Kin Groups and Reciprocity: A Model of Credit Transactions in Ghana*

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Abstract

This paper studies kinship band networks as capital market institutions. Membership in a community where individuals are dynastically linked has two effects on informal credit transactions. First, the non-anonymity of the dynastic link allows to sanction the defaulters' offpring and induce compliance even in short term interactions (*social enforcement*). Second, preferential agreements can arise in which kin members condition their behavior on the characteristics of a player's predecessor, e.g., lend to the children of rich players, because they expect that others will do the same with their offpsring (*reciprocity*). These effects are incorporated in an overlapping generations repayment game with endogenous matching between lenders and borrowers and tested using household-level data from Ghana.

Keywords: kinship, dynasty, reciprocity, social norm, informal credit
JEL codes: O17, O16, J41

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Ahwe-wo-da-bi ba na wahwe no.

One shows benevolence to the child of his benefactor. (Twi proverb, Ghana)

1 Introduction

Nonmarket institutions have been the object of growing attention for their potential in coping with market failures. In the developing world, an overwhelming fraction of economic transactions occurs between members of a particular nonmarket institution called "kin group", i.e. a network of unilineal families that share common cultural traditions, ethnic identity, and often ancestors. What makes kinsmen differ from a generic set of individuals who interact more or less frequently and have possibly lower transaction costs? First, one *is born* with a given set of blood relations and cannot electively choose to join it or leave it. Second, kinsmen are *dynastically linked* in such a way that the actions of parents can fall upon their children, for good or bad. This paper explores the implications of these features on the terms of economic transactions (in particular, informal credit) between relatives and non-relatives in the presence of limited enforcement. More generally, the paper sheds light on the role played by communities whose members are linked in *non-anonymous* ways in alleviating or exacerbating market imperfections.[1]

The paper addresses three main questions. First, how does membership in a kin group affect the possibility of supporting self-enforcing agreements? Second, what pattern of transactions can we expect to see among kinsmen, e.g. in the choice of partners? Third, does kin membership affect the terms of the transactions, e.g. the price? The model employs an overlapping generations framework in which people are born either rich or poor, an endogenous matching process between rich and poor determines who borrows from whom, and parents depend on their children for support in old age.

Regarding the first question, I show that the *non-anonymity of the dynastic link* allows to prevent unilateral deviations even in very short term interactions. It is possible to "use the borrower's child" to enforce repayment, either by having the child deny support to a defaulting parent ('direct' punishment), or by having future lenders deny credit to the child of a defaulter, thus indirectly

[1] Although the analysis is in the context of 'village economies', the basic framework and results can be applied to other settings in which similar 'dynastic' organizations exist.

harming the parent in the event the child is born poor and cannot afford to support the parent ('indirect' punishment). As will be argued in the next section, both mechanisms are at work in African countries.

A second result regards the choice of the matching rule between lenders and borrowers. When there are more poor than rich individuals, uniform random matching entails a positive probability that a young poor will not get a loan, even if he or she is born from a rich parent. The rich can improve upon this scheme by lending preferentially to the children of those who were rich in the previous period: if every lender obeys this rule, their own children will get a loan with probability one. This scheme, denoted "matching with reciprocity among lenders" (MRL), has several interesting properties. First, even when 'bilateral' reciprocity is not possible because the two partners will *not* interact in the future, 'generalized' reciprocity is: current players can expect reciprocation from someone who is not a direct beneficiary today. Secondly, this rule conditions the matching on a characteristic which is totally irrelevant from the point of view of the credit contract. In the absence of savings or bequests, the parent's wealth (or lender status) does not affect the likelihood that the child will repay: all poor types are the same and there seems to be no reason why a lender would discriminate among them. Yet this pattern fits well with a wealth of evidence on social customs that condition behavior on apparently payoff-irrelevant characteristics. Finally, even if the distribution of endowments is randomly picked at the beginning of each period and bequests are not allowed, MRL induces initial inequalities to persist for one generation because the children of rich parents are guaranteed access to future loans while those of poor parents are not.

The third result from the model concerns the *terms* of the loans among kinsmen. The equilibrium interest rate is lower on 'reciprocal' loans than on 'market' loans (i.e., those allocated randomly), not because of altruism but because reciprocity alters the players' incentive compatibility constraints. Preferential agreements among some set of players make it less profitable for others to comply with the norm, hence the terms of the transaction must be made more favorable to the latter. Again, this sheds light on a wealth of anthropological evidence regarding apparently 'uneconomical' transactions.

To sum up, the model in this paper suggests that some types of social relations (specifically, dynastic links among players) not only enlarge the space of agreements that can be supported, but also alter the characteristics of such agreements, by encouraging preferential dealings between some sets of partners and changing the terms of economic transactions. These predictions are tested using household level data from Ghana that contains detailed information on credit flows and on the relationship to the partner in the transaction. The two main elements employed to disentangle the effects of reciprocal agreements are family structure (e.g., whether the borrower has children that can reciprocate or be punished in the future) and migration status (e.g., whether the borrower is an 'outsider' for the local kin group). The impact of these variables is estimated separately depending on the loan source, to test whether social enforcement and reciprocity between relatives act differently than with other lenders. Overall, I find broad support for the mechanisms outlined in the model. The virtual absence of interest on loans among relatives, the higher ability to borrow for households who contributed resources in the past, and the lower default rates on intra-kin loans by people with children are all consistent with the theory proposed. So is the fact that outsiders are less able to borrow both from members of the local kin group and from their own kin.

This paper fits into the recent literature on nonmarket institutions as responses to problems of imperfect monitoring and limited enforcement (e.g., Greif (1993)), and is related to several strands of the literature. First, it relates to work on informal credit and social enforcement, such as Udry (1994) and Besley and Coate (1995). The latter refer to the sanctions imposed by members of close-knit communities as 'social collateral', and show that it can improve repayment. While previous work has taken social pressure as given modelling it as a direct utility loss, the present paper endogenizes it by modelling *the way* in which social sanctions are carried out.

The notion of reciprocity has been established in models of informal insurance with limited commitment, such as Coate and Ravallion (1993) and Ligon, Thomas and Worrall (2002). Those models consider repeated interaction between two given partners, and employ a notion of 'bilateral' reciprocity. As mentioned above, this paper relies on 'generalized' reciprocity, i.e. someone else than the current partner reciprocates in the future. In addition, this paper differs from Ligon et al. (2002) because, despite the similarity of the 'lending' element, the goal is *not* to establish to what extent risk pooling is achieved, but to investigate how the dynastic structure of kinship can determine *who* will get a loan in the presence of credit rationing and at the same time can affect the terms of the loan transactions.[2]

Finally, the model proposed here builds on the literature on repeated games played by overlapping generations of players, e.g., Kandori (1992a,b) and Smith (1992). One common feature is the notion of "community enforcement", according to which, when agents change their partners over time, other people than those directly hit by a deviation punish the player who has deviated. An important difference is that in that literature no genealogical link exists among the players, so no individual can be held accountable for the actions *of a predecessor*. As a consequence, the punishment has to target the defector and the possibility for cooperation depends on the length of the overlapping period. In this paper the overlapping period is reduced to the minimum and the possibility of enforcement relies on the dynastic links among players. To the best of my knowledge, this is the first attempt to employ overlapping generation games in such 'non-anonymous' way.

The remainder of the paper is organized as follows. Section 2 introduces the notion of kin groups and their economic functions as they emerge from the anthropological literature and from related studies in economics. Section 3 develops the theoretical framework and the testable implications of the model. Section 4 describes the data and illustrates the main trends in the patterns of lending and borrowing. In section 5 the various predictions of the model are tested through multivariate analysis. Section 6 contains some concluding remarks.

2 Kin groups, reciprocity and enforcement

The notion of kinship is rather complex and much debated upon in the anthropological literature. Here kin groups will be defined as an intermediate level of social organization between clans and tribes. While a *clan* is a unilineal group of relatives living in one locality, a *kin group* is formed by various clans and comprises "socially recognized relationships based on supposed as well as actual genealogical ties" (Winick 1956: 302). A *tribe*, on the other hand, consists of several kin groups bound together by language and by common rules of social organization.

[2] In Ligon et al. (2002) the partners in the transaction are fixed, while in this paper who manages to become a partner is determined endogenously. Aggregate income is stochastic in Ligon et al. and deterministic in the present paper, where the only random element in each period is the realization of types (lenders and borrowers).

Thanks to their intermediate size, large enough to constitute an adequate risk pool but not so much to hinder the monitoring and enforcement of members' obligations, kin groups perform a number of economic functions. One is to provide *informal insurance* to their members, often in the form of sharing non-storable production surplus or in the form of consumption credit (Posner (1980)). As noted by Fafchamps (1992), solidarity mechanisms emerge naturally in societies with high idiosyncratic risk, and kinship is one of the main networks through which mutual insurance operates. Bates (1990) reports evidence that in many parts of East and Central Africa varying degrees of kinship ties reflect different needs to cope with risk.

