

Formalizing Informal Institutions: Theory and Evidence From A  
Kenyan Slum\*

(Forthcoming in *Institutions and Economic Growth*, Elhanan  
Helpman (editor), Harvard University Press)

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May 2007

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\*We thank Tim Besley, Avner Greif and an anonymous referee for extensive comments on an earlier draft. This paper has also benefited from discussions with the participants of the Institutions, Organizations and Growth program of CIFAR.

# 1 Introduction

Since Weber, the rise of the West has been associated with a rise in formalism in everything from the arts and music to the governing of personal relations, political relations, and economic ties. Yet why formalization matters for long term growth, and how the process of formalization unfolds is only beginning to be understood. The works of Acemoglu and Robinson, Greif, Besley, Persson and Tabellini and other contributors to this volume have been key in defining the perspective from which institutions are studied by economists today, and framed the questions on which progress will be defined in future. We bring these questions back to the details of development in one of the world's poorest locations – Kibera, a slum of over one million inhabitants, which sits on the outskirts of Nairobi.

We study the degree of formalism that self-sustaining groups invoke to help govern their relations in Kibera. We are interested in knowing what features of self-sustaining groups make some choose informal structures of governance, while others choose formal ones. By formalism, we mean implementing rules, procedures and codified adjudication methods that clearly specify actions to be taken in contingencies, rather than relying on the discretion of decision makers when such contingencies arise. Generally this is hard to measure, but here we bring concrete data to the investigation of the phenomenon. The data provides a snapshot of steps of increased formalization being taken by otherwise informal groups.<sup>1</sup> A place like this is one of the best to study the behavior of informal groups because groups formed here are able to be set up beyond the direct reach of the usual instruments of coercion; both political and legal. They are thus a relatively pure example of self-enforcing institutions, that can autonomously decide on the structure of their decision making protocols and collective rules.

The information we have on them contains numerous variables that are good proxies for this formalization process. We have information about groups' attempts to codify their rules on expected behavior, their attempts to spell out clear punishments in case of transgression, and perhaps most importantly, their attempts to provide external oversight regarding decision making by inviting

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<sup>1</sup>This is related to sociological explanations of insitutional development, which have focused on the need for intense ties at institutional inception, but then notes that such intensity hampers futher institutional expansion. Authors such as Granovetter (1998), Woolcock and Narayan (2000), and Rao and Woolcock (2001) have emphasized the need for groups to move from the reliance on the personal links to more anonymous and codified means of decision making.

outside scrutiny over group behavior and decisions.

Our study relates broadly to the study of institutional development, which is increasingly seen as a key to economic development. At the country-wide level, the usual institutions of interest are the macro political and legal ones whose development has long been known to be correlated with income levels, and is increasingly evidenced as having an important causative role.<sup>2</sup> Micro level institutions, where our study is focused, though necessarily of more localized impact, have the advantage of allowing a deeper characterization of institutional details.<sup>3</sup> But what is unique here is our focus on a set of institutions where the first steps of formalization seem to be emerging. This may help us better understand the conditions under which these formal components are useful, and why they might arise. Avner Greif's work over the long historical spread of Western European institutional formation is explicitly concerned with the dynamics of institution formation too, see Greif (1994, 2006) and his contribution to the present volume. By analyzing the historical underpinnings of Western European market institutions in Mediaeval trade, his work illuminates the process by which institutions may have morphed into the complex structures which we observe today. Though only a static picture is provided by the work here, this may still have implications for this dynamic process if we are glimpsing the first steps from fully discretionary decision making to something more restricted.

Relatedly, others have noted that, in successful community development programs, linkages by informal groups to outside authorities are forged incrementally (Rao and Woolcock (2001)). Here we unearth reasons why these and other actions of formalization may arise. One key determinant seems to be a group's ethnic structure. A reasonable conjecture emanating from the literature on social capital is that groups of homogeneous ethnic structure, and presumably rich in social ties, should find it less necessary to rely on formalization.<sup>4</sup> Formalization instead should arise to strengthen group cohesion in places where individuals do not bring strong externally based interconnections

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<sup>2</sup>Acemoglu, Johnson and Robinson (2001) demonstrated this causation in a sample of ex colonies, and their emphasis on identifying causation has characterized the best subsequent work in the field. In this volume, the works of Nunn, Persson and Tabellini, and Besley and Kudamatsu, further demonstrate the insights that can be extracted by country-level perspectives.

<sup>3</sup>An early seminal works is Greif (1994) and Besley (1995) surveys micro studies of risk sharing institutions. The chapters by Acemoglu, Bautista, Querubin and Robinson, and Drelichman and Voth in this volume exemplify the advantages afforded by the detail that such micro level approaches allow.

<sup>4</sup>A similar theme is advanced by Mokyr's chapter in the present volume. There he argues that high degrees of trust in industrial revolution Britain augmented formal institutional developments in providing the foundation for Britain's sustained economic development.

to their informal groups. This is consistent with anecdotal observations comparing formalization (which is strong in the developed West, where traditional or ethnic ties are weak) with lower formalization in LDCs (where traditional or ethnic ties are strong). The first striking and robust empirical finding here is that, contrary to the conjecture above, the groups constituted along ethnic lines are the ones most likely to choose these formalization procedures. Groups formed amongst unrelated individuals, with presumably weaker inter-individual connections, seem more content to persist with informal decision making and procedures.<sup>5</sup>

We conjecture that this is because the ties which are usually seen as beneficial in overcoming agency, moral hazard, and enforcement problems in informal groups, can also have a downside. Specifically, these ties, which consist of social links between kin members that extend beyond the workings of the group, impose social and psychological costs on individuals when it comes to punishing recalcitrant group members. Lacking formal sanctions, punishment in self-enforcing groups amounts to exclusion from future interaction with the group. We posit that when an individual from a group organized along kin lines is excluded from the group, both the individual being punished and the remaining members of the group suffer these costs.

The effects of these non-pecuniary costs on the punished are well known, and have been thoroughly analyzed previously. They raise the cost of cheating, and thus help in sustaining informal group functioning. However, the effects of these costs on the punishers have, to our knowledge, not received any attention in the economics literature.<sup>6</sup> Costs that are similar to the ones we posit have, however, come to increasing prominence in recent work in organizational science. Schulze et. al. (2001), for example, identify the cost imposed on agency relationships when members are linked by altruistic tendencies towards each other in the context of family firms. One of these costs

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<sup>5</sup>See also the related work on problems of tribal links in Africa. That literature emphasizes the power of familial obligation in restraining, not just opportunistic behavior, but behavior that might be beneficial. Specifically, it emphasizes how familial ties and claims to wealth provide disincentives to personal wealth accumulation. Such ties make it hard for individuals to refuse the demands of family members, no matter how unreasonable those demands may be. For a recent economic analysis of this aspect, see Hoff and Sen (2005). Platteau (2000 Ch.15) has emphasized the role of migration in creating physical distance between kin members and freeing them of these onerous obligations. In our context of self-sustaining groups, such “unreasonable” or detrimental demands may manifest as an inability, or unwillingness, to punish group members who have been wayward and/or irresponsible in their actions vis a vis the group. If that is the case, then we conjecture that perhaps, by instituting formal modes of punishment, procedures, and decision making rules that are beyond discretion, formalism can overcome this lack of credibility in punishing transgressors.

<sup>6</sup>An exception is a recent survey by Cox and Fafchamp (2006) which touches upon this issue but it is not their focus.

is difficulty in disciplining family members, which they argue can make agency problems in family firms worse than those in standard firms. According to them, connections between family members can get in the way: “Altruism, on the other hand, can make parent owner-managers unable or unwilling to properly administer incentive programs. The altruist’s ability to enforce agreements is often compromised by the ramifications that such actions might have on familial relationships, both within and among extended family. Both phenomena, if carried into the family firm, make it difficult for owner managers to discipline family agents and enforce agreements..” (p.111)<sup>7</sup>

In the formal model that we develop, the main impact of these connections is to raise the costs of dismissing, and hence weaken the credibility of punishing recalcitrant group members. Since the credibility of punishment is key to the effective functioning of such groups, the informal groups seek to respond by altering their governance protocols. We analyze two ways in which they do this. The first is by formalizing decision making, in the ways outlined above, and the second is by strengthening decision makers’ incentives to follow through on promised punishments by asking members to post membership fees as bonds.

The chapter is also related to work on the interaction between formal and informal institutions. For example Arnott and Stiglitz (1991) who argued that, in the context of insurance, well functioning informal insurance mechanisms that provide protection against small shocks, could undermine the diffusion of formal insurance by compromising the ability of formal insurers to impose deductibles on clients.<sup>8</sup> In contrast, we are not directly concerned with the interaction between the informal and formal institutions here, but instead with the means by which the formal may emerge from the informal.

Our emphasis on ethnicity also relates this to previous work on the role of ethnic ties in sustaining cooperation between individuals in informal groups (for example, La Ferrara (2003), Fafchamps (1992), Udry (1994), and Bates (1990)). The literature on informal group formation and social capital has pointed to the role of kinship ties. The theoretical underpinnings of sustaining cooperative outcomes in informal settings relates back to the folk theorem and the benefits of information flows

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<sup>7</sup>Other indications are provided by Gomez-Mejia et. al. (2001) who show, using the entire population of Spanish Newspapers during a 27 year period (1966-1993), that firm performance and business risk are much stronger predictors of executive tenure in non-family versus family firms. Schulze et. al. (2001) show that the majority of US family firms offer employed family members short and long term performance based incentive pay. They draw on household economics and altruism literature to explain why family firms might feel compelled to do so. They provide a theory to explain how altruism influences agency relations within the family.

