

ABSTRACT

Microcredit Groups and Support An Examination of Group Member Characteristics and Individual Outcomes

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While the microcredit group has existed since its introduction by Mohammed Yunus in 1976, very few studies address a key feature – the individual and collective characteristics of the group members themselves. Group members depend on each other to pay off the loans for which they are jointly liable, and, unlike many corporate teams, they form their own groups, with some guidance but no coercion from the lending officer. Drawing on data from a survey of 249 micro-entrepreneurs within 25 lending groups from Nairobi, Kenya, this study uses five group formation mechanisms, and within- and between-group analysis, to examine how group member characteristics relate to the members' businesses performance. Of note, I find personality-based group leader selection and trust-based group member selection characterize groups with significantly higher average sales of members. This thesis suggests pursuit of a neglected line of investigation into how to make microcredit more effective.

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MICROCREDIT GROUPS AND SUPPORT
AN EXAMINATION OF GROUP MEMBER CHARACTERISTICS AND
INDIVIDUAL OUTCOMES

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To my family and all the friends who have supported
and prayed for me throughout this process

CHAPTER ONE

Introduction

Development economics, and more recently, other academic disciplines have shown increasing interest in testing and applying business models as a means of poverty alleviation (World Bank, 2010). A significant proportion of academic work and practice fostering business and income generation includes microcredit groups as a source of capital, personal support, and entrepreneurial training. In theory, microcredit has the potential to transform individuals and communities by providing capital for business start-ups providing a source of income to the entrepreneur and eventually to others through employment in the community (Hashemi, Schuler, and Riley 1996; Hossain 1988; Pitt and Khandker 1998). Despite the theoretical potential and early initial enthusiasm (Hashemi, Schuler, and Riley 1996; Hossain 1988; Pitt and Khandker 1998), other more recent studies find microcredit has little benefit (Banerjee et al. 2015; Morduch 1999), leading to increased scrutiny—(Bateman and Chang 2012; Dichter and Harper 2007), and studies designed to specify where microcredit is most effective—(Banerjee and Duflo 2012; Karlan and Appel 2011).

However, few studies, to date, address a central feature of microcredit groups – some configurations of group member characteristics may associate with individual and aggregated group performance. Considerable evidence from the organizational teams literature highlights the importance of member characteristics on group interaction and team performance (Ancona and Caldwell 1992). Therefore, studying microcredit member selection, how groups interact based on selection criteria, and how this affects

group and member outcomes is worthwhile. Microcredit groups are not organizational teams in another context. At least two features distinguish microcredit groups. First, members self-select rather than forming teams by assignment of an administrator. Second, joint liability loan risk among members factors into member selection criteria and group member dynamics in process. These features along with differing institutional norms in a developing economy may challenge current theoretical explanations of how groups and teams perform. Thus, my general research questions are, “What configuration of demographic and business capabilities do groups select, and how do those characteristics affect individual outcomes, within-group, and between-group performance?”

In this study, I develop my theory for characteristics of group formation organized by five explanatory mechanisms: homophily, functionality, status, networks, and ecological constraints. I used data collected in Nairobi, Kenya from 250 microcredit entrepreneurs organized in 25 groups. I find not only significant differences in entrepreneurs’ performance, but also significant variance of sales performance between groups. While I cannot rule out selection or causality effects, I examine key member characteristics associated with better performing microcredit groups. I find significant differences between microcredit groups for characteristics of the four theorized mechanisms. These results warrant added attention during group member selection to individual characteristics and capabilities associated with better performance or developing these features among group members over time while in the program.

CHAPTER TWO

Background on Microcredit Groups

Cooperation is a key function of social life. Individuals take part together with others in voluntary organizations, the workplace, and in marketplace exchanges where social cooperation is necessary. Microcredit banking cooperatives formed as a response to a failure to produce collective goods in financial credit for individuals with a lack of collateral and typically in poverty. The formation of microcredit groups shares similarities with other voluntary associations where each member joins and contributes to producing a collective good and benefits when other members cooperate to produce the good. An alternative mode of group formation occurs when administrators assign members to task groups or committees. Given the emphasis on larger organizations in the group literature, I expect to find theoretical and empirical differences due to differences in the selection of group members, the characteristics of group members in microcredit, and group differences in member behaviors because of the development context.

Microcredit group structures developed out of the challenge of securing loan repayments when physical assets are unavailable, since lending without collateral generates moral hazard and adverse selection problems (Bruton, Khavul, and Chavez 2011). The unique feature of microcredit, for which Mohammad Yunus won the Nobel Prize (Yunus 2004), is the notion of “social collateral” to secure the loans. Each member is jointly liable for the other group member’s loan if they do not make payments. As a result, the risk of cooperation is higher than other cooperative groups.

Consider the scenario of a classroom or group setting where you had to choose group members for collaboration. If you had to pick a group of five people from the room to share joint liability for loans, whom would you pick? Do you pick a friend who you know and trust more, but is less likely to be successful in business to be able to repay the loan? Do you try to work with those you are less familiar with, but who seem to have more experience or more motivation in their work? Do you pick those who live nearby so you can monitor their effort more and find them if collection is needed?

While there is a large literature on microcredit banking performance and impact, there is surprisingly little understanding of microcredit groups formation processes and member characteristics. While participants usually select their other group members themselves, microcredit organizations often suggest potential members to the groups as they form (Feigenberg et al. 2014; Sharma and Zeller 1997). This is the case in this study, meaning that while some members have prior relationships with fellow group members, most or all have the opportunity to form new relationships through group interaction (Feigenberg et al. 2014). If these “cooperative groups” are to have a positive impact on the members, it seems likely that certain configurations of member characteristics might lead to better performance for the group and individual members. In two of the few studies on microcredit groups, Anthony (2005) examined group identity, sanctions and reciprocity, finding all associate with increased borrowing. Only reciprocity had significant estimates with group longevity and lower loan delinquency. In Milanov and colleagues’ (2015) study of Kenyan microcredit entrepreneurs, they find a positive relationship between within-group ties and firm performance, with more

positive estimates for male entrepreneurs. For female entrepreneurs, the social tie-firm performance relationship is contingent on both individual and group characteristics.

