Lineage-based Heterogeneity and Cooperative Behavior in Rural China

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Abstract

This paper investigates how lineages, the commonly found organizations in rural villages of China, affect people's intra- and cross-lineage cooperative behavior. We use data from the Chinese Household Income Project Survey 2002, which exclusively contains information about the lineage structure in these villages allowing us to classify three levels of lineage-based heterogeneity. Our identification strategy relies on the exogeneity of lineage-based heterogeneity. We find evidence that people in a village with higher lineage-based heterogeneity are less likely to exhibit reciprocity behavior within lineages or contribute to the provision of public goods that are jointly shared across lineages. The estimation results remain robust to the inclusion of various control variables and additional background characteristics. Finally, we examine a number of other economic outcomes and find that more homogenous villages do better than other types of villages.

JEL classification: D71; O12; O17; H41

Keywords: Cooperation; Lineage Networks; Reciprocity; Local Public Goods; China

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1. Introduction

Developing countries, including China, make tremendous efforts to promote rural development and reduce poverty. Because the success of many economic endeavors, such as the exchange of goods and services and the provision of public goods depend on cooperation, understanding the nature of cooperative behavior is of vital importance. In developing areas where formal contract enforcement is often weak, informal institutions such as lineages, tribes, or castes guide people's behavior. In rural Chinese villages, for example, lineage solidarity, which is based on concepts of family and shared patrilineal descent, still plays an important role in providing informal institutions of accountability (Tsai, 2007). However, different villages have different lineage structures and therefore are more or less heterogeneous. This paper seeks to understand how an informal institution like clan lineage influences cooperation by examining villages with varying degrees of lineage-based heterogeneity.

Existing studies have associated heterogeneity, including ethnic, linguistic, religious and tribal heterogeneity, with trust (Alesina et al., 2002), economic growth (Easterly and Levine, 1997), provision of public goods (Alesina et al., 1999) and the quality of governance (La Porta et al., 1997). Our paper adds to this literature by investigating the effects of lineage-based heterogeneity on both intra- and cross- lineage cooperative behavior simultaneously in the same villages in rural China. To the best of our knowledge, this is the first paper that presents a full picture of cooperative behavior by examining both intra-group and cross-group cooperation. Bowles and Gintis (2008) state that cooperation can take the form of mutually beneficial transactions that may fail to materialize without trust and reciprocity (intra-group), or it can take the form of the providing public goods, which requires agreement and collective action (cross-group). Lineage networks play an important role in institutional development because intra-group moral commitment reduces enforcement cost, and social organizations spanning groups have a comparative advantage in facilitating cross-group cooperation. In this paper, we measure intra-group cooperation by the frequency of mutual help in monetary and non-monetary terms that occur between most familiar individuals while varying the lineage homogeneity across the villages of these individuals. Cross-group cooperation is measured by individual contributions to build village infrastructure and by the share of the village budget that is spent on village public goods. With this setup, we exploit not only both individual and village level variations but also the comparison between intra-and cross-lineage cooperation.

We begin by examining intra-group cooperation. Empirical studies on intra-group cooperation are rare. Conflict theory in sociology suggests that diversity fosters in-group solidarity as well as out-group distrust (Blalock, 1967). However, Putnam (2007) claims that the fundamental assumption behind the conflict theory: in-group trust and out-group trust are negatively correlated – is essentially unwarranted. In other words, bonding with own-group members is not necessarily at the cost of bridging with other groups. Putnam (2007) further argues that there might be the possibility that diversity actually reduces both in-group solidarity and out-group trust and presents some evidence from the United States. Thus, having heterogeneity in the lineage structure of the villages allows us to see how the composition of the village and the extent of the presence of other groups in the village affect intra-group cooperation. Our results support Putnam's hypothesis where we find that more homogeneous villages demonstrate greater cooperation – just the possibility of repeated interaction within your own group can lead to more cooperation.

