

Cooperation, Resources, and Network Structure

Theory and Evidence from the Syrian Refugee Crisis *

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Abstract

How does network structure affect the capacity of communities to respond to public goods problems? Arguments that make explicit or implicit claims about the effects of network features – like group homogeneity and shared ethnicity – have failed to account for the unavoidable endogeneity of network features. For most network features, we cannot manipulate one feature of a network without causing variation in other features. Contrary to existing theory on group homogeneity and cooperation, I argue that in some settings diverse groups have a unique advantage in mitigating collective problems. Although dense homogeneous networks facilitate cooperation by helping to overcome the free-rider problem, they make cooperation less effective by constraining access to external information about resources. Refugee communities are one such setting. I offer a theory that explicitly frames the trade-off between network features, and argue that in situations where external resources are necessary to mitigate problems, diverse groups will have an advantage over homogeneous groups because of greater access to diverse resources, despite their disadvantage in monitoring free-riding. I draw on a social-network field experiment with Syrian refugees in Lebanon and Jordan and comparative case studies of refugees' responses to community problems in Lebanon to show that while dense groups have an advantage in punishing free-riders, which incentivizes cooperation, diverse groups are more likely to have access to information and resources that are useful for mitigating problems.

1 Introduction

How does network structure affect the capacity of communities to respond to public goods problems? A large body of literature makes explicit or implicit claims about the effects of network features, including group homogeneity and shared ethnicity, but until now this literature has largely failed to account for the unavoidable endogeneity of network features. For most network features, any naturalistic variation in one dimension, even random variation, will cause variation in other features as well. For example, we cannot conceive of naturalistic variation in group density that does not simultaneously alter other features of the network.

Explicitly incorporating this endogeneity into theory, I present an argument where higher network density comes at the cost of lower network diversity. I argue that, contrary to existing theory on group homogeneity and cooperation, when resource access is the binding constraint on cooperation diverse groups have a unique advantage in mitigating collective problems. Although dense homogeneous networks facilitate cooperation by helping to overcome the free-rider problem, they make cooperation less effective by constraining access to external information about resources. This matters because the free-rider problem is neither the sole nor the primary obstacle to cooperation. Looking broadly at responses to social dilemmas, whether people have access to resources and information necessary for effective action will shape their

choice to act or not.

The availability of and constraints on information and resources are critical determinants of cooperation, and some communities lack resources to solve public goods problems even in the presence of strong trust and reciprocity. Although scholarship on the effects of resource availability and constraints on the prospects for effective cooperation has a long tradition in sociology and political science (McCarthy and Zald, 1977; Morris, 1986; McCarthy and Wolfson, 1996; Weinstein, 2006; Staniland, 2012), it remains missing from literature on networks and cooperation. Whereas existing political science scholarship on networks and cooperation emphasizes the importance of internal information, which concerns the actions and resources of people in a group and serves to disincentivize free-riding, I emphasize the role of external information about the actions and resources of people outside the group, which incentivizes cooperation by increasing the efficacy of contributions.

Refugee communities are one such setting where resource access is the binding constraint on cooperation. Existing scholarship on refugee crises emphasizes the importance of refugees' networks in acquiring quotidian essentials like housing and a mobile phone (Steinberg, 2015) and obtaining the money and information needed to flee a war zone and settle in a safe country (Jacobsen and Landau, 2003). Beyond refugee contexts, networks have been widely demonstrated to affect political

behavior. In their role as conduits of information, networks affect public goods provision and cooperation (Miguel and Gugerty, 2005; Habyarimana et al., 2009; Larson, 2017*b*) as well as people’s choices to protest or rebel (Hassanpour, 2017; Steinert-Threlkeld, 2017).

This paper offers theory and evidence about the effects of group structure on cooperation and public-goods provision within groups. Theoretically, I explicitly frame the trade-off between network features, and argue that in situations where external resources are necessary to mitigate problems, diverse groups will have an advantage over homogeneous groups because of greater access to diverse resources, despite their disadvantage in monitoring free-riding. I highlight the trade-off of network density for cooperation in precarious communities and the important distinction between internal and external information and their functions in facilitating cooperation. By explicitly framing the claims of existing literature on the effects of group structure in terms of network theory, I highlight that although dense networks facilitate cooperation by helping groups overcome the free-rider problem, they limit access to information and resources from outside the group.

Empirically, I draw on a social-network field experiment with Syrian refugees in Lebanon and Jordan and comparative case studies of refugees’ responses to community problems in Lebanon. To test my theory that dense networks will have less access

to diverse external information and resources, even while they help to overcome the free-rider problem, I conducted a randomized controlled network field experiment in 56 focus group discussions with Syrian refugees, across 14 cities, towns, and refugee camps in Lebanon and Jordan. I randomly assigned focus groups to comprise dense or diverse groups, where a dense group is one where a high share of group members know each other, and a diverse group is one where people have fewer redundant connections. Experimental variation included recruiting participants through either random sampling or referral recruiting, both from the UN Refugee Agency census.

To study cooperation around public goods problems in the focus groups, I presented participants with audio vignettes about community problems that are common in refugee communities. I developed the content of the vignettes based on over a year of qualitative fieldwork in Syrian communities in Lebanon, and in conjunction with Syrian, Lebanese, and Jordanian NGO staff who work with Syrian refugees. The public goods issues presented to participants included public safety, freedom of movement, redistribution of humanitarian resources, protection of private property rights and the right to income, and interaction with public authorities/security forces. Outcomes include behavioral metrics of cooperation and deliberation from focus group transcripts, and survey data on participant characteristics.

To illustrate the processes of how networks facilitate responses to collective prob-

lems, I present two brief case studies of camps in Lebanon's Bekaa valley, discussing how they each leveraged their network connections to respond to the 2015 trash collection crisis. I trace the ways that communities varied in the structure of their social ties, and consequently how social ties shaped the nature and effectiveness of responses to the trash collection crisis. Although the cases do not serve as dispositive evidence about causal relationships, they provide complex grounded discussion of networks, resources, collective problems and responses in the context of the Syrian refugee crisis, thereby complementing the more abstract theory and quantitative theory testing.

Both the experimental results and the comparative case studies provide evidence that dense groups demonstrate greater engagement with collective problems, and diverse groups draw on a wider range of resources. These findings support the dominant explanation in political science and economics that dense networks facilitate internal information flow, cooperation, and public goods provision (e.g., Putnam 2007, Habyarimana et al. 2009), and provide novel evidence that dense networks constrain the flow of external information and access to useful resources. These findings align with predictions from social network theory on diffusion through networks (e.g., Granovetter 1973, Granovetter 1983, Centola 2015), and suggest that low network density can provide benefits for effective cooperation around public goods problems. Theories

that explain networks and cooperation without reference to information flow, such as altruism (Alesina and La Ferrara, 2005), norms of strong reciprocity (Putnam, 2000), and preference homogeneity (Alesina, Baqir and Easterly, 1999; Goldin and Katz, 1999), do not find support in the data.

In addition to the theoretical and empirical contributions, this essay contributes to a growing literature in the social sciences that studies social networks in the field, and offers a new method for making inferences from network data that could be used by researchers in different settings. Causal inference with network data is often challenging, and the design I introduce in this essay (and elaborate in Masterson (2018)) allows researchers to nonparametrically identify and estimate the effects of group structure, even when the broader network structure is unknown. Most existing techniques for network intervention and inference require complete network mapping, which is difficult and expensive even in small networks (e.g., Banerjee et al., 2013; Paluck, Shepherd and Aronow, 2016; Larson and Lewis, 2016). The method I develop and employ in this essay facilitates network interventions *without* mapping the network, even in large and complex networks.

2 Networks, Resources, and Cooperation

In this essay I explore the conditions that facilitate cooperation around collective problems in refugee communities. I define *cooperation* as engaging with others in mutually beneficial activity (Bowles and Gintis, 2011). In addition to collaborative actions with a collective benefit, I think of cooperation broadly as encompassing both actions where individual behavior has some collective benefit (e.g., voting in a democracy) and actions where multiple people work together toward a common goal with benefits only for the actors (e.g., some forms of criminal activity). In this paper, I am interested in problems where the benefits of responses are imperfectly excludable, or where there are positive externalities from the action. The key feature of the responses is not that more than one person acts, but that any given person would be better off if someone else solved the problem. In theory, trash collection could have selective imperfect exclusion. One family could be denied trash collection, and encouraged to keep their trash around their home. That family would, nonetheless, benefit from the fact that trash collection made the community, in general, cleaner.

I draw on Bowles and Gintis (2002, 420) in defining a *refugee community*, the unit of analysis for the study, as “a group of [refugees] who interact directly, frequently, and in multi-faceted ways,” and I conceive of *interaction* as relations between individuals or groups implying that parties are potential contributors and beneficiaries

from each other's cooperation. Bowles and Gintis (2002)'s definition of community emphasizes the interactional and non-geographic nature of community, which is more general and useful for understanding how social ties define communities among people who do not necessarily live as close neighbors. Nonetheless, for populations with limited mobility, such as refugees facing legal vulnerability, a community must be geographically clustered for members to mutually contribute to and benefit from public goods. Therefore, in my conception of the interactions that define community, the interactions should take place within a fairly small geographic area, such as a town or an urban neighborhood. Accordingly, the primary sampling unit for focus groups was defined geographically as the village in rural areas, the town in peri-urban areas, and the neighborhood in cities.