Microcredit groups meet regularly according to a schedule set by the lending agency. The primary purpose of these meetings is to facilitate loan repayments and, when necessary, to deal with loan defaults, but they also provide opportunities for participants to discuss personal and business-related issues (Feigenberg et al., 2014) as seen in my sample (see Methods section for details). Meeting frequency can vary from weekly to monthly, depending on the microcredit agency. Since meetings are often valuable for growing social capital and fostering collaboration among participants, meeting frequency can play a significant role in group success (Feigenberg et al. 2014). Since much of the entrepreneurial activity in Kenya occurs in the informal economy, relationships are important in this context (Khavul, Bruton, and Wood 2009).

Next, in Chapter 3, I build on the notion of micro-mechanisms for microcredit groups offering a theoretical basis for group formation and model testing of microcredit groups and individual members. The methods and empirical models follow in Chapters 4 and 5, and Chapter 6 will discuss limitations and suggestions for future research.

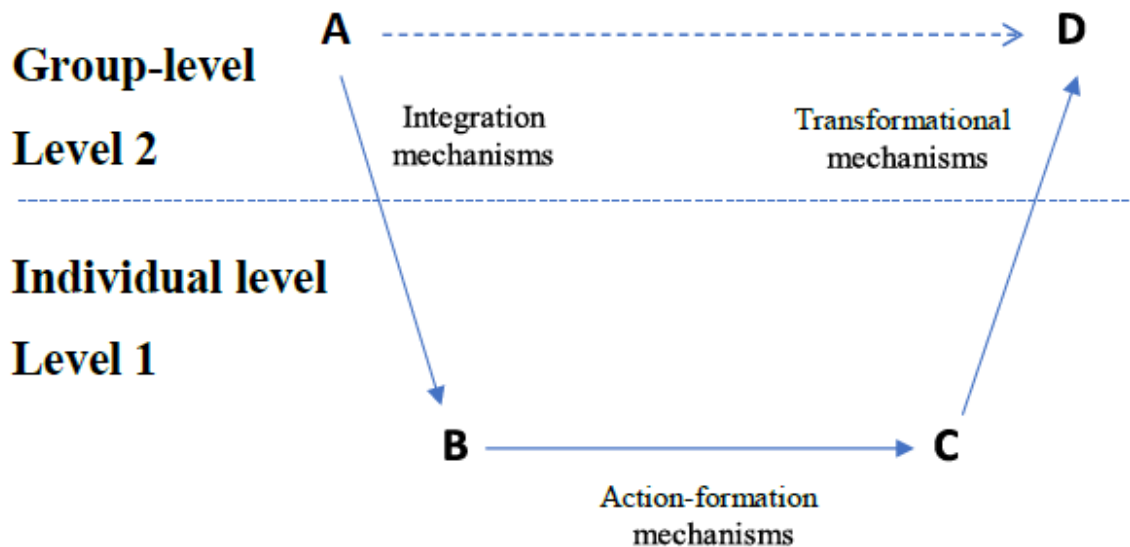
CHAPTER THREE

Theory and Hypothesis

Groups and Multilevel Processes

Understanding the mechanisms governing the formation and composition of social groups (e.g., organizational teams or groups) is often a challenge because the ability to observe a large enough number of teams or observations is biased toward observing only teams that have survived. Furthermore, the characteristics and actions of individuals within groups will naturally create variance in group cooperation and outcomes. Coleman (1990) offered the well-known bathtub or boat model illustrated in Figure 1 to clarify this “macro-micro problem” often debated among economists and organizational scholars that study multilevel phenomena.

Figure 1: Theoretical Model Based on Coleman (1990)



The general model illustrated in Figure 1 is a conceptual adaptation of Coleman's (1990) "bathtub model" to microcredit group performance (Felin & Foss, 2006). At the group level, formation characteristics are integrating mechanisms that may affect group performance and aggregated group member business performance (A → D). However, this proposed direct association between group level antecedents and outcomes might be a simplification of a more complex process at the micro-foundation level of individual members (Felin and Foss 2005; Kim, Wennberg, and Croidieu 2016). Explanations of group characteristics on group-level performance improve through inclusion of micro-level drivers that add explanatory power beyond analysis at the macro or group level alone (Coleman 1990). Following the conceptual model in Figure 1, Group antecedents (A) create situational mechanisms (A → B) that influence the conditions of individuals' behaviors. Controlling for other individual factors, individual behaviors (B) induce action-formation mechanisms (B → C) that lead to individual behavior outcomes (C). In turn, individual behavioral actions aggregate as transformative mechanisms (C → D) to the group level and determine group performance (D). *Integration mechanisms* refer to the formal and informal structures, norms and routines by which an organization, in this case the microcredit bank, coordinates its activities across and within its organizational group units. These group formation characteristics shape the mechanisms by which the microcredit group enables or constrains member business behaviors (B). *Action-formation mechanisms* (B → C) explain how these opportunities, goals, and beliefs influence an actor's behavior (individual antecedents to outcomes); and *transformational mechanisms* (C → D) describe the behavior of many actors jointly creating both intended and unintended group-level outcomes (Kim, Wennberg, and Croidieu 2016).

Group Formation Mechanisms and Characteristics

I will build theory and arguments for microcredit groups composition and outcomes from Ruef and Aldrich's (2003) examination of entrepreneurial team formation where they offer five different mechanisms for group composition: those based on *homophily, functionality, status, network constraints, and ecological constraints*. While microcredit entrepreneurs have their own businesses, they voluntarily select into a microcredit group and help select other group members. Because of the financial ties to other group members, I expect similar mechanisms for microcredit group selection to those involved when entrepreneurs form founding teams.

Homophily

The homophily mechanism describes the tendency to bond with similar others. When groups form, members gravitate to associations based on shared characteristics. These characteristics may be innate and visible externally to the individual, such as race, gender, and age, or they may be internal, like an individual's beliefs or values (McPherson, Smith-Lovin, and Cook 2001). Whatever the similar group members characteristics, homophily theory posits that similarity increases trust, understanding, and attraction between members. Increased homophily is expected because of the time and financial investment of microcredit members, (Bird 1989). Members with similar characteristics have shared understandings reducing friction in communication and support.