Two key features allow these insurance schemes to work: reciprocity and enforcement. The reason why people share their crops or livestock is that they expect to become recipients in the future, although the exact time and extent of the 'repayment' may not be known at the date of the transaction. Among members of a kin group the scope for reciprocity is greater than in generic bilateral transactions, in that reciprocation can be carried out not only by the original beneficiaries but also by their offspring and can be directed to the original benefactors as well as to their offspring. In Ghana, for example, it is common that when young people receive support from older relatives (e.g., to finance their studies), they reciprocate by helping their younger relatives once they start earning money, rather than by repaying the person who helped them in the first place.[3]

Regarding social enforcement, kin groups have an advantage over generic close-knit communities because kinsmen often obey the principle of *collective responsibility*, whereby members of the same clan are held jointly responsible for each other's actions (Posner (1980)). Social stigma or retaliation from the injured party can thus fall on the defectors as well as on other members of their clan, increasing the cost of breaching the contract. Field (1940: 109) reports that in Ghana "responsibility for wrongdoing is a family affair. (...) The solidarity of the family, and the helplessness and destitution of an individual at variance with his family, was beyond all else what kept the individual law-abiding". In my model, this idea is captured by having lenders deny credit to the children of defaulters ('indirect' punishment). As a reaction to the damage caused to the whole lineage by the 'deviant' members, sometimes it is the kin itself that sanctions their behavior. As documented in a

[3] Personal communication from Gracia Clark.

recent study on social control in Ghana, "the paramount need for members of the lineage to avoid being thrown into the socially shameful state of penurious insolvency (...) gave each lineage member a moral mandate to keep surveillance over the actions of other members. (...) Traditional society's response to the notion of the collective responsibility of the group for the wrongs of individual members produced a reaction which yielded a number of measures formally invoked *by the lineage.* These include the *collective withdrawal of financial or moral support* for the culprit".[4] In the model this is formalized by having children deny financial support to a defaulting parent ('direct' punishment).

3 The model

3.1 Setup

Consider an economy where n individuals are born each period; a fraction α is born with endowment $\overline{e}$, and a fraction $(1-\alpha)$ with $\underline{e}$, where $\overline{e} > \underline{e}$. Let αn be integer and let $\overline{E}$ and $\underline{E}$ denote, respectively, the sets of types $\overline{e}$ (rich) and $\underline{e}$ (poor). People live for two periods. In the first they are 'young' and they produce a (deterministic) non-storable surplus $g > 0$, provided they can pay the input costs $\underline{e} + l$. While rich individuals can always pay these costs, poor ones are only able to produce if they get matched to a rich one and borrow $l > 0$. For the moment, the interest rate is fixed at $r > 0$; this assumption will be relaxed later. Unmatched poor individuals simply consume their endowment $\underline{e}$. After producing, people decide whether to repay (if they have borrowed) and whether to transfer a fixed amount $b > 0$ to their parent, and they consume the residual amount. At the end of the first period every individual has a child. From now on, I refer to the parent as 'she' and to the child as 'he'. The child's endowment is uncorrelated with the parent's, so everyone knows that her child will be rich with probability α and poor otherwise. In the second period, people are 'old' and consume $b > 0$ if their child grants it to them, and zero otherwise.[5] The temporal structure of the model is sketched below.

[4] Abotchie (1997), pp.14, 90. Emphasis added.

[5] In principle, any young born in t could be matched with someone born in $t-1$ for this purpose. However, if we realistically assume that information flows more easily within the same family, information costs are minimized by matching children with their parents.

t						$t+1$
Endow	*Match*	*Produce*	*Actions*	*Consume*	*Child*	*Consume*
$\overline{e}$	Yes	g	lend, transfer	residual income	Yes	$b; 0$
$\underline{e}$	Yes	g	repay, transfer	residual income	Yes	$b; 0$
	No	–	–	$\underline{e}$	Yes	$b; 0$

To make the problem interesting, the following assumptions are made:

(A1): $\alpha < 1/2$

(A2): $2l \leq (\overline{e} - \underline{e}) < 3l$

(A3): $\overline{e} < 2(\underline{e} + l)$

(A4): $\underline{e} + g \geq rl + b$; $\underline{e} < b$.

Assumption (A2) says that a rich individual can lend at most to one other person. Given this, (A1) implies that there is credit rationing in equilibrium. (A3) guarantees that the endowment of a rich is not sufficient to undertake two projects on his own. (A4) says that the income of a poor who obtains a loan is enough to both repay the loan and transfer b to his parent, while $\underline{e}$ alone is not enough to support the parent. All agents are non-altruistic, have instantaneous utility $u(\cdot)$, with $u'(\cdot) > 0$, $u''(\cdot) \leq 0$, and discount future utilities with a factor $\delta \leq 1$. Without loss of generality, $u(0) = 0$.

Strategies and equilibrium concept

Although people live for two periods, their strategic behavior is confined to the first. Throughout the model, the subscript t will denote a generation born at time t. Players' action space is characterized as follows. First, types $\overline{e}$ can choose whether to Lend (L) or Not Lend (NL), and types $\underline{e}$ whether to Borrow and Repay (shortly, R for Repay) or Not Repay (NR). Second, all players choose whether to Transfer (T) or Not Transfer (NT). Third, players can choose *who* to lend to or borrow from. This will formalized by allowing players to choose a matching rule, and denoting with $\mu(i_t) = j_t$ the borrower j_t who is matched with lender i_t.

In the absence of legal enforcement, the stage game has only one Nash equilibrium, constituted by the strategies $s_i = (NL, NT)$ for $i \in \overline{E}$, $s_j = (NT, NR)$ for $j \in \underline{E}$. The infinitely repeated version, where two-period-lived players successively play the stage game, has a multiplicity of subgame perfect equilibria. I am interested in equilibria in which all borrowers repay their loans and all young individuals support their parents. Following Abreu (1988), I describe strategy profiles as rules specifying an initial path and punishments for any deviation from the initial path. I will use the following criteria to select the equilibria on which to concentrate.

(i) *Stationarity.* Every generation faces the same problem of the previous generations, so that for a given history, a strategy that is optimal for an individual i_t must be optimal for an individual j_{t+1} of the same type.

(ii) '*Minimal*' strategies. The punishment to player i_t for deviating from the equilibrium path must not extend beyond $t+1$. This is without loss of generality, given that in this model any outcome that can be achieved by extending the punishment for i_t's deviation to periods $t+k$, $k>1$, can be achieved by punishing in $t+1$ only.[6]

3.2 Social enforcement

This section shows how the dynastic structure can be used to support an equilibrium in which all rich individuals lend, all borrowers repay, and every matched player sends transfers to his parent. Formally, the actions chosen on this equilibrium path are:

$$\begin{aligned}
&a_i = (L, T) \text{ for all } i \in \overline{E};\\
&a_j = (T, R) \text{ for all } j \in \underline{E} \text{ such that } j = \mu(i) \text{ for some } i \in \overline{E};\\
&a_j = (NT, NR) \text{ for all } j \in \underline{E} \text{ such that } j \text{ is unmatched.}
\end{aligned} \tag{1}$$

I momentarily abstract from the strategic choice of the matching rule and concentrate on equilibria where lenders randomize among potential borrowers in every period. This rule, which I refer to as *uniform random matching* (URM), is such that all poor individuals have the same probability $\alpha/(1-\alpha)$ of obtaining a loan and the matching in each stage is independent. The key to enforcing cooperation is to design punishments that make a unilateral deviation from the equilibrium path unprofitable for any single player after any history. I consider two main ways in which such punishments

[6] For more on this requirement and for a discussion of stationarity, see La Ferrara (2003).

can be designed, one 'direct' and one 'indirect'.[7]

Direct punishment

The *direct* punishment requires that if a player deviates at time t, either by not repaying or by not helping the parent, her child will refuse to transfer b in the following period.[8] Proposition 1 provides the conditions under which the equilibrium in (1) can be enforced through this penal code.

Proposition 1 *For values of δ satisfying*

$$\delta \geq \frac{u(\underline{e}+l+g)-u(\underline{e}+g-rl-b)}{2\alpha u(b)} \tag{2}$$

the equilibrium path described in (1) can be supported under URM through the penal code:

If k_t deviates from a_k $(k=i,j)$, k_{t+1} will play NT instead of T in a_k.

If k_{t+1} fails to carry out the above punishment, he is subject to the same penal code.

Proof.

The expected lifetime utility of a type $\overline{e}$ from conforming to the equilibrium is

$$u(\overline{e}+g+rl-b)+\delta\left[\alpha u(b)+(1-\alpha)\left(\frac{\alpha}{1-\alpha}\cdot u(b)+\frac{1-2\alpha}{1-\alpha}\cdot 0\right)\right]$$

where the terms in square brackets represent the parent's expected transfers from her child in period two, α being the probability that the child is born rich. The most profitable deviation —to (L, NT)— yields $u(\overline{e}+g+rl)$. Therefore a type $\overline{e}$ player has no incentive to deviate unilaterally if $\delta \geq \delta_{\overline{e}} \equiv [u(\overline{e}+g+rl)-u(\overline{e}+g-rl-b)]/2\alpha u(b)$. Analogously, a type $\underline{e}$ has no incentive to deviate unilaterally to (NT, NR) if $\delta \geq \delta_{\underline{e}} \equiv [u(\underline{e}+l+g)-u(\underline{e}+g-rl-b)]/2\alpha u(b)$. Given assumption (A2) and $u''(\cdot) \leq 0$, we have $\delta_{\underline{e}} > \delta_{\overline{e}}$ so condition (2) is sufficient to ensure that the equilibrium is subgame perfect for both types. $\square$

[7] I focus on punishments that are intrinsically 'economic' and tightly connected with the credit market. Social pressure mechanisms such as shame or ostracism may be equally important and can be modeled as a direct utility loss.

[8] Note that it is always in the child's interest to punish the parent for deviating, because this involves consuming b himself rather than transferring it.