There is a large body of literature studying the impact of heterogeneity on the provision of public goods. The findings generally indicate that heterogeneity in ethnicity, religion or social class undermines cross-group cooperation and the provision of public goods (Alesina et al., 1999; Banerjee, Iyer and Somanathan, 2005; Bandiera et al., 2005). In this paper, we present evidence that villages that are more heterogeneous in terms of lineage spend a lower share of the village budget on village public goods and villagers contribute less labor to build village infrastructures. These findings are consistent with the burgeoning studies emphasizing the importance of tribal structures. For example, Fukuyama (2011) provides new insights into China's development and argues that it was shaped by two forces working in tandem: legalism and Confucianism. One of the great constants in Chinese history is the importance of family, kinship and lineage ties for the social fabric or organization. While legalism sought to centralize the state, Confucianism supported patrimonial power and the importance of the family enabling the two forces to reinforce each other. Although at certain periods one force may dominate the other, they were not in conflict and work together to shape China's transition. In rural China, local governments bear almost complete fiscal responsibility for local public good provision (Oi, 1996; Tsai, 2000). Before the 1980s, village leaders in rural China were generally appointed by the upper levels of the government. Because of increasing conflicts between leaders and villagers over taxes and fees, *the Organic Law of Village Committees* (draft) was first implemented in Guangxi province at the end of 1980 (Fan, 2001; He et al., 2001). This law laid out comprehensive provisions for the election

of village committees so that villagers were able to elect their own leaders (Zhang et al., 2004). This institutional shift not only improved the efficiency of local governance but also improved the efficiency of public spending (Zhang et al., 2004; Wang and Yao, 2006; Brandt and Turner, 2007; Luo et al., 2010). On the other hand Xu and Yao (2015) document that informal institutions such as the lineage culture facilitate local governance.

A general concern in the literature is that the residential sorting process is endogenous (Easterly and Levine, 1997; Alesina et al., 2002; Miguel and Gugerty, 2005). However, in our analysis the village composition is independent of economic activities (Coleman, 1994; Peng, 2004). In other words, the identification strategy of this paper relies on the assumption that the lineage structure in a rural village, measured by surname patterns, is exogenous to cooperative behavior. [2] Shortly after communist China was founded in 1949, the central government established administrative villages to strengthen the party's rule and to build the commune system. [3] Administrative villages, the lowest level of administrative unit in China, also serve as the lowest rung of collective farming in the commune system. To meet the needs of collective farming, administrative villages included one or more adjacent lineages (Wang, 2006). Therefore, the lineage composition within a village was exogenously determined by a shock – that of China's administrative re-organization. In addition, in 1958, China enacted the household registration system, which inhibits free migration and essentially ties rural people to the land where they were born. Thus, the lineage structure in rural villages has remained stable since 1958 (Solinger, 1999).

Using data from the Chinese Household Income Project Survey (CHIPS) 2002, we find that lineage-based heterogeneity has a negative effect on both the frequency of monetary and non-monetary mutual help. It turns out that villagers do not treat them differently with regard to lineage obligations and enforcement. Our results show that lineage-based heterogeneity has a negative effect on cross-lineage cooperative behavior as well. In other words, people in lineage-homogenous villages are more likely to engage in reciprocal behavior with their lineage members and more likely to contribute to the provision of public goods that are jointly shared across lineages.

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[2] Despite the possibility that over time cooperative behavior may lead to larger families, this is unlikely to be a serious concern for us. In her seminal study of surname groups Tsai (2007) notes that surname patterns were largely determined exogenously in the pre-communist period by imperial land settlement policies and natural disasters. Moreover, the post-communist period of around fifty years is not long enough to have had a sizable impact on the population growth of cooperative families. Moreover, our heterogeneity variable is defined by village composition instead of lineage sizes. As we explain later, the village border is exogenously determined by the central government.
[3] The goal of the reorganization was to facilitate the penetration and concentration of the Communist regime but did not take into account the common interests of the villages.

Importantly, we provide additional support for the rice cultivation and cooperative behavior hypothesis since the association between the lineage-based heterogeneity and the cooperative behavior is stronger in the South. This also offers us more confidence regarding the causal effect of lineage-based heterogeneity.

Our results are robust to the inclusion of various control variables and additional background characteristics. The effect of lineage-based heterogeneity on cooperation are likely to imply different economic outcomes in those villages after years of development. To explore the impact of lineage-based heterogeneity on those villages' economic outcomes, we investigate the villagers' total financial assets at the end of 2002, income from farming, fishing and forestry, the percentage of rural-urban migrant workers from each village, and the existence of a junior high school in each village. The results generally suggest that the lineage culture not only fosters cooperation, but also improves economic outcomes over time.

The remainder of this paper is organized as follows. In Section 2, we provide some background information. Section 3 describes the data. Section 4 demonstrates the identification strategy and the empirical models. Section 5 discusses the results. The last section concludes the paper.