A large body of work in political science and economics suggests that network density leads to more cooperation around public goods problems (e.g., Fearon and Laitin 1996, Miguel and Gugerty 2005, Putnam 2007, Habyarimana et al. 2009). Much of the work specifically studies the effects of shared ethnicity, which I conceive of as a social network where proximity is defined according to ascriptive similarity. A majority of work in political science and economics argues that densely connected groups have more cooperation because free-riding is more likely to be detected. Social network theory, however, suggests that higher network density may inhibit the flow of

information and resources important for cooperation around public goods problems, meaning that lower density networks may provide unique benefits for communities with limited resources trying to improve their well-being (e.g., Granovetter 1973, Centola 2015). In what follows, I discuss the predictions from the two literatures, highlight unexplored bounds on each body of theory. Political science has largely failed to recognize the implications of network endogeneity for causal claims about the effect of variation in network features. Social network theory has been more nuanced in considering this endogeneity, but has not considered implications for the study of cooperation. I then suggest a set of testable predictions that emerge from the clarification of each theory.

2.1 Information Flow and Punishment

The dominant explanation in political science for the correlation between group density and public goods provision states that high-density networks facilitate information flow and effective in-group sanctioning (Fearon and Laitin, 1996; Putnam, 2000; Miguel and Gugerty, 2005). The flow of information increases the likelihood that free-riding is detected, that information spreads about the free-riding, and that the person in question can be located and punished. Because social ties transmit information, the higher a network's density, *ceteris paribus*, the more opportuni-

ties people will have to share and receive information. Miguel and Gugerty (2005) clearly presents the central theoretical intuition in their model's assumption that "social sanctions and coordination are possible within groups due to the dense networks of information and mutual reciprocity that exist in groups but are not possible across groups" (p. 2330).

A great deal of empirical evidence supports these theories. Miguel and Gugerty (2005) find evidence in western Kenya that higher ethnic homogeneity in villages resulted in a better provision in local public goods and services, a result which they argue is due to homogeneous communities facing lower cost in overcoming collective action problems associated with applying social sanctions. Tsai (2007) shows that local officials in China are more likely to provide goods and services when they are part of the same social groups, such as churches, as common citizens, rendering social sanctions more feasible. In Kampala, Uganda, Habyarimana et al. (2009) test a number of mechanisms to explain the robust positive correlation between ethnic concentration and public goods provision, and find evidence that people tend to interact more frequently with coethnics, believe they can better read information about coethnics, and may be better able to locate a specific coethnic if necessary.

2.2 Information Flow and Resource Access

If we turn to social-network theory we find a seemingly contradictory prediction. Work on diffusion through networks states that a densely connected group is more likely to be homogeneous and therefore more likely to have redundant information, and less likely to have diverse information. If we think of information flow as the volume of *non-redundant* information that flows between people, the work in social network theory would predict that a dense group will have less information flow than a diverse group.

When we speak about network diversity, we need to define diversity with respect to what? In this context, the relevant content of diversity is the information and connections that in-group members have to out-group members. That is, a more diverse group will have more diverse information and a more diverse set of connections to out-group members.

We can think of these both probabilistically and mechanically. Because people are more likely to form and maintain relationships with people similar to them (a feature of network formation known as homophily), a densely connected group is more likely to be homogeneous. We can also see the trade-off between density and diversity mechanically, where if we hold constant the average number of connections that group members have, as the group members know more people in the group, the

share of connections to out-group members would need to decrease. Mechanically, holding the number of social ties constant, as the number of connections between people in a group increase, the share of people's overlapping connections will increase.

Social network theory has offer numerous informal and formal theoretical tools for thinking about how diversity in a network increases the flow of non-redundant information. Granovetter (1973, 1983)'s argues that bridging ties between distant parts of a network tend to link diverse individuals, spreading information that recipients could not otherwise access (Granovetter, 1973, 1983). Dense groups can be so clustered as to prevent meaningful contact outside that group, thereby stymying the flow of resources and information (Blau and Schwartz, 1984). Centola (2015) makes an argument with similar implications, writing that as the similarity of groups increase, the narrower the subset of the population to whom each person is exposed, arguing that the relationship between group similarity and information flow follows an inverse U-shaped curve.¹ Watts (1999, p.14) argues that the network characteristics of two connected nodes, and the consequent dynamics of their interactions, are not determined by the type of tie, but rather by structure of the network around

¹ What I refer to as group similarity is formally 'consolidation,' which is "the degree to which people's social position in one dimension of social life correlates with their position in other dimensions," a network feature conceptually analogous to diversity (Blau and Schwartz, 1984; Centola, 2015)

them.²

Related predictions flow from resource mobilization theory, which asserts that almost any group of people striving for social change needs to marshal external resources and aggregate the resources for collective purposes subject to the structural constraints they face (Morris, 1986; McCarthy and Wolfson, 1996). Groups with serious objective deprivations will need to rely more heavily on external resources to realize their preferences for social change (McCarthy and Zald, 1977, 1225-6). In refugee communities, resources can include public services, material goods, information, human capital, and political connections. With more access to resources that help mitigate community problems, the rewards of cooperation will be higher, while

² A contrasting prediction comes from Aral and Van Alstynne (2011) who argues that dense networks have a higher volume of information flow in supply-driven environments with a wide range of information and potential ways to mitigate problems. In such situations dense groups may have an advantage. While the likelihood of novelty is higher for any given piece of information between network-distant (diverse) connections, the frequency and volume of information transfer (bandwidth) is higher between closer (more similar) nodes. The theoretical and empirical setting of the essay – employees in a business and acquiring clients – has key differences from refugees settings. Aral and Van Alstynne (2011) argue that supply-driven high-information environments, whereas I characterize refugee attempts to mitigate collective problems as generally demand-driven low-information environments. In these situations bandwidth will prove to be less important than diversity.

the costs remain constant, thereby incentivizing cooperation.

2.3 Internal and External Information

Political science literature argues that dense networks facilitate cooperation by disincentivizing free-riding, and theory from network science argues that diverse connections facilitate access to a wide range of information and resources. These apparently contradictory predictions arise because the two literatures are generally talking about different types of information. Political science is talking about the flow of what I call *internal information*: information about the behavior, characteristics, and resources of in-group members. In contrast, social network theory is talking about the flow of, what I call, *external information*: information about the behavior, characteristics, and resources of out-group members. I define the relevant group according the definition of community offered in the last section as people who regularly *interact*, implying relations such that members of the group are potential contributors and beneficiaries from each other's cooperation.

In other words, the 'in group' and 'out group' for this study are not all Syrians and all non-Syrians in Lebanon, respectively, but rather groups of people who could mutually benefit from cooperation. For a group of Syrians discussing how to respond to a collective problem, the term 'external resources' does not denote resources con-

trolled by non-Syrians, but rather resources not controlled by the people in the group. The bounds of in-groups and out-groups for cooperation are often shaped by characteristics of the problem people face just as much as the the characteristics of the people. In a particular refugee camp facing a trash collection problem, this would probably mean that the in-group is people living in that camp. In a focus group discussion, it refers to the people sitting in a room discussing responses to the audio vignettes.

2.4 Density-Diversity Trade-off

I use the predictions of the two literatures to develop the *Density-Diversity Trade-off*. A foundational intuition for the trade off is that density and diversity are endogenous and negatively related in social networks. This aligns with a widespread empirical regularity in social network studies that density and diversity are negatively correlated – dense groups tend to be less diverse, and diverse groups tend to be less dense. We can predict from political science that more density and less diversity means more internal information flow. From social network theory, we can predict that more density and less diversity means means less external information flow. As more people within a group share mutual connections, they range of non-redundant relationships decreases.

The trade-off between density and diversity matters for cooperation because, on the one hand, more internal information can facilitate cooperation by reducing the free-rider problem. On the other hand, more external information can facilitate cooperation by increasing the effectiveness of group responses, and therefore the expectation that contributing to a public good will lead to a productive outcome. Even in the absence of the free-rider problem, if people believe that their actions will fail, there is no reason for them to contribute. And in a context where a group doesn't have the internal resources to mitigate its own problems, access to a broader range of external information could be critical for mitigating problems. More diverse information may expand the toolkit that a group can leverage to mitigate a problem.

First, the density-diversity trade-off would predict from political science and economics that treatment groups will have higher internal information flow, which disincentivizes free-riding. Because free-riding is more costly in expectation dense network will manifest higher engagement around community problems. In focus groups, this has the observable implication that people will engage more around public goods problems. Second, the density-diversity tradeoff would predict from social-network theory that treatment groups will have lower external information flow, which has the observable implication of less diversity of external resources that groups draw on in response to community problems.

H1: From political science and economics

Treatment groups (recruited to be a dense group) will have higher internal information flow, and therefore higher engagement

H2: From social-network theory

Treatment groups (recruited to be a dense group) will have lower external information flow, and therefore less diversity of resources groups draw on in responses.