Indirect punishment

An alternative, *indirect* punishment requires that children only police deviations of their parents from the intergenerational social security scheme, and that defections on the credit side are sanctioned by the credit market itself. Consider the following penal code: the child of a borrower who defaulted or of a type $\overline{e}$ who did not lend in period t is denied a loan in $t+1$. This code constitutes an indirect penalty for the parent because, unless born rich, the child will not have enough resources to transfer b in $t+1$.

Proposition 2 *For values of δ satisfying*

$$\delta \geq Max\left\{\frac{u(\underline{e}+l+g)-u(\underline{e}+g-rl-b)}{2\alpha u(b)},\frac{u(\underline{e}+l+g-b)-u(\underline{e}+g-rl-b)}{\alpha u(b)}\right\} \tag{3}$$

the equilibrium path described in (1) can be supported under URM through the penal code:

If i_t (j_t) plays NL (NR), i_{t+1} (j_{t+1}) will be unmatched if they are of type $\underline{e}$. If i_t (j_t) plays NT, i_{t+1} (j_{t+1}) will play NT.

Anyone who fails to carry out the above punishment is subject to it.[9]

Proof: Along the same lines of Proposition 1.

The first threshold value in (3) guarantees that unilateral deviations from the social security scheme are unprofitable; the second refers to deviations on the credit market. Notice that the indirect punishment scheme may require more patient players because parents who defaulted on the credit market face a positive probability of being unpunished (i.e., they still receive b if their children are born rich). Both the direct and the indirect codes exploit the fact that the link between parents and children constitutes a form of *social collateral* and should be seen as alternative ways of enforcing agreements. For simplicity, the results in the following sections are presented using the 'direct' penal code. All results apply to the 'indirect' scheme, provided the threshold value for the discount factor is adjusted accordingly.

[9] Note that under our assumptions lenders always have an incentive to carry out the punishment. For further discussion on this point and for a proof of Proposition 2, see La Ferrara (2003).

3.3 Pareto efficient matching rules and reciprocity

The next step is to endogenize the choice of the matching rule. A rule should specify who is matched with whom for every possible realization of types. Every matching rule μ induces a probability p that a type $\underline{e}$ will get a loan in equilibrium. All potential borrowers are *ex ante* equal, except for the fact that they may be born from a type $\underline{e}$ or from a type $\overline{e}$ parent. Matching rules can therefore discriminate among players according to the type of their parent. Let $\underline{p}$ ($\overline{p}$) denote the overall probability that a poor individual born from a type $\underline{e}$ (type $\overline{e}$) obtains a loan, and let $\underline{p}|k$ ($\overline{p}|k$) denote the analogous probabilities *conditional* on k children of previous period lenders being type $\overline{e}$. From combinatorial calculus we have:[10]

$$\underline{p} = \sum_{k=0}^{\alpha n} \frac{\binom{\alpha n}{k}\binom{n-\alpha n-1}{\alpha n-k}}{\binom{n-1}{\alpha n}} \left(\underline{p}|k\right) \tag{4}$$

$$\overline{p} = \sum_{k=0}^{\alpha n-1} \frac{\binom{\alpha n-1}{k}\binom{n-\alpha n}{\alpha n-k}}{\binom{n-1}{\alpha n}} \left(\overline{p}|k\right). \tag{5}$$

Let $U_{\overline{e}}(\overline{p})$ and $U_{\underline{e}}(\underline{p})$ indicate the expected lifetime utilities of a type $\overline{e}$ and a type $\underline{e}$, respectively. The following proposition characterizes the frontier of Pareto efficient matching rules.[11]

Proposition 3 *The Pareto frontier is a line with slope $-(1-\alpha)/\alpha$ whose endpoints are the combinations $(U_{\overline{e}}(\overline{p}), U_{\underline{e}}(\underline{p}))$ obtained by substituting in (5) and (4) the following values:*

Best equilibrium for type $\overline{e}$ players:

$$\overline{p}|k = 1, \;\; \underline{p}|k = \frac{k}{(1-2\alpha)n+k}. \tag{6}$$

Best equilibrium for type $\underline{e}$ players:

$$\overline{p}|k = Max\left\{0, \frac{(3\alpha-1)n-k}{\alpha n-k}\right\}, \;\; \underline{p}|k = Min\left\{\frac{\alpha n}{(1-2\alpha)n+k}, 1\right\}. \tag{7}$$

[10] For a derivation of expressions (4) and (5), see La Ferrara (2003).

[11] Proposition 3 holds for $\delta \geq Max\left\{\frac{u(\underline{e}+l+g)-u(\underline{e}+g-rl-b)}{(\alpha+\underline{p}-\alpha\underline{p})u(b)}, \frac{u(\overline{e}+g+rl)-u(\overline{e}+g+rl-b)}{(\alpha+\overline{p}-\alpha\overline{p})u(b)}\right\}$, where $\underline{p} = \sum_{k=0}^{\alpha n} \frac{\binom{\alpha n}{k}\binom{n-\alpha n-1}{\alpha n-k}}{\binom{n-1}{\alpha n}} \frac{k}{(1-2\alpha)n+k}$ and $\overline{p} = \sum_{k=0}^{\alpha n} \frac{\binom{\alpha n-1}{k}\binom{n-\alpha n}{\alpha n-k}}{\binom{n-1}{\alpha n}} Max\left\{0, \frac{(3\alpha-1)n-k}{\alpha n-k}\right\}$.

Proof: see the Appendix.

[Insert figure 1]

The Pareto frontier is depicted in figure 1. The variables on the two axes are the ex ante expected utilities for the two types. Intuitively, the frontier is linear because we are considering only equilibria in which the total amount of resources gets invested and the "size of the pie" is fixed: what changes as we move along the frontier is how much of the pie each type will get. Point R in the figure corresponds to the URM equilibrium of proposition 1, in which $\overline{p}|k = \underline{p}|k = \alpha/(1-\alpha)$. Points above R are obtained by giving the children of rich players probabilities $\overline{p}|k$ higher than $\alpha/(1-\alpha)$, up to the point $(U_{\underline{e}}^{min}, U_{\overline{e}}^{max})$ where all poor children of types $\overline{e}$ are guaranteed a loan with probability one and children of types $\underline{e}$ are allocated only the *residual* loans. Similarly, points below R are obtained by giving the children of type $\underline{e}$ parents probabilities $\underline{p}|k$ higher than $\alpha/(1-\alpha)$, up to the point $(U_{\underline{e}}^{max}, U_{\overline{e}}^{min})$ where poor children of types $\underline{e}$ have priority on the allocation of loans for all values of k.

Consider the problem of choosing a point on the Pareto frontier from a positive point of view. The relative scarcity of lenders suggests that they should be able to select who they want to lend to. It would be suboptimal for lenders to randomize among all potential borrowers, because their children would face a positive probability of needing a loan and not getting it. Consider instead the following matching rule:

"*Randomize among poor children of type* $\overline{e}$ *players first, and only after they all obtained a loan randomize among poor children of types* $\underline{e}$".

If all lenders obey this rule, with probability one their children will have the resources necessary to support them, i.e. $\overline{p}|k = 1$, $\forall k$. This corresponds to the best equilibrium for types $\overline{e}$ in proposition 3. I refer to this rule as one of *matching with reciprocity among lenders* (MRL) because by lending to the child of an old lender, a type $\overline{e}$ creates an obligation for somebody else to reciprocate in the future and grant preferential treatment to her child. Formally, MRL can be expressed as follows:

$$Prob\,\{\mu(j_t) = i_t\} = 1 \text{ for some } i_t \in \overline{E}_t,\ \forall j_t \in \underline{E}_t | j_{t-1} \in \overline{E}_{t-1},\ \forall t.$$

This rule has three interesting features. First, it goes beyond the notion of 'bilateral' reciprocity, according to which the same person who receives something today is expected to give it back to the original partner in the future. In this model any young lender has an interest in reciprocating a loan given *to somebody else* in the past, because this way he enters a pool of creditors who help each other by helping each other's children. Secondly, this rule shows that it can be optimal for some players to condition the matching upon an apparently irrelevant characteristic (from the point of view of the ability to repay), as is the parent's type. Finally, even if the distribution of endowments is randomly picked at the beginning of each period and bequests are not allowed, this rule induces initial inequalities to persist for one generation because credit market imperfections act differentially on the children of rich and poor people. Although the children of lenders cannot choose to be lenders themselves unless nature decides so, they are at least guaranteed loans and hence a positive income stream.

3.4 Endogenous interest rates: the 'price' of reciprocity

I next allow lenders to choose the interest rate as well as the matching rule. In the benchmark case of URM, lenders set r so as to maximize their expected utility subject to the borrowers' incentive compatibility (IC) constraint, with $\overline{p} = \underline{p} = \frac{\alpha}{1-\alpha}$. The IC binds in equilibrium, so the optimal interest rate under URM, r_u, must solve:

$$u(\underline{e} + g - r_u l - b) + 2\alpha\delta u(b) = u(\underline{e} + l + g). \tag{8}$$

When both the matching rule and the interest rate can be chosen, lenders face a trade-off. On the one hand, by choosing a rule that increases $\overline{p}$ they can increase their expected utility; on the other hand, the resulting decrease in $\underline{p}$ may require a reduction in r in order to maintain incentive compatibility for types $\underline{e}$. The solution is described in the following.[12]

Proposition 4 *In the best subgame perfect equilibrium for types $\overline{e}$, $\overline{p}^*|k$ and $\underline{p}^*|k$ are given by (6),*

[12] Proposition 4 holds for $\delta \geq \frac{u(\underline{e}+l+g)-u(\underline{e}+g-rl-b)}{(\alpha+\underline{p}^*-\alpha\underline{p}^*)u(b)}$. As before, the proof is derived for the direct penal code.

and r^* solves:

$$u(\underline{e}+g-r^*l-b)+\delta(\alpha+\underline{p}^*-\alpha\underline{p}^*)u(b)=u(\underline{e}+l+g) \tag{9}$$

Corollary to Proposition 4: $r^* < r_u$.

