borrower depends on both current and next period payoffs.

Proposition 2: *In a two-period game, the threat of losing access to lending in the next period induces an opportunist borrower to cooperate in the first period.*

Proof: A borrower who reimburses his loan in each period has the following net profit function:

$$\pi_D^{(2)} = K(1 + \theta) - K(1 + r) - e + \delta[K(1 + \theta) - K(1 + r) - e] \quad (6)$$

²³ In the last part of the model, we do not solve for e^* but for $\bar{\pi}$, the borrower's reservation payoff that is incentive-compatible. The two are equivalent in the sense that if repayment requires a high level of effort, it means that the corresponding minimum level of payoff inducing repayment is also high.

where δ is the discount factor capturing the impact of time preference, $0 < \delta \leq 1$. The superscript on $\pi_D^{(2)}$ means two-period payoff. A borrower who shirks in the first period of a two-period game has the same net payoff as in (3) since he doesn't get any funding in the second period:

$$\pi_S^{(1,2)} = \gamma K(\theta - r) \quad (7)$$

where the subscript $\pi_S^{(1,2)}$ indicates the payoff of the first period in a two-period game. A borrower who shirks in the second period of a two-period game has the following payoff:

$$\pi_S^{(2)} = K(1 + \theta) - K(1 + r) - e + \delta\gamma[K(1 + \theta) - K(1 + r)] \quad (8)$$

For a borrower envisaging defaulting in the first of a two-period game, the equilibrium level of effort is:

$$e^{(1,2)} = \left[\frac{(1 + \delta - \gamma)}{1 + \delta} \right] (\theta - r) K \quad (9)$$

where $e^{(1,2)}$ is the level of effort in the first period of a two-period game. This equilibrium level of effort is strictly higher than e^* in equation (5) so he is willing to exert more effort.²⁴

Hence, a borrower expecting funding in the second period is willing to exert a high level of effort to reimburse his loan in the first period. Therefore, the dynamic nature of the relationship helps discipline a borrower who would otherwise default in a one-shot game.

What about a borrower who cooperates in the first period but defaults in the second period? Comparing equations (6) and (8), the condition that cooperation is an equilibrium strategy is given by:

$$e^{(2,2)} = K(\theta - r)(1 - \gamma) \quad (10)$$

²⁴ Dividing both (5) and (9) by $(\theta - r)K$ reduces the comparison to $1 - \frac{\gamma}{1 + \delta}$ in (9) and $(1 - \gamma)$ in (5). So, because δ is strictly greater than zero it is clear that (9) is greater than (5).

The incentive compatibility constraint in (10) is exactly equal to the one derived in the case of a one-period game given in equation (5). This is because in the second period, the game becomes a one-shot game if it is common knowledge that there will be no third period. Hence, a profit maximiser borrower will choose to cooperate in the first period to feign that he is honest and shirk in the second period when the threat of cutting credit is no more credible. The central result is that repeat lending disciplines a borrower who would otherwise default in a one-shot game. It is this process of reputation building that makes a dynamic game worthwhile.

Definition: *A borrower's reputation is given by the lender's belief or subjective probability μ that the borrower is honest and works hard to pay his debt. The lender learns about a borrower's reputation through repeated interaction and the value of reputation μ is updated according to Bayes' rule, whenever possible.*

A lender estimates the value of μ based on the borrower's track record. Modelling beliefs is a contentious issue in game theory. However, Harsanyi (1967) reminds us that beliefs are probabilities and that probabilities are based on available information. Paraphrasing Harsanyi (1962: 38), the lack of belief in the borrower's willingness to keep explicit agreements and/or tacit understandings, in particular in cases where no independent agencies exist to effectively *enforce* (Harsanyi's emphasis) agreements leads to mutual *distrust*. No credit trade is possible in such circumstances.