The assertion of a trade-off between density and diversity suggests that there may be an optimal balance between the two network features, and I argue that the optimal mix depends on the constraints on effective responses to problems that a group faces in a given context. In situations where the free-rider problem is the binding constraint on cooperation, we can expect to see higher cooperation in dense groups than diverse groups. That is, if a group possesses the resources to mitigate a problem, then the primary obstacle to cooperation will be people taking advantage of a common resource without contributing to it. The possible solutions to the collective action problem in the literature (e.g., reciprocity, reputation, and trust, à la Ostrom (1998)) may be sufficient to mitigate collective problems. In contrast, in situations where resource access is the binding constraint, we may observe higher levels of cooperation in diverse groups. Even when the conditions exist to overcome

the free-rider problem, we are unlikely to see people cooperating and contributing to a common resource if they know that they lack the resources to translate action into outcomes. Because this study did not have variation in types of binding constraints that groups faced, I do not further explore the idea of an optimal balance between density and diversity in this essay.

3 The Syrian Refugee Crisis

In Lebanon and Jordan, most Syrian refugees live in urban and peri-urban settings. In Jordan 20% of Syrians live in formal UN camps, and although the UN has not established official refugee camps in Lebanon, 15% of Syrians live in informal camps.³ Worldwide, refugees living outside camps is the norm; less than one third of the world's 22.5 million refugees live in camps.

In the early years of the refugee crisis it was fairly simple for Syrians to enter and reside in Lebanon or Jordan. However, legal restrictions on entry, residency, and work increased as the conflict continued, severely limiting Syrians' ability to

³ People conversant in NGO/UN legalese may be familiar with the term '*informal settlement*' (*IS*) used to describe refugee camps in Lebanon. The term is meant to emphasize the fact that the camps are not run by the UN Refugee Agency. I maintain that the difference is more bureaucratic than useful, and I deliberately use the term 'camp' rather than IS

enter the countries, and forcing the majority of those already residing there into legal and financial precarity. Lebanon and Jordan deny Syrians a general right to work and constrain their movement. For most refugees, any interaction with state authorities, such as police or government bureaucracy, can carry significant risk. In Lebanon and Jordan, Syrians fear passing through checkpoints due to the risk of abuse, arrest, and deportation. Traveling even short distances might involve passing through checkpoints, which means that Syrians cannot move freely; those who cannot legally move cannot safely work, visit family, go to hospitals to receive healthcare, or travel to urban centers to renew their documents.

Although Syrians cannot change the fundamental causes of their problems, they leverage their connections and resources in response strategies to meet their daily needs and ease their difficulties (a process of ‘making do’ that many Syrians referred to as *zabat al-hal*). The inchoate dynamic nature of refugee communities magnifies the importance of information about social, economic, and bureaucratic processes that many stable communities can take for granted. People continually search for information about safe travel routes, reliable employers, the current state of work-permit laws, and the services currently available from NGOs and international organizations. Even with useful information, people’s strategies may only be day-to-day responses rather than permanent solutions, leaving people frustrated that they could

not do more. The responses may be an ongoing negotiation between Syrians, or between Syrians and host-country individuals and organizations, or between Syrians and humanitarian organizations. The responses that people employ may be different each time they encounter a new problem, and may be a process of trial and error where people try a response to their problems, find that the response was ineffective or incomplete and try a different response the next time they encounter the same problem.

4 The Social-Network Field Experiment

To design an experimental test of the Density-Diversity Trade-off, we need to think about how to compare dense groups and diverse groups. We do not want to look at individuals in dense groups and individuals in diverse groups. The question of theoretical interest is how the groups themselves differ. Therefore, we study focus groups to compare dense groups in their deliberative behavior to diverse groups in their deliberative behavior.

I ran 56 focus group discussions with Syrians in Lebanon and Jordan to study how refugee communities cooperate in the face of collective problems. I randomly assigned focus groups to be recruited through either a random sample or a referral sample. These two strategies created groups that have either high or low network

density between participants, with respect to pre-existing ties. Random assignment was blocked by country, site, and gender. This produced one treatment group and one control group per gender per site, across 14 research sites in Lebanon and Jordan. Variation in the recruitment strategy used to construct focus groups allows us to study the impact of dense group structure on participant discussion of public goods problems in the focus groups. I designed and fielded the study as part of a broader World Bank research project on the effects of the Syrian refugee crisis on Syrians and host communities. Two experienced focus group moderators conducted the focus groups. I discuss details about the moderators, research assistants, transcriptionists, and other project staff in the appendix.

Table 1 describes the two experimental recruitment strategies. For each gender and site, we can conceive of the design as sampling two nodes from an undirected graph representing a social network. One node is randomly assigned to sit in a diverse group of randomly sampled nodes from the graph; the second node is assigned to serve as a seed for a referral sample of its network neighborhood, forming a dense group. We can directly compare the treated focus groups to the control focus groups to estimate the consequences of being in a dense social group rather than a diverse group.

In practice, I conducted the experimental sampling strategy as follows: First,

I obtained the census of roughly 1.7 million registered Syrians refugees. I then purposively selected seven localities in each country to sample from. Therefore the network subsampling strategy draws on networks of the census of Syrian refugees in one town or city, and the localities ranged in size from a few hundred residents to ten of thousands of residents each.

Second, I randomly sample individuals from the network. This entails sampling one person from the network to serve as a seed for the recruitment of other participants into the dense focus group, and randomly sampling ten people to serve as participants in the diverse group. Referrals had to live in the same town as the referrer, be the same sex as the referred, be registered with UNHCR, not be a member of their nuclear family, and be between the ages of 20 and 50.

During recruitment I subsetted the data to remove social-network isolates. In practice, this means that when staff called potential recruits, they asked if people to refer the three people they interacted with most in the last two weeks. For both treatment arms, even those people in the diverse group, whose referrals we would not subsequently use for recruitment, we needed to ensure that all people sampled from the census could have participated in either experimental condition. That means they need to be able to refer other people in order to be in the referral group condition, that is, my dense group condition.

Table 1: Description of Experimental Conditions

Control: Low density	Treatment: High density
Ten individuals randomly selected from the UNHCR census, representative of the eligible population, representing a baseline (or null) distribution against which to compare referral-recruited (dense) groups.	One ‘seed’ randomly selected from the UNHCR census, and 9 close acquaintances drawn from a systematic two-wave, three-contact referral sample.

The recruitment experiment creates variation in the network features of the groups. Each town and city in Lebanon Jordan ranged from a couple hundred people to tens of thousands of Syrians. A random sample from tens of thousands of people will get people who diverse and spread far across the networks. In the dense groups seed serves as the seed for a referral sample, which results in recruiting a dense network neighborhood of people, many of whom know each other. And we can expect that this will also come with the other features that generally come with dense groups, like social capital, trust, and strong reciprocity.

The research design has two key features: (i) random seed selection and (ii) random assignment of seeds to treatment. I sampled from UNHCR registration

data, a census of all registered Syrian refugees in Lebanon and Jordan. The units that are randomly sampled from the UNHCR census are representative in expectation of the population meeting the study's inclusion criteria. Because the control-group is representative in expectation of the population, we can interpret the experimental results in two non-mutually exclusive ways. The tests show how dense groups differ from the overall population, and also compare dense social groups and diverse social groups. Another desirable feature of random selection and assignment is that the characteristics of observed network neighborhoods are representative in expectation of the population's network neighborhoods. Therefore the experiment allows us to compare groups that are representative of the real-world networks (control) to groups that are representative of real-world groups (treatment).

Refugees could only be recruited if they were willing and able to refer their network neighborhood, operationalized as the three people with whom they had interacted most frequently over the past two weeks. This inclusion criterion screened out people who do not have a recruitable network neighborhood, and establishes that focus group potential outcomes are fixed and defined counter-factually, in the sense that each unit has a network neighborhood that we would have observed if it had been assigned to treatment. Therefore, the inclusion criterion ensures that all participants could have been assigned to either treatment condition, and both

treatment and control potential outcomes are defined for every unit in the study⁴ The fact that *all research participants could have referred three people* is critical for ruling out reverse causation — for example, that people who are more likely to talk to each other and more likely to be cooperative are more likely to have social ties and therefore be selected as a dense focus group seed.⁵

4.1 Public Goods Vignettes

To study how Syrians engage in a group around public goods problems I designed focus groups where participants discussed public goods problems that are common in refugee communities, and presented the problems in audio vignettes. In the audio vignettes, two Syrian men discuss problems that Syrian refugee communities commonly face. I wrote the scripts in Arabic and hired Syrian voice actors to record the scripts. I developed the content of the vignettes based on more than a year of qualitative fieldwork in Syrian communities in Lebanon, and in conjunction with

⁴ Additional inclusion criteria were applied. In both arms, participants needed to be between the ages of 20 and 50, live in the study site, be the same gender as the referrer, not be members of another participant’s nuclear family or household.

⁵ The fact a potential recruit could have referred others only ensures that they are referrable if I assume an undirected social network. That is, I assume that the three people a seed would refer if asked, would in turn refer the seed if any of them had been asked first. The assumption is non-trivial but was necessary to maintain the feasibility of the study.

Syrian, Lebanese, and Jordanian NGO staffers who work with Syrian refugees.