2. Background

2.1 Lineage Networks in rural China

A substantial existing literature explores the relationship between ethnic groups and economic development.[4] In China, there are a total of 56 ethnic groups, and the Han makes up the vast majority of the total population – around 91.6 percent. Among the other 55 minority ethnic groups, 44 occupy their own autonomous regions and the largest one is the Zhuang which consists of around 1.3 percent of the total population (Dincer and Wang, 2011). While there is not much variation in ethnicity in China, rural villages provides an ideal setting for the study of lineage groups.[5] Being exposed to similar social shocks at the provincial or national level, these villages have enough variation in lineage composition (Xu and Yao, 2015) to make them useful units of observation.

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[4] See for instance Alesina et al., (1999); Alesina and La Ferrara, (2000); Alesina et al., (2001); Fearon and Laitin, (2000); Luttmer, (2001); Miguel and Gugerty, (2005); Putnam, (2007).

[5] We do not take urban regions into account, because the lineage culture does not have much impact on urban life after 1949 (Freedman, 1958).

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In the long history of China, lineage culture has been a major driving force behind different forms of social interaction from conflicts to cooperation and reciprocity. Lineage culture dates back hundreds of years. Extended families related to the male's line living in one settlement and form a lineage. All men in one lineage were descendants of a common ancestor. Male members hold primary power in political leadership, moral authority, and social benefits. In short, the social structure is patriarchal. Therefore, while female members could be from other ethnicities, lineages, or villages, male members from the same lineage have the same surname and are consequently from the same ethnicity. In imperial China, rural organizations and communities were in fact the outgrowth of lineages. The size of the lineage ranged from a handful to a few hundred households. Over generations, the common surname became the lineage identity and promoted solidarity among lineage members (Peng, 2004). Lineage heads and sub-heads played a crucial role in rural governance and were responsible for community affairs, public goods, rules and regulations for lineage members and so on. Thus, lineage identity brought loyalty with it. Lineage members were closely-bonded and held rituals to worship the same ancestors regularly (Tsai, 2007). They were willing to contribute to, or sacrifice for the benefit of the entire lineage.

Different from some other traditional groups in the world, lineage organizations were preserved in rural China even after radical social changes and are still one of the most important informal institutions in the countryside. While the data is incomplete, Huang (1985) indicates as late as the turn of the twentieth century most of the villages in the south were composed of members of one lineage. In imperial China, the formal government was hardly able to reach rural areas (Kuhn 2002). After communist China was founded, Party Secretaries and Villagers' Committees started to tighten control over villagers and take on the power to manage village affairs. To reach this goal, the communist regime reorganized lineages by establishing administrative villages without considering historical and traditional boundaries of these lineages and their common interests (Wang, 2006). As a governing unit, an administrative village may include one or more adjacent lineages. Lineages still play a significant role in cooperative actions such as resolving conflicts, cooperation, and coordination, especially in southeastern China (Weber 1981, 1951; Freedman, 1958). Some qualities of lineage members such as familism, kinship loyalty and moral obligations (Whyte, 1995; Peng, 2004) still persist. They hold rituals and plan collective activities regularly. In the meantime, lineages are making efforts to share power with the formal government. For example, according to a six-month fieldwork carried out by Tsai in 316 villages between 1999 and

2001, the obligations to contribute to the good of the lineage groups provide incentives for public good provision. Greif and Tabellini (2015) argue that clans resumed their role in promoting mutual aid, securing their own benefits as well as contributing to public goods. Xu and Yao (2015) find that village leaders from larger lineages considerably increased local public good investment.

Freedman (1958) finds that lineage groups act as a substitute in places where formal institutions are weak. He also finds that the lineage culture is stronger in the South of China than in the North and proposes three reasons to explain the difference. Firstly, the South is farther away from formal government control since the political center of China is located in the North. This provides a basis for the lineage culture to thrive in the South. Second, rice-cultivation in the South demands extensive irrigation. Inter-household cooperation in irrigation could be the base from which the lineage organizations emerged. Third, the population in the South has many immigrants from the North. The exigencies of frontier life could stimulate the development of lineages. Talhelm et al. (2014) offer another possible explanation for the lineage culture to thrive in the South – the history of farming rice in the south needs cooperation in extensive irrigation while in the North wheat farmers can rely on rainfall. The need for irrigation fosters lineage-based rural organizations since lineage members' stronger reciprocal and moral obligations could enforce cooperation. The Yangtze River in China splits the wheat-growing north from the rice-growing south. Talhelm et al. (2014) point out the percentage of cultivated land devoted to rice paddies is more than 50 percent in each province in the rice-growing south (below the Yangtze River). In a follow up study using incentivized experiments, Zhou (2017) finds greater cooperation among students from the Southern provinces of Hunan and Zhejiang than from students of the Northern provinces of Hebei and Shandong.