While homophily preferences may follow achieved characteristics or psychological states, I adopt Ruef, Aldrich, and Carter's (2003) approach limiting my

consideration of homophily to innate characteristics of gender and age¹. Gender homophily appears in many contexts, from personal social networks (McPherson, Smith-Lovin, and Cook 2001; Milanov et al. 2015) to the scholarly peer review process (Helmer et al. 2017). Organizational research on gender (Kanter, 1977) has focused on how females' proportional representation in the workplace affects their professional experience. Many microcredit organizations strategically target loans to women, raising the proportion of groups in this context composed entirely or mostly of female participants. However, my study data is from a microcredit organization that contains a roughly even gender distribution across all loans and my sample. Therefore, the variance in the proportion of women and men in groups highlights homophily mechanisms among others in group formation. Milanov et al. (2015) argue a female dominant majority (greater than 80%) is a necessary condition to shift the status of females and group norms and resulting in performance improvements of female group members. Similarly, researchers find men's business discussion networks have few women (Aldrich 1999).

Age proxies the timing of various life course transitions. Age at marriage and having children is a function of societal norms but these norms may shift by generation. In Kenya, like other countries, the average age continues to move upward with people living as single adults longer. The delaying of "older" responsibilities of marriage and family formation changes associational, residential, and occupational patterning of the young and middle-aged (Smith, McPherson, and Smith-Lovin 2014). A single person without children and renting a home will have a different associational profile from a

¹ Race is another characteristic commonly examined but was not included due to a lack of variance in my study sample.

married home owner with children. Business interests and founding team cooperation are more likely with those in similar stages of life resulting in age-related homophily mechanisms. A study by Marsden (1988) found age homophily where respondents having “discussed important matters” decreased with differences in age.

Prior research shows age has a positive relationship with a variety of outcomes with diminishing effects in later stages (Shane 2003). If people segregate into groups by age, I would expect differences in the businesses started and the cooperative nature of groups. Following homophily theory, I expect that groups whose members share more innate characteristics in common will exhibit greater trust and cooperation resulting in higher group cohesion sales.

Functionality

Whereas homophily drives groups towards similarity in innate characteristics, the functionality mechanism in groups drives preferences for capability, knowledge and motivation that enhance the team and improve chances for success. Diversity results from the functional mechanisms of task and founding group member preferences for members with a variety of needed skills. This need is most likely to be filled by forming diverse groups, in which the members have significantly varying backgrounds. Diversity or homogeneity in functions may both produce the same predictions as homophily because the functional aspects of business can vary while sharing commonality in personal and social associations. While most task groups select members according to expertise to accomplish a common goal, microcredit group members have shared interests through the loan program, but likelihood of success for the group is greater when group member expertise matches individual business needs and not those of the

loan group. Individuals with prior industry experience or business experience have more knowledge of the actions and routines required across business functions. If entrepreneurs believe their experience and knowledge increases likelihood of business success, then it follows that the functionality mechanisms will be towards group members with shared experiences and skills. Entrepreneurs also differ in their motivation for starting a business. Opportunity-focused entrepreneurs have given up other options to pursue a business. In contrast, necessity-motivated entrepreneurs often take up entrepreneurship to make ends meet due to unemployment or low benefit other options. Prior work from Global Entrepreneurship Monitor (GEM) data across countries highlights significant differences in activities and outcomes for opportunity versus necessity motivation (Acs et al. 2005; Frese 2000; Bradley et al. 2012). Necessity entrepreneurship motivations often result in replication of a revenue-generating firm that lowers risk, but also potential rewards. Opportunity-focused entrepreneurs find a resource niche requiring a product or service innovation. Motivated entrepreneurs seeking growth opportunities prefer this characteristic in other group members to share ideas and provide support. Given functional mechanisms lead to logic for both homophily and diversity in functionality, which dominates in microcredit groups and whether it leads to higher performance remains an empirical question.

Status

While the mechanisms of homophily and functionality feature proxy characteristics that are present or absent in members, the mechanism of status reflects in rank ordered desired preferences based on social desirability norms. While there is a substantive literature on status expectations related to race and gender, I consider

demographic characteristics within the homophily mechanism as a personal trait preference for other with a shared background and interest related to those traits. Assuming microcredit entrepreneurs are utility-maximizing individuals seeking to reduce risk and under constraints, I expect the status mechanism to drive preferences for high esteem characteristics valued by others and improving personal success chances. While these ascriptive characteristics may, like race and gender, be logically irrelevant to task performance, certain characteristics have a symbolic value that increases social capital with others.

Education, particularly in developing economies, is a signal of status given average education achievement is still low and higher education is a rarity. Education attained is perceived by others as a proxy for knowledge level, intelligence, capability and social class access. Studies show that education level is a strong correlate of geographic segregation with higher-educated families associating and children attending the same schools (Smith, McPherson, and Smith-Lovin 2014).

Status mechanisms contribute to the microcredit group leader selection. Cultural norms often defer to age as a key leader characteristic due to tradition and associations of age with wisdom. Alternatively, business-focused group members might value the status of prior business success or experience over age expecting tangible knowledge and experience have greater benefit to members' entrepreneurial efforts. A third group leader characteristic I consider is personality. In recent years, the charisma of leaders has risen to the forefront as a key desirable quality that can motivate and unify group members. Rather than viewing the leader as a task dispenser or knowledge source, group members see positive social traits as a key leadership quality. It's unlikely there will be unity

among members for group leader qualifications and it is possible that the group leader possesses all three leader status mechanisms measured. Of interest is whether member preferences for group leader characteristics differ across groups, and if this status mechanism indirectly relates to group-member performance.