The scenarios capture common collective problems that Syrian refugees face in Lebanon and Jordan pertaining to issues of law and order, freedom of movement, resource redistribution, and the ability to earn a basic livelihood. The full text of the vignettes is available in the appendix and on my website, where the reader will find links to videos that include the Arabic-language audio of the vignettes with English-language subtitles.

After playing each vignette the discussion was opened up for the participants. Although the community problems have possible collective responses, the vignettes did not impose collective responses upon participants. Indeed, we see variation in discussion of the vignettes from disinterest to heated debate, and from atomistic statements to communal responses. Moderators did little to shape participants' responses to the audio vignettes.

One might question whether conversations from focus group discussions are actually evidence of information flow, but measuring discussion between individuals allows for direct observation of information flow. Although information flow is not tangible, it is not a rarefied or abstract process. Information flows through networks through interpersonal communication in the form of the spoken and written word. Group discussion of how to respond to a problem and statements within a group

about which resources will be helpful for Syrians to mitigate a problem are not just observable implications of information flow, but are in fact instances of information flow.

I played the audio vignettes about 90 minutes into focus groups that lasted two hours on average, and the presentation and discussion of all four vignettes lasted about 15 minutes on average. Then the four public goods vignettes were played in random order in each focus group to eliminate order effects and facilitate consistency of measurement across focus groups.

A strength of the focus group setting is that we observe real groups of Syrians engaging deliberative responses to realistic social problems. To attain evidentiary validity, vignettes should resonate with participants, which may not happen if the vignettes are designed based on researchers' *a priori* assumptions. Therefore, I sought to achieve three goals in designing the audio vignettes' content. First, I aimed to maximize the realism and salience of scenarios. Second, the audio vignettes described problems that were sufficiently general they would resonate with Syrians living in urban, peri-urban, and camp settings in both Lebanon and Jordan. Third, the content of the recordings needed to be sufficiently specific to prompt meaningful discussion.

The focus group transcripts demonstrate that the issues raised in the vignettes resonated in a vast majority of focus groups. I coded whether people made state-

ments about the relevance and irrelevance of the vignettes during the focus-group discussions. In the majority of vignette discussions (79%) there was at least one explicit comment about the vignette's relevance (e.g., "This type of thing happens in our community"), and in only a minority of the vignette discussions (10%) did anyone say anything about its irrelevance (e.g., "This type of thing does *not* happen in our community").

To help preserve excludability, moderators were not told about the intention of the construction of dense and a diverse groups, and were not told about the hypotheses under investigation.⁶ The presentation of the vignettes was not heavily structured and participants were not prompted to respond in any particular way, or even respond at all. I trained moderators to do very little to guide discussion after the vignette audio files were played. At most, if participants asked what they were supposed to do, the moderators were trained to say something minimal like, "What are you going to do?" or "Can you do anything in this situation?" but explain no more and never express expectations that people work together.

⁶ Moderators did know that the groups were either people who mostly knew each other, or mostly did not know each other, which was necessary for practical reasons of getting participants into the right room.

4.2 Network Intervention Without Network Mapping

One feature of the design is that it does not require obtrusive or costly network measurement. We start with a census, and all we need to do is collect data for the people we sample in the network and we do not need to collect any data on the people we did not recruit. With my approach, we do not need to observe the complete network or even measure ties between people. We just need to randomly vary recruitment in a way that creates different group structures, which gives us just enough information to make network inferences. The formalization of the experiment is discussed briefly in the paper, with more details in the appendix, and discussed at length in Masterson (2018).

4.3 Empirical Strategy

I assume SUTVA at the level of the focus group, such that the observed values of a focus group's outcomes and covariates are only a function of the treatment assigned to that focus group. Random assignment implies that focus group-level potential outcomes are independent of treatment assignment relationships. I offer a formal presentation of the empirical strategy in the appendix. For a general formal discussion of this type of network recruitment experiment, see Masterson (2018).

Although potential outcomes are independent of treatment assignment, referral

recruited participants have different probabilities of recruitment than randomly sampled participants. In traditional experiments, the research design implies both the independence of treatment assignment and potential outcomes and the observable similarity of the pre-treatment covariates across treatment arms. My research design implies the independence of treatment assignment and potential outcomes but does not imply that the observed covariate looks similar across treatment arms.

The characteristics of all randomly sampled units are equivalent in expectation. Therefore, when looking at the group mean of a covariate, the expectation for the control group will be the population mean for the covariate.

4.4 Estimation

I present difference-in-means estimates for focus group behavior and covariates. I present difference-in-means estimates at the focus-group-vignette level with robust standard errors clustered at the focus-group level, and randomization-inference p values calculated based on randomization at the focus-group level blocked by country, site, and gender.⁷ To test for differences between the treatment and control groups' covariates, I use participant survey data and calculate difference-in-means estimates at the focus-group level, with robust standard errors, and randomization-inference p

⁷ Although errors are likely correlated within regions as well as within focus groups, standard errors are clustered by focus group because it was the level of random assignment.

values from randomization blocked by country, site, and gender.

4.5 Randomization Check

I check randomization by testing for the observable similarity of randomly sampled participants across treatment arms, which includes all control-group participants and treatment-group seeds, and excludes treatment-group referral recruits. I discuss the randomization check in greater detail in the appendix.

As we would expect under random assignment, data from a participant questionnaire shows that measured pre-treatment covariates of randomly sampled units are balanced across the two experimental conditions. I run a test of joint balance (aka, joint orthogonality), testing the joint hypothesis: $\beta_1 = \beta_2 = \dots = \beta_k = 0$, by running an F-test on a linear regression of treatment assignment on measured covariates, subsetted to randomly sampled observations, which includes the referral seeds and excludes referral-sampled observations. The test of joint orthogonality fails to reject the null hypothesis of equality (randomization-inference p value: 0.485). The variables for the randomization check are drawn from the post-focus group questionnaire, meaning they were measured post-treatment. The content of the questions, however, is plausibly fixed pre-treatment, including age, tribal identity, number of households members, and year of arrival in the host country.

4.6 Manipulation Check

I present the formalization of the manipulation checks and the detailed results in the appendix. As a basic test of design, I demonstrate that treatment groups had higher density and lower diversity. First, I test whether treatment groups had higher focus group density, defined as the share of realized ties to possible ties in focus group i , for example, if everyone knows everyone else in a group, the density is 1. If half of the possible dyadic relationships in a group are realized, the density of the group is 0.5

I present three metrics of participant connections. First, I measured simple ties, operationalized as other people in the focus group whom the respondent knew by name before the day of the focus group. Second, I asked respondents how many other participants they regularly exchange visits with, a metric I refer to as strong ties. Third, I calculate a metric of weak ties by subtracting the strong-ties metric from the simple-ties metric for each respondent, which captures the number of participants whom the respondent knows by name but does not regularly exchange visits with.

Figure 1 shows that the density of dense groups was much higher than that of diverse groups. Based on participant self-reports the diverse groups had 11.6% average density of pre-existing simple ties, compared with 64.6% for the dense groups. Looking at panel 2, we see that the diverse groups had 5.4% average density of pre-

existing strong ties, compared with 39.7% for the dense groups. Looking at panel 3, we see that the diverse groups had 6.2% average density of pre-existing weak ties, compared with 24.3% for the dense groups.

Although Figure 1 clearly demonstrates both the statistical and substantive significance of treatment effect, I also present regression results in the appendix.

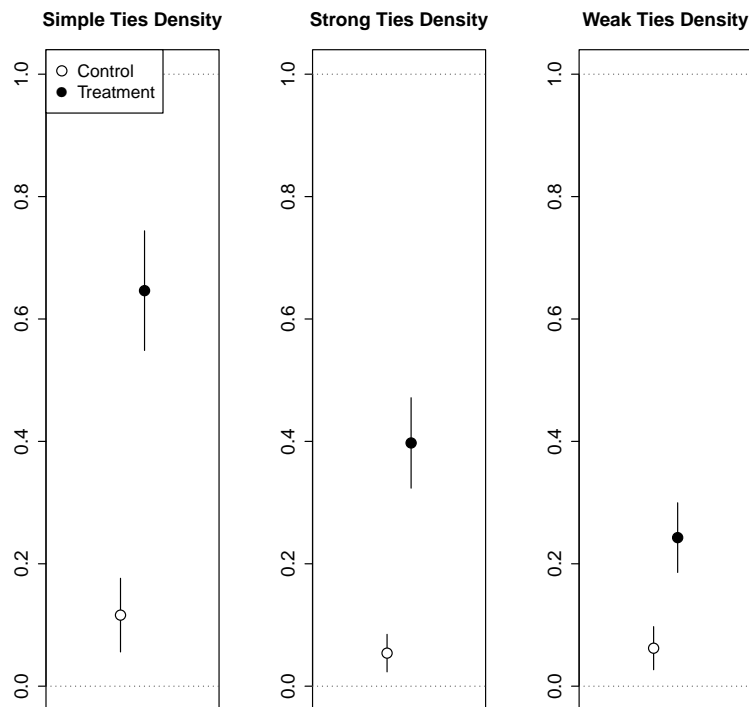


Figure 1: Density of Within-Focus-Group Social Ties, $n=56$

The data clearly demonstrates that the groups assigned to the ‘dense’ condition are in fact more dense. Next, I examine whether the dense groups had lower average

diversity than control groups. The claim that the dense groups will be less diverse is based primarily on a broad social network literature on homophily and the related empirical regularity that people who are connected are more similar than people who are not connected. There is widespread empirical and theoretical support for the idea that “birds of a feather flock together” (McPherson, Smith-Lovin and Cook, 2001). In the current study my ability to provide definitive evidence that treatment manipulated diversity among study participants is constrained by issues of measurement and statistical power.