2.2 Local Governance and Public Investment in Rural China

In rural China, local governments bear almost complete fiscal responsibility for local public goods provision (Oi, 1996; Tsai, 2000). Before the 1980s, village leaders were generally appointed by the upper levels of the government. Because of increasing conflicts between leaders and villagers over taxes and fees, the *Organic Law of Village Committees* (draft) was first implemented in Guangxi province at the end of 1980 (Fan, 2001; He et al., 2001). This law laid out comprehensive provisions for the election of village committees so that villagers were able to elect their own leaders (Zhang et al., 2004). Since then, village elections were promoted all over the country.

However, this promotion did not run smoothly. In most of the villages, committee members were still appointed by the upper levels of government. According to the National Fixed-point Survey conducted by the *Research Center of Rural Economy* in China, by 1994, only half of the villages had started the election process. In 1998, the revised version of the *Organic Law of Village Committees* was officially passed by the National People's Congress and elections quickly spread to villages all over the country. Wang and Yao (2006) report that since 1998, pure government nomination has disappeared and the incidence of electing local leaders is now fully established.

Key differences between leaders appointed by the upper levels of government and leaders elected by the local villagers lie in the degree of decentralization, participation, and accountability (Dethier, 2000). They are also important for monitoring the delivery of public goods and services. Zhang et al. (2004) are among the first to investigate how this institutional shift in village governance affected public good provision. They find that elected leaders tend to spend more on local public goods since elections have impose accountability in decision-making. They also suggest that when decisions are made by the village committees rather by one or two individuals, the efficiency of public spending is higher perhaps because of the reduction in wasteful spending by village leaders.

Nevertheless, the institutional environment in China is not especially friendly towards the democratic process. The upper levels of government often intrude in village elections and village affairs creating a conflict for local leaders who may now have to satisfy both their local constituents as well as the upper echelons of government. This has led some to question whether the elected leaders truly serve the will of the villagers. To provide concrete answers, Wang and Yao (2006) study the impact of village elections on the accountability of the village committee, local fiscal sharing, and state taxation in rural China. They find that elections substantially increase the share of public spending in the village budget, but reduce the shares of administrative costs and income handed to the upper levels of government. These findings suggest that elections have enhanced the accountability of the village committees, but weakened local fiscal sharing and the state's grip. Luo et al. (2010) provide another explanation for the accountability of the selected leaders by testing the potential mechanism behind the consistent relationship between elections and public good provision. They find that the re-election incentives affect the behavior of incumbents even in an early democratization situation, because the voters only reward good leaders. Brandt and Turner (2007) find that even very corrupt elections can provide strong incentives for elected

leaders to act in interest of their constituents. Kennedy et al. (2004) use a sample from Shaanxi province and compare government-appointed candidates with candidates who were nominated by villages. They find that nominated village leaders were more accountable to villager's decisions regarding land reallocations.

2.3 Why lineage composition matters?

Different from other solidarity groups, lineage group obligation is based on the concept of family. In this sense, intra-lineage cooperation is important in two ways. Firstly, usually the households in a lineage have been clustered in a settlement for generations, and this long-term connection as well as the repeated nature of their interaction (possibility of needing help in the future) provides them with incentives to help other lineage members (Coate and Ravallion, 1993). Second, choosing not to help a lineage member would be like choosing to be disowned or to be denied other lineage benefits by being ostracized (Basu, 1986). Moreover, the obligation may be stronger as the size of the lineage increases (Pan, 2012).[6] In a large lineage where everyone knows everyone else due to clustering over generations, a deviant may be denied future exchanges not only with the person in need of assistance but also with many other lineage members as in Bloch, Genicot and Ray (2008). In other words, the cost of defection potentially rises as the size of the lineage increases. Consequently, reciprocity will be more often in large lineages than in small lineages. We note that the size of a lineage in a homogeneous village, on average, is greater than a lineage in a heterogeneous village. Thus, we hypothesize there is more frequent intra-lineage reciprocity in homogenous villages than in heterogeneous villages.

For cross-lineage cooperation like public good provision, there are two streams of literature investigating the relationship between social capital and public good provision. One is related to informal institutions, explained by accountability, obligation and moral standing. Tsai (2007) proposes a model of informal governmental accountability to explain public good provision in rural China. Local officials have the incentive to provide public goods if villagers assign them higher moral standing for doing so. In a more homogeneous village, the village leader is more likely to be from the large lineage. Being in the large lineage, village leaders can earn authority conferred by their lineage members and provide public goods for the good of their group (Tsai,

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[6] According to Posner's (1980) study of institutions in primitive societies, the reciprocity among lineage members can be regarded as a form of implicit contract that says, "*I help you today because I expect you to help me tomorrow*".