Network Constraints

The network constraint mechanism identifies a boundary by the number with which an individual socially interacts. Regular interaction is frequent among family members (strong ties) providing shared-identity, trust and time to discuss plans for starting a new business. Close friends may also be a form of strong ties if the relationship shares characteristics of family, but most friends and acquaintances (weak ties) have identities through their own kinship ties. Friends and acquaintances have familiarity through time spent together personally, in community associations or through work. Because of the considerable work time investment, colleagues have opportunities to learn each other's strengths and weaknesses and develop trust (Ruef, Aldrich, and Carter 2003). Individuals may also develop a network of external ties through work association that can provide connections to information, key suppliers and buyers and other support when needed. While interactions are less frequent, these ties provide a reciprocal exchange of value that benefits both individuals. Higher number of informational ties between members should mean more communication and sharing of information, which should improve business and group outcomes.

Ecological Constraint

Besides the structural limitations composing the network constraint, geographic and industry-related limitations can significantly impact group formation. Ecological constraints are the limitations on group formation caused by the distribution of individuals with certain characteristics across a geographic area. Previous studies have shown that proximity plays an important role in group formation (Goffman 1963, Hawley 1950), and that sharing an industry can have similar effects to sharing a spatial location (Carroll and Hannan 2000). These ecological constraints can affect the weight of various homophily, functional, and status factors.

CHAPTER FOUR

Methodology

The following sample background draws heavily on prior work with the same dataset (Milanov et al. 2015).

Sample

The study survey data was collected in the spring of 2011 within a broader data-collection effort intended to provide better understanding of microcredit entrepreneurs. Collection was facilitated by a microcredit agency that has been operating in Nairobi, Kenya since 1975. The agency began as an effort to provide relief in the slums, coordinated by the National Council of Churches of Kenya, and in 1999, with the help of the United States Agency for International Development (USAID), it became a microcredit organization. In 2012, the organization had a total of 54,000 active borrowers throughout Kenya, with approximately 60% of its loans issued to females. The organization expressed a commitment to “justice, fairness and equal opportunity and participation” as well as “gender balance for equitable distribution of management responsibilities” (Milanov et al. 2015). These core values are evident in my sample, where five of the nine loan officers were female. Most of the bank’s loan offerings were group loans, for which each member was chosen by or assigned to a group, facilitated by a loan officer from the bank.

Since most of the Nairobi group members could speak and write it, the survey was given in English, after a pilot test was run to ensure that the questions were understandable and to determine how long the survey would take to complete. For the

data collection itself, four surveyors accompanied the nine loan officers on their weekly visits to the groups. The surveyors and loan officers asked the group members to take part in this “important and voluntary” survey, offering a reward to those who finished it (Milanov et al. 2015). Anonymity of responses was emphasized, and participants were encouraged to approach the surveyor with any doubts. Most group members agreed to participate, but some had to leave early or miss the meeting entirely (sending a delegate with their loan payment). For some of the groups, the surveyors were not allowed to conduct the interview at the group meeting itself but were encouraged to visit the members at home or work. Together, these situations led to missing responses from one or more members of many of the groups. While this would not be an issue for individual-member studies, response rate is important for a group-based study like this one. Because of this, I followed group network literature by requiring at least an 80% response rate for each included group (Sparrowe et al. 2001). This gave us a final sample of 249 respondents – 153 female and 83 male – across 25 groups, within which the average response rate was 94%.

Measures

Dependent variable: Current Monthly Sales

To capture the performance of microcredit entrepreneurs, the participants were asked their current monthly sales. This figure was converted to USD from Kenyan shillings using the exchange rate at the time. Sales is a simple but central measure that both entrepreneurs and lending agencies use to track their performance, since it is easy to

understand and accurately report. Because of the skewness of the sales variable, I use the natural log of sales for my analysis.

Independent variables

Age provides more time for an entrepreneur to gain experience and increase credibility, making it easier to obtain the resources or relationships needed to strengthen the business (Freeman, 1982). However, an older entrepreneur may also be less inclined to take the risks necessary to start a business, or the further risks inherent in attempting significant innovation (Holtz-Eakin, et al., 1994). Aside from either of these effects, however, age can be a marker of sameness or difference, making it a relevant proxy for homophily. I use age as self-reported at the time of the survey.

Next, I control for entrepreneur's gender through a *female* dummy variable, since gender often plays a significant role in selection of group members. While microfinance organizations often emphasize providing loans to women, only a small majority, 54 percent, of the sample participants were female, while 46 percent were male. This suggests that differences in group gender proportions were due to member choice, and thus to homophily, rather than necessity.

I used three variables to account for the functionality mechanism. *Family business experience* is a dummy variable coded as 1 for a positive answer to the question: "Did you ever work full or part time for your parents' businesses? This measure captures involvement in, rather than just basic exposure to, the family business, and, as would be expected, is 0 for all entrepreneurs whose parents did not run a business.

Prior industry experience (dummy code Y=1) records whether the participant had worked before in the industry of their new business venture, since this prior experience

would provide a familiarity with products, processes, customers and suppliers that I would expect to enable greater recognition and pursuit of opportunities to innovate and grow sales.

Opportunity is an average of two seven-part Likert scale prompts: “I have given up other job opportunities to start this business” and “in comparison to my other job opportunities, this job is likely to provide.”

Education level, the first of my status variables, has been associated with greater propensity to take advantage of entrepreneurial opportunities (Rees and Shaw 1986) and with an improvement in the performance of those businesses (Gimeno, et al., 1997). Education level is recorded as the number of years a participant has completed in school.

The *leader selection* criteria were drawn from the answers to the question “Why is s/he the leader of your group (e.g. age, experience, personality, etc.)?” and were split into three dummy variables, one for each of the example reasons. Age was used as the reference category.

The *External networks* variable is a measure of whether the participant has access to useful information and advice to help her business.

Business idea diversity is a measure of network diversity, or ties to a wide variety of people, should encourage access to information that facilitates innovative business opportunities (Aldrich and Zimmer 1986). Diversity was calculated based on a list of the number of people from the following groups that have been involved with the business: family members or friends, lending group, business customers, and business suppliers. Network diversity (H) was then computed in terms of Shannon and Weaver’s (1963) information entropy measure as:

$$H = \sum (\ln(p_i)) p_i$$

where H is summed over the number of categories for social ties and p_i is the proportion of total contacts in that category

Trust is a dummy variable ($Y=1$) for whether the item “I know this person well” was a criterion used to select group members. Since trust will be much higher among individuals with prior (good) relationships, and since most groups are fairly young, this works as an approximate indicator of the level of trust within the group.