<sup>8</sup>See also Stiglitz (1999) for a thorough discussion of this interaction between formal and informal institutions.

both within and outside the group (for example, Kandori (1992)). A standard result theoretically, that has been confirmed in empirical settings, is that improvements in the quality of information flows between group members should help in creating functional institutions. Such information flows are often thought to be linked to the quality of social and extra-situational ties between the individuals (for example, Besley and Coate (1995)). Similar insights underlay attempts to improve lending to the poor by exploiting their information sharing in setting up joint-liability lending (for example, Ghatak (1999) and Morduch (1999)). Our focus is instead on the effects that such ties have on the credibility of punishing recalcitrant group members, rather than on their effects in aiding information flows.

Alternative means of supporting cooperative behavior have been the invoking of bonding technologies (Kranton (1996)). A type of bond also plays an important role in the groups we study. However, once again, for different reasons than have been emphasized in the previous literature. Bonds are usually seen to help in ensuring that individuals liable to moral hazard have incentive to take the actions they promise (or forfeit their bond).<sup>9</sup> Here the bonds we analyze aid the credibility of following through on threatened punishments once moral hazard has occurred.

This chapter is also related to the downside of the social capital created by ties of ethnicity, though for different reasons than have previously been suggested. Previously the extent of ties between individuals, and the lack of these ties across other individuals has been seen to stifle the extent to which production can move beyond the kin group (Woolcock (2002) surveys this literature, and Francois and Zabojnik (2005) develop a theory emphasizing the role these ties play in the implementation of modern technologies). Here, however, the cost we identify is more direct, in that the flip-side of the benefit they generate in imposing costs on morally hazardous behavior is the imposition of similar costs on those who must punish the deviators.

We first develop a simple model to analyze our claims that kinship ties may create problems with punishment, and to tease out empirical implications. A natural issue that arises is how these posited problems of kinship interact with the well known benefits that such ties create in raising the costs of morally hazardous behavior. The model we develop makes clear that the beneficial side of kinship is that it is useful in helping sustain interactions that are of relatively low intrinsic value to members. Groups of higher intrinsic value will be sustainable both with and without ethnic

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<sup>9</sup>See, for example, Carmichael (1989).

homogeneity. However, it is at these high values where kin groups encounter the additional difficulty that arises from the credibility of enforcement - although this is also a difficulty that all informal groups will have, it is worse for them. Consequently, formalization is a means to overcome this, and though used by all groups, will be more intensively used by the kin groups. The alternative to formalization is providing internal, to the group, incentives for individuals to punish transgressors. As will be seen, this is costly in the present context – with the costs being proxied by membership fees – but there is a trade-off between providing this internally costly incentive to punish versus relying on costly formalization procedures to take over the role from the outside.

The model makes clear predictions about what sort of groups will choose formalism, how these should relate to membership fees, the value of groups and the capacity which groups have to punish. We explore these conjectures in the data. The chapter proceeds as follows. The next two sections outline the data and the key variables and relationships that will form the basic building blocks of our model. The model is then built to explore the ways in which these key features interact. Specifically what are the reduced form relationships between the key variables we observe: ethnicity, formalization, membership fees, and the value of groups. We then test these implications on the data in Section 5, and subsequently discuss these implications and certain other observed correlations. Section 7 concludes.

## 2 The Context

We exploit unique data that comes from a survey of households conducted in 1997 in the slum of Kibera which is located on the outskirts of Nairobi, Kenya.<sup>10</sup> The slum is one of the largest in Africa, extends over 250 hectares of land, and is purported to house a population of more than one million people. The inhabitants are very poor. They live with enormous risks to their health and income, with no access to formal insurance or credit institutions. There is little activity by the state to improve the well-being of the slum population. Individuals are left to their own devices to meet their most basic needs. These circumstances have given rise to the formation of numerous informal groups that come together for the purposes of savings, insurance, and investment.

Individuals from approximately 520 households were interviewed, all living in the same area

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<sup>10</sup>This data was collected by Jean-Marie Baland from the University of Namur in Belgium.

of Kibera, namely the village of Kianda.<sup>11</sup> In addition to the standard household survey information, the survey asked individuals details of informal group membership, and details about the characteristics of the groups in which they participate. Over 80% of households in the slum had at least one member in at least one informal group and from this process, information on approximately 600 groups was collected. Characteristics of these groups include information on: function of the group, ethnic composition, membership fees, group duration, disputes, punishments and formalization attempts.

The groups provided three distinct functions, and are thus divided into three categories. About 60% of the groups have a savings role. These function as rotating savings and credit associations (ROSCAs). The groups meet regularly, and each member attends the meeting with an equivalent pre-specified monetary amount. The total contribution of all individuals is then taken home by one individual. The identity of the individual changes each time there is a meeting until a cycle of all members is completed. This method of saving is one of the most common in the developing world, and is the subject of a considerable literature in economics.<sup>12</sup>

Approximately 30% of groups serve an insurance function. These generally provide two types of insurance. The first is medical insurance for individuals who fall sick. These groups may cover the costs of medical treatment for household members, as well as support for dependents in case of lost earnings due to incapacity. The second type of insurance is covering funeral and body transport costs in case of death. Most members of the slum still have some ties to their home village in their tribal area. It is a strongly held belief that the deceased should be interned in their home villages, and the costs of paying for the transport and funeral proceedings are met out of the fund.

The final function, comprising about 25% of groups, is an investment one.<sup>13</sup> Members of investment groups collect their savings into a larger pool which is then used to generate income for the members. The two main income generating sources are a bank account, and lending to other residents of the slum. The table below lists some summary statistics on the different groups:

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<sup>11</sup>The slum is divided into 12 main villages.

<sup>12</sup>See, for example, Besley Coate and Loury (1993). Anderson and Baland (2002) analyse ROSCAs in this slum.

<sup>13</sup>The total adds up to over 100% because some groups have multiple functions.



	<b>Savings Group</b>	<b>Insurance Group</b>	<b>Investment Group</b>
Membership	16.1 (11.6)	67.0 (53.7)	34.3 (32.6)
Years Existed	2.3 (2.6)	7.6 (7.7)	4.1 (4.6)
Membership Fee	219.3 (361.6)	241.2 (503.0)	346.4 (595.7)
Monthly Contributions	595.3 (733.4)	655.2 (901.9)	498.4 (588.1)
Number of Observations	365	196	143

**Table 1 - Summary statistics on characteristics of groups**<sup>14</sup>

We see from the table above that insurance groups are the largest and have existed the longest in the slum. Membership fees and monthly contributions are in (year 1996) Kenyan shillings, when there were approximately 55 Kenyan shillings to the US dollar. Monthly contributions to these groups are significant as average individual monthly income for a typical household member in the slum is 3526 Kenyan Shillings, so that group contributions reflect around 15%-20% of earnings. Membership fees are roughly 10% of earnings.

A key variable that will be exploited here is the measure of formalism in groups. A direct measure of this is the binary variable “registered”. Groups that are registered are subject to some degree of external oversight. The oversight is usually performed by a social worker, of which there are many active in the slum. If the group is registered, individuals aggrieved with behavior of leaders or administrators in the group, or upset with the treatment they have received, are able to appeal directly to a social worker for interventions. A registered group pays a fixed amount to the government and is, nominally at least, required to do a number of other things. Registered groups are required to both keep minutes of their meetings, and have a set of written rules that determine the way in which the group members should act in certain contingencies. These actions can also be undertaken by non-registered groups as well, and it turns out that not all registered groups follow these guidelines. Both having written rules and the keeping of minutes are measured in the data as well; the variables “written rules” and “minutes” respectively. Additionally, there is information on whether groups have formal penalties for individuals that do not directly comply with the rules of the group, this is the variable “penalties”. A final variable which aids in enforcement is whether the groups has a bank account, which helps to monitor the fees and contributions collected by the group.

<sup>14</sup>Standard deviations are in parentheses. Monthly contributions for insurance groups come in two forms. The first is the regular contribution, the second is the average monthly contribution in the form of a spot fund, where members voluntary contribute funds when an emergency occurs. Membership fees average is computed for the sub-set that pay such fees.

Measure of formalism	Mean	Standard Deviation
registered	0.39	0.49
written rules	0.68	0.47
minutes	0.64	0.48
penalties	0.76	0.43
bank account	0.40	0.49

**Table 2 - Summary statistics on measures of formalism**

Some groups in our data are almost entirely informal (11%), in the sense of having implemented none of these procedures, whereas others have implemented them all (28%). We see from the table above, the majority of groups have written rules, keep minutes of their meetings, and impose penalties on their members, whereas only 40% of groups are registered and have a bank account. As expected, these variables are positively correlated, as seen from the table below:

	written rules	registered	minutes	penalties	bank account
written rules	1				
registered	0.546	1			
minutes	0.807	0.586	1		
penalties	0.219	0.104	0.182	1	
bank account	0.542	0.810	0.561	0.070	1

**Table 3 - Correlations between measures of formalism**

Since the formalization processes that we study each entail some costs to the groups – either in terms of flexibility, time or resources – we hypothesise that these will only be borne if they help in achieving the groups’ goals. Since these groups are largely self-sustaining and self-enforcing, the successful ones (i.e., the ones we observe) are somehow able to sustain collectively beneficial outcomes by ensuring that members forego individually beneficial deviations that would hurt other members. Successful repeated interaction corresponds to a set of individual behaviors, along the equilibrium path, that are mutually beneficial and become individually rational within the confines of the group. How is this sustained? It is sustained by ensuring that individuals who deviate from the required path are: (1) detected, and (2) punished by the other members of the group. With (1) and (2) in place, individuals have incentives to act as promised, and groups can succeed in realizing objectives.