2007; Xu and Yao, 2015). If they are not from the large lineage, they are less able to guarantee the provision of public goods. The other one is related to formal institution. Alesina et al. (1999) claims that ethnic groups have different preferences even over a seemingly neutral public good. If there are many distinct preferences across groups, the chosen type of public goods is not preferred by a large fraction of the population (Alesina et al., 1999). The costs of heterogeneity come from the inability to agree on the common public goods (Alesina and La Ferrara, 2005). In that case, individuals contribute fewer resources to public goods, because a large fraction of their resources are used to provide public goods that are shared with other groups (Banerjee et al., 2001).

One has to pay attention to the fact that the institutional background in rural China is mixed. A recent study in the context of rural China by Padró-i-Miquel et al. (2015) investigates the interaction of the two theories and concludes that informal institutions like the lineage culture is actually the pre-condition that enhances the performance of formal institutions. In other words, the lineage culture and formal institutions are complements. Thus, in a more homogeneous village, village leaders are more able to guarantee the provision of public goods. Villagers increase their contributions because most of the beneficiaries of the public goods belong to their own groups. Moreover, if rural China is moving towards democracy, we can expect more public good provision because high social capital and formal institution compensates each other in this perspective.

3. Data and Descriptive Statistics

We use data from the rural part of the CHIPS 2002 survey.[7] In this portion of the survey, 9200 randomly-selected households were interviewed from 961 villages in 22 provinces.[8] Figure 1 presents a map of the provinces in China wherein the surveyed provinces have been shaded. As explained in the previous section, the lineage culture is more developed in the South than in the North. To investigate how this cultural difference affects the results, we adopt the grouping strategy of Talhelm et al. (2014) and use the Yangtze River as the South-North divide to separate the 22 provinces into two groups: Southern provinces and Northern provinces. As shown in Figure 1, the darker shade denotes Southern provinces which include ten provinces are classified as being

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[7] Our analysis is based on three questionnaires – the household level main rural questionnaire, the village level questionnaire and the social network questionnaire.

[8] Although there are 34 province-level administrative units in China, the 22 provinces in the CHIPS 2002 data set provide a nationally representative sample. The 22 provinces were selected from four distinct regions in China – metropolitan, eastern, central, and western – to reflect variations in economic development and geography (Li et al, 2008).

in the South, while the lighter shade denote twelve Northern provinces.[9] To better focus on the lineage culture, we exclude minority ethnic groups from our sample, since they are historically herding areas and have different languages, cultures and religions (Talhelm et al., 2014).

In our sample, individual-level questions were answered mainly by heads of households or other household members when household heads were not available.[10] Those include questions about both the individuals and their families. For each village, the village-level questions were answered by a village representative who was familiar with the geographic, demographic and economic characteristics of the village. A village representative could be the party branch secretary, the head of the village committee, or the village accountant, whoever was available during the survey. In each village, around 10 to 15 families were surveyed. Table 1 presents summary statistics for all variables that form the core of this analysis. In the following subsections, we first explain how we measured lineage-based heterogeneity in our analysis, and we then discuss cooperative behavior.

3.1 Three Types of Villages

Although from our data we are not able to obtain the traditional heterogeneity index used in most existing literature, two village-level questions in the survey make it possible for us to categorize the 961 villages into one of three types based on the level of heterogeneity.[11] The two questions are:

- Q1. "Is the percentage of households belonging to the largest lineage in the village more than 50 percent?"

- Q2. "Is the percentage of households belonging to the top five largest lineages in the village more than 50 percent?"