Geographic proximity reports the distance of the respondent’s business from their loan source, from 1 = 0-2 km to 5 = 8 km or more. This is used as an approximation of the entrepreneur’s distance from the others in her group and the difficulty of interacting beyond required meeting times.

Finally, there are three *Industry* dummy variables – manufacturing, wholesale, and retail – with services as the reference sector. These industries represent distinct environments in which entrepreneurs who share an industry may interact.

Controls

Because in young businesses both the age of the business (Evans, 1987; Mitchell, 1994) and its perceived legitimacy (Zimmerman and Zeitz, 2002) are correlated with sales, I controlled for these. I measure *business age* as the difference between the year of data collection and the year of founding, since younger businesses often do not perform as well (Stinchcombe 1965). Entrepreneurs were asked whether their business was *registered* with the government, and I use this as an indicator of legitimacy, since, in East

Africa, registering with the government has been shown to raise stakeholders' perceptions of legitimacy (Khavul et al., 2009).

I also include *lending group size* as a control, since it is very plausible that the size of the group would significantly affect the relationship dynamics within it, and this thesis is very interested in those dynamics.

Analyses

My analysis centers on determining both within- and between-group effects. A large amount of within-group variance suggests that individuals within a group differ regarding a variable (e.g. members of Group A have ages ranging from 20 to 70). A large amount of between-group variance suggests that groups themselves differ on a variable (e.g. Group A has much higher sales than Group B). Identifying both within- and between-group variance is important for examining the connection between the individual and group-level characteristics of microcredit groups and the outcomes of the members' businesses.

I began by using a fixed-effects (FE) model to estimate the within-group effects of the independent variables. The FE model contains an error term that varies over individuals within a group but not a group-level disturbance term. This is useful because it means that the coefficient estimate remains unbiased even if the group-level disturbance term is correlated with the independent variables. However, the FE model loses any variables that don't vary within a group (e.g. group leader characteristics or proportion of women in the group). To capture these variables, I ran a random-effects (RE) model, which includes both within- and between-group effects. However, this comes at the cost of requiring the assumption that the independent variables are

uncorrelated with both the within-group error term and the group-level disturbance term, which remains constant over all individuals within a group.

To relax this assumption, I used the hybrid model and the correlated random-effects (CRE) model, as described by Schunck (2013). The hybrid model is essentially a combination of these two, a linear regression with random intercepts. For the hybrid model, I identify the group means for each variable and then decompose the variable (x_{it}) into a within-group component ($x_{it} - \bar{x}_i$) and a between-group component (\bar{x}_i). This hybrid analysis allows us to determine how much of the variance in a variable's correlation with the dependent variable is because of being in one group rather than another, and how much is because of individual factors. By identifying both within- and between-group variance, I increase the total variance in my analysis, improving the statistical power.

The CRE model is very similar to the hybrid model; both share the fixed-effects estimate for the within-group effect, and both use a group mean value to avoid needing to assume that the individual-level variables are uncorrelated with group-level error. However, whereas the hybrid model uses the group mean (\bar{x}_i) to estimate the between-group effect, the CRE model uses it to estimate the difference of the within- and between-group effects.

CHAPTER FIVE

Results

Table 1 provides the descriptive statistics. Table 2 contains the results of my regression using all four models. In Model 2.1, the results of the fixed-effects (FE) regression show the within-group effects. Of the homophily measures, age positively correlates with sales, and that relationship is strongly significant. None of the functionality measures is statistically significant. Since the functionality mechanism is based on the idea that members of founding

Table 1: Descriptive statistics

Variable	N	Mean	Std. Dev	Min	Max
DV: Ln(Sales)					
<i>Controls</i>					
Business age	249	6.41	4.29	0	29
Legitimacy	249	0.48	0.50	0	1
Group size	249	10.98	2.91	3	19
<i>Homophily</i>					
Age	245	35.73	8.09	15	61
Female (=1)	249	0.63	0.48	0	1
<i>Functionality</i>					
Family Business Experience	249	0.63	0.30	0	1
Prior Industry Experience	249	0.30	0.46	0	1
Opportunity Based	249	0.53	0.50	0	1
<i>Status</i>					
Education	249	5.54	1.48	1	7
Leader Selection – Personality	249	0.42	0.49	0	1
Leader Selection – Experience	249	1.53	1.48	0	3
<i>Networks</i>					
External networks	249	0.32	0.47	0	1
Business Idea Diversity	250	-0.23	0.38	-1.33	0
Trust	249	0.55	0.50	0	1
<i>Ecological Constraints</i>					
Geographic proximity	249	3.56	1.27	1	5
Industry – Manufacturing	249	0.18	0.38	0	1
Industry – Wholesale	249	0.08	0.27	0	1
Industry – Retail	249	0.49	0.50	0	1

Note: Observations (N) distributed among 25 groups

groups need a variety of skills to operate a business together, it is not surprising that this mechanism would be weak or absent from microcredit groups, in which each member runs her own independent business. Of the status indicators, education is significant and positively correlated with sales, and leader selection for experience is marginally negatively significant. Of the network constraint measures, both external networks and business idea diversity are marginally significant, with networks positive and idea diversity negative. Finally, of the ecological constraints, geographic proximity is significant to the $p < .01$ level and negative¹, while the industry dummies for manufacturing and retail are both marginally significant and negative.

Model 2.2 displays the results of the random effects (RE) model. The group size variable, with its between-groups-only variance, drops from the within-group FE model but is present in this model; the same is true for the variable for the proportion of women in the lending group. Beyond the group-level variables, the results from the RE model are very close to those of the FE model. Unlike in that model, leader selection based on experience is not even marginally significant, and business idea diversity has a more negative and significant (rather than marginally significant) association with sales. Likewise, the geographic proximity estimate is slightly larger and even more significant. Apart from these, the coefficients differ slightly from those of the FE model, but there are no major differences.