When such groups choose formalization, we conjecture that it is because it helps in achieving one, or both, of these actions. But when one looks at the nature of the formalization process that we measure, it seems unlikely that these could help with task (1). The capacity to detect deviations

from prescribed behavior seems more like an immutable feature of the information environment these groups face, than a variable affected by formalization procedures. It is conceivable that formalization could bring with it improved means of detection, for instance if it allowed members to access a technology that enhanced observation, or monitoring of members’ actions, but in the present context this seems unlikely. Instead we think a much more likely benefit to formalization is in helping groups punish individuals straying from prescribed behavior.

There is reason to believe that this may be particularly relevant in the African context. Relatedly, another important detail that we observe in the present context is information regarding the measure of social connectedness in groups. We have a number of measures of this, two that relate to the current composition of the group, and two that relate to the groups formation. The variable “same ethnicity” measures whether the group is ethnically homogeneous or heterogeneous. There are five main ethnic groups in the slum, Kikuyu (local to Nairobi and surrounds), Luhya, Luo, Kamba and Kisii. Additionally there are a number of smaller ethnicities. A second measure, “majority local”, pertains to whether a majority of members of the group live in the part of the slum, Kianda, where the data was collected. Two remaining binary variables, “started with relatives” or “started with friends” pertain to the formation of the group.

<b>Measure of social connectedness</b>	<b>Mean</b>	<b>Standard Deviation</b>
same ethnicity	0.47	0.50
majority local	0.56	0.50
started with relatives	0.23	0.42
started with friends	0.43	0.50

**Table 4 - Summary statistics on measures of social connectedness**

In general, groups seem to be comprised in one of two ways. Either they are formed by individuals who are ethnically related, or they are formed by individuals who are friends and/or live close to each other. Approximately 20% of groups are organized around both same ethnicity and local area, whereas 17% of groups are not organised around either of these two measures of social connectedness. These latter groups are more likely to have been started with friends. The correlations between measures of social connectedness are as follows:

	same ethnicity	majority local	started with relatives	started with friends
same ethnicity	1			
majority local	-0.236	1		
started with relatives	0.510	-0.3067	1	
started with friends	-0.149	0.1700	-0.481	1

**Table 5 - Correlations between measures of social connectedness**

This table shows that there is a positive correlation between starting with relatives and being a group of homogeneous ethnicity, and that both of these factors are negatively correlated with the group starting with friends and being composed of members who are from the same part of the slum.

### 3 Relationship between formalism and social connectedness

We see from Table 4 that the groups are almost evenly allocated between those that have been formed along ethnic, or extended kin, lines and those that admit multiple ethnicities. In the African context, kin groups are powerful levels of authority. These groups are able to provide enforcement, both by threat of social ostracism and by exclusion from other beneficial group activities – see Garg and Collier (2005). We use kin information to allow inference regarding the extent of non-economic ties between members. A reasonable conjecture emanating from the literature on social capital is that groups rich in such ties should find it less necessary to rely on formalization. Formalization, it is conjectured, instead should arise to strengthen group cohesion in places where individuals do not bring strong externally based interconnections to their informal groups. This is consistent with anecdotal observations comparing formalization (which is strong in the developed West, where traditional or ethnic ties are weak) with lower formalization in LDCs (where traditional or ethnic ties are strong).

The first striking and robust empirical finding is that, contrary to the conjecture above, the groups constituted along ethnic lines are the ones most likely to choose these formalization procedures. The tables below demonstrate the significant positive correlation between formalism and ethnic homogeneity. We first present correlation results for each measure of formalism independently and then for estimations on an index of formalism.

The table below presents results from a probit estimation on the binary variables which measure formalism as a function of ethnic homogeneity and other controls which include the other main

measure of social connectedness, i.e., the majority members are from the local area, membership and existence of the group, as well as the primary function of the group.

<b>Variable</b>	<b>registered</b>	<b>written rules</b>	<b>minutes</b>	<b>penalties</b>	<b>bank account</b>
same ethnicity	0.39 (0.14)***	0.58 (0.14)***	0.44 (0.13)***	0.24 (0.13)*	0.31 (0.14)**
majority local	-0.12 (0.14)	-0.014 (0.15)	-0.087 (0.14)	-0.13 (0.13)	-0.26 (0.14)*
membership	0.002 (0.001)**	0.012 (0.005)***	0.0016 (0.0018)	-0.0003 (0.0002)	0.003 (0.001)**
years existed	0.014 (0.012)	-0.018 (0.021)	0.044 (0.023)*	-0.013 (0.010)	0.013 (0.015)
insurance	1.61 (0.16)***	1.51 (0.25)***	1.61 (0.22)***	0.055 (0.15)	1.99 (0.18)***
investment	1.10 (0.15)***	1.38 (0.18)***	1.37 (0.17)***	0.93 (0.17)***	1.045 (0.15)***
Constant	-1.48 (0.16)***	-0.62 (0.16)***	-0.63 (0.15)***	0.55 (0.13)***	-1.46 (0.17)***
Observations	582	582	582	582	582
$\overline{R}^2$	0.37	0.36	0.35	0.07	0.47

**Table 6 - Probit estimations on measures of formalism<sup>15</sup>**

The results demonstrate the significant positive correlation between ethnic homogeneity and our five separate measures of formalism. We see that the other measure for social connectedness, where groups instead organise around local proximity, is negatively but insignificantly related to measures of formalism. These results are robust to including other measures of social connectedness, such as whether the group started with friends or with relatives. Other controls such as membership size is positively related to formalism for some of the measures. Relative to savings groups (the left out category in the above regressions), insurance and investment groups are significantly more likely to use formalism. Nevertheless, it is important to point out that the positive correlation between ethnic homogeneity and measures of formalism is robust if we break the data up into sub-samples defined by the function of the group. That is, even for just savings groups, for example, the positive correlation holds.

The regressions below instead use an index of formalism as the key dependent variable. We constructed this index using principal component analysis on our five binary measures of formalism.

<sup>15</sup>Standard errors are in parentheses. A triple asterix denotes significance at the 1% level, double for the 5% level, and single for the 10% level.

<b>Variable</b>	<b>formalism</b>	<b>formalism</b>
same ethnicity	0.45 (0.10)***	0.39 (0.11)***
majority local	-0.19 (0.10)*	-0.16 (0.10)
started with friends		-0.20 (0.11)*
started with relatives		0.20 (0.16)
membership	0.0001 (0.0001)	.0001 (0.0001)
years existed	0.017 (0.008)**	0.015 (0.008)*
insurance	2.10 (0.12)***	1.97 (0.13)***
investment	1.46 (0.11)***	1.48 (0.11)***
Constant	-1.27 (0.11)***	-1.16 (0.13)***
Observations	582	582
$\overline{R}^2$	0.55	0.55

**Table 7 - OLS estimations on formalism index**

We see that the positive correlation between ethnic homogeneity and formalism holds for this index. There is also a negative and significant relationship between starting the group with friends and formalism. The longer the group has existed is also positively related to the index of formalism. Similar relationships to those in Table 6 between the function of the group and this index of formalism still hold.

Starting from the somewhat puzzling empirical observation that the groups constituted along ethnic lines are the ones most likely to choose these formalization procedures. We conjecture that kinship ties, while beneficial for group formation, can be detrimental to enforcement. In our context of self-sustaining groups, kinship ties may manifest as an inability, or unwillingness, to punish group members who have been wayward and/or irresponsible in their actions vis a vis the group. If that is the case, then we conjecture that perhaps, by instituting formal modes of punishment, procedures, and decision making rules that are beyond discretion, formalism can overcome this lack of credibility in punishing transgressors.

To analyze this conjecture we first develop a simple model to explore this consequence of formalization. A natural issue that arises at first is why, given the excessive (and hence damaging) commitment individuals may feel towards their kin groups, do kin based organizations arise at all? The answer is easily obtained by looking at the more standard literature on enforcement in repeated interaction.<sup>16</sup> An advantage of kin based groups is that, in addition to the direct benefits from forming the groups that we see here – insurance, savings and investment – individuals who

<sup>16</sup>An important contribution to this literature in a similar context to the present is provided by Greif (1994). Treating institutions as self-enforcing constructs has lead to many valuable insights into their functioning, see for example Greif (2006) and North (1990) for extensive discussion and illustration.

are connected by kin also have more social and personal connections that can help in sustaining the interaction. That is, kin connections bring additional surplus to the engagement which can be used as a type of collateral allowing other useful, but difficult to sustain, interactions between group members to occur. This of course, however, depends on the credibility of the group members spending that collateral in the event of a transgression, i.e., on the problem of the credibility of punishment within groups referred to above. The theoretical model develops a simple mechanism of enforcement that groups can use to overcome this problem, a mechanism whose measurement we can proxy by observing membership fees. The model explores how groups with high collateral, the ethnically homogeneous, will choose strategies that contrast with those that are heterogeneous in this context.