Empirical measurement of diversity is more nuanced than density because direct measurement of the network characteristics we care about to study information diversity is difficult. My key claim is that a densely connected group will have less diverse information and a less diverse set of connections to people outside of the group. That is, the share of redundant information and redundant out-group connections is increasing in group density. The best metric of information diversity that I have – the diversity of comments in the focus group – is itself a main outcome in this essay, and therefore cannot be used as a manipulation check.

Measuring diversity of out-group social ties requires extensive and costly network mapping. Because of funding constraints, I did not conduct complete social network mapping within the focus groups, let alone attempting network mapping for

participants with people outside of the focus group. Ideally, we would have social network data for who focus group participants know in the complete community, and we could study whether the ties that participants have are more diverse.

One could present group-level variance in member characteristics as a metric of diversity, and assert that more diversity in individual-level characteristics (age, marital status, etc.) provides some evidence about diversity of information and ties. As I present in the appendix, compared to dense (referral sampled) groups, diverse (randomly sampled) groups exhibit higher variance in terms of a number of ascriptive and descriptive characteristics including age range, marital status, household size, and number of days worked in the past month. These differences are not statistically significant, possibly due to the small sample size (that is, 56 focus groups).

5 Data

Data includes both behavioral metrics of deliberation and cooperation in the focus groups capturing how focus group participants responded to the vignettes. I coded responses to the vignettes based on the transcripts. I was blind to treatment status while developing the vignette coding guide and while coding vignettes. I only merged treatment status with other covariates after I completed coding. Coding was not automated or predictive; I read and hand-coded all focus group transcripts using

the qualitative data analysis software Dedoose, which then output the results in a spreadsheet for statistical analysis. Details of the coding guide and coding process are available in the appendix.

I conducted 56 focus groups ($n = 56$), comprising 489 individuals, and 223 vignettes (rather than 224, due to a focus group moderator error in presenting the vignettes). The average focus group had 8.7 participants, ranging in size from 6 to 10 participants. Attendance rates were balanced across treatment and control arms. Focus groups were either all-male or all-female, with no mixed-gender focus groups. The study was conducted in Levantine Arabic. I speak the dialect fluently and all recruiters and focus group moderators were native speakers. All data collection was conducted in Levantine Arabic and all documents read to or distributed to participants were in formal Arabic. I explained the content of the documents to many participants in Levantine Arabic to ensure comprehension. I monitored all aspects of the study including recruitment, data collection, and focus group transcription. I discuss more details of study conduct and quality checks in the appendix.

I ran the focus groups in Lebanon in May and June 2016, and in Jordan in June and July 2016.⁸ Due to delays with obtaining permits for research in Za‘atari

⁸ Recruiters read all people contacted a consent script approved by the Yale Human Subjects Committee under protocol HSC #1603017430. Focus group moderators read another consent script to participants before focus groups were conducted.

camp, I ran the focus groups there in September 2016. I conducted pilot focus groups in Lebanon in May 2016 to improve the public goods vignettes, discussion guide, and framing of the study. I present additional information in the appendix about site selection, blocking, assignment of moderators to focus groups, recruitment procedures, and focus group participant descriptives.

5.1 Participant Protection in Humanitarian Crises

Recruiting and conducting research with participants from a vulnerable population is difficult and requires great care to minimize potential for harm. To decrease the transparency of recruitment identifiers I utilized the fact that a majority of Syrian adults have a nickname. During recruitment and focus group conduct the research team referred to participants by their nickname whenever possible. The widespread local nickname system is based on the name of someone's eldest son or eldest daughter (if they have no son). For example, Em Ali (meaning Ali's mom) is the nickname for a woman whose eldest son is named Ali. Abu Muhammed (meaning Muhammed's dad) is the nickname for a man whose eldest son is named Muhammed. Sometimes a man without children uses a similar nickname, but replaces the name of a child with the name of his father, implying that when he has a son, he will name the son after his father, although it is also widespread among young men and men to use

their father's name even if they do not plan to name their child after the father. Women who do not have children less frequently adopt such nicknames, although some adopted them during the early days of the uprising to protect their identities.

Files including recruitment information and transcripts are password-protected and encrypted. People's responses are further protected by the fact that their statements and real names never appear in the same document. In the audio files of the focus group discussions, moderators referred to people by their nickname (which was written on a placard in front of each person at the beginning of the focus group to help the moderator with the nicknames), and the transcripts identify participants by their nickname.

Achieving effective anonymization of focus group data while maintaining the ability to link respondent comments to respondent characteristics requires special effort. Focus group moderators consistently referred to participants in the focus group discussions by their nickname, and were trained to never refer to people in the focus group's by their real name. The post-focus group questionnaires recorded each participant's nickname and never their real name. With participant's nicknames recorded in the audio recordings, focus group transcripts, and post-focus group questionnaires, I can link focus group data to questionnaire data while maintaining participant anonymization.

5.2 Coding and Tagging

I tagged the transcripts according to a coding guide that I developed in partnership with three researchers who were not otherwise involved in the project. We each read a random sample of vignettes to define codes that capture salient dynamics in the discussions. The process was iterative. In the first stage, one outside researcher and I each read a random sample of transcripts, documented the salient themes that we each found in the discussions. We met to consolidate our respective themes and collaboratively define coding rules for each thematic tag. Next, a second outside researcher read a random sample of focus group transcripts, and then read the draft of the coding guide, offering comments on existing themes, refining coding rules, and suggesting additional themes and coding rules. Third, a third outside researcher conducted the same procedure as the second. After all this feedback, I finalized the coding guide.⁹

I then read all the transcripts in blocked-randomized order to code them according to the coding guide. I randomized the the order in which I read each focus group and the order the vignettes within each focus group. I made no modifications to the coding guide after beginning coding.

All of us were blind to treatment status while developing the coding guide and I

⁹ The coding guide is available at at <http://danieltrmasterson.com>.

was blind to treatment status while coding the transcripts. There is little information in the transcripts that would reliably reveal the treatment status of a group to a reader.

6 Results: How Does Group Structure Affect Community Cooperation?

To explore how group structure shapes patterns of cooperation around public goods problems in refugee communities, I employ several statistical analyses to test my hypotheses. First, I present the experimental results for the treatment effects on behavioral metrics of cooperation and resource access drawn from transcripts of vignette discussions to test Hypotheses 1 and 2, about network density and the flow of information. In the next section, I present experimental tests of alternative explanations for the correlation between network density and cooperation that do not rely on information flow. After that I present comparative case studies of how two camps' collective responses to the Lebanese trash collection crisis in order to demonstrate how density and diversity affect responses to collective problems in a real-life setting.

6.1 Information Flow

The flow of information through networks may facilitate punishment of free-riders in dense networks and facilitate the spread of external information and resources in diverse networks. These propositions lead to two hypotheses. First, (H1) treatment (being recruited to form a dense group) increases internal information flow, which disincentivizes free-riding and incentivizes cooperation. An observable implication of this in the context of a focus group discussion is that treatment will increase engagement around discussion of public goods problem. Second, (H2) treatment (being recruited to form a dense group) decreases external information flow. An observable implication of this in the context of a focus group discussion is that treatment groups will be less likely to draw on diverse resources in response to public goods problems.

To test the first hypothesis, I proxy for a group's engagement in response to collective problems by examining the treatment effect on the amount of interpersonal discussion about the public goods problems. For each public goods vignette, I examine the number of comments where participants were actively discussing the issue on the table with other participants. Dialogue is coded comments about the problem on the table and either responded to a previous comment or prompted a direct response from another participant.

To test Hypothesis 2, I measure a group’s access to diverse resources by looking at whether a focus group states that Syrians could turn to an outside party in response to the problem being discussed. Outcomes include a speaker saying that, in response to the public goods problem on the table, Syrians (a specific Syrian including the speaker, or Syrians in general) could turn to some resource outside the focus group members. I test for results across all resources that were discussed in any focus group. The resources discussed included Syrian leaders, brokers between the Syrian and the host community, traditional dispute resolution involving sheikhs (*sulha*), the host community, NGOs, and the national government.

Table 2: Community-Problem Responses

	Dialogue	Leaders	Brokers	Sulha	Host	NGOs	Gov	Police
Control mean	2.46	0.1	0.17	0.14	0.2	0.05	0.39	0.07
$\hat{\beta}$	1.33	-0.06	-0.09	-0.08	-0.08	-0.04	-0.04	0.04
	(0.62)	(0.03)	(0.04)	(0.03)	(0.04)	(0.02)	(0.06)	(0.04)
RI p -value	<0.01	0.03	0.02	0.02	0.06	0.01	0.49	0.35

Notes: $n = 223$. $\hat{\beta}$ denotes difference-in-means estimate. HC2 robust standard errors, clustered at the focus-group level, are reported in parentheses. Randomization inference performed with 10,000 simulated randomized treatment assignment vectors, clustered at the focus-group level and blocked by country, site, and gender. Results are robust to adjustment.