Proof: see the Appendix.

Proposition 4 says that lenders will choose a rule of MRL and increase the interest rate up to the point where borrowers are indifferent between repaying and defaulting. Note that $\overline{p}$ is preferable to r as an instrument for lenders because it enters the borrowers' IC linearly (any increase in $\overline{p}$ induces a *proportional* decrease in $\underline{p}$), while r enters through the concave utility function (so that a corresponding increase in r lowers the left hand side of IC more than proportionately).

Finally, the corollary to proposition 4 says that, *ceteris paribus*, the equilibrium interest rate under MRL will be lower than that under URM. Under MRL, borrowers have less to gain from repaying their loans because there is a higher chance that their children will *not* get a loan. In order to satisfy the borrowers' IC lenders must therefore make the decision to repay less costly in the present, i.e. set a lower r. Loosely speaking, the interest forgone by the lenders can be thought of as the 'price' of reciprocity, i.e. the monetary return that lenders are willing to give up in order to be assured that their children will be able to borrow if they need to.[13]

3.5 Outsiders versus insiders

In the above model the *kin group* is the set of all generations belonging to the local community, $\left\{\overline{E}_t \cup \underline{E}_t\right\}_{t=1,2,..\infty}$. Two features make this a model of transactions among kinsmen as opposed to anonymous individuals. The first is the assumption that actions are publicly observable, which confines the validity of the analysis to a closed-knit community where information flows freely. The second is that the model relies on *genealogical ties*, in the sense that social enforcement and reciprocity require that parents' actions can fall upon their children, for good or for bad.

The same framework can be extended to account for transactions among individuals who do not belong to the local kin group. Assume that there exists a set $\{M_t\}_{t=1,2,..\infty}$ of 'outsiders' (say,

[13]Note that, although we refer to the interest lost as a 'price' for reciprocity, the lender in fact raises his lifetime utility by lowering r.

migrants) who are identical in all respects but have an exogenous probability $\pi > 0$ of moving out of the local community at the end of the first period of their life. If it is costly for members of the new community to gather information about the past behavior of an immigrant, the schemes discussed so far become harder to implement.

Let ut start by considering social enforcement under URM. If no one in the new community (be it a lender or the migrant's child) observes the past behavior of an immigrant, the temptation to default for an M borrower is higher because with probability π he will go unpunished. Under the direct penal code, the denominator of (2) in proposition 1 is multiplied by a factor $(1-\pi)$, which means that for sufficiently high π even a perfectly patient player will deviate. If the child observes the parent's actions but prospective lenders do not, the direct scheme works as in the baseline model, while the indirect one is altered. A migrant can deviate to (T, NR) and face a probability $\alpha\pi$ that, being born poor, her child gets a loan in the new community. This amounts to multiplying the denominator of the second term in (3) by $(1 - \pi)$. Turning to reciprocity, lenders can expect reciprocation from the child of a migrant only with probability $(1 - \pi)$, while by lending to an insider the lender faces a probability one that her child will get a loan in equilibrium. This makes reciprocal arrangements with migrants less attractive. Note that the effects on enforcement and reciprocity apply equally to transactions between an insider and an outsider, and between two outsiders. In fact a migrant is a 'risky partner' both for a local lender and for another migrant. We should then expect to see some sort of 'segmentation' along kinship lines whereby members of the local kin group lend and borrow from each other, while outsiders transact with other outsiders or with institutional sources, with less scope for reciprocity and social enforcement.

3.6 Extensions and empirical implications

The two-period structure of the model constrains all action to take place *among* generations. Extending the model to a multi-period setting, one can expect the same sort of effects to apply in the various stages of an individual's life as among generations. This extension will be implemented in the empirical section. Other extensions, including the possibility that children inherit their parents' debt or that parents leave bequests, the introduction of a storage technology, and the existence of altruism are discussed in La Ferrara (2003). In most cases the mechanisms of social enforcement and reciprocity carry through, although the scope for implementing these arrangements may be altered.

In order to test the predictions of the model, ideally one would want to know *who* one's kinsmen are and what happens over time *across generations*. The former piece of information is missing from virtually all data sources covering loan transactions[14], and the latter would require panel data that spans at least two decades. Given data limitations, I am forced to get at the kinship element indirectly, by relying on the following proxies. The first is *migration status*. As argued in the previous section, the scope for social enforcement and reciprocity is lower when the transaction involves an 'outsider', because it is costly for potential partners to acquire information on migrants and it is likely that they will move again. One can therefore expect the migration status of an individual to be a significant predictor of his or her access to kin group loans. A second aspect to be considered is *family structure*. Having children enlarges the scope for sanctioning defaulters, as well as the possibilities of future reciprocation. Ceteris paribus, people with children should behave and be treated differently from people without descendants in the market for kin loans. A third strategy, related to the *multi-period* extension, is to test whether the same enforcement and reciprocity mechanisms that work for parents and children also work at different stages of an individual's life. Having a two-year panel on can test whether credit market outcomes in the second year respond to individual actions in the first.

Starting from these premises, the following *ceteris paribus* predictions of the model will be tested:

(i) *Loan sources:* Migrants should be less likely to borrow from kinsmen, and people with children more.

(ii) *Default:* Borrowers who have children should be less likely to default. Migration status should not affect default on loans from kinsmen since migrants should not be part of reciprocal schemes in the first place.

(iii) *Interest rates*: Interest rates should be lower on 'reciprocal' loans than on 'market' ones.

(iv) *Past contributions*: People who lend to their kinsmen should expect their offspring to receive loans in the future. In the multi-period version, individuals who lent or contributed resources to

[14] A partial exception is the study of Fafchamps and Lund (2002) on 206 rural households in the Philippines.

others in the past should have access to more credit in the present.

4 The data: a descriptive analysis

The above predictions will be tested using household-level data from the Ghana Living Standard Surveys (GLSS) of 1987/88 and 1988/89. The data was collected nationwide, but no community level information is available for urban clusters. The analysis will therefore be restricted to rural and semi-urban areas (i.e., with less than 5,000 inhabitants), yielding a 'full sample' of 1,954 households in 1987/88 and 2,116 in 1988/89. Of these, 850 households were interviewed in both rounds.

In the full sample, 34% of the households borrowed in the first year, 41% in the second, and 24% in both. Similarly, 27% lent in the first year, 33% in the second, and 16% in both years. When asked what the main reason for borrowing was, 41% and 29% of the loans were described as related to farm or business in the first and second year, respectively, 1% and 2% to education, and 58% and 69% to 'other' purposes, among which are consumption and transfers to friends or relatives. The survey did not ask the *identity* of the lenders, but only the broad category to which they belonged, so it is not possible to match lenders and borrowers belonging to the same kin group. A conservative approximation is to consider relatives, who are a subset of the kin group, while a coarse approximation would include relatives plus non-professional private lenders (who have a positive probability of being members of the borrower's kin group but may also be friends or neighbors).

[Insert Table 1]

Table 1 contains information on several loan characteristics for both rounds of the survey (pooled). The first two columns give a breakdown of all loans according to the lender's category. 'Relatives' and 'Privates' (non-moneylenders) together account for about 80% of the number of loans and 67% of the total value, suggesting a crucial role for (potentially) intra-kin loans. The average loan size from all sources is 9,186 Ghanaian Cedis.[15]

[15] For households who borrowed positive amounts, the annual amount borrowed was 22,225 GHC and annual household expenditure in the two rounds of the survey was 341,425 GHC (in year 2 prices). The official exchang rate was 202 GHC per US dollar in 1988, and 270 in 1989 (Source: World Bank, World Development Indicators).

Columns 4 to 8 describe the conditions attached to loans depending on their source. Only 4.5% and 7.2% of the loans from relatives and private individuals, respectively, carry an interest, be it explicitly specified or implicitly embodied in the amount to be repaid (column 4). The corresponding figures for moneylenders, banks and cooperatives are, respectively, 26%, 83% and 50%.[16] This suggests that some form of compensation other than the interest must be expected by the lender, consistently with our reciprocity story.[17] Column 5 reports the average annual interest rate on loans from the different sources, conditional on the interest rate being non-zero and weighted by the amount of each loan. Private individuals, moneylenders and 'other' sources seem aligned around the figure of 42%-47%; relatives charge about 31%, and banks and cooperatives charge rates of about 20% and 10%, respectively.[18] Note that the rates in table 1 are annualized, and the average duration of informal loans is much shorter than that of formal ones. Still, interest rates on loans from relatives are about 10 percentage points lower than from other informal sources, and in real terms are about zero. Finally, when asked whether "additional goods or services should be provided together with the repayment", most respondents said no (column 6).

The next two columns explore the guarantees of repayment incorporated in the various loans. In

[16] When asked *explicitly* whether the loan carried an interest, the respondents answered yes only for 4% of the loans given by relatives and 4.9% of those given by private individuals. To account for the possibility that these low figures were due to misperception, I constructed a broader measure. Respondents were asked how much the original loan was and how much they should have paid, were the loan to be repaid at the date of the interview. There were instances in which the same individual who had answered no to the interest rate question reported that a larger amount than that originally borrowed should be repaid. The data in the table reports these 'adjusted' figures, which are at most 2 percentage points higher than the 'explicit' ones. When the interest figures are calculated for non-Muslim households only, they remain virtually unchanged.