A basic implication of the model is that kin groups will be useful in sustaining interactions that are of less, but still positive, intrinsic value to members. Groups of higher intrinsic value will be sustainable both with and without ethnic homogeneity. However, kin groups create the additional difficulty of credible enforcement – although this is also a difficulty that all informal groups will have, it is worse for them. Consequently, formalization is a means to overcome this, and though used by all groups, will be more intensively used by the kin groups. The alternative to formalization is providing internal (to the group) incentives for individuals to punish transgressors. As will be seen, this is costly in the present context – with the costs being proxied by membership fees – but there is a trade-off between providing this internally costly incentive to punish versus relying on costly formalization procedures to take over the role from the outside.

The model makes clear predictions about what sort of groups will choose formalism, how these should relate to membership fees, the value of groups (measured by monthly contributions) and the capacity which groups have to punish. We explore these conjectures in the data in Section 5.

## 4 The Model

Apart from controls on group size and age, the key variables that we have at our disposal relate to the value of groups, their ethnic composition, the formalization procedures they use and the size of membership fees (what we think of as bonds) which they demand. We want the model we develop here to suggest the ways in which these observables might be related. Our conjecture, as already stated, is that ethnicity increases ties between individuals which creates higher non-pecuniary costs

when things go badly between group members. These costs fall on those committing morally hazardous acts (deviations from prescribed behavior), and also on those whose task it is to punish the deviations. A natural context in which to explore these issues is the repeated prisoner's dilemma setting.

The usual repeated prisoner's dilemma game with a cooperative outcome that is not a Nash equilibrium, due to a collectively costly but individually beneficial deviation, sustains the cooperative outcome by trigger strategies. If any player deviates from the cooperative strategy in a stage game, all others play the non-cooperative strategy from then on. Since the non-cooperative outcome is an equilibrium of the stage game, this is also an equilibrium of the repeated game, and moreover, since sustained reversion to the non-cooperative outcome minimizes payoffs, this represents the harshest punishment for single period deviations. This punishment thus sustains the cooperative outcome for the widest range of parameter values. But, for the context we are studying, this will not do. Since our hypothesis is that a key issue for informal groups is the credibility of punishment, focusing on the usual optimal punishment schemes with permanent reversion to the non-cooperative stage game forever is of little use.

To look at the issues we are concerned with we will allow for limited commitment on the part of the other members of the group when facing a deviation. Specifically, though groups may threaten deviators with dismissal from the group from then on, since such actions are costly to the dismissors as well as the dismissed – in both pecuniary and non-pecuniary ways – the other group members will have trouble committing. This will be a problem if, following a deviation, the deviator will be able to credibly commit to reverting back to the cooperative outcome from then on. Our focus will thus be on the means that groups use to sustain the credibility of such threats.

Though we are, of course, focusing on sub-game perfect equilibria, by allowing the possibility of reversion back to cooperative play once a deviation has occurred, we are not studying equilibria that are on the possibilities frontier of the simple framework that we have set up. In the present context we think this is defensible for two reasons. Firstly, there is the reason of simplicity. Since our aim is primarily to explore data where such problems of credibility seem to arise, it is plainly not possible to do this in the usual simple repeated prisoner's dilemma framework where the issue of credibility of commitment to punishments does not arise. The frontier is characterized by reversion to the non-cooperative outcome, where credibility of commitments does not come up since the non-



cooperative outcome is an equilibrium of the stage game. Secondly, it would certainly be possible in a more complex form of the repeated prisoner’s dilemma to allow for punishments along the equilibrium path. In that case, reversion to the harshest punishment – permanent exclusion from the group – is unlikely to be optimal. There, the credibility of punishment comes into play more directly. We have not followed that modelling strategy here primarily for reasons of simplicity. Though we do think that it would be potentially interesting to build the more complex model with equilibrium punishments, for our present ends, which is a simple theory to guide us through a first pass at the data, the standard repeated prisoner’s dilemma game is sufficient.

#### 4.1 Primitives

Individuals who are identical and infinitely lived, are randomly allocated into potential groups of size  $N$ , which we treat as exogenous. Each potential group has the possibility of forming in order to undertake a mutually beneficial activity. At time 0, when formation of the group is decided upon, each individual  $j$  in the group has wealth  $W$ . The wealth can be used to buy numeraire consumption goods, or can be invested in setting up the group, which we shall see can involve incurring fixed costs. There is no other storage technology. If the group is formed, the group can ask for a membership fee  $M_i$ , to be paid by each member. The level of this fee is determined endogenously. This is our representation of a bonding technology. We proxy the bonds through membership fees as this is what we observe in the data.<sup>17</sup> More generally, the bond corresponds to anything the individual has invested in the group, and which is forfeited and redistributed to other members on dismissal.

Individuals value consumption, and they also derive non-pecuniary value from social interactions. Such interactions are organized around ethnicity. We model the valuations of non-pecuniary social interactions in a simple binary form. The value of these interactions for  $i$  at  $t$  is denoted by  $\phi_i(t)$ . Individual  $i$  either has good relations with members of her ethnic group, and hence derives some value,  $\phi_i(t) = v > 0$ , or not  $\phi_i(t) = 0$ . Finer gradations of quality in these relationships could be introduced without altering this chapter’s main results. Preferences are represented by a quasi-linear utility function, where  $i$ ’s period  $t$  utility, denoted  $\Upsilon_i(t)$  rises with consumption  $c_i(t)$ ,

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<sup>17</sup>These are relatively small in the data but are likely to be correlated with the total amount of bond that an individual has invested in the group.

and the quality of social relations with own group members,  $\phi_i(t)$  :

$$\Upsilon_i(t) = U(c_i(t)) + \phi_i(t).$$

Per-period consumption enters utility in an increasing and concave manner:  $U' > 0, U'' \leq 0$ , and the future is discounted by factor  $\beta$  per period.

If individuals choose not to form a group, they receive income  $w$  each period. If forming a group, the structure of the game played between members of the group is a prisoner's dilemma.<sup>18</sup> The per period value of group activity to each member of group  $i$ , if all individuals act in good faith (i.e., cooperate), is denoted  $V_i$ . The variable  $V_i$  is a random variable drawn before the group forms from some well defined distribution with supports  $(w, \widehat{V})$ . Once drawn, this value remains constant for each period that the group continues to function.

The group activity is susceptible to individually beneficial deviations. Specifically, if a single individual, cheats, i.e., deviates from prescribed actions, the cheater has stage game income  $\widehat{V}$ , and their partners all obtain  $\underline{V}$ , in the period. If more than one individual deviates the payoffs are  $(0, 0)$ . Assuming that no one else has cheated, player  $j$  chooses between the following two actions and income levels.

Player j \ Players _j	Cooperate	
Cooperate	$V_i, V_i$	This stage game is repeated each
Cheat	$\widehat{V}, \underline{V}$	

period that the group stays together, and stops as soon as the group is disbanded. Individuals can also be dismissed from the group by means which we outline below. Dismissal is costly since  $V_i > w$ . We also assume that it is costly to the dismissers, i.e., the remaining  $N - 1$  members of the group who continue on. These members then have a lower per period payoff,  $V_{i-1} < V_i$  from the cooperative outcome in every period that the group continues. This reduction in group size due to dismissal is roughly equal in its effect on group value irrespective of the  $V_i$ . Formally, we shall assume throughout that the ordering over the  $V_i$  is also imposed over the  $V_{i-1}$ .

Without a storage technology, consumption simply equals income each period. Consequently  $c_i = w$  for individuals not in groups, and equals output derived from the group if in one.

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<sup>18</sup>Even though the groups in our sample have widely varying functions: insurance, investment, savings, all report problems with opportunistic behavior and have structured their groups to help overcome this moral hazard. The prisoner's dilemma stage game is a simple and well understood means of representing such problems.

## 4.2 Ethnicity

The existence of ties to individuals that extend beyond the group has only one effect in the present context. Individuals forming groups along ethnic lines suffer a decline in the quality of their social relations if they are themselves dismissed from, or they dismiss, a group member. If an individual is dismissed from an ethnically homogeneous group at time  $t$ , then  $\phi_i(\tau) = 0$  for all  $\tau \geq t$  and for all  $i$  members of the group. This captures the cost borne by both the dismissed individual and by the dismissers.<sup>19</sup>

## 4.3 Feasibility of Group Formation

Assuming that a group  $i$ , can be made incentive compatible – the conditions of which are to be explored below – its feasibility when asking for a once off membership fee of  $M_i$  requires:

$$U(V_i + W - M_i) + \phi_i + \frac{\beta}{1 - \beta} (U(V_i) + \phi_i) \geq U(w + W) + \phi_i + \frac{\beta}{1 - \beta} (U(w) + \phi_i). \quad (1)$$

$$s.t. \ W \geq M_i$$

This simply depends upon the benefits of formation  $V_i$  being high enough relative to the outside option,  $w$ , and, due to concavity, on the individual having enough wealth at period 0 to be able to bear the cost of any required membership fee  $M_i$ .