In Table 2 the unit of analysis is the focus-group vignette. The outcome for

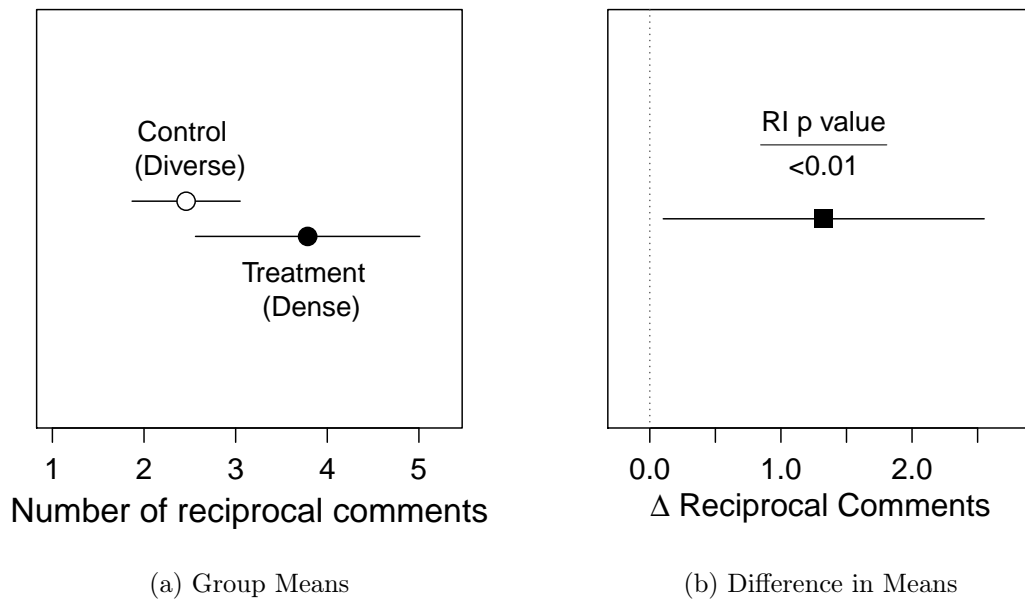
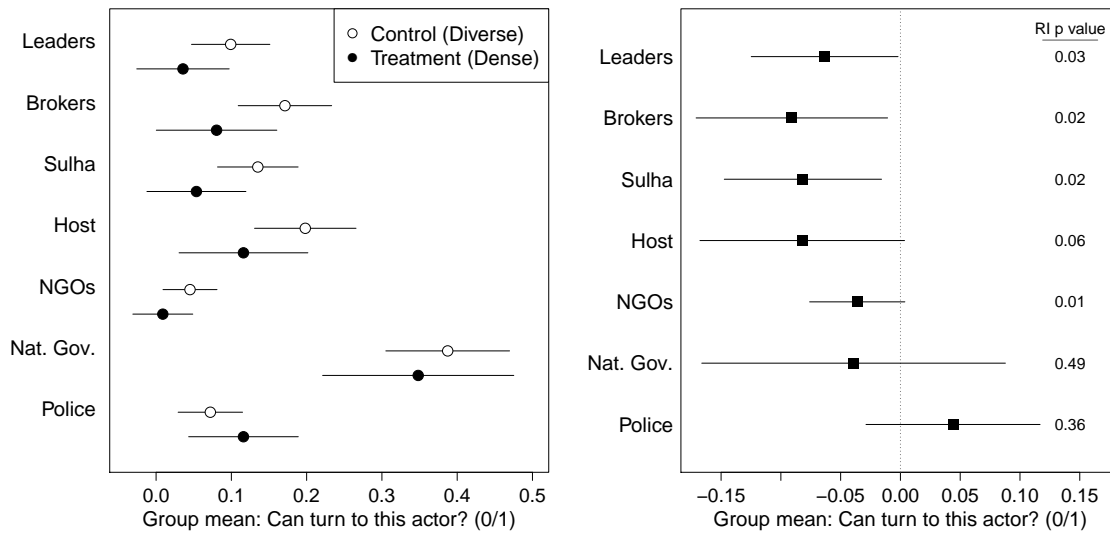


Figure 2: Difference-in-means for Dialogue

the Dialogue column is a continuous measure of the number of reciprocal comments between two participants discussing the community problem. The mean number of comments in one focus-group vignette discussion was approximately 11. We can see a large increase in how much dense group participants engaged with each other in response to the community problems. The control mean shows that in diverse groups 2.46 comments were dialogue per vignette discussion, whereas the dense groups made 3.79 dialogue comments on average. This constitutes a 54 percent increase from baseline in the number of dialogue statements, and a 12 percentage point increase in the share of comments that were dialogue, from roughly 22% of comments being dialogue in control to roughly 34% of comments in treatment. And there were about 13 comments per vignette-focus group pair, which means that the magnitude of this effect is a 10 percentage point increase in the share of comments that are dialogue, rather than stand-alone comments.

HC2 robust standard errors are clustered at the focus group level, where the unit of analysis is the vignette. That is, there are 56 focus groups and 4 vignettes per focus group. Also, we can see the randomization inference p value, which I calculate by randomly permuting the treatment assignment labels of the groups, conditional on the blocking structure that used for actual randomization.

The other outcomes in Table 2 are binary variables, and each indicates whether



(a) Group Means

(b) Difference in Means

Figure 3: Difference-in-means for Resources

at least one respondent stated that Syrians can turn to each actor in response to the community problem. We see that across a range of actors, dense groups are consistently *less* likely to say that they could draw on these resources, with the exception of discussion of relying on the national government and police. Almost all results align with theoretical predictions. Point estimates are negative and the difference in means is statistically significant for all variables except the national government and police.

Across the different external resources, the diverse groups – the groups comprising a random sample from the community – more often made statements indicating belief that they or Syrians could turn to this resource to help mitigate the problem under discussion. That is the treatment (dense) groups had a lower rate of saying that Syrians could turn to external resources like leaders to help mitigate the collective problem under discussion. This means the speakers both know about the existence of the resource, its usefulness, and have some belief about the chances of accessing and mobilizing that resource.

Turning to results for the national government and the police, the findings are not what I expected from my theory. We see wide confidence intervals, and although the point estimate for the outcome of relying on the national government is negative, which aligns with theory, the point sign of the point estimate for relying on the police

is in fact positive. I speculate that these institutions may be too distant for networks and social ties may not be a panacea for resources access. For the police, the baseline outcome shows that very few focus groups stated that turning to the police would be useful for mitigating their community problems. And the experimental null result suggests that network structure does not change their accessibility. In contrast, the baseline rate of turning to the national government is quite high, but there is no strong evidence that social connections change accessibility. Although I am hesitant to engage in post hoc theorizing and another study would be necessary to test any refined hypotheses, I see these null results as suggestive evidence that there are bounds on what network ties can facilitate in collective problem solving. In this case, bureaucratic or threatening organizations require more than just information flow about their existence and how to access them to make social networks useful.

Next, I test for a treatment effect on explicit statements about *not* being able to rely on outside resources, which allows us to refine the interpretation of the treatment effect. The results presented in Table 2 in the previous section are based on statements like “We can turn to brokers in response to the problem.” The treatment effect on negative statements, like “We *cannot* turn to the police in response to the problem,” is a separate empirical question. I coded transcripts for both positive and negative comments about whether each type of outside resource would or would

not be helpful. This analysis allows us to further test my argument by exploring alternative arguments for the link between group structure to group behavior. If we were to observe that diverse (control) groups make both more positive and more negative comments about outside resources, it would suggest that diverse groups discuss outside resources more, and possibly are more aware of their existence, but the conclusion would be unclear as to whether diverse groups are better able to access external resources. However, if diverse groups are better able to access resources, we would expect to see a negative treatment effect on positive statements about outside resources, as we saw above in Table 2, and we would expect to see a null or positive treatment effect on negative comments.

If having a greater amount of non-redundant information about outside resources in a group increases the group's ability to utilize those resources, we would expect to observe the latter relationship between treatment and focus group statements. In keeping with the second interpretation, we find little evidence of a treatment effect on negative statements about the helpfulness of outside resources. The regression results are presented in Table 3. First, no one made statements that Syrian leaders, brokers, traditional dispute resolution, or the police would *not* be helpful, so we see in columns 1-3 that the control-group mean and the treatment effect estimates are both 0. The one metric where we observe a statistically significant treatment effect in Table 3 is

an increase in the number of vignette discussions where someone discussed not being able to turn to the national government, from 0 of 111 control-group discussions to 5 of 112 treatment-group discussions. It is worth noting that if even one control-group discussion had mentioned not being able to turn to the national government, this result would go away. Nonetheless, the results obtain across all variables except respondents' views about being able to turn to the national government.