In Model 2.3, the hybrid model breaks out the within and between effects. The within-group column is identical to the FE results, as should be expected given that the FE model is a within-group measure. Between the groups, however, the results are quite different.

¹Since the geographic proximity measure increases as distance increases, this means that decreased distance between business and lending group locations is associated with increased sales.

Table 2. Fixed-effects, random-effects, hybrid, and correlated random-effects linear regression models for group characteristics on log-sales

Variable	FE Model (2.1)		RE Model (2.2)		Hybrid Model (2.3)		RE Correlated (2.4)		
	Within	Between	Within	Between	Within	Between	Within	Between	
DV: LnSales									
<i>Controls</i>									
Business age	0.029*	(0.013)	0.032**	(0.012)	0.029*	(0.012)	0.029*	(0.012)	0.066 (0.046)
Legitimacy	0.380***	(0.109)	0.337**	(0.103)	0.380***	(0.104)	-0.833**	(0.300)	-1.213*** (0.318)
Group size	-		-0.000	(0.040)	-		-0.135**	(0.046)	-0.135** (0.046)
<i>Homophily</i>									
Age	0.025***	(0.006)	0.024***	(0.006)	0.025***	(0.006)	-0.090***	(0.025)	-0.115*** (0.026)
Female (=1)	0.050	(0.117)	0.021	(0.111)	0.050	(0.112)	0.645	(0.451)	0.595 (0.465)
Proportion women	-		0.457	(0.398)	-		0.787*	(0.400)	0.787* (0.400)
<i>Functionality</i>									
Family Business Experience	-0.129	(0.122)	-0.098	(0.116)	-0.129	(0.117)	0.588	(0.395)	-0.129 (0.412)
Prior Industry Experience	-0.072	(0.119)	0.005	(0.113)	-0.072	(0.114)	-0.025	(0.407)	-0.072 (0.423)
Opportunity Based	-0.046	(0.042)	-0.034	(0.040)	-0.046	(0.040)	0.112	(0.175)	-0.046 (0.180)
<i>Status</i>									
Education	0.057*	(0.022)	0.053*	(0.021)	0.057**	(0.021)	0.040	(0.098)	0.057** (0.021)
Leader Selection - Personality	-0.097	(0.225)	0.027	(0.213)	-0.097	(0.215)	3.167***	(0.694)	-0.097 (0.215)
Leader Selection - Experience	-0.124+	(0.074)	-0.100	(0.070)	-0.124+	(0.071)	0.786**	(0.272)	-0.124+ (0.071)
<i>Networks</i>									
External networks	0.228+	(0.127)	0.202+	(0.120)	0.228+	(0.121)	-0.020	(0.635)	0.228+ (0.121)
Business Idea Diversity	-0.289+	(0.159)	-0.367*	(0.151)	-0.289+	(0.153)	-1.126**	(0.412)	-0.289+ (0.153)
Trust	-0.086	(0.111)	-0.041	(0.106)	-0.086	(0.106)	1.333**	(0.450)	-0.086 (0.106)
<i>Ecological Constraints</i>									
Geographic proximity	-0.153**	(0.055)	-0.169***	(0.051)	-0.153**	(0.053)	-0.399***	(0.105)	-0.153** (0.053)
Industry - Manufacturing	-0.289+	(0.171)	-0.278+	(0.161)	-0.289+	(0.164)	0.330	(0.477)	-0.289+ (0.164)
Industry - Wholesale	-0.174	(0.206)	-0.184	(0.195)	-0.174	(0.197)	0.446	(0.786)	-0.174 (0.197)
Industry - Retail	-0.214+	(0.125)	-0.239*	(0.118)	-0.214+	(0.119)	-0.630	(0.821)	-0.214+ (0.119)
Constant	0.308	(0.524)	-0.057	(0.671)	0.308	(0.524)	1.518	(1.204)	1.518 (1.204)
sigma_u	0.610		0.504		0.610		0.427		0.427
sigma_e	0.702		0.676		0.702		0.702		0.702
rho	0.430		0.357		0.430		0.271		0.271
Log likelihood	-233.5		-270.4		-233.5		-247.9		-247.359
Chi2	.		95.98		.		330.9		320.050
R ² or Pseudo R ²	0.331		0.151		0.331		0.427		0.427
Observations	241		241		241		241		241
Number of Groups	25		25		25		25		25

† p<.10; * p<.05; ** p<.01; *** p<.001

Null LL Model: -320.94

The between-group effect of age is more than three times the size of the RE estimate but is a negative rather than positive effect, still significant to the $p < .001$ level. The hybrid model's estimate of the between effect for the proportion of women in the group is much greater than the RE estimate, and is significant, while the latter was not. As in the RE model, none of the functionality measures is significant, though the signs of the estimates are all reversed from the RE model. The status measure of having a leader selected based on personality is highly significant and positively associated with sales, with a coefficient of 3.167 at the $p < .001$ level, while selection on experience had a more modest and slightly less significant correlation, with a coefficient of 0.786 at the $p < .01$ level. Similarly, trust, which was insignificant in all three of the previous models, is significant between groups to the $p < .01$ level, with a coefficient of 1.333. This suggests that, while having more trust than your peers is not strongly associated with any better sales outcomes, being in a more trusting group is associated with significantly higher sales. The estimate for business idea diversity is more significant, and more strongly negative, than in the previous models, while the coefficient of geographic proximity more than doubled the value from previous models and matched their strong significance.

Model 2.4 shows the results of the correlated random-effects model (CRE), again divided into within- and between-group effects, with the within effects again identical to the FE results. Between groups, the numbers are very similar to those from the hybrid model. The level of significance for family business experience and the legitimacy control increased, while on business idea diversity and geographic proximity, as well as the business age control, it decreased. In general, the significant independent variable estimates became slightly larger except where significance decreased.

A Hausman test reveals an overall difference between the within and between set of coefficients. An additional Wald test (Table 3) for equivalence where the null hypothesis is 0 provides additional understand of the individual variables driving the overall differences. Of the controls, registered business [legitimacy] was particularly different between groups. Age homophily was significantly different across groups while gender homophily was not significant. Leader selection criteria based on personality and experience relative to leadership based on age was an important difference across groups. Trust as a variable for group member selection had significant effects and a diverse source of contacts for business ideas was also significant. Finally, distance of business from loan source [geographic proximity] showed significant differences between groups as a predictor of sales performance.