## 4.4 Incentive Compatibility of Cooperative Behaviour

Given that cheaters will be punished by removal from the group, behaving cooperatively depends on the cost of that punishment relative to the benefits from cheating. We derive the incentive compatibility of cooperative behaviour assuming, for now, that punishments are credible, and shall explore the credibility of punishments below. The usual factors determine the credibility of cooperative behavior: i.e., if future discounting is low enough, the value of sustained interaction high enough, the gains from deviating, and the cost of being in autarky both low enough. That is, for each member  $j$  of group  $i$  we require.:

$$\frac{U(V_i) + \phi_j}{1 - \beta} \geq U(\widehat{V}) + \phi_j + \frac{\beta}{1 - \beta} (U(w) + \phi_j). \quad (2)$$

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<sup>19</sup>It is not essential for the results presented here that the non-pecuniary costs of dismissal are equivalent to both the dismissed and the dismissers. It is possible for these costs to be greater for the dismissed as we detail after the main results are established.

Groups formed along the same ethnic lines differ from groups that are heterogeneous in terms of incentive compatibility. Assuming that all  $j$  incoming members of any group start with social relations in tact, then  $\phi_j = v$ , however, once dismissed from an ethnically homogeneous group  $\phi_j = 0$ . Consequently incentive compatibility for an ethnically homogeneous group requires:

$$\frac{U(V_i) + v}{1 - \beta} \geq U(\widehat{V}) + v + \frac{\beta}{1 - \beta} (U(w)). \quad (3)$$

The comparable condition for groups not formed along ethnic lines is the harder to satisfy:

$$\frac{U(V_i) + v}{1 - \beta} \geq U(\widehat{V}) + v + \frac{\beta}{1 - \beta} (U(w) + v). \quad (4)$$

Consequently, as is standard, social relations make it easier (i.e., feasible for lower  $V_i$ ) to make a group incentive compatible. This, however, is contingent on punishments being credible, which we now explore.

#### 4.5 Credibility of Punishment if Cheated

Since  $V_i > V_{i-1}$ , punishing is costly to both homogeneous and ethnically mixed groups. Also since, in ethnically homogeneous groups, both the punished and the punishers suffer a deterioration in social relations from  $\phi_i = v$  to  $\phi_i = 0$ , there the costs are even greater. Credibility of punishments is therefore an issue with which groups are concerned. Specifically, we are implicitly allowing for a deviating member, who is threatened with punishment by perpetual exclusion from the group, to approach the other members of his group and offer to never commit the deviation again. Moreover, we implicitly allow that the members of the group believe this offer to be true. Since repeated cooperation is an equilibrium outcome, these beliefs are rational. Credibility of punishments will thus only be possible if the group of  $N - 1$  members find it in their interests to punish a cheating member even though they believe that the member will never again deviate to cheating.

Here, we explore two means by which groups maintain credibility in light of these problems. The first method is to ask joining members for a membership fee that is held as a bond and forfeited in the event of punishment with dismissal. The second is to implement formalization procedures that effectively reduce group discretion in evoking punishments.

##### **Method (1) Membership fees (bonds)**

At time 0 each member of group  $i$  is required to pay an amount of membership fee  $M_i$ . Each member's payment is then kept in abeyance as a fund. If  $N - 1$  members of the group agree, they

can dismiss one member of the group and share that member's fee amongst themselves. In that case, each receives  $\frac{1}{N-1}M_i$ . Once the member has been removed, the group can choose to continue at the lower per period value  $V_{i-1}$ , or disband and receive  $w$  from then on. For the bond to both make punishment credible, and at the same time not lead to incentives for abuse by a coalition of  $N - 1$  members, it is necessary that: (1) An individual who cheats is punished by having their membership fee expropriated by the others, and then being dismissed from the group from then on, and (2) An individual who has not cheated is not expropriated.

### **Method (2) Formalization**

We interpret formalization as the group taking actions in setting up its governance provisions that help in providing some degree of external oversight to the administration of the groups rules and procedures. The data includes information on (1) whether the group has written rules, (2) whether it is registered as a group with the government, (3) whether it keeps written minutes of meetings, (4) whether it has formal penalties, and (5) whether it has a bank account. Registration of informal groups is, strictly speaking, a legal requirement. However, less than half of the groups in our sample choose to do so. It allows for some oversight of group activities, and requires the group to be open to visits from a social work in the slum. Oversight by a third party of group decision making helps in removing the possibility of discretion from group members. Having well defined rules and penalties helps in making clear what a transgression is, and the expected group behavior in case of transgression; keeping minutes of meetings helps to establish an account of previous decisions and actions that is observable by outsiders; having a bank account helps in ensuring the location and size of the group's funds. In the data we explore various ways of treating these binary variables each of which we think of as capturing formalization. In the theoretical part of the model we will treat formalization as a binary choice.

Having such formal procedures involves a cost, which we call the formalization cost, denoted by an amount  $F$ , per member. In return for such a payment we assume that the group obtains full credibility in enforcing of the rules. Thus, when formalized, punishments will be credible and, in the event that no transgression has occurred, there will not be any false punishments.

Since both formalization and holding membership fees as bonds can be used to achieve the same end: i.e., making punishments credible, they are substitutes. Groups will choose to either use the bonding technology or to formalize. We return to the optimal choice subsequently, but first we

consider the level of membership fees necessary for the bonding technology to work.

#### 4.6 Optimal Membership Fees

The first function of the membership fee is to ensure that when a single member cheats, the remaining  $N - 1$  members have incentive to punish. Suppose individual  $k$  cheats. The remaining  $N - 1$  individuals will exclude the cheating member from future group activities and expropriate his membership fee if and only if, for each one of these,  $j$ :

$$U\left(\underline{V} + \frac{1}{N-1}M_i\right) + \phi_j + \frac{\beta}{1-\beta}(U(V_{i-1}) + \phi_j) \geq U(\underline{V}) + \phi_j + \frac{\beta}{1-\beta}(U(V_i) + \phi_j). \quad (5)$$

For any  $M_i$  satisfying this, when cheating occurs, the  $N - 1$  cheated individuals will dismiss the cheater, and allocate his membership fees amongst the remaining members.

At the same time, it should not be the case that the membership fee makes it attractive for individuals to form  $N - 1$  member coalitions in order to expropriate non-cheaters from their membership fees. To see whether this occurs the condition is:

$$U\left(V_i + \frac{1}{N-1}M_i\right) + \phi_j + \frac{\beta}{1-\beta}(U(V_{i-1}) + \phi_j) \geq U(V_i) + \phi_j + \frac{\beta}{1-\beta}(U(V_i) + \phi_j). \quad (6)$$

The difference between these expression is that, in the latter one, the first term on both sides of the expression has  $V_i > \underline{V}$ . This makes the condition harder to satisfy for (6) than for (5). Intuitively, when no cheating has occurred, consumption of the  $N - 1$  members is higher than if they have been expropriated. Consequently, due to concavity, their valuation of marginal consumption in condition (6) is lower than in (5). Thus, if the membership fee is set at a level that is just sufficient to ensure punishment when cheating has occurred, i.e., when (5) binds, punishment will not occur when cheating has not happened (6) fails. We summarize with the following proposition:

**Proposition 1:** *At a membership fee  $M$  such that (5) just binds, it is credible for an individual to be dismissed from the group when he cheats. However, the group would have no incentive to punish and exclude a member who has not cheated.*

Proof: Follows directly from concavity of  $U$ .

Since membership fees held as bonds are costly, and do not benefit group members other than through ensuring punishment, the group will find it optimal to set them such that condition (5)

binds. By doing so, they also ensure that a super-majority of  $N - 1$  members will also not have an incentive to expropriate a member when cheating has not occurred. It is then immediate that if individuals are wealthy enough to afford the membership fee, it will be possible to find values of  $V_i$  for which group formation is feasible. We summarize with the following:

**Proposition 2:** *There exists a critical level of initial wealth  $W$ , denoted  $W^*$ , such that, for  $W > W^*$ , for some values of group membership valuation  $V_i \in (w, \widehat{V})$ : (A) condition (1) holds, so that it is worthwhile for individuals to start a group; (B) there exists a membership fee  $M_i$  such that condition (5) holds, so that individuals who cheat will be dismissed by the  $N - 1$  others, even if the others believe that without dismissal the cheater will revert to the cooperative outcome from then on; and (C) no one will be dismissed if cheating did not occur.*

For these values of  $V_i$ , groups will be able to function without cheating by imposing membership fees that solve:

$$U\left(\underline{V} + \frac{1}{N-1}M_i\right) + \phi_j + \frac{\beta}{1-\beta}(U(V_{i-1}) + \phi_j) = U(\underline{V}) + \phi_j + \frac{\beta}{1-\beta}(U(V_i) + \phi_j). \quad (7)$$

#### 4.7 Comparing Bonds and Formalization

By paying the amount  $F$  per member and formalizing, the group avoids having to raise  $M_i$  from members to ensure credibility of punishments through bonds. Groups thus face a simple choice, if  $F < M_i$  from equation (7) then formalize. If not, keep a fund of amount  $M_i$  as a bond for each member. In case of cheating, the individual is dismissed from the group, and if the  $M_i$  is held as a bond, it is shared amongst the remaining  $N - 1$  group members. A direct implication of this is that it should be the relatively high value groups, *ceteris paribus*, who choose formalization. Specifically:

**Proposition 3:** *Ceteris paribus, groups with high valuations  $V_i$  should be most likely to choose formalization, and groups that are formalized have the highest membership fees.*

This follows because the membership required to ensure the credibility is higher for groups of high value. These will thus be the ones most likely to prefer to pay  $F$  and instead use the alternative means of ensuring credibility, i.e., formalism will be chosen when  $F < M_i$ .