In a sequential equilibrium, the lender uses the borrower's past behaviour to update his belief on the borrower's current and future behaviour. Using the two-period game above, there are three possible strategies: (i) pay in the first and second period; (ii) pay in the first period but default in the second; and, (iii) default in the first period and be punished in the second. Assuming that reputation μ follows a Markov chain, the three strategies can be summarised in the following transition matrix:

$$M = \begin{bmatrix} \mu_1 & 1 - \mu_2 \\ 1 - \mu_1 & \mu_2 \end{bmatrix} \quad (11)$$

where the two columns are the first and second periods and the subscripts represent the periods. As the probabilities in the diagonal reflect the case when the borrower pays in both periods, additional information collected on the borrower implies that $\mu_1 \leq \mu_2$ and $(1 - \mu_1) \geq (1 - \mu_2)$. On this basis and following Kreps and Wilson (1982), a borrower's reputation in period two is:

$$\mu_2 = \frac{\mu_1}{\mu_1 + (1 - \mu_1)\sigma_1} \quad (12)$$

where σ_1 is the probability that an opportunist can pretend to be a diligent borrower. In other words σ_1 is the probability of a pooling equilibrium. This probability captures the fact that in the first stages of the interaction, reputation is measured with noise. From the formulation in equation (12), reputation in any given period is an increasing function of past reputation ($\frac{\partial \mu_2}{\partial \mu_1} > 0$) and a decreasing function of the capacity of the opportunist borrower

to mimic a diligent borrower ($\frac{\partial \mu_2}{\partial \sigma_1} < 0$).

4.4. *A Generalised Repeated Lender-Borrower Game*

In order to present a generalised version of the game, it is more convenient to derive the borrower's incentive compatible reservation payoff instead of his level of effort. The two are equivalent. A high reservation payoff has the same interpretation as a low incentive compatible level of effort (see Equation (4)). Given the equilibrium concept of sequential optimality, we may derive the borrower's lifetime income depending on his current status,

whether he is in a credit relationship or in a punishment phase. These value functions simplify the notation.²⁵

Let W_p be the borrower's expected lifetime income if he is currently in punishment, and let W_R be a borrower's expected lifetime income if he is currently in a credit relationship. Let W_R^{in} and W_p^{in} be the value functions of a borrower who is in a credit relationship and who will remain there in the next period; and a borrower who is in a credit relationship but who defaults in the next period, respectively. We assume that the payoff outside the credit relationship is $W^{out} = 0$. Based on the transition matrix (11), there are three probabilities associated with three states characterising a borrower's position at any time. A borrower may be in a credit relationship in period t and pay in period $t+1$ with probability μ_2 . The borrower may be in a credit relationship in period t but defaults in period $t+1$ with probability $1 - \mu_2$. Finally, the borrower could be in a punishment phase in period t and rejoin the credit market in period $t+1$ with probability μ_1 .²⁶

4.4.1. On Credibility of 'Threats'

Central to reputation contracts is the concept of punishment. The basic reason a self-interested long-term borrower pays his debt is because default is costlier than cooperation. Hence, for reputation equilibrium to hold, the threat of punishment must be credible. Without such a credible threat, there can be no reputation and hence no intertemporal trade. This sub-section discusses and proves this claim.

²⁵ Comparable functions are used in Davidson, *et al.* (1998) study on trade and unemployment.

²⁶ Because the game is dynamic, it is not sufficient to describe a borrower's strategy in period t only. Paying one's debt in the current period does not guarantee payment in the next period. The case of a borrower currently in punishment and who remains in punishment in the next period is analytically uninteresting since there is no credit transaction taking place.

Proposition 3: *The threat of punishment of opportunistic behaviour must be credible for credit trade to be sustainable. That is $\mu_1 \rightarrow 0$.*