[17] The figures for loans from moneylenders and banks seem quite low too, most likely due to measurement error. In some cases collateral was provided in the form of land which yielded substantial returns. Also, Aryeetey (1994) reports that in Ghana it is common among moneylenders to see the interest rate as determined by the 'need' of the borrower. As for the 17% of bank loans that apparently carry no interest, all but three are loans that have not expired, and for which the respondent has repaid some but not all of the tranches. A possible conjecture is that the sum of the tranches exceeds the principal, but the respondent "does not realize it".

[18] These are *nominal* interest rates. The annual inflation rate was 31% in the first year and 24% in the second (Source: CPI figures from GLSS documentation). These interest rates are calculated taking into account the 'implicit' interest embodied in the final repayment.

only 13% of the cases were households who borrowed from relatives and private individuals required to make regular payments (column 7), and the pledge of collateral is very infrequent (column 8). Overall, both the low or zero interest rates and the absence of formal guarantees on loans from relatives and private individuals are consistent with the reciprocity and social enforcement mechanisms suggested by the model.

Finally, columns 9 and 10 explore the pattern of default on different types of loans. The GLSS contains only a variable indicating whether the loan has been repaid or not at the date of the interview, so default has to be inferred by comparing the expiration date of the loan with the date of the interview. Since only the month, but not the day, of expiration is known, I construct two default variables. DEFAULT1 is a dummy taking value 1 if the loan was contracted in year 1 or 2 of the survey, expired at least one month before the date of the interview, and was reported as "not repaid" at that date.[19] The more comprehensive variable, DEFAULT2, takes value 1 if the loan expired before *or during* the month of the interview, and is reported as "not repaid" at the time of the interview. We can see from table 1 that DEFAULT1 is likely to underestimate default (3.4%), while DEFAULT2 is likely to overestimate it (15.8%). Note that the default rate *on loans from relatives* is less than 6% even under the broader definition, and about 1% under the more restrictive one. For all other sources default rates jump up to 15-20% when DEFAULT2 is considered. This suggests that it is much more common for loans from relatives to be repaid a month before or during the month of their expiration, consistently with the need to maintain good standing within the kin group.

5 Econometric analysis

This section tests the predictions of the model using multivariate analysis. Given the impossibility of testing directly the intergenerational mechanisms for lack of data, I will gather a number of pieces

[19] Households belonging to the panel sample were also followed in the second year. A loan taken in year 1 and whose expiration date was after the first year interview but before the second year one is considered in default if (i) there was no loan from the same source reported as outstanding in year 2, or (ii) there was a loan from the same source and of greater or equal amout reported as outstanding in year 2. Rescheduling smaller amounts with the same lender was not counted as default.

of evidence consistent with the model, and discuss why they may be viewed as indirect confirmation of the theory. Before proceeding, one major qualification is in order. The model gives clear-cut predictions for the effects of kin membership on the availability and conditions (supply) of credit, but it does not bear similarly sharp implications for credit *demand*. In particular, the model assumes that all households demand loans but access to credit is rationed, so a supply equation should be estimated. In reality, demand differs across households and I will try to account for this as much as possible by including in all regressions a number of controls that should affect the demand for credit.[20] To the extent that possible omitted variables are not correlated with our regressors of interest, this objection should not invalidate the general findings.

5.1 Loan sources

What individual and community characteristics affect the likelihood of borrowing from different sources? Table 2 reports multinomial logit estimates of the probability that a loan is taken from four sources: relatives, private non-moneylenders, professional moneylenders, and (as omitted category) banks or cooperatives.

[Insert Table 2]

The probability of borrowing from relatives and private non-moneylenders first decreases and then increases with the age of the head, suggesting that individuals in the middle stages of their life are those who most have access to formal loans. Increases in household labor income decrease the probability that loans are taken in the informal sector, while the distance from the nearest bank increases it. Turning to the variables that are the focus of this analysis, the results are mixed. The presence of children does not have a significant effect, and this remains true also if one controls

[20] The controls are: age, sex, education, language, religion and migration status of the head; household size; dummy for whether the head has children; dummy for whether the head speaks the language of the dominant ethnic group in the community; number of years the head has lived in the current place of residence; number of changes in residence; household labor income; value of the crop lost by the household due to fire, rodents, etc; distance from the nearest bank (miles); and dummy for whether the community has more than 1,500 inhabitants. Summary statistics for all variables are reported in La Ferrara (2003).

for the age of the children and/or interacts the children dummy with the age of the household head. The migrant dummy has instead a strong negative effect on the likelihood that a loan is taken from a relative, as predicted by the theory. Holding other controls at the sample mean, the predicted probability that the source of the loan is a relative is .19 for a migrant and .26 for a non-migrant. This is a non-negligible effect, especially if we take into account that loans from relatives carry more favorable conditions than loans from other informal lenders (see table 1). The fact that the coefficient on the migrant dummy is insignificant for informal categories other than relatives is comforting because it suggests that kinship mechanisms –as opposed to generic migrants' unobserved characteristics– may be the underlying explanation. In panels B and C the robustness of this hypothesis is tested against some competing explanations. The table reports only the coefficients of interest (on the migrant dummy and on some additional controls), while maintaining the basic specification of panel A.

An alternative explanation is that moral hazard and *information* problems on migrants are more severe for relatives than for other categories of lenders. Panel B includes a dummy for those migrants who moved to "follow/join family" as opposed to work or other reasons. Having family members nearby does increase the probability of borrowing from them, but the migrant variable remains negative and significant. Panel C attempts to control more generally for the circulation of information in the community, by including the log of its population, a dummy for whether the migrant comes from a village (which should make it easier to get information), a dummy for whether "people in the community leave temporarily during certain times of the year to look for work elsewhere" (which should make it more difficult to gather information), and the number of religious groups in the community (to proxy for religious fragmentation as a barrier to information flows). Only religious fragmentation significantly (and negatively) affects the likelihood of borrowing from relatives, while the migrant dummy retains its significance at the 10% level.[21] Another possibility is that migrants borrow less from their relatives not because they do not have access to kin loans, but because they

[21] When the variable "Family here" is included together with those in panel C, the migrant dummy loses its significance, likely due to collinearity. Also, "Migrant" is not significant when the number of ethnic groups in the village is included, but this is *not* inconsistent with our hypothesis. Migrants are likely to belong to a different ethnic group, so part of the effect of ethnic fragmentation has to do precisely with reduced scope for kinship ties.

can afford to borrow from formal sources at more convenient terms. However, in the data migrants are *not* more free to sell their land and offer it as 'liquid' collateral to banks. Indeed, the higher incidence of collateral for migrants occurs in the categories of 'relatives' (2% of the loans taken by migrants versus 0.3% by non-migrants), and 'private' lenders (3.4% versus 1.6%), which reinforces the interpretation that migrants lack 'social collateral'.

Overall, the results in this section show that migrants are less likely to borrow from relatives than from other sources, and that while information constraints may be part of the explanation, they cannot entirely account for this finding.

5.2 Default and family structure

I next test whether, ceteris paribus, borrowers who have children are less likely to default. Remember that children should matter in reciprocal relationships, but not in all informal transactions. One can thus estimate the following probit equation:

$$Y_{it}^* = C_{it} I^R \beta^R + C_{it} I^{NR} \beta^{NR} + D_t \alpha + X_{it} \delta + \varepsilon_{it} \tag{10}$$

where Y_{it}^* is a latent variable, C_{it} is the children dummy, D_t is a dummy for year 1, X_{it} represents all other controls and ε_{it} is the error term. The children dummy is interacted with two indicator variables: I^R is a dummy equal to 1 if the loan is taken from a relative, and I^{NR} is $1 - I^R$. The coefficients β^R and β^{NR} therefore capture the impact of having children on default when the lender is, respectively, a relative or a non-relative. The conjecture is that $\beta^R < 0$, while β^{NR} should be 0.

[Insert Table 3]

Table 3 reports estimated and marginal probit coefficients for a model where the dependent variable is DEFAULT2.[22] As predicted by the theory, the coefficient on children in column 1 is negative and significant at the 1% level for loans taken from relatives, and insignificant for other loans. The test for the equality of the two coefficients rejects the null with a p-value of .01. To assess the magnitude of this effect, note that ceteris paribus having children when the loan is from

[22] As shown in La Ferrara (2003), all results are robust to using DEFAULT1, but estimates are less precise due to the low number of defaults.

a relative decreases the probability of default by 12.5 percentage points, against an overall default rate of 15%.

In columns 4-6 the robustness of this result is tested against some competing explanations. Having children is a proxy for residential stability, hence people with children may default less because they are less free to run away. In addition to 'years of residence in the present community' and 'number of changes in residence', which already proxied for the prospects of mobility, I include a dummy for whether the respondent's family lives in the same place (which should reduce mobility) and a dummy for whether the spouse of the respondent is from a different region (which should increase it). A second reason why children may affect default is that they can contribute resources to the family. Three variables are included to control for this effect: the amount of remittances received from children, a dummy for whether "there is a system of mutual aid among the farmers of the community for field work", and the number of man days of labor that the household has received in the past year as part of an exchange of unpaid labor (the latter two variables should make the role of children as income generators less relevant). After the introduction of all these controls, the coefficient β_R remains negative and highly significant. Still, there may be some omitted factors that are not controlled for (e.g., people with children may be more cautious in their business strategies), which would also be picked up by our estimates.