## 4.8 Implications of Ethnicity

The first implication of same ethnicity is that the membership fee required to ensure credibility of punishments,  $M_i$ , must be higher for an equivalent  $V_i$ , if groups are ethnically homogeneous. To see this, note that in the ethnically homogeneous case,  $M_i$  solves:

$$U\left(\underline{V} + \frac{1}{N-1}M_i\right) + v + \frac{\beta}{1-\beta}U(V_{i-1}) = U(\underline{V}) + v + \frac{\beta}{1-\beta}U(V_i + v), \quad (8)$$

which is greater than that required in the ethnically heterogeneous case, where dismissal does not impose a cost on social relations. That is, in the heterogeneous case, the last term on the left hand side above is replaced with  $\frac{\beta}{1-\beta}U(V_{i-1} + v)$ . This is the cost of homogeneous ethnicity.

**Proposition 4:** *Conditional upon a group not being formalized, membership fees amongst the ethnically homogeneous are, on average, higher than amongst the ethnically diverse.*

Proof: Consider the lowest value of  $V_i$  at which a group of homogeneous ethnicity is viable. From equation (3) this is given by  $V_i$  solving:  $\frac{U(V_i)+v}{1-\beta} = U(\widehat{V}) + v + \frac{\beta}{1-\beta}U(w)$ . For this value of  $V_i$  compute the value of  $M_i$  which is just required for this group to have credible punishments. This is given from equation (8) by  $U\left(\underline{V} + \frac{1}{N-1}M_i\right) + v + \frac{\beta}{1-\beta}U(V_{i-1}) = U(\underline{V}) + v + \frac{\beta}{1-\beta}U(V_i + v)$ . Substituting out for  $V_i$  from the previous equation yields:

$$U\left(\underline{V} + \frac{1}{N-1}M_i\right) + \frac{\beta}{1-\beta}U(V_{i-1}) = U(\underline{V}) + \beta\left(U(\widehat{V}) + v + \frac{\beta}{1-\beta}U(w)\right). \quad (9)$$

This value of  $M_i$  is that required for the lowest feasible ethnically homogeneous group. Denote it by  $M_i^S(low)$ . Now compute the corresponding value of  $M_i$  for the heterogeneous groups. For these groups the lowest  $V_i$  at which they are viable is:  $\frac{U(V_i)+v}{1-\beta} = U(\widehat{V}) + v + \frac{\beta}{1-\beta}U(w + v)$ , and the corresponding membership fee solves:  $U\left(\underline{V} + \frac{1}{N-1}M_i\right) + v + \frac{\beta}{1-\beta}U(V_{i-1} + v) = U(\underline{V}) + v + \frac{\beta}{1-\beta}U(V_i + v)$ . Substituting for  $V_i$  as we did above yields:

$$\begin{aligned} U\left(\underline{V} + \frac{1}{N-1}M_i\right) + \frac{\beta}{1-\beta}U((V_{i-1}) + v) &= U(\underline{V}) + \beta\left(U(\widehat{V}) + v + \frac{\beta}{1-\beta}U(w + v)\right) \\ \Rightarrow U\left(\underline{V} + \frac{1}{N-1}M_i\right) + \frac{\beta}{1-\beta}U(V_{i-1}) + \beta v &= U(\underline{V}) + \beta\left(U(\widehat{V}) + v + \frac{\beta}{1-\beta}U(w)\right). \end{aligned} \quad (10)$$

Denote this value  $M_i^M(low)$ . It is immediate from (9) and (10) that  $M_i^M(low) < M_i^S(low)$ . Since both the heterogeneous and homogeneous  $V_i$  are drawn from the same distribution, and since any



high draws yielding a  $V_i$  for which  $M_i > F$  will be formalized, it then follows that the set of homogeneous ethnicity groups who are not formalized will, on average have higher membership fees than the heterogeneous ones that are not formalized. See Figure 1. ■

Though for, a given  $V_i$ , membership fees are clearly higher amongst the homogeneous groups, since these groups will be viable at lower values of  $V_i$  it is not immediately clear that averaging across all groups that are not formalized, the ethnically homogeneous will have higher membership fees. The higher fees required for a given  $V_i$  are offset by the fact that the homogeneous groups also form for lower  $V_i$ . The proposition shows that this offsetting effect will not be sufficiently great. This depends critically on the difference in non-pecuniary costs of the dismissers being not too much less than such costs for the dismissed.<sup>20</sup>

**Corollary 1:** *Membership fees are, on average, higher amongst the ethnically homogeneous groups independent of formalization. But, conditional upon being formalized, membership fees between ethnically homogeneous and mixed groups are identical.*

This follows because, for the  $V_i$  where formalization is chosen, both groups simply pay the fixed amount  $F$ . However, over the lower ranges where groups find it better to remain unformalized, the homogeneous will have higher membership fees for all  $V_i$ .

A further implication can be obtained by comparing the levels of  $V_i$  making ethnically heterogeneous and homogeneous groups just indifferent to formalizing. Since from Proposition 4, groups of the same ethnicity require higher bonds for a given  $V_i$  for credibility of punishments, they will choose formalism for lower values of  $V_i$  than the heterogeneous groups.

**Proposition 5:** *The unconditional probability of a group formalizing is higher if it is of homogeneous ethnicity.*

The benefit of ethnic ties is that they make groups that might otherwise not be viable, able to form. Specifically, consider the value of  $V_i$  just required to make a homogeneous ethnicity group viable, which we denote by  $V_i^S$ , and compare it with the equivalent marginally viable mixed

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<sup>20</sup>Stated somewhat loosely, the required condition is that:  $\phi(\text{dismissed hetero}) - \phi(\text{dismissed homo}) < \frac{1}{\beta}(\phi(\text{dismitter hetero}) - \phi(\text{dismitter homo}))$ . But since  $\phi(\text{dismissed hetero}) - \phi(\text{dismissed homo}) = (\phi(\text{dismitter hetero}) - \phi(\text{dismitter homo})) = -v$ , the condition clearly holds here.

ethnicity group, denoted  $V_i^M$ . The marginal group for the homogeneous is given from (3):

$$\frac{U(V_i^S) + v}{1 - \beta} = U(\widehat{V}) + v + \frac{\beta}{1 - \beta} (U(w)). \quad (11)$$

The comparable  $V_i$  for the heterogeneous ethnicity is from (4):

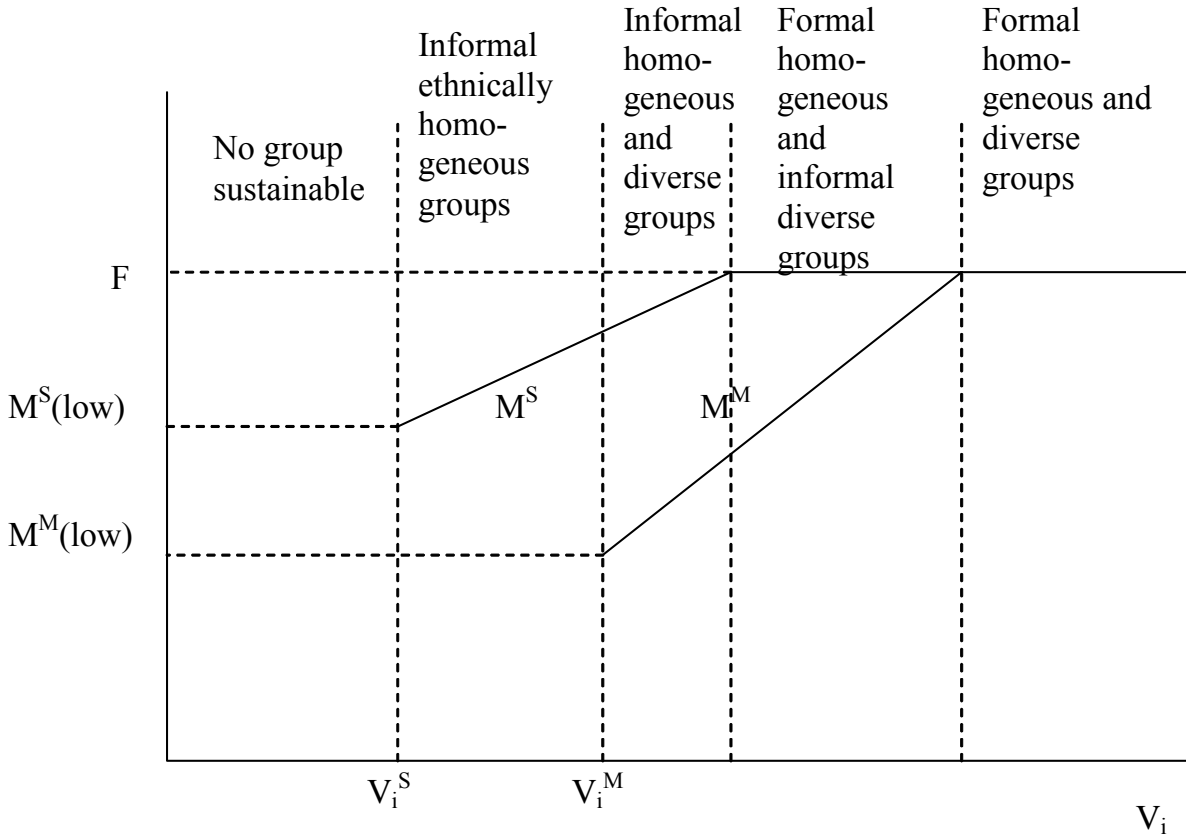
$$\frac{U(V_i^M) + v}{1 - \beta} = U(\widehat{V}) + v + \frac{\beta}{1 - \beta} (U(w) + v). \quad (12)$$

It follows immediately from these two conditions that  $V_i^S < V_i^M$ .