Proof: The current asset value equation for a borrower in a punishment phase is:

$$\delta W_P = \mu_1(W_R - W_P) \quad (13)$$

The impact of punishment, especially its length, is captured by both μ_1 and the values of W_R and W_P .²⁷ It is clear that $W_R - W_P$ is the gain accruing to the borrower if lending resumes so this gain must be weighted by the probability that the borrower is reintegrated in the credit market. For a borrower currently in a credit relationship but entering a punishment phase in the next period, his current asset value equation is:

$$\delta W_R = K(\theta + 1) - (1 - \mu_2)(W_R - W_P) \quad (14)$$

$W_R - W_P$, the potential loss when lending stops, is weighted by the conditional probability $(1 - \mu_2)$ that lending actually stops. Computations and substitutions based on equations (13) and (14) yield the following discounted values:

$$\delta W_P = \frac{\mu_1(\theta + 1)K}{\delta + \mu_1 + (1 - \mu_2)} \quad (15)$$

$$\delta W_R = \frac{(\delta + \mu_1)(\theta + 1)K}{\delta + \mu_1 + (1 - \mu_2)} \quad (16)$$

A borrower who can default and borrow again the next period without punishment has $\mu_1 = 1$. Substituting this value in equation (13) and adding the instantaneous gain of the

defaulting borrower yield $W_P = \frac{(\theta + 1)K + W_R}{1 + \delta}$. In equation (14), $\mu_2 = 1$ gives the upper

limit of δW_R : it is the maximum expected present value of a player who never defaults.

²⁷ The origin of the threat is irrelevant. Whether punishment comes from the lender or from a third party, if it is credible, has the same effect on the borrower.

Substituting this value in the same equation returns $W_R = \frac{(\theta+1)K}{\delta}$. Substituting W_R in W_P yields $W_P = W_R = \frac{(\theta+1)K}{\delta}$ implying that any small probability of default generates values of δW_R that produce $W_R < W_P$. The result that W_R can be, at best, equal to W_P or, put differently $W_R \leq W_P$, means that the borrower would always default. The implication is that the credit market would not be sustainable. Hence, it is only when the threat of punishing opportunistic behaviour is credible that a credit market can be sustained.²⁸ **QED**

Corollary: For $\delta > 0$ default is never an equilibrium strategy.

Proof: Dividing equations (15) over (16):

$$\frac{W_R}{W_P} = \frac{\delta + \mu_1}{\mu_1} \quad (17)$$

where $\frac{W_R}{W_P} > 1$. Hence, the lifetime income of a borrower who does not default is always greater than that of one who defaults. **QED**

4.4.2. Reputation and Incentive Compatible Credit Contracts

Having shown that the threat of punishment of opportunistic behaviour must be credible, the last sub-section derives the conditions under which reputation enforces a credit contract.

²⁸ There are several examples of non-credible threats that have led to credit crises. A recent example is the banking crisis in Uganda where influential Ugandans, including politicians and their families as well as senior bank executives engaged in large borrowings from commercial banks and defaulted without fear of prosecution. It is relevant to note that many of these borrowers defaulted on several loans. Their defaults led to a banking crisis in which five commercial banks collapsed in about one year between September 1998 (International Credit Bank) and 24 November 1999 (Trust Bank Uganda Limited). Other banks that collapsed during the period were Greenland Bank in 1998, Co-operative Bank, one of the country's oldest banks with 30 agencies across the country, in April 1999, and Uganda Commercial Bank [see Habyarimana (2003)].

Reputation sustains a credit market if the credit contract is incentive-compatible; that is only when:²⁹

$$W_R^{in} \geq W_P^{in} \quad (18)$$

The problem, therefore, amounts to deriving the payoffs meeting the incentive-compatibility constraint. Specifying inequality (18), the payoff functions are:

$$W_R^{in} = K(\theta - r) + \delta W^{in} \quad (19)$$

$$W_P^{in} = K(\theta + 1) + \delta(1 - \mu_2)W^{in} \quad (20)$$

A rational borrower chooses the strategy that maximises his discounted expected payoff:

$$W^{in} = \max [W_R^{in}, W_P^{in}] \quad (21)$$

A reputation-based credit contract must promise a borrower his reservation payoff to induce him to cooperate. This leads us to proposition 4, the most important result of the model.

Proposition 4: *In an infinitely repeated credit relationship, reputation sustains credit trade if the borrower's payoff is higher or equal to a reservation payoff: $\bar{\pi} = \frac{(1 - \delta)(\theta + 1)K}{\mu_2}$.*

Proof: For the credit game to be in equilibrium inequality (18) must be set to equality.