5.3 Interest rates

Another prediction of the model was that interest rates would be lower on 'reciprocal' loans than on 'market' ones. We saw in table 1 that more than 92% of the loans from potential kinsmen carry no interest, so instead of focusing on the *value* of the interest rate I focus here on the *probability* that a loan carries a positive interest. Table 4 estimates a probit model in which the dependent variable equals 1 if the loan carries an interest (be it explicit or implicit). The coefficient on children is allowed to differ depending on whether the lender is a relative, as in expression (10).[23]

[Insert table 4]

[23] Originally both the coefficient on children and that for migrant were allowed to differ according to loan source, but the difference was never significant for the migrant dummy.

As expected, having children matters when the lender is a relative, but not when it is another source. The magnitude of the effect is substantial: in the face of an overall probability of interest of 14%, having children when the lender is a relative decreases this probability by 10.8 percentage points. The difference between the two coefficients is always significant at the 1 percent level.

Columns 4-6 address some competing explanations. The hypothesis that children proxy for residential stability and lower the 'risk premium' paid by the borrower does not seem warranted: neither the fact that the family lives in the same place, nor that the spouse comes from another region affect the likelihood of facing an interest. Another possibility is that children 'substitute' for interest payments, for example by offering unpaid labor. I include a dummy for whether "members of the household have taken part in any exchange of unpaid labor in the last 12 months" and a dummy for whether "during the past 12 months the household has worked as sharecroppers on someone else's land". Neither variable is significant. Finally, to proxy for altruism or other social norms that may affect the likelihood of charging an interest, I include a dummy for whether there is a system of mutual aid among farmers in the community. Once again, after the introduction of these controls the coefficient β_R remains negative and significant at the 1% level.

5.4 Reciprocation of past contributions

The last step is to test the *effectiveness* of reciprocity, asking whether individuals who have lent or given contributions to others in the past have access to more credit in the present. This is done by estimating the reduced form of a system of demand and supply of loans:

$$L_{it} = X_{it}\beta + R_{i,t-1}\gamma + \epsilon_{it} \tag{11}$$

where L_{it} is the amount borrowed by household i at time t, X_{it} is a vector of household controls, $R_{i,t-1}$ is the amount of 'reciprocal contributions' given by the household in the previous year (i.e., loans to other private individuals plus remittances sent), and ϵ_{it} is an error term.

I adopt two estimation strategies. The first is to take into account both the probability that the household borrows a positive amount, and the entity of the sum borrowed. In this case the dependent variable L_{it} is censored, taking value 0 for those households that did not borrow, and a positive value for those that did. Estimation is done with OLS (which are inconsistent in this case), with Tobit, and with Powell's (1984) censored Least Absolute Deviations (LAD) estimator, which is consistent even when the error terms are heteroscedastic. The second strategy is to consider the effect of past contributions on the amount borrowed *conditional* on borrowing a positive amount. The question asked in this case is: for those households who borrow, do past contributions translate into larger loans today? The dependent variable L_{it} then takes only positive values and (11) is estimated by OLS, adjusting the standard errors for clustering at the village level. The second strategy allows to restrict the attention to loans taken from relatives and private individuals only while the former does not, due to the high degree of censoring which makes the implementation of the LAD estimator impossible.[24] The dependent variable in the first approach thus includes the amount borrowed from all sources (even in this case, 55% of the sample is censored).

[Insert table 5]

The first three columns of table 5 report the results when the sample includes both households who borrowed and households who did not. With all three methods the amount of money lent to others or sent as remittance in the previous year has a positive and significant effect, suggesting that reciprocity may indeed be at work. Columns 4 to 6 report OLS estimates for the households who borrowed positive amounts. The dependent variable is, respectively, the amount borrowed from all sources (col. 4), the amount borrowed from relatives and private non-moneylenders (col. 5), and that borrowed from moneylenders, banks, cooperatives and "others" (col. 6). In column 5 past contributions show a positive and significant coefficient: conditional on borrowing, ceteris paribus more than 20 percent of the money contributed comes back to the household in the form of higher loans from potential kinsmen. On the contrary, in column 6 the amount borrowed from non-kin is not affected by past contributions, suggesting that such contributions do not simply proxy for the size of one's operations. On the side, notice that the value of crop lost by the household, which is

[24] Powell's (1984) estimator is implemented through the iterative linear programming algorithm proposed by Buchinsky (1994). The asymptotic covariance matrix is estimated by bootstrapping.

insignificant in other regressions, displays a positive and significant coefficient in column 5, suggesting a possible insurance function for intra-kin loans.

6 Conclusions

This paper makes two contributions. First, it proposes a theoretical framework for analyzing how membership in a dynastically-linked community shapes individual incentives in economic transactions. The model shows that the scope for 'social enforcement' is enlarged in a dynastic community because sanctions can fall upon the deviant member as well as upon his or her offspring. This makes cooperation possible even in very short term interactions. Also, thanks to the non-anonymous links, reciprocal arrangements can be sustained by a *changing* set of players, and this can result in a set of social norms that condition players' behavior on characteristics *of their predecessors*, even when such characteristics bear no interest from the point of view of the economic transaction. Consequences of such behavior include the possible persistence of inequalities and changes in the terms of the transactions (e.g., lower prices).

The second contribution is an attempt to test some of these ideas using data on credit flows in rural Ghana, a setting where the role of (dynastic) kin groups is paramount. I find that about 67% of the total amount borrowed is borrowed from potential kinsmen, and that family structure helps enforce these loans: ceteris paribus, having children who can be punished when the loan is from a relative reduces the estimated probability of default by 80%. As for reciprocity, a first indicator of its extent is that less than 5% of the loans from relatives carry an interest. The relationship between reciprocity and family structure is suggested by the fact that having children when the lender is a relative reduces the estimated probability of facing an interest by 77% compared to the baseline case. Reciprocity seems effective even in the short run: conditional on borrowing, more than 20% of the money contributed to others in the previous year comes back to the household in the form of higher loans from potential kinsmen. Finally, 'outsiders' are at a disadvantage in borrowing not only from the local kin group, but also from their own relatives: ceteris paribus, the predicted probability that the source of the loan is a relative is 27% lower for migrants than for non-migrants.

These results have potentially relevant implications from a policy perspective. Given the role played by kin groups in coping with credit constraints in developing countries, it would be inappropriate to disregard their existence and structure when designing interventions in the credit sector. The fact that migrants and other categories of 'displaced' people may be unable to borrow from their kinsmen to a significant extent, having to resort to more expensive informal sources (e.g., moneylenders), may call for special interventions targeted to these categories.

In general, this paper highlights the need for a better understanding of how social structure affects economic organization and performance. Concepts that have traditionally been studied by anthropologists need to be taken seriously by economists, and this is particularly true for low-income environments. For example, more should be done to understand the impact of kin membership on other dimensions of economic activity, such as intra-household allocation, learning and information transmission, the formation of business networks, etc. Future research should also address the difficult but fascinating question of how economic development threatens (or reinforces) the existence of informal institutions, and how the latter react to reinforce their social norms. A better understanding of the economic impact of family structure and social groups can be a first step for endogenizing their strength.

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Appendix

A.1 Proof of proposition 3

Let $\widetilde{U}_{\underline{e}}$ denote the minimum utility that type $\underline{e}$ individuals must be guaranteed. The Pareto problem is to maximize with respect to $\overline{p}|k$ $(k = 0, 1, ..., \alpha n - 1)$ and $\underline{p}|k$ $(k = 0, 1, ..., \alpha n)$ the following:

$$U_{\overline{e}}(\overline{p}) \equiv u(\overline{e} + g + rl - b) + \delta [\alpha u(b) + (1 - \alpha)\overline{p}u(b)] \tag{A.2}$$

s.t.

$$U_{\underline{e}}(\underline{p}) \equiv u(\underline{e} + g - rl - b) + \delta \left[\alpha u(b) + (1 - \alpha)\underline{p}u(b)\right] \geq \widetilde{U}_{\underline{e}} \tag{A.3}$$

$$u(\underline{e} + g - rl - b) + \delta \left[\alpha u(b) + (1 - \alpha)\underline{p}u(b)\right] \geq u(\underline{e} + l + g) \tag{A.4}$$

$$u(\overline{e} + g + rl - b) + \delta\alpha u(b) + (1 - \alpha)\overline{p}u(b) \geq u(\overline{e} + g + rl) \tag{A.5}$$

$$(\alpha n - k)(\overline{p}|k) + [(1 - 2\alpha)n + k](\underline{p}|k) = \alpha n, \quad k = 0, 1, ...\alpha n \tag{A.6}$$

where $\underline{p}$ and $\overline{p}$ are defined by (4) and (5) in the text. The objective function is the expected lifetime utility of a type $\overline{e}$; (A.3) is the Pareto constraint; (A.4) and (A.5) are the IC constraints for types $\underline{e}$ and $\overline{e}$, respectively; (A.6) are feasibility constraints on the number of available loans. The Pareto frontier is obtained by tracing the solutions to the above problem for all possible nonnegative values of $\widetilde{U}_{\underline{e}}$.