Intuitively, the lowest value groups are those for which it is barely feasible to sustain the cooperative outcome. In the homogeneous groups, the extra cost of cheating (i.e., the loss of  $v$  from then on) increases the range of feasible (low  $V_i$ ), for which the group will work. We thus have:

**Proposition 6:** *The lowest value groups will be the same ethnicity, so that the value of sustainable groups will, on average, be higher if they are mixed.*

We summarize the implications of the model in the following figure:



For low values of  $V_i$  no groups are sustainable. For  $V_i$  above the first dashed line, only same ethnic groups will be viable, and they will be informal. At some higher value of  $V_i$ , the second dashed line, the mixed ethnicity groups also become viable, and they form too. These will be viable without the need for formalism. At some higher level of  $V_i$ , the third dashed line, then same ethnic groups will find it cheaper to use formal procedures rather than informal ones to maintain the credibility of punishments. At an even higher level of  $V_i$ , the heterogeneous ones will do so as well.

## 5 Econometric Results

The model makes clear predictions about what sort of groups will choose formalism, how these should relate to membership fees, the value of groups and the capacity which groups have to punish. We explore these conjectures in this section. Since many of the variables we analyze are endogenous and could easily be affected by idiosyncratic group components that we do not observe, most of our results involve simple comparisons of means which test the consistency between the conditional conjectures of the model and the data. The econometric regressions demonstrate these correlation results are robust to the inclusion of our available controls but the data does not allow us to properly address sample selection and endogeneity issues so that the conclusions here are tempered and suggestive of future directions.

### 5.1 Membership fees

In this section, we explore some of the implications regarding membership fees derived from the theoretical framework. To this end, we have four main predictions generated from the model and we briefly re-state the intuition for each in turn.

From Corollary 1:

**Conjecture 1** *Groups of homogeneous ethnicity have higher membership fees than heterogeneous groups, ceteris paribus.*

Ethnic ties make it more costly to dismiss members who have cheated, consequently, to offset this, groups of same ethnicity have to provide greater incentives for the cheated members to do so by allowing them to claim a higher forfeited membership fee.

From Proposition 3:

**Conjecture 2** *Groups that are formalized have higher membership fees.*

According to the theory, it is the groups that have greatest difficulty committing to punishments that will need the highest membership fees to make punishment credible. Consequently, it is these groups that will make use of the fees to evoke formal procedures. The groups able to sustain the commitment to punishment with low fees will use these instead and will not formalize.

From Proposition 4:

**Conjecture 3** *Amongst the non-formalized groups, those with the same ethnicity have higher membership fees.*

Conditional upon not being formalized, for a given  $V_i$ , groups with the same ethnicity have higher membership fees on average.

From Corollary 1 we also have:

**Conjecture 4** *Amongst the groups that are formalized ethnicity has no impact on membership fees.*

This is because being of the same ethnicity does not affect the cost of formalization,  $F$ . Ethnicity affects the choice of formalization but not costs once formalized. Consequently, if of high enough  $V_i$  to find it worthwhile to formalize, the group simply pays  $F$  and ethnicity plays no role.

	Membership Fees	Equivalence of Means
same ethnicity	166.88	86.75 (23.11)***
mixed ethnicity	80.13	
high formalism	262.81	195.80 (24.77)***
low formalism	67.01	
same ethnicity/high formalism	296.05	88.63 (62.94)
mixed ethnicity/high formalism	207.42	
same ethnicity/low formalism	92.64	44.07 (19.98)**
mixed ethnicity/low formalism	48.57	

**Table 8 - Equivalence of means tests on Membership Fees<sup>21</sup>**

<sup>21</sup>The variable high formalism takes on the value of one if the group adopts all five of the measures of formalism. This is the case for approximately 30% of the groups.

The above table provides some evidence in support of Conjectures 1 through 4. The first two rows compare average membership fees by ethnicity of the group and the second two rows by the degree of formalism. We see that, as stipulated by Conjectures 1 and 2, membership fees are higher for groups of the same ethnicity and for those which are more formal. The last two pairs of rows, compare membership fees across groups by ethnicity, first for those with high formalism and then for those with low formalism. Consistent with Conjectures 3 and 4, average membership fees are not significantly different for ethnically homogeneous groups compared to heterogeneous ones if the groups are highly formalized. Whereas same ethnicity groups have larger membership fees if they have less formalization.

The results from tobit estimations on membership fees as a function of same ethnicity and additional controls are listed below. The first column lists the results for the sample of all groups, and thus tests Conjecture 1. The second column considers only groups with high formalism and the third is for groups with low formalism. The insignificant relationship between same ethnicity and membership fees for high formalism groups and the positive significant relationship for low formalism groups is consistent with Conjectures 3 and 4.

Variable	Entire Sample	High Formalism	Low Formalism
same ethnicity	97.6 (37.0)***	90.4 (70.6)	69.3 (40.8)*
majority local	-156.7 (36.5)***	-208.2 (67.2)***	-92.7 (41.2)**
membership	0.03 (0.03)	0.20 (0.27)	0.03 (0.03)
years existed	-3.4 (2.7)	-6.9 (4.2)	-1.6 (3.5)
insurance	336.4 (41.4)***	-30.5 (85.6)	346.4 (53.5)***
investment	383.9 (39.1)***	170.4 (77.6)**	332.9 (46.4)***
Constant	-202.1 (43.3)***	257.1 (108.7)**	-241.1 (46.8)***
Observations	576	160	416
$\bar{R}^2$	0.04	0.01	0.04

**Table 9 - Tobit estimations on membership fees**

## 5.2 Monthly Contributions

Assuming that the net value of the group is correlated with the amount of regular monthly contributions by individual group members, we have the following prediction from Proposition 6:

**Conjecture 5** *Groups of the same ethnicity have lower net value on average.*

This is because ethnicity makes groups viable that would not be viable without the connections that ethnicity provides. It extends the range of groups at the lower end of the distribution, as

high value groups are able to formalize anyway. Since the left tail of the feasible distribution for homogeneous ethnicity groups is longer, their values are, on average lower.

	<b>Monthly Contributions</b>	<b>Equivalence of Means</b>
same ethnicity	328.33	-182.76 (51.40)***
mixed ethnicity	511.33	
same ethnicity/low formalism	392.52	-80.29 (66.66)***
mixed ethnicity/low formalism	572.80	
same ethnicity/high formalism	218.42	-46.0 (65.8)
mixed ethnicity/high formalism	264.42	

**Table 10 - Equivalence of means tests on monthly contributions**

The table above provides mixed support for this conjecture. The first two rows compare average monthly contributions by ethnicity of the group. We see that, unconditionally, ethnically homogeneous groups have significantly lower average monthly contributions. The last two pairs of rows make the same comparison for groups with low formalization and high formalization respectively. The significance of the mean differences persists for the low formalization groups only. However, the model would predict that we should see it for the high ones as well.

The table below further tests this conjecture by presenting estimation results of regular contributions as a function of same ethnicity as well as additional controls. The first column presents results for the entire sample of groups, the second column is for the sub-sample of groups with low formalism and the third for high formalism. We see that the relationship between average contributions and ethnic homogeneity reflected in the sample means survives with the additional controls. The fourth column describes results from a regression that includes the additional controls which represent the function of the group. When these variables are included, the result is no longer robust, the negative relationship between same ethnicity and contributions is only significant at the 11% level and when we further divide the sample by formalism, the results are even less significant.

Variable	Entire Sample	Low Formalism	High Formalism	Entire Sample
same ethnicity	-153.85 (53.13)***	-139.16 (68.37)**	-96.23 (69.72)	-83.23 (52.48)
majority local membership	-128.45 (53.81)**	-154.04 (70.09)**	-187.95 (69.33)***	-205.70 (53.05)***
years existed	-0.02 (0.05)	-0.01 (0.06)	-0.19 (0.28)	-0.02 (0.05)
insurance	-18.82 (4.19)***	-21.66 (6.28)***	-9.59 (4.41)**	-8.79 (4.30)**
investment				-409.22 (60.95)***
Constant	653.93 (53.69)***	731.10 (68.59)***	446.64 (72.99)***	-118.58 (57.26)**
Observations	576	160	416	576
$\bar{R}^2$	0.05	0.04	0.06	0.12

Table 11 - OLS estimations on monthly contributions

### 5.3 Discussion

The model lines up with the data reasonably well in terms of the predicted relationships between group value, membership fees, ethnicity and formalization. Note that, for all of these results, we have controlled for the function of the group, its age and its membership size. As mentioned earlier, however, we have no means of controlling for selection into groups nor for the possibility that omitted variables may be leading to the correlations we observe. So though somewhat encouraging of the formal theory, we view the results presented here as preliminary.