In the sample, villages that answered "yes" to Q1 are defined as Type 1 villages. Villages that answered "no" to Q1 and "yes" to Q2 are Type 2 villages. Villages that answered "no" to both Q1 and Q2 are Type 3 villages. Thus, Type 1 villages are the most homogenous villages, as the majority of households in a Type 1 village are from the largest lineage. Type 3 villages are the

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[9] The provinces in the "South" include Jiangsu, Zhejiang, Anhui, Jiangxi, Sichuan, Chongqing, Hubei, Hunan, Guangdong, Guangxi, Yunnan and Guizhou. The provinces in the "North" include Beijing, Shandong, Hebei, Liaoning, Jilin, Henan, Shannxi, Gansu, Xinjiang and Shanxi.
[10] In the sample, about 97.8 percent of the respondents are household heads or their wives.
[11] The traditional heterogeneity index is a Herfindahl-based index as shown in Alesina and La Ferrara (2002, 2003) and Alesina et al. (1999).

most heterogeneous villages as each village consists of a number of small lineages. Type 2 is a medium-type village. Figure 2 provides a visual comparison of lineage structure for the three types of villages. In our sample, 30 percent of the villages are Type 1 and 37 percent are Type 2. Table 2 lists the percentage of each type for each province.

An additional household-level question also provides lineage information:

- "Does your family belong to the largest lineage in the village?"

This question enables us to calculate the percentage of the sampled largest-lineage households in each village. Our calculations show that, on average, 71 percent of the sampled households in Type 1 villages, 37 percent in Type 2 villages and 15 percent in Type 3 villages belong to the largest local lineage. Note that Type 3 villages are the most heterogeneous villages while Type 1 villages are almost twice as homogenous as Type 2 villages.

We use Type 3 villages as the reference group and examine whether people in Types 1 and 2 villages are more cooperative. Therefore, we define two binary variables: *TYPE1* and *TYPE2*. *TYPE1* is equal to 1 if the respondent belongs to a Type 1 village, and 0 otherwise. Similarly, *TYPE2* is 1 if the respondent belongs to a Type 2 village, and 0 otherwise.

3.2 Intra-lineage Reciprocity Variables

Our analysis focuses on both intra- and cross-lineage cooperative behavior. This section describes the construction of intra-lineage reciprocity variables. To measure intra-lineage interaction, we rely on the following question from the CHIPS 2002 survey:

- "How often do you offer the following types of mutual help to your relatives and neighbors?"

The types of mutual help include (*i*) borrowing and lending money, (*ii*) helping with farming during the busy season, (*iii*) helping with house building, and (*iv*) caring for the elderly, the sick, and babies. Because extended families in rural China are usually established in the immediate vicinity of each other in the same area (Holcombe, 1985; Ye and Wang, 2005; Wang, 2006; Greif and Tabellini, 2011; Xu and Yao, 2015), we can assume that the respondent's relatives and neighbors are mostly from his/her own lineage and make use of the responses to the above question to proximate intra-lineage reciprocity. [12] Among the four types of help listed above, the first

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[12] Note that in the first type of village which is dominated by a single clan, it is highly likely that typical villagers would think of a member of their own lineage when they were asked the question involving "relatives and neighbors"

reflects monetary reciprocity while the other three capture the non-pecuniary favors, especially those favors that require an investment of time. Therefore, we define two dependent variables: *borrow* and *help* to separate monetary from non-monetary reciprocities. The binary variable *borrow* takes the value 1 if the respondent answered that borrowing or lending money occurs often or very often, and zero if the respondent stated that this mutual help occurs rarely or never.

With regard to the other three types of mutual help, (*ii*), (*iii*) and (*iv*), we first construct a binary variable for each type in the same way as we did for *borrow*. We then define *help* by summing the three indicators. Hence, *help* takes values 0, 1, 2 or 3 where a greater number implies more mutual help regardless of the type of non-monetary help. For example, 0 means that all the three binary help variables have the value 0. That is, the respondent answered mutual help in all three types, (*ii*), (*iii*) and (*iv*), occurs rarely or never. Conversely, 3, the greatest possible number for *help,* indicates all three binary variables take the value of 1. That is, the respondent answered mutual help in types (*ii*), (*iii*) and (*iv*) occurs often or very often.

3.3 Cross-lineage Cooperation Variables

We now explain how to measure cross-lineage reciprocity. A commonly used measurement of cross-group cooperation in the literature is the provision of public goods (Alesina et al., 1999; Banerjee et al., 2005). We adopt this idea by examining villagers' physical effort in the provision of public goods and the share of the villages' budgets spent on public goods. Village public goods, such as irrigation facilities, roads, and schools, are jointly consumed by all villagers, regardless of their lineage membership. Therefore, people's willingness to invest in public goods reflects the cross-lineage reciprocities in any given village.