Table 3: Not Able to Rely on Resources

	Not Leaders	Not Brokers	Not Sulha	Not Host	Not NGOs	Not Gov	Not Police
Control mean	0	0	0	0.23	0.03	0	0.25
$\hat{\beta}$	0	0	0	-0.04	0.02	0.04	-0.02
	(0)	(0)	(0)	(0.05)	(0.02)	(0.02)	(0.07)
RI p -value	1	1	1	0.42	0.5	0.02	0.75

Notes: $n = 223$. $\hat{\beta}$ denotes difference-in-means estimate. HC2 robust standard errors, clustered at the focus-group level, are reported in parentheses. Randomization inference performed with 10,000 simulated randomized treatment assignment vectors, clustered at the focus-group level and blocked by country, site, and gender. Results are robust to adjustment for observed covariates.

In summary, the social-network experiment provides supportive evidence for Hypotheses 1 and 2. The experimental results based on the focus group transcripts show robust differences in how dense groups respond to public goods problems relative to

diverse groups. First, dense groups were more likely to engage in dialogue with each other, responding directly to one another’s comments, as opposed to making stand-alone statements. Second, dense groups were less likely to discuss the helpfulness of outside resources — including NGOs, leaders, brokers, and host community — in response to public goods problems. They were less likely to say that they would turn to leaders, brokers, dispute resolution mediated by community elders (*sulha*), NGOs, the national government, and the host community. The estimated treatment effects on all proxies for access to information and resources are statistically distinguishable from zero, except for turning to the national government.

These results suggest that people in dense groups are more able to rely on informal connections and discursive exchange between community members but are also less able to draw on diverse resources. The experimental finding that treatment (being recruited to form a dense group) increases engagement in response to collective problems supports Hypothesis 1 and aligns with the large body of existing evidence that dense groups have an informational advantage in monitoring and punishing free-riders. We also find supportive evidence for Hypothesis 2 that treatment (being recruited to form a dense group) decreases information about and access to diverse resources that support cooperation. As shown in the appendix, results are robust to adjustment for observed covariates.

An anecdote from the conduct of the study highlights the importance of information and resources for refugees to confront their problem. Participants in the focus groups were given my contact information (my WhatsApp number for free texts and calls) as part of the informed consent form. In the year after the study was conducted, I received messages from and corresponded with dozens of participants. Far and away, the most common general category of messages was requests for information, such as filing a claim for a service from the UN or an INGO, registering someone with UNHCR, or gaining access to medical services. The important point is that all the information is publicly available and has been promoted through UN and INGO information dissemination campaigns. Nonetheless, only once these participants were provided with a bridging tie to someone who had the information — in this case, me — were they able to get information that the UN and INGOs have been actively trying to deliver to them. Furthermore, the majority of these participants subsequently benefited from the information and services they had inquired about, ruling out the possibility that they had not received the information because they were not eligible for the services.

7 Alternative Explanations

A number of explanations for the observed correlation between group density and cooperation do not rely on information flow. First, people in dense groups may cooperate more because they care about each other's welfare, prefer working with each other, or share a sense of normative obligation (Putnam, 2000; Alesina and La Ferrara, 2005; Wood, 2003). People interacting with a group of close acquaintances may be more likely attend to the needs of others, thereby promoting cooperative behavior. Participants in dense groups, sitting with people whom they know and relate with, may more easily think of problems and responses as collective issues, or they may more readily feel the trust that is necessary for people to contribute to public goods (Kahan, 2003).

Second, numerous mechanisms proposed by existing scholarship rely on in-group similarity relative to out-group members to explain the correlation between group density and cooperation; for instance, coethnics may have similar preferences or may work well together. Scholars including Alesina, Baqir and Easterly (1999), Goldin and Katz (1999), and Alesina and La Ferrara (2005) suggest that a "diversity of tastes" comes with ascriptive diversity. Given that recent work testing the mechanism of shared preferences has cast doubt on its importance (Habyarimana et al., 2009; Larson and Lewis, 2016), further empirical testing is particularly important.

Finally, even among similarly dense networks, the network location of key actors may have critical effects on outcomes. Recent work in political science argues that different node location will produce different outcomes even when holding density constant, and that peripheral network locations may be more important for initiating and mobilizing high-risk collective action than central members (Larson and Lewis, 2016; Steinert-Threlkeld, 2017; Hassanpour, 2017; Larson, 2017*a*).

7.1 Testing for Alternative Explanations

To test whether psychological mechanisms are at play in the observed differences between the high- and diverse groups, I proxy for psychological mechanisms using two metrics. First, if people have more sociotropic preferences in dense groups, participants in the dense experimental groups will express concern or recognition of the issue as one that affects the well-being of other people in the community, not just themselves. Therefore, I coded whether a speaker expressed concern or recognition of the problem as one that affects the well-being of people other than their own and that of their family, either self-inclusive (e.g., “this affects us”) or self-exclusive (e.g., “this affects many other people in the community, although not me”).

In a second coding, I applied a higher standard of sociotropic preferences. I coded whether statements discussed the impact of the problem in the vignette on people

other than the speaker or their family members. Last, I coded whether comments explicitly acknowledged that people should work together to mitigate the community problem.

As the experimental results in the appendix show, I find no detectable treatment effect on whether groups discussed the need for collective action, and no detectable effect on whether groups viewed the problems from a more collective perspective. The lack of evidence of psychological mechanisms aligns with existing studies, including Habyarimana et al. (2009), who find that people do not exhibit greater concern for their in-group peers' welfare or prefer working with in-group members.

Another alternative explanation is that dense groups may include participants who have different network locations in their real-world community. Recent work in political science argues that node location affects cooperation even when holding density constant, and that peripheral network locations may be more important for initiating and mobilizing high-risk collective action than central members (Larson and Lewis, 2016; Steinert-Threlkeld, 2017; Hassanpour, 2017; Larson, 2017*a*).

In the appendix, I present results for tests of whether dense groups are more central in real-world networks than diverse groups. We do find that dense groups know more people in the community, meaning that they are more central to the network, but as we saw in section 6.1, they still talk less about external resources. The

most straightforward prediction about the relationship between network centrality and the diversity of resources would be an observed positive relationship. The results in section 6.1 about deliberation and access to diverse resources, however, move in the opposite direction, with the treatment group turning to outside resources less in discussing their community problems. Although the treatment groups do have higher network centrality, I do not interpret the result as evidence that the treatment effect is driven by participants' locations in the broader community instead of the flow or information between recruited participants. The fact that the diverse groups, even though they are less network central, still discuss a wider range of external resources, can be viewed as even stronger evidence of the importance of diversity in facilitating access to non-redundant information.

8 Case Studies

To flesh out the processes of how networks facilitate responses to collective problems, I discuss comparative case studies of two Syrian camps (aka, informal settlements, IS's) in Lebanon's Beka'a valley, and how each responded to the 2015 trash collection crisis. I focus on the density and diversity of social ties in the camps, the nature of the camps' strategies in response to the crisis, and their effectiveness in finding ways to get trash collected.

8.1 Empirics

I conducted fifteen months of participant observation in Syrian communities in Lebanon from summer 2015 to autumn 2016, which followed fifteen months of exploratory research in Lebanon between fall 2013 and spring 2015. In the part of the project that I present in this essay, I use comparative case studies of two camps to study their response strategies and outcomes. The first case study, a camp that I call Helween, served as one of my two primary field sites during fieldwork. I spent 1-4 days per week in Helween over the course of one year. The second case study is a camp I call Sharqi. This site was not one of my primary field sites, and I spent about one day each month in Sharqi over the course of one year. I draw on multiple data sources for the comparative case studies, including my field notes; open-ended interviews that I conducted with camp residents, camp leaders, Syrian NGO workers, and international NGO employees; and structured interviews that research assistants conducted with Syrian and Lebanese community leaders in the area of the camps.

In my fieldwork I sought to map the concepts of ‘public goods problems’ and ‘cooperation’ onto the grounded experience of Syrian communities. I positioned myself to observe the central collective problems that Syrians face and the patterns of responses. Syrians’ connections and access to resources regularly emerged as an essential feature of response strategies. In this sense, my fieldwork became a

process of observing and mapping processes and connections. It became clear that communities were continually attempting different processes for mitigating problems, and that people in the communities are acutely aware of the importance of their social relationships in the process of trying to mitigate their problems. Connections matter for the processes because every relationship holds the possibility of useful information or assistance.

The comparative case studies of the garbage crisis in camps are useful for examining and validating mechanisms for several reasons. First, the comparative case studies allow me to relax the simplicity of the focus-group experiment, and highlight the complex ways that community structure shaped outcomes.

Second, I study responses to the garbage crisis because the sudden nationwide public services crisis allows us to ‘hold constant’ the problem and focus on variation in the characteristics of the cases. For most collective problems that Syrian communities face, the challenges themselves will be shaped by features of the community, rather by a national-level policy crisis, which means that not only the features of the communities vary but also the problems that they face.

Third, focusing on camps in the comparative case studies allows us to maximize control for alternative explanations in the controlled comparison, and for a conceptual clarity in defining a group and the ties between members, given a camp’s defined

geography. My broader theory and project pertain to urban, peri-urban, and camp settings, although the comparative case studies focus on camps alone. That being said, focusing on any single setting poses a constraint on evidentiary validity given the diversity of Syrians' experiences in Lebanon, and indeed the diversity of refugees' experiences worldwide. Only 15% of Syrians in Lebanon live in camps, and only about one third of refugees worldwide live in camps.