Hence, $K(\theta - r) + \delta W^{in} = K(\theta + 1) + \delta(1 - \mu_2)W^{in}$. Since reputation implies cooperation,

$W^{in} = W_R^{in}$ in equation (21). Hence $K(\theta - r) + \delta W_R^{in} = K(\theta + 1) + \delta(1 - \mu_2)W_R^{in}$. Substituting

equation (19) into this equality and solving for W^{in} we derive the equilibrium value function:

$$W^{in} = \frac{[(1 + \delta\mu_2)(\theta - r) - (\theta + 1)]K}{\delta^2\mu_2}. \quad \text{Given that } W^{in} = W_R^{in} \text{ it follows that}$$

$W_R^{in} = (\theta - r)K + \delta W_R^{in}$ and $(1 - \delta)W^{in} = (\theta + r + 2)K$. Substitutions and simplifications

yield $\mu_2(\theta - r)K = (1 - \delta)(\theta + 1)K$. By equation (1), we know that $(\theta - r)K = \pi$. Hence, we

²⁹ For the knife-edge case where default and cooperation yield the same payoff, we assume the borrower will cooperate.

reach our final result that $W_R^{in} \geq W_P^{in} \Leftrightarrow \bar{\pi} \geq \frac{(1-\delta)(\theta+1)K}{\mu_2}$. Therefore, a credit contract is

in reputation equilibrium if:

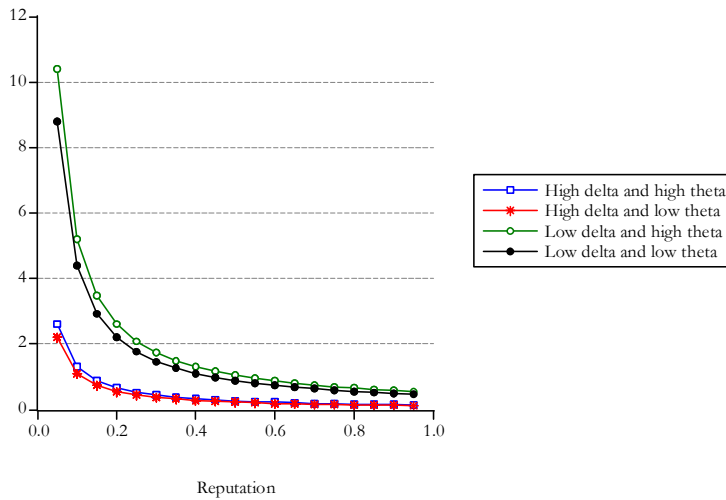
$$\bar{\pi} = \frac{(1-\delta)(\theta+1)K}{\mu_2} \quad (22)$$

QED

4.4.3. An Example and the Limiting Properties of Reputation Equilibrium

In the following Figure, we plot $\bar{\pi}$ as a function of μ_2 using hypothetical values of δ and θ . Capital K is normalised to 1. The lowest two curves in the bottom of the graph represent the case where δ is high. The first is the case where both δ and θ are high, taking values 0.9 and 0.3, respectively. The second function plots the case where δ is high but θ is low with values 0.9 and 0.1, respectively. The remaining two functions are cases where δ is low. The function on the top represents the case where δ is low with value 0.6 and θ is high with value 0.3. Lastly, we have the case where both δ and θ have low values, 0.6 and 0.1, respectively.