The data also included information about what happens in the event that groups have problems. This also seems consistent with the basic premise followed here, that credibility of punishments is a greater problem in homogeneous ethnicity groups and it is mitigated by formalism. However, it is not possible to derive formal propositions regarding this from the theoretical model. This is because, along the equilibrium path of our model, there are no deviations, no reported problems, therefore no punishments, and no difficulty punishing. However, in the data we observe all of these things. Here we thus simply report the information on these variables and note how they correlate with formalism and ethnicity.

### 5.4 Additional variables of Interest

#### 5.4.1 Attendance and Payments

The variable “attendance” denotes irregular meeting attendance, and the variable “payments” denotes irregular payments of due contributions. The summary statistics for these two variables are listed below. We also include a binary variable for if the group has expelled members in the

past.

<b>Problem faced by the group</b>	<b>Mean</b>	<b>Standard Deviation</b>
attendance	0.32	0.47
payments	0.41	0.49
expelled members	0.13	0.34

**Table 12 - Summary statistics on problems faced by the groups**

Although a large proportion of groups have faced problems of irregular attendance and failure to meet monthly contributions, only a small number of them actually expelled members due to poor behavior. The proportion of groups who expelled members increases to 22% if we condition on the fact that the group has faced problems of attendance or payments in the past.

The first observation is that having homogeneous ethnicity seems to create problems in enforcement relative to being heterogeneous. This is assumed to be perfectly mitigated, in the model, by using formalism or raising membership fees. However, if this is less than perfect, so, for instance it only works proportionately some of the time, then groups of the same ethnicity should have more problems. Also, groups that use formalism should be able to mitigate these problems of ethnicity.

	<b>Attendance</b>	<b>Equiv. of Means</b>	<b>Payments</b>	<b>Equiv. of Means</b>
same ethnicity	0.39	0.14 (0.04)***	0.48	0.14 (0.04)***
mixed ethnicity	0.25		0.34	
same ethnicity/high formalism	0.45	0.07 (0.08)	0.53	0.10 (0.08)
mixed ethnicity/high formalism	0.38		0.43	
same ethnicity/low formalism	0.36	0.14 (0.04)***	0.45	0.14 (0.05)***
mixed ethnicity/low formalism	0.22		0.32	

**Table 13 - Equivalence of means tests on group problems**

The above table compares the prevalence of the two main problems the group faces, irregular attendance and payment of contributions, by ethnicity of the group. As consistent with the basic premise of our chapter, groups of homogenous ethnicity are significantly more likely to face problems, but this is only for the case for those groups with low formalism. The two tables below demonstrate that this result is robust controlling for other determinants of problems. In Table 14, the dependent variable is the probability that the group faced attendance problems. We see that there is a positive relationship between this probability and ethnic homogeneity, which is significant only at the 15% level for the overall sample, but statistically significant at the 10% level for



those groups with low formalism. There is no significant relationship for those groups with high formalism, as would be consistent if formalism helps in overcoming problems.

<b>Variable</b>	<b>Entire Sample</b>	<b>High Formalism</b>	<b>Low Formalism</b>
same ethnicity	0.18 (0.12)	-0.15 (0.25)	0.27 (0.14)*
majority local	-0.22 (0.12)*	-0.46 (0.23)**	-0.16 (0.14)
membership	-0.00005 (0.0002)	0.0004 (0.0009)	-0.0001 (0.0002)
years existed	-0.002 (0.009)	-0.023 (0.014)	0.03 (0.01)**
insurance	0.49 (0.13)***	0.63 (0.30)	0.16 (0.20)
investment	-0.30 (0.14)**	-0.46 (0.26)*	-0.31 (0.18)*
Constant	-0.56 (0.13)***	-0.11 (0.38)	-0.68 (0.14)***
Observations	582	163	419
$\overline{R}^2$	0.06	0.10	0.05

**Table 14 - Probit estimations on attendance problems**

In Table 15 below, the dependent variable is the probability that the group faced problems of irregular payment of contributions by group members. We see that there is a significant and positive relationship between this probability and ethnic homogeneity for the overall sample, and for the sub-sample of groups with low formalism. However, this relationship is statistically insignificant for the sub-sample of groups with high formalism, which is again consistent with the basic premise of our investigation here. Groups of same ethnicity should face greater difficulties because of the problems they have with punishment, but they should be able to be mitigated with sufficient use of formalism.

<b>Variable</b>	<b>Entire Sample</b>	<b>High Formalism</b>	<b>Low Formalism</b>
same ethnicity	0.31 (0.11)***	0.08 (0.24)	0.35 (0.13)***
majority local	-0.27 (0.11)**	-0.63 (0.23)***	-0.14 (0.14)
membership	-0.0001 (0.0002)	0.0007 (0.0009)	-0.0002 (0.0003)
years existed	0.002 (0.009)	-0.03 (0.01)**	0.03 (0.01)**
insurance	-0.04 (0.13)	-0.08 (0.28)	-0.41 (0.20)**
investment	0.05 (0.12)	-0.20 (0.26)	0.03 (0.16)
Constant	-0.24 (0.12)*	0.45 (0.37)	-0.41 (0.14)***
Observations	582	163	419
$\overline{R}^2$	0.02	0.06	0.03

**Table 15 - Probit estimations on payment problems**

#### 5.4.2 Expulsion

Expulsion is again something which is not analyzable in our model. This is because deviations from cooperative behavior that would induce expulsion should never occur on the equilibrium

path. Nonetheless, a basic premise of our analysis is that formalism is evoked in order to make such actions more credible. It is thus interesting to see if there is a relationship between expulsion and formalism. We see in the table below that this relationship is significant and positive. The result is robust to including other control variables and the regressions only include the sample of groups who have faced problems in the past.

<b>Variable</b>	<b>Expulsion</b>	<b>Expulsion</b>
formalism index	0.09 (0.05)*	0.14 (0.07)**
same ethnicity		-0.23 (0.18)
majority local		0.02 (0.18)
membership		-0.0003 (0.001)
years existed		-0.03 (0.02)*
insurance		-0.03 (0.25)
investment		0.18 (0.21)
Constant	-0.80 (0.08)***	-0.59 (0.21)***
Observations	298	298
$\overline{R}^2$	0.01	0.04

**Table 16 - Probit estimations on the rate of expulsion**

Considering these additional elements of the data that go beyond the simple model has provided some indications that are consistent with the basic premise of our analysis. That is, that formalism is a means groups utilize in order to help in carrying out punishments of recalcitrant members. Formalizing seems to make punishment by exclusion more likely, and to make it less likely that groups will have faced problems in the past.

## 6 Conclusion

Informal groups in Kibera, one of the largest slums in the developing world, seem to use steps of formalization in ways which help in enabling them to credibly enforce punishments for transgressors of group rules. The problem of credibly committing to punishments seems to be greatest for groups of homogeneous ethnicity. A simple theoretical model consistent with this basic observation generates a number of other implications which we were able to explore in the data. It seems that the pattern of group behavior, both across formalized and unformalized, and across homogeneous and mixed ethnicity, is consistent with many of the implications of the theoretical model.

Future work would ideally address the shortcomings of our current study. Firstly there are econometric problems arising from selection and endogeneity. The empirical treatment we have

taken has necessarily had to treat group formation as exogenous. Conceptually, we assume that groups of identical, otherwise connected, individuals simply have an opportunity for mutual gain presented to them exogenously, which they either exploit or not. In reality, individuals may actively seek out groups, have heterogeneous characteristics, bring their histories of past behavior with them, and develop reputations across multiple groups. These possibilities are beyond the data and are not considered here, but they would be clearly of importance to analyze in future. At a theoretical level, we have taken shortcuts that should be rectified in future work. We have analyzed problems of punishment credibility in a standard repeated prisoner's dilemma game in which optimal punishments should never allow such problems to arise. According to optimal punishments, individuals who deviate from prescribed behaviour should be dismissed from groups in perpetuity. The principle advantage of this is simplicity, but a more complete treatment would allow for credibility to be analyzed when punishments are realized along the equilibrium path. In that case, optimal punishments need not imply perpetual expulsion.

Despite these shortcomings, we have learned considerably from this undertaking. Firstly, at least for the informal groups in this environment, these small steps of formalization seem to serve the function of taking some of the authority in decision making out of the hands of group members. This may be helpful in stopping abuse, but the pattern of its occurrence also seems to be consistent with its help in ensuring that promised punishments actually occur. Similar considerations may have underlay the movement from informal kin based organizations to formal ones in other historical contexts, or in other contemporary environments. Even though, given the strength of tribal and kin loyalties in the African context, it may be that this difficulty in punishing kin members, which is also consistent with other kin based difficulties, is peculiar to the African context. But the strength of familial ties actually entering as a hindrance to collective undertakings is suggested in Western family firms as well, so it is at least possible that such motives for formalization may have arisen elsewhere.

More broadly, the investigation here is consistent with a theme that pervades all forms of organizations. All need to design mechanisms that mediate conflicts of interest between group members. This needs to be dealt with whether these organizations are states (as in Acemoglu and Robinson (2005)) or informal groups as we see here. At a normative level, if the conjectures here are correct, outsiders may be able to play a helpful role in improving the function of informal groups.

The process of registration, and the oversight of group decision making by social workers seems to be services that groups actively sought out because it helped the groups function. Since improving the performance of such groups may significantly improve the welfare of the very poor, governments should be encouraged to experiment with alternative means of providing such services. Especially if, as is the case in Kibera, groups are effectively free to choose or reject the use of such services as they see fit.

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