Table3: Wald chi-squared test of significant difference for within and between effects.

Variable	Wald χ^2	p value
<i>Controls</i>		
Business age	2.090	0.149
Legitimacy	14.550	0.000
Group size		
<i>Homophily</i>		
Age	19.810	0.000
Female (=1)	1.640	0.200
<i>Functionality</i>		
Family Business Experience	3.030	0.082
Prior Industry Experience	0.010	0.912
Opportunity Based	0.770	0.379
<i>Status</i>		
Education	0.030	0.865
Leader Selection - Personality	20.180	0.000
Leader Selection - Experience	10.490	0.001
<i>Networks</i>		
External networks	0.150	0.702
Business Idea Diversity	3.630	0.057
Trust	9.400	0.002
<i>Ecological Constraints</i>		
Geographic proximity	4.330	0.037
Industry - Manufacturing	1.510	0.219
Industry - Wholesale	0.580	0.445
Industry - Retail	0.250	0.617

CHAPTER SIX

Discussion and Suggestions for Further Research

There has been increasing academic interest in using business for poverty alleviation in recent years, including in using microcredit groups to fund, train, and support entrepreneurs. This interest has spurred many studies on the effectiveness and best applications of microcredit, but few have addressed the role that group member characteristics play in group interaction and participant performance. Given that microcredit groups are self-selected rather than assigned and involve significant shared liability, it is likely that the group member selection and interaction would differ from what standard groups theory would predict. This thesis analyzes data from a microcredit organization in Nairobi, Kenya to ask the question: “What configuration of demographic and business capabilities do groups select, and how do those characteristics affect individual outcomes, within-group, and between-group performance?”

My findings suggest that groups that select their leaders based on personality perform much better than leaders selected because of their age or level of experience. In a group situation, communication can be very valuable for new entrepreneurs sharing knowledge, insight, and ideas. A leader who can get conversation flowing in the group and encourage members to share could be essential. To that end, a leader who holds a position of authority in advance, either through age or greater experience, may be unhelpful if the group members feel uncomfortable disagreeing with or appearing to challenge her because of established social norms. While I can't infer causality from the leader popularity-sales correlation, its strength and magnitude suggest that further study

would be worthwhile. It is also worth noting that groups which selected their leaders based on experience also significantly outperformed those that selected based on age.

My findings also show a significant positive association between trust and sales in the between-group effects. The basic inference that groups that trust each other more perform better is intuitive, but since the *trust* variable codes group membership selection based on pre-existing relationships, the inference is potentially more interesting. Given this, selecting people as group members based on already knowing them well associates with better sales outcomes for the group, not just easier relationships.

There are several limitations on my findings. First, my analysis was directed toward establishing correlation, not causality. Thus, while I can observe that certain group features are associated with better outcomes, I have not demonstrated that any of these features produce or even contribute to these outcomes. Second, while sales is a useful and convenient measure of business success, it is imperfect. A struggling or badly-run large company may have a much higher level of sales than a well-run and successful small company. However, where this difference in size is not because of a difference in age (which I control for) or industry (one of the ecological constraints) or real business success (what I'm attempting to measure), it's likely that it is rare enough to be insignificant.

Future research could reexamine the significant relationships that I found to test for causality, providing microcredit agencies with prescriptive guidance for how to most helpfully advise their participants in the formation of their groups. In particular, identifying or refuting a causal relationship between selecting a group leader based on personality and sales could be particularly helpful in determining the guidance

microcredit agencies might give to lending groups with regard to selecting their leaders, since that is a dimension on which groups have significant choice. It would also be worth running the analysis with other extant variables as dependent variables, such as innovation and group cohesion. With additional data, ethnicity could be included in the homophily mechanism, since it is a very common measure of homophily that was not present in my dataset, and strong and weak ties, since these were also unavailable.

CHAPTER SEVEN

Conclusion

This study offers valuable insights into the different ways that microcredit groups form, and the variety of outcomes associated with those formation mechanisms. Ruef, Aldrich, and Carter's (2003) five mechanisms of group composition are broadly useful for understanding microcredit group formation, but I do not find significant support for the functionality mechanism in this context. For microcredit institutions seeking to alleviate poverty by funding successful start-ups, understanding the effects of group composition on member business sales is essential.