To find the endpoints of the frontier, assume that δ is such that, at the exogenous $r > 0$, constraints (A.4) and (A.5) are satisfied whatever the matching rule. The best rule for types $\overline{e}$ yields $\overline{p}|k = 1$, $\forall k$. Constraints (A.6) then yield the corresponding feasible $\underline{p}|k$ for each k. The best rule for types $\underline{e}$ is found in a similar way, keeping in mind that children of poor players cannot be *guaranteed* a loan because their number may exceed that of available loans. As for the slope of the frontier, note that from (A.2) and (A.3) $\Delta U_{\overline{e}}/\Delta U_{\underline{e}}$ will be constant if and only if $\Delta\overline{p}/\Delta\underline{p}$ is. Start from URM and move to a point more favorable to types $\overline{e}$ by giving their children probability one of getting a loan when there are $\alpha n - k$ of them who are poor. In this case

$$\begin{aligned}
\Delta\overline{p} &= \frac{\binom{\alpha n-1}{k}\binom{n-\alpha n}{\alpha n-k}}{\binom{n-1}{\alpha n}}\left(1-\frac{\alpha}{1-\alpha}\right) > 0 \\
\Delta\underline{p} &= \frac{\binom{\alpha n}{k}\binom{n-\alpha n-1}{\alpha n-k}}{\binom{n-1}{\alpha n}}\left(\frac{k}{n-2\alpha n+k}-\frac{\alpha}{1-\alpha}\right) < 0.
\end{aligned}$$

Simplifying the binomials, the ratio $\Delta\overline{p}/\Delta\underline{p}$ is equal to $-\frac{1-\alpha}{\alpha}$. The threshold values for δ in the note to proposition 3 are derived by imposing that the equilibrium strategies are incentive compatible for types $\underline{e}$ and $\overline{e}$ in the worst equilibria for each type. □

A.2 Proof of Proposition 4

The problem is to maximize (A.2) with respect to $r \geq 0$, to $\overline{p}|k \in [0,1]$ and $\underline{p}|k \in [0,1]$, $(k = 0, ..., \alpha n)$, subject to constraints (A.4) and (A.6). Setting up the Kuhn-Tucker conditions and simplifying the factorials, an interior solution would require the ratio $u'(\overline{e}+g+rl-b)/\ u'(\underline{e}+g-rl-b)$ to equal $(1-\alpha)/\alpha$, which is inconsistent with $u(\cdot)$ concave and $\alpha < 1/2$. Therefore at any interior solution $u'(\overline{e}+g+rl-b)/(1-\alpha) < u'(\underline{e}+g-rl-b)/\alpha$. But then if the lender decreases r by dr and increases $\overline{p}|k$ by $u'(\underline{e}+g-rl-b)\left[\delta\alpha(1-\alpha)u(b)\frac{\binom{\alpha n}{k}\binom{n-\alpha n-1}{\alpha n-k}}{\binom{n-1}{\alpha n}}\frac{\alpha n-k}{n-2\alpha n+k}\right]^{-1} dr$, the borrower's IC (A.4) is still satisfied and the lender gets a utility change of $-u'(\overline{e}+g+rl-b)dr + \frac{1-\alpha}{\alpha}u'(\underline{e}+g-rl-b)dr > 0$. The lender will raise $\overline{p}|k$ up to the point where $\overline{p}|k = 1$, $\forall k = 0, ..., \alpha n$.[25] The Corollary to Proposition 4 follows from comparing (8) with (9) and observing that $\underline{p}^* < \frac{\alpha}{1-\alpha}$. □

[25] Our parameterization implies that $r > 0$ is consistent with $\overline{p} = 1$ (see the derivation of the Pareto frontier in the case of an exogenous r). If we allow r to hit 0 before $\overline{p} = 1$, the qualitative results are unchanged. In this case MRL implies the highest *feasible* probability of getting a loan for the children of lenders, and $r = 0$ strengthens the conclusion that, compared to URM, interest payments are foregone by lenders in order to grant their children access to credit.

Table 1: Loan characteristics, by source

	% number of loans	*% value of loans*	*Mean amount*	*% with interest*	*Avg. interest*	*% with additional conditions*			*Default rates*$^{(a)}$	
						Goods/serv	*Regular pay*	*Collateral*	*Default1*	*Default2*
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Relatives	20.5	14.2	6,382	4.5	31.2	2.1	12.9	0.7	1.2	5.5
Private	60.1	52.8	8,081	7.2	41.7	3.2	13.5	1.1	4.3	17.4
Moneylender	4.8	8.6	16,276	28.0	46.0	3.0	13.0	1.0	1.5	20.3
Bank	5.2	15.2	26,798	83.0	19.9	9.3	27.8	8.4	4.4	14.1
Coop	0.8	1.4	16,300	50.0	10.5	6.3	50.0	6.3	14.3	42.9
Other	8.6	7.8	8,308	12.4	47.0	2.3	19.8	0.6	0.7	20.7
All sources	100	100	9,186	12.3	50.7	3.2	14.9	1.4	3.4	15.8

Source: author's calculations on the GLSS.

Sample includes both rounds of the survey. Monetary amounts in Ghanaian cedis, constant prices Sept. 1988.

(a) Default1 counts as default all loans expired at least a month before the interview and not repaid. Default2 counts as default all loans expired before or during the month of the interview and not repaid.

Table 2: Probability of borrowing from different sources

	Relative		Private		Moneylender	
	Coeff.	*Std.err.*	*Coeff.*	*Std.err.*	*Coeff.*	*Std.err.*
	[1]	[2]	[3]	[4]	[5]	[6]
PANEL A						
Children	.294	(.420)	.553	(.379)	.706	(.581)
Migrant	-.636**	(.300)	-.260	(.261)	-.212	(.411)
Age	-.198**	(.078)	-.189**	(.076)	-.136	(.090)
Age sq.	.002**	(.001)	.002**	(.001)	.001	(.001)
Female	.386	(.444)	.305	(.400)	.669	(.531)
Education	-.041	(.028)	-.057**	(.026)	-.015	(.039)
HH size	.016	(.056)	.067	(.048)	-.036	(.079)
Ga-Adangbe	1.569**	(.707)	1.436**	(.620)	.677	(1.014)
Ewe	-.040	(.508)	.122	(.453)	.275	(.587)
Other language	.583	(.465)	-.081	(.435)	.648	(.588)
Dominant language	-.481	(.332)	-.354	(.305)	-.181	(.423)
Muslim	-.141	(.639)	.427	(.573)	-.457	(.996)
Years resident (ln)	-.275	(.213)	-.287	(.192)	-.412	(.273)
# changes residence	-.023	(.068)	.058	(.054)	.228**	(.111)
Income	-.465**	(.149)	-.391**	(.134)	-.558**	(.203)
Value of crop lost	-.064	(.045)	-.060	(.041)	-.104*	(.056)
Semi-urban	.577*	(.332)	.540*	(.289)	-.139	(.466)
Distance from bank	.085**	(.029)	.067**	(.028)	.056*	(.032)
No. obs.	1434					
McFadden R^2	.08					
Count R^2	.67					
PANEL B						
Migrant	-.540*	(.300)	-.234	(.263)	-.170	(.415)
Family here	1.038**	(.385)	.353	(.364)	.556	(.470)
No. obs.	1434					
McFadden R^2	.09					
Count R^2	.67					
PANEL C						
Migrant	-.537*	(.331)	-.297	(.294)	.020	(.480)
From village	.364	(.444)	.621	(.383)	.076	(.630)
Population (ln)	.262	(.193)	.294*	(.170)	.245	(.286)
Seasonal outflows	-.213	(.383)	-.014	(.340)	.449	(.517)
# religious groups	-.714**	(.219)	-.517**	(.197)	-.278	(.239)
No. obs.	1167					
McFadden R^2	.09					
Count R^2	.67					

Notes: * denotes significance at the 10 percent level, ** at the 5 percent level.

Multinomial logit, omitted category is "banks and cooperatives". Sample pools loans taken in 1987/88 and 1988/89 (controls include a dummy for 1987/88). Standard errors corrected for heteroskedasticity and clustering of the residuals at the household level.

Count R^2 is the proportion of correct predictions.

Table 3: Probability of default

Dependent variable: DEFAULT2

	Coeff. [1]	*Std.err.* [2]	*Marginal*$^{(a)}$ [3]	*Coeff.* [4]	*Std.err.* [5]	*Marginal*$^{(a)}$ [6]
β_R : Children | relative	-.802**	(.257)	-.125**	-.737**	(.316)	-.114**
β_{NR} : Children | non-relative	-.023	(.163)	-.005	.038	(.212)	.008
Migrant	.004	(.128)	.001	.009	(.147)	.002
Age	.007	(.027)	.001	.033	(.036)	.007
Age sq.$^{(b)}$	-.004	(.029)	-.008	-.025	(.038)	-.005
Female	.202	(.153)	.047	.286	(.208)	.067
Education	.019	(.012)	.004	.028**	(.013)	.006**
HH size	.021	(.022)	.005	.010	(.027)	.002
Ga-Adangbe	.429*	(.232)	.112*	.385	(.294)	.096
Ewe	.180	(.178)	.042	.183	(.200)	.041
Other language	.211	(.184)	.050	.276	(.212)	.064
Dominant language	.097	(.128)	.021	.089	(.143)	.019
Muslim	-.159	(.269)	-.032	-.110	(.287)	-.022
Years resident (ln)	-.036	(.067)	-.008	-.112	(.080)	-.023
# changes residence	.009	(.025)	.002	.007	(.035)	.001
Income	.032	(.052)	.007	.022	(.061)	.005
Value of crop lost	-.016	(.016)	-.003	-.020	(.018)	-.004
Semi-urban	.175	(.131)	.039	.266*	(.153)	.059*
Distance from bank	-.005	(.009)	-.001	-.005	(.010)	-.001
Family here				.108	(.171)	.024
Spouse different region				.296	(.185)	.069
Remittances from children				-.012	(.034)	-.002
Community help				.143	(.205)	.028
# days exchange labor				.005*	(.003)	.001*
No. obs.	1018			770		
McFadden R^2	.06			.08		
Count R^2	.85			.85		
Observed P	.15			.15		
Predicted P	.14			.13		

Notes: * denotes significance at the 10 percent level, ** at the 5 percent level.