Solidarity groups play a key role in providing local public goods across rural areas in China. During six months of fieldwork in 1999 and 2001 respectively, Tsai (2002) discovered the widespread phenomenon that village officials rely on informal institutions such as lineage groups to fund and manage public services. Before 2002, all villagers (between the ages of 18 and 65) in China were required by law to provide unpaid labor to build local public goods, such as irrigation

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simply because of their larger numbers. Indeed there is clear evidence that the lineage size is larger in these villages. Essentially friends who are not relatives would have to be a minority in such villages. Hence it would be a statistical anomaly for the average member in such villages to think of neighbors. Thus, to provide greater justification to our assumption, we apply the full models and compare the intra-lineage cooperative behavior between type 1 villages and other types (type 2 and type 3 together) of villages. The relationship remains robust. The results are not reported but are available upon request.

systems, dams, roads, and school buildings. [13] The number of regulated days of unpaid work varied from place to place, but was usually between 7 and 21 days per year. If villagers could not physically participate in the unpaid work, they were charged fines for each day they missed. The villages could then use the collected fines to hire other people to replace the missing workers. Since 2002, China has eventually waived this unpaid-labor duty and replaced it with "One-Issue-One-Meeting", which also allowed the village authority to raise funds and free labor from villagers to finance local public good provision in a more democratic way (Chen and Ma, 2014). When CHIPS 2002 was conducted, this reform had still not been implemented in 140 of the 961 surveyed villages that provided us with data on the fulfillment of the unpaid-labor requirement. In these 140 villages, each surveyed household reported the number of days that they were required to work for free and the number of days they actually completed in 2002. Based on this information, we construct the variable *fulfill,* which is the ratio of the number of actually completed days to the number of required days, to measure the households' physical effort in contributing to village public goods.

To investigate monetary contributions to public goods, we construct two additional village level variables using data from 961 villages across China: (*i*) *share*, which measures the share of the village budget spent on education, the medical system, and other common expenditures (i.e., expenditures for environmental protection and public safety) and (*ii*) *sgrowth*, which measures the change in the *share* variable from 1998 to 2002. [14] As the revised version of *the Organic Law of Village committees* was passed in 1998 and the election has then spread quickly to all the villages, we also construct the *sgrowth* variable to investigate how village elections affect the relationship between lineage-based heterogeneity and public good provision.

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[13] This was mandated by the *Regulations on Peasants' Fees and Services* (1992) announced by the State Council of the People's Republic of China. Before the tax-for-fee reform around 2002, households were required to supply labor for free to local authorities mostly for the construction of local infrastructure. The number of regulated days varied with local needs. Local authorities were responsible for enforcing this regulation. The unpaid labor requirement should take place during the off-season for farming.

[14] In CHIPS 2002, public goods include education, infrastructure, health and other common expenditures but *share* excludes infrastructure investment in this paper. In contrast to other public goods, infrastructure needs both money and labor investment from rural villagers because of the fact that funds from the upper echelons of government are usually not sufficient to cover the total spending for these public projects. Thus, the results would be biased if we included infrastructure in *share* while ignoring the labor contribution to it.

3.4 Descriptive Statistics

Table 1 lists all the variables used in our analysis. The first column displays sample averages while the next two columns illustrate the means in the South and the North respectively. The first panel documents our outcome variables of interest. Consider *borrow* as an example. We find that 38.7 percent of the respondents in the South responded that borrowing and lending money occur often or very often while the number of the respondents in the North is 0.8 percent lower.

We control for a set of village characteristics. Approximately half of the villages are located in mountainous areas. Because village location plays an important role in the prevalence of lineage culture (Freedman, 1965), we include other geographic controls, such as whether the village is located in a city suburb, the distance to the nearest transportation terminals, and the distance to the nearest county. As irrigation is the most important form of long-term cross-lineage cooperation in rural China (Freedman, 1965), we control for this variable, denoted as *CANAL98*, which measures whether the village used a canal as the major irrigating method in 1998. We find that 69.2 percent of the sample villages answered "yes" to this question. In rural China, the village is led by a village head (the chairman of the Village Committee) and a party secretary, and the village economy depends heavily on village leadership (Oi, 1999). Thus, the characteristics of village leaders are accounted for in our analysis. Five measures are used, including the number of years the village leader has been in office, the age of the village leader, the education level of the village leader, the enterprise management experience and the experience of operating a non-agricultural family business.