Figure 2: Simulated $\bar{\pi}$ Functions



The Figure illustrates some important aspects of the model. Firstly, all $\bar{\pi}$ functions have the same shape showing a decrease in the borrower's reservation payoff as his reputation increases. The drop is steeper in the first stages of reputation building and it flattens over time. Secondly, at a given level of reputation, the discount factor seems to have the most important impact on $\bar{\pi}$ while the impact of the expected rate of return is much lower. The curves where δ and θ are both high and where δ is high but θ low almost coincide. The implication is that both the discount rate and the level of reputation are more important in determining whether or not a borrower is expected to reimburse his debts, and hence get a further loan, than the expected rate of return of the project. This contrasts with the classical literature where the key determinant of funding is a project's rate of return. It is also relevant to analyse the first-order conditions from equation (22) and their limiting properties.

$$\frac{\partial \bar{\pi}}{\partial \mu_2} < 0 \quad (23)$$

$$\frac{\partial \bar{\pi}}{\partial \delta} < 0 \quad (24)$$

The result in (23) shows the direct impact of reputation on credit trade. The higher a borrower's reputation the lower is his incentive-compatible payoff. In other words, lenders know that a borrower with high reputation has a low reservation payoff that induces him to reimburse so the probability of lending is high. Also note that:

$$\lim_{\mu_2 \rightarrow 0} \bar{\pi} = \infty \quad (25)$$

Since there can be no effort level yielding: $\bar{\pi} = \infty$, the implication is that there is no credit trade without some level of reputation.

Equation (24) gives a similar result. A long period of interaction gives a diligent borrower an opportunity to signal his good type resulting in a separating equilibrium where

$\mu_2 \rightarrow 1$.³⁰ The reservation payoff that enforces the credit contract in long-term credit trade is lower than the level required in one and two-period interactions. To show this, we take the limiting case where $\delta = 1$ and $\mu_2 = 1$:

$$\lim_{\delta \rightarrow 1} \bar{\pi} = 0 \quad (26)$$

For comparison, the level of profitability required for a borrower to cooperate in the static game is $\gamma K(\theta - r) > 0$ since $0 < \gamma < 1$ and $\theta > r$ by assumption. The result in (26) confirms that in an infinitely repeated game or a game with a stochastic end, the reputation equilibrium is always achievable as any effort level is compatible with $\bar{\pi} = 0$.

This result may explain the ‘surprising’ empirical regularity showing the stock of unpaid debt positively correlated with the issuance of fresh debt in developing economies’ credit markets. This result has been found in the case of Indonesia by Harris, *et al.* (1994) and in Africa by Bigsten, *et al.* (2003) and Soderbom and Teal (2000). The finding by Fafchamps (1996) that 85 percent of bankers in Ghana accord fresh credit to borrowers who have not been able to repay their past loans could also be interpreted in this light. The result is not surprising if it is interpreted in the context of a reputation-based rather than a collateral-based credit market.

5. Conclusion and Suggestions for Future Research

The central objective of this paper was to show that in the presence of reputation effects, a credit market can be sustained without the use of collateral. The paper reviewed the literature on the use of collateral as a contract enforcement instrument and found that even in developed economies the use of courts of law to adjudicate business disputes implies costly and lengthy proceedings. Parties to a contract are usually better off settling their disputes

³⁰ Fudenberg and Tirole (1991) argue that if a player has cooperated 99 times out of 99 plays in an infinitely repeated game, it is logical to expect him to cooperate in the 100th period.

amicably. This is even more relevant in Africa where legal institutions are usually weak with unpredictable, lengthy and costly procedures.

In this regard, we have proposed a model where reputation alone sustains credit markets. The model developed in this paper provides insights into the most important attributes a borrower needs to enjoy a continued stream of loans from his lender. Firstly, he needs to build and keep a good reputation by paying back his debts. This is especially important in the beginning of the credit relationship. The second attribute, which is related to the first, is that both the lender and the borrower need to have a long time horizon for credit trade to be sustainable. It is the threat of cutting future credit that induces a self-interested borrower to cooperate.

Among possible extensions to the model are the following. First, although age could be used as a proxy for a firm's reputation, a natural extension could be a derivation of a firm specific empirical measure of reputation. For instance, the Dynamic Multiple Indicator Multiple Cause (DMIMIC) method could be used to estimate reputation. The method has been applied, for instance, by Quagraine, *et al.* (2003) in their study of the reputation of apples in the American market. Once a measure of reputation is derived, another possible extension could be to study the impact of reputation on firm performance, possibly through its effect on credit access.

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