Probit estimates. Standard errors corrected for heteroskedasticity and clustering of the residuals at the household level. Sample pools loans taken in 1987/88 and 1988/89 (and a dummy for 1987/88 is included among the controls).

(a) Marginal probit coefficients calculated at the mean. For dummies, marginal effect is calculated for discrete change from 0 to 1.

(b) Coefficients and standard errors multiplied by 100.

Count R^2 is the proportion of correct predictions.

Table 4: Probability of interest rate on loans taken

Dependent variable: INT RATE

	Coeff. [1]	*Std.err.* [2]	*Marginal*$^{(a)}$ [3]	*Coeff.* [4]	*Std.err.* [5]	*Marginal*$^{(a)}$ [6]
β_R : Children | relative	-.809**	(.220)	-.108**	-1.071**	(.264)	-.130**
β_{NR} : Children | non-relative	-.008	(.143)	-.001	-.131	(.184)	-.025
Migrant	.032	(.106)	.006	.002	(.129)	.0005
Age	.011	(.022)	.002	.023	(.026)	.004
Age sq.$^{(b)}$	-.005	(.022)	-.001	.014	(.026)	-.003
Female	-.202	(.136)	-.035	-.276	(.200)	-.045
Education	.014	(.011)	.002	.015	(.013)	.003
HH size	-.029	(.022)	-.005	-.024	(.026)	-.004
Ga-Adangbe	-.269	(.205)	-.044	-.265	(.248)	-.043
Ewe	-.358**	(.176)	-.057**	-.464**	(.202)	-.071**
Other language	.121	(.156)	.024	.140	(.184)	.027
Dominant language	.116	(.116)	.022	.196	(.135)	.037
Muslim	-.363	(.225)	-.055	-.447*	(.262)	-.065*
Years resident (ln)	.133**	(.062)	.025**	.164**	(.078)	.030**
# changes residence	-.044**	(.022)	-.008**	-.046	(.029)	-.008
Income	.145**	(.050)	.027**	.137**	(.060)	.025**
Value of crop lost	.013	(.013)	.002	.015	(.015)	.003
Semi-urban	-.352**	(.122)	-.061**	-.293*	(.150)	-.050*
Distance from bank	-.009	(.006)	-.002	-.008	(.007)	-.001
Family here				.135	(.146)	.026
Spouse different region				.112	(.162)	.022
Exchange labor				-.058	(.134)	-.011
Sharecropper				.177	(.159)	.035
Community help				-.155	(.158)	-.031
No. obs.	1434			1064		
McFadden R^2	.10			.12		
Count R^2	.86			.86		
Observed P	.14			.14		
Predicted P	.11			.11		

Notes: * denotes significance at the 10 percent level, ** at the 5 percent level.

Probit estimates. Standard errors corrected for heteroskedasticity and clustering of the residuals at the household level. Sample pools loans taken in 1987/88 and 1988/89 (a dummy for 1987/88 is included among the controls).

(a) Marginal probit coefficients calculated at the mean. For dummies, marginal effect is calculated for discrete change from 0 to 1.

(b) Coefficients and standard errors multiplied by 100.

Count R^2 is the proportion of correct predictions.

Table 5: Reciprocation of past contributions

Dependent variable:[(a)]		BORROWED		ALL LOANS	LOANS FROM KIN	NON-KIN
	OLS	Tobit	LAD	OLS	OLS	OLS
	[1]	[2]	[3]	[4]	[5]	[6]
Age	-.179.4	-254.2	-277.8	-813.0	-896.5	-115.2
	(331.2)	(652.9)	(640.1)	(645.0)	(697.5)	(280.9)
Age sq.	1.77	.34	1.94	10.05	9.43	2.14
	(3.07)	(6.22)	(6.44)	(6.18)	(6.69)	(2.74)
Female	409.8	-811.8	4266.6*	441.7	-3846.8	2607.6
	(1839.8)	(4020.8)	(2435.6)	(3456.4)	(2482.7)	(2126.6)
Education	364.4	517.8	251.6	574.3	-362.9	935.2
	(293.0)	(424.6)	(230.7)	(629.3)	(287.5)	(600.2)
HH size	418.9	948.9	472.7	858.3	775.1	290.7
	(393.9)	(691.8)	(318.5)	(774.5)	(723.6)	(527.7)
Children	-1102.9	-79.24	-1149.6	-7420.8	-305.4	-8521.2
	(3389.7)	(4918.6)	(2686.4)	(7743.5)	(3425.6)	(8110.8)
Migrant	-1267.1	3572.7	2664.3	-5319.7*	-3906.2	1114.1
	(1327.2)	(2954.7)	(2246.9)	(2871.1)	(3023.9)	(1046.3)
Ga-Adangbe	-297.7	-602.0	-206.1	4732.0	3727.6	932.2
	(1307.1)	(2956.2)	(4541.8)	(4354.1)	(3334.0)	(3136.9)
Ewe	-566.1	-2464.8	2651.5	1509.3	-214.8	2095.4
	(2271.8)	(4805.8)	(1976.1)	(3965.6)	(4134.2)	(5094.4)
Other language	1352.9	-5199.3	373.7	8145.9	2357.9	4735.8
	(2456.7)	(4439.5)	(2980.5)	(5018.9)	(4009.7)	(3590.1)
Dominant language	-937.9	113.3	-3318.6	-5084.0	-5.13	-3401.2
	(1423.7)	(2929.5)	(2234.8)	(3605.1)	(2726.0)	(2978.5)
Muslim	-3067.2	-538.3	-660.3	-9908.0**	-7438.0*	-1346.9
	(2057.3)	(4845.8)	(2041.8)	(4822.2)	(4308.0)	(1631.9)
Years resident	856.8	2366.9	5018.1**	-458.3	-283.5	1322.0
	(1175.0)	(2406.6)	(1966.7)	(2398.9)	(1643.2)	(1458.5)
# changes residence	1953.1*	3469.5**	1627.4**	2109.4	1263.1*	1345.9
	(994.5)	(1359.7)	(762.6)	(1512.0)	(691.6)	(1217.7)
Income	1945.6**	3291.5**	2637.4	5592.2**	3842.4**	1588.6
	(739.0)	(1493.3)	(1642.3)	(1814.4)	(1401.4)	(1368.7)
Value of crop lost	71.8	382.6	179.1	-9.50	664.8**	-596.8
	(257.6)	(450.5)	(206.4)	(617.9)	(323.4)	(553.6)
Semi-urban	-1756.5	-5473.6	-1773.9	-545.8	-3110.7	4396.9
	(2082.1)	(4045.1)	(2320.5)	(4844.5)	(3377.6)	(3442.8)
Distance from bank	-146.6**	-361.6**	-369.6*	-310.6**	-262.3**	23.5
	(68.4)	(142.0)	(196.8)	(131.5)	(117.7)	(69.6)
Amount lent/remitted	.147**	.187**	.082**	.226**	.205**	.026
last year	(.06)	(.085)	(.034)	(.092)	(.085)	(.076)
No. obs.	587	587	182	248	205	205
Pseudo Rsq	.16	.02	.06	.24	.23	.23

Notes: * denotes significance at the 10 percent level, ** at the 5 percent level. Sample includes households interviewed both in 1987/88 and in 1988/89. Standard errors in cols. 1,2,4, 5 and 6 are corrected for heteroskedasticity and clustering of the residuals at the village level; those in col. 3 are bootstrapped.

(a) Dependent variable in cols. 1-3 is amount borrowed by household from all sources (including 0 for households that did not borrow). Dependent variable in col. 4 is amount of all loans taken by household (conditional on borrowing positive amounts); in col. 5 is amount of all loans taken from relatives and private non-moneylenders (conditional on being positive); in col. 6 is the difference between col.4 and col.5.

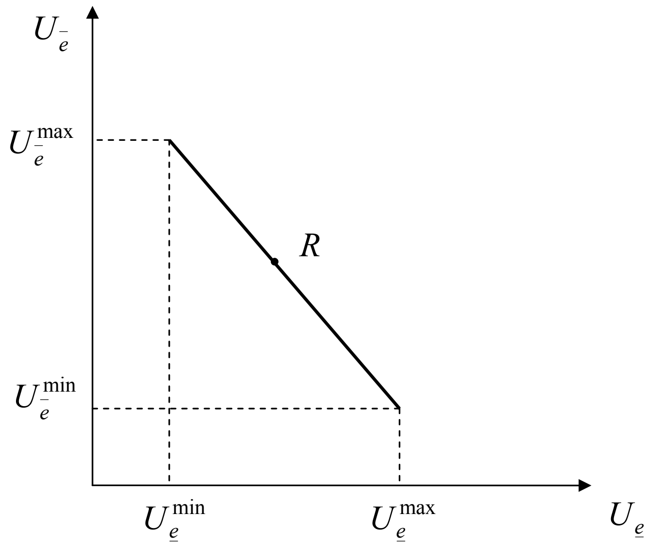

Figure 1: Pareto Frontier