8.2 The Trash Crisis

Summer 2015 proved the perfect storm for Lebanon's solid waste management system. After years of strained makeshift solutions to trash collection, the region of Beirut and Mount Lebanon found itself with neither a means to collect trash nor a place to deposit it. After years of protests by Na'ameh's residents, the government officially ended its use of the landfill in the town in July 2015. The Na'ameh landfill, which had received approximately half of the country's trash the previous year, closed without a replacement. The same month, in the midst of political gridlock, trash collection in Beirut and Mount Lebanon ended as the contract with the company Sukleen expired. Although these two problems were formally limited to Beirut and Mt. Lebanon, the failure of trash collection in the country's most populous region strained waste management nationwide.

As pressure on solid-waste management systems increased, Syrians struggled to find ways to avoid public health crises in their communities. Syrians in Lebanon generally need to pay for trash collection by household or by camp. When they cannot pay, Syrians need to find makeshift responses to manage solid waste. In 2015, many Syrian communities sought assistance from NGOs and municipalities. Without an external solution, some Syrian communities disposed of trash in unoccupied land or consolidated trash in places far from residences or drinking water supply. At worst, Syrian communities burned their trash or left trash in streets, fields, and rivers.

8.3 Two Camps

Helween and Sharqi are located in the central Beka'a valley, about a 10-minute drive from each other. In 2015 the Helween camp comprised about 100 families. The residents of Helween come from cities across western Syria, including Homs, Hama, Damascus, and smaller cities. Within Only small groups of Helween's residents knew each other before leaving Syria.

Some of Helween's residents are middle-class Syrians who were hit hard financially by the war and forced to live in a camp. Other residents worked in Syria's factories, construction industry, ironwork and welding shops. Some of the residents are longtime working class urban residents, and others are more recent migrants from

the countryside, within the last generation or two.¹⁰

After the trash crisis began more than a dozen Helween residents went to NGOs and the municipality to speak with people they knew in these organizations. Most of these connections led nowhere.¹¹ Other residents went to the municipality to speak with social connections there. Many NGOs told them that were not financing trash collection and the municipal officials repeatedly said that the trash “was not the municipality’s problem.”¹²

Despite most connections proving unhelpful, one connection to a large INGO proved useful. One man from the camp had previously worked part-time for this particular NGO and still knew employees at the organization.¹³ More generally, a number of camp residents regularly interacted with the organization and repeatedly contacted the NGO to tell them about the conditions in their camp.¹⁴ Trash was piling up and a wave of rashes was affecting the camp’s children, likely because of the garbage.¹⁵ Although we cannot attribute the INGO response solely to these calls, camp residents believe that the INGO was not aware of the severity of the problem before their calls, and the contacts directly preceded the INGO’s decision to pay the

¹⁰ Fieldnotes, Fall 2015

¹¹ Fieldnotes, Spring 2016

¹² Interview with Hassan, Syrian NGO worker, November 2017

¹³ Interview with Hassan, November 2017

¹⁴ Fieldnotes, Spring 2016

¹⁵ Fieldnotes, Spring 2016

municipality to collect trash in Helween and the surrounding camps.

The second camp, Sharqi, comprised about 40 families in summer 2015. About half of the camp's residents come from the Damascus neighborhood of Saideh Zaineb and the other residents largely come from the periphery of Homs. Within each of these two groups, most people were family and friends before they arrived.¹⁶

Sharqi's residents knew fewer people in the municipality to contact and told me that they only knew one Syrian NGO, and no one at INGOs. The Syrian NGO contacted INGOs on Sharqi's behalf, but this indirect contact proved less effective than Helween's direct contact.¹⁷ Although the municipality occasionally came to Sharqi to trash pick up trash being paid by an INGO, but these pickups were positive externalities from the efforts of other camps, and not the result of actions taken by Sharqi residents. Sharqi enjoyed much less frequent trash collection than Helween.¹⁸

The Helween camp was able to leverage its relationship with outside actors to get trash collected. Despite the fact that most of Helween's residents did not know each other a few years ago they asked searched across a diverse range of connections to external actors to find the resources they needed. Helween's residents had a range of diverse connections and was therefore more likely to have nonredundant

¹⁶ Fieldnotes, Summer 2016

¹⁷ Fieldnotes, Summer 2016

¹⁸ Fieldnotes, Spring 2016

information about and access to resources useful for mitigating their public goods problems. These diverse ties linked Helween's residents to people outside the camp, linkages that included relationships with NGOs, the UN, and local officials and elites. In contrast, Sharqi camp failed to get trash collected regularly. Despite the fact that Sharqi's residents knew each other, trusted each other, and wanted to help each other, they shared a narrow set of similar connections, and they did not have the right connections to get trash collected. In spite of Sharqi camp's dense networks of trust and strong reciprocity, the community's large proportion of overlapping network connections constrained the flow of diverse external information that could have given the residents access to relationships, public services, or NGO resources to help resolve their community problems.

Despite Sharqi's inability to leverage relationships to get trash collected regularly, the camp was able to execute coordinated responses that kept trash off their streets. People did not burn their trash in the streets and did not generally throw trash in the streets. The residents of Sharqi disposed of trash outside of the camp in the nearby Litani river and agricultural fields and coordinated to consolidate trash just outside the entrance to the camp. Trash did not pile up in the streets, but instead piled up just outside the camp entrance and in the field and river next to

the camp.¹⁹ Although the negative externalities of Sharqi's responses are obvious, the response demonstrates the capacity for coordination but an inability to access outside resources, which are both features we would expect given the camp's dense social network. In contrast, some of Helween's residents burned their own trash or tossed it in the street.²⁰ Some residents cooperated to consolidate trash by the entrance of the camp, but many residents did not participate.²¹ Despite the failure to prevent free-riding inside the camp, outside actors more frequently picked up trash in Helween than in Sharqi, in response to Helween residents leveraging their connections to outside actors and INGOs.

Another lesson from the case studies is that local public goods solutions will often leave underlying problems and downstream problems unresolved or even exacerbate broader problems. The fact that one camp found makeshift solutions for internal solid waste management does not resolve broader infrastructural problems. Even as individual Syrian communities and camps find methods for getting trash collected, Lebanon still suffers its poor nationwide solid waste management. Helween is relatively better off than Sharqi, but public health problems, soil and groundwater pollution and chemical contamination, remain for both camps and Lebanon more

¹⁹ Fieldnotes, Spring 2016

²⁰ Interview with Hassan, November 2017

²¹ Interview with Muhammad, Helween resident, Spring 2016

broadly. Furthermore, although residents of Sharqi effectively avoided disposing of trash in their own streets, their actions have negative externalities for residents of the surrounding areas.

9 Conclusion

The dominant explanation in political science for the correlation between group density and public goods provision is that dense groups facilitate the flow of information about members' actions and thereby support in-group sanctioning of free-riding. I have argued that the flow of information through networks also facilitates cooperation by shaping which external information and resources people are aware of and know how to access.

Overall, the results in the essay largely align with predictions from the density-diversity trade-off, that dense groups have higher flow of internal information, and that diverse groups will have higher flow of external information. My metric for engagement – dialogue – was much higher in dense groups, in line with the expectation from the theory that higher internal information flow within densely connected groups will produce higher engagement. I also see that the dense groups appear to have less external information flow, and a way that we can see this, is that dense groups less frequently talked about turning to useful external resources. Overall,

the dense groups manifest a higher level of internal information flow and the diverse groups manifest a higher level of external information flow. The data does not support alternative explanations for the correlation between network density and cooperation that do not rely on information flow.

This study does not explore the determinants and effects of tie formation, including the ways networks develop over time and people's strategic selection into networks to improve their well-being. People make strategic choices about whom to form links with, within the constraints of personal knowledge and ability. We might assume that if a potential link were going to be particularly valuable, it would be rational to form such a link even at a high cost, as long as the decision-maker expects the benefits to exceed the costs. But this logic belies the reality that refugees often do not have the material or social resources to pay a short-term cost even with the promise of long-term benefit, with constrained material and social capital and little access to credit.

What does this project suggest for policy design in humanitarian interventions? The experimental results in this paper speak directly to policy makers' choices about who to bring into refugee community-driven and community-capacity-building programs. The underlying assumption of community programming is that beneficiary communities often have internal collaborative capacities to help themselves that aid

agencies fail to recognize. My findings show that this approach will often not be the right answer. If refugee groups do not have the internal resources necessary to mitigate their problems, NGO community-driven programming that attempts to leverage a group's ability to solve problems internally may be promoting precisely the wrong capacities. Rather than a group solving its own problems internally, it may be optimal for a group to go to outsiders for help. In refugee communities, program design may be more effective if NGOs support refugees in asking who they can go to for help, rather than asking how they solve a problem themselves. In communities where trust or reciprocity is the binding constraint for effective cooperation, building social ties and systems of accountability within the community can help. In communities where resource access is the problem, linking refugees to local authorities, service providers and surrounding neighborhoods, in ways that are sensitive to the dynamic vulnerabilities the refugees face vis-a-vis these actors, may be an effective way to facilitate access to resources necessary to meaningfully mitigate problems.

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