APPENDIX

APPENDIX
Stata Code Used for Analysis

```
/******  
Name: microcredit_support_group_analysis.do  
Description: Analysis of Kenyan microcredit data using group formation mechanisms  
            from Schunk et al. (2013)  
Author: Paul Paternoster and Steve Bradley  
Edited: 7/23/19  
*****/  
clear  
macro drop all  
capture log close  
cd [insert your file path here, ending where you want result output to go]  
use ../Data/7.20.19_PJPThesisData.dta , replace  
log using ../Log/paul_paternoster_thesis.log , append  
***** Set Macros *****  
//Variables by mechanism  
global homophily    age female prop_women  
global functionality  fambusexp prior_ind_exp i_opportunity  
global status       education i_select_leader_personality i_select_leader_experience  
                    //select_leader_age used as ref *Leadership selection criteria  
global net_const    extnet idea_diversity trust //Network Constraints  
global eco_const    i_geo_proximity ind1 ind2 ind3 //Ecological Constraints  
  
//Variable Sets  
global depVar       salesln //Dependent Variable  
global conVars      i_bus_age legitimacy groupsize //Control Variables  
global indepVars    $homophily $functionality $status $net_const $eco_const  
                    //Independent Variables, calling mechanism macros  
  
xtset groupid  
  
***** Mark sample *****  
//Identify the set of observations that have responses for all variables  
markout nonmiss $depVar $conVars $indepVars  
count if nonmiss /* Check # of observations remaining in marked sample */
```

```

***** Generate Group Mean Variables *****
//The deviation score is how much variance there is within a group around the mean
local varlist $conVars
macro drop h_conVars uc_conVars
foreach var of local varlist {
    capture drop d`var' m`var' //drops any already-generated variables to avoid errors
    by groupid, sort: center `var' if nonmiss==1, prefix(d) mean(m)
        label variable m`var' group_mean_of_`var'
        label variable d`var' indiv_group_mean_center_of_`var'
    local h_conVars `h_conVars' m`var' d`var' //appends newly generated variables to
        the variable list for the hybrid model local macro
    local uc_conVars `uc_conVars' m`var' `var' //appends newly generated variables
        to the variable list for the uncentered (correlated RE) local macro
}
global h_conVars `h_conVars' //generates a global macro for control variables in the
    hybrid model using the local macro generated above
global uc_conVars `uc_conVars' // generates a global macro for control variables in the
    uncentered (correlated RE) model using the local macro generated above

local varlist $indepVars
macro drop h_indepVars uc_indepVars
foreach var of local varlist {
    capture drop d`var' m`var' // drops any already-generated copies to avoid errors
    by groupid, sort: center `var' if nonmiss==1, prefix(d) mean(m)
        label variable m`var' group_mean_of_`var'
        label variable d`var' indiv_group_mean_center_of_`var'
    local h_indepVars `h_indepVars' m`var' d`var'
    local uc_indepVars `uc_indepVars' m`var' `var'
}
global h_indepVars `h_indepVars' //generates a global macro for independent variables in
    the hybrid model using the local macro generated above
global uc_indepVars `uc_indepVars' //generates a global macro for independent variables
    in the uncentered (correlated RE) model using the local macro generated above

*individual variance from group mean (d) doesn't make sense for group measures
*    drop d_____
    drop dprop_women

***** ^ Run after any variable adjustment ^ *****
***** Fixed-effects and Random-Intercept Models *****
//outreg2 in following models exports to excel. May have to sscinstall outreg2. Use
sideway after comma if you want ( ) sideways rather than below

```

```

//fixed effects model Table 1 Model 1
    xtreg $depVar $conVars $indepVars , i(groupid) fe
    estimates store fe
    outreg2 using Model1$depVar , sideways se bdec(3)rdec(3) e(ll, chi2, r2_p,
sigma_u, sigma_e, rho) alpha(0.001, 0.01, 0.05, 0.10) symbol(***, **, *, +) excel
replace
//create summary statistics Table
    reg $depVar $conVars $indepVars
    set matsize 5000
    outreg2 using summary$depVar , sum(detail) eqkeep(N mean max min) excel
replace see
//random-intercept model Table 1 Model 2
    xtreg $depVar $conVars $indepVars , i(groupid) mle re
    estat ic
    estimates store re
    outreg2 using Model2$depVar , sideways se bdec(3)rdec(3) e(ll, chi2, r2_p,
sigma_u, sigma_e, rho) alpha(0.001, 0.01, 0.05, 0.10) symbol(***, **, *, +) excel
replace

```

***** Hybrid Model *****

```

//Hybrid Model Table 1 Model 3
// $y_{it} = \beta_0 + \beta_1 x_{it} + \beta_2 c_i + \pi x_i + v_i + \epsilon_{it}$  where  $\mu_i = \pi x_i + v_i$ 
// $\beta_1$  is the fixed-effects estimate, should be the same if you ran xtreg, fe model
// $\pi = \beta_3 - \beta_1$  and is the difference of the between and within effects
    xtreg $depVar $h_conVars $h_indepVars , i(groupid) re
    xtreg $depVar $h_conVars $h_indepVars , i(groupid) re mle
    mixed $depVar $h_conVars $h_indepVars || groupid:, stddev cov(unstructured)
    mixed $depVar $h_conVars $h_indepVars || groupid:, stddev
    estimates store hybrid
    outreg2 using Model33$depVar , sideways se bdec(3)rdec(3) e(ll, chi2, r2_p,
sigma_u, sigma_e, rho) alpha(0.001, 0.01, 0.05, 0.10) symbol(***, **, *, +) excel
replace
//The correlated random-effects model is fit in a similar way, but it includes uncentered
//versions of the level 1 variables. Table 1 Model 4
    xtreg $depVar $suc_conVars $suc_indepVars , i(groupid) mle re
    estimates store corr_re
    outreg2 using Model4$depVar , sideways se bdec(3)rdec(3) e(ll, chi2, r2_p,
sigma_u, sigma_e, rho) alpha(0.001, 0.01, 0.05, 0.10) symbol(***, **, *, +) excel
replace
// also could use
    mixed $depVar $suc_conVars $suc_indepVars || groupid: , cov(unstructured)
stddev

```

```

//hybrid model with random slopes Table 1 Model 5
//Let us assume we have reasons to believe that the within effect of a variable varies
across groups.
//In other words, the dvariable variance differs across groups
//lets assume the nature of opportunity varies across groups
    mixed $depVar $h_conVars $h_indepVars || groupid:  dportunity, stddev
    estimates store hybridslope
*test to see if the hybrid random slope is different from hybrid random intercept. high
LR chi sq low pvalue says random slope is significant
    lrtest hybridslope hybrid
    outreg2 using Model5$depVar , sideway se bdec(3)rdec(3) e(ll, chi2, r2_p,
sigma_u, sigma_e, rho) alpha(0.001, 0.01, 0.05, 0.10) symbol(***, **, *, +) excel
replace
*can also run model not assuming default independence, but with covariance
unstructured
    mixed $depVar $h_conVars$h_indepVars || groupid:  dportunity,
covariance(unstructured) stddev
*test for significance in model which looks like cov(opportunity,_cons). It is level 2
variable and intercept.
    lrtest . hybridslope
***** Wald Test *****
*A Wald test can be used to test for equivalence of within and between estimates. A chi
sq with significant p value show significant differences
estimates restore hybrid
test mfemale dfemale
test mededucation dededucation
test mbus_age dbus_age
test mprior_ind_exp dprior_ind_exp
test mportunity dportunity
test mgroup_cohesion dgroup_cohesion
hausman fe re
*These results show non-significant Hausman Test, which normally means that it is ok to
use the random effect approach.

capture log close

```


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