The last panel of Table 1 documents detailed characteristics of the respondents, or the respondents' family. Of the respondents, 16 percent were village cadres.[15] Villagers in rural China, on average, spent around seven years in school. Following the study of Alesina and La Ferrara (2002), we construct a *PAST DISASTER* variable that takes a value of 1, 2, 3 or 4. A larger number indicates that the respondent suffered more natural disasters in the last five years (1998 – 2002). Alesina and La Ferrara (2002) include a similar indicator – "recent traumas", in their model, which equals 1 if the respondent suffered a negative experience in the past year such as divorce, diseases, accidents, or financial misfortune and zero otherwise. Their study shows "recent traumas"

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[15] "Cadre" means administrators in China. In both Russia and China's revolutionary eras, the word refers to a group of leaders active in promoting the revolution of the communist party. It no longer has any revolutionary implications in today's China (Pan, 2012).

has a negative impact on trust. Due to data limitations, we do not have all the details on villagers' past experiences, but only on disasters. Thus, our analysis includes *PAST DISASTER* instead to determine if the number of disasters suffered by the respondent affects his/her cooperative behavior.

4. Identification Strategy and Estimable Models

Our main identification assumption is that lineage-based heterogeneity is exogenous with respect to either intra-lineage or cross-lineage cooperative behavior. Prior to 1949, natural villages were mostly the outgrowth of lineages who had settled in a place for a long period of time.[16] While the data is incomplete, Huang (1985) illustrate as late as the turn of the twentieth century most (as high as 87 percent) of the natural villages in the south were composed of members of one lineage. Recall that in a lineage, members are related to a male's line so that male members hold primary power in political leadership, moral authority, and social benefits. In short, the social structure is patriarchal. Therefore, while married female members could be from other ethnicities, lineages, or villages, male members from the same lineage have the same surname.

Shortly after communist China was founded in 1949, the central government established administrative villages by including one or more adjacent natural villages geographically. Administrative villages were formed keeping two goals in mind. The first goal was to tighten control over lineages after the Communist regime came into power. Administrative villages were established as one governing unit across lineages boundaries and did not take into account the lineages' common interest. Party penetration of villages was institutionalized and the Party branch replaced traditional village leaders such as lineage heads. The party branch was identified with the interest of the party-state rather than lineage interests so lineage groups were not able to manipulate this process (Wang, 2006). During the same period, many movements including the notorious Great Leap Forward was launched in China, and communist China began to collectivize farming. Another goal of village re-organization was to be able to facilitate the gathering of the produce of farmers/peasants into the hands of the newly formed communist state. This has been documented by Kuhn (2002). Therefore, the lineage composition within a village was exogenously determined by a shock – that of China's administrative re-organization.

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[16] There were some exceptions --- some pre-1949 villages might contain multiple lineages because of other reasons like disasters, geographical conditions and so on. However, this does not affect our identification strategy.

Selective migration from one village to another was not frequent because of the tight lineage bonds and the high moving costs (Freedman, 1958; Hsiao, 1960).[17] Shrines and temples were built in each lineage to perform lineage worship and rituals, and to protect their members (Chang, 1955; Tsai, 2007).[18] Following the Great Leap Forward in the late 1950s, about 20 million of people died in the famine (Becker, 1996). Lineage members depended on each other to survive through the disasters. In addition, in 1958, China enacted the household registration system, which inhibits free migration and essentially ties rural people to the land where they were born.[19] Thus, the lineage structure in rural villages has remained stable since 1958 (Solinger, 1999). To provide additional evidence to support our results, in the robustness check section we add job characteristics dummies and working location dummies into the baseline model and check how these may affect our results.

Another concern could be whether cooperative behavior affects lineage structure in some unobservable way. Previous studies provide some evidence to support our assumption suggesting that this is not a concern. For example, Coleman (1994) argues that lineage networks are established exogenously "for noneconomic purposes but with economic consequences". Essentially, shortly after 1949, administrative villages were formed to meet the needs of collective farming, and to be better governed by the party branches. Solinger (1999) points out during the Maoist period, strict policies against internal migration froze surname patterns in rural China, which were largely determined exogenously by imperial land settlement policies and natural disasters. Peng (2004) also states that the village composition is independent of economic activities. Tsai (2007) even uses surname pattern as an instrumental variable in her study of solidarity groups and local public good provision in rural China. It seems unlikely that the

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[17] According to a survey conducted by Lohmar et al. (2011) in over two hundred villages from nine presentative provinces in 1988 and 1995 respectively, about 0.5 percent of the rural labor force are rural-rural migrants in 1988 and about 3 percent in 1995. However, rural-rural migrations often occur because of marriage and family reunion (Poncet, 2006) type events. Note that in China women typically move into their husbands' villages if they are from different places.

[18] Though most of the shrines and temples were torn down during the Cultural Revolution, lineage members tried to rebuild them in the late 1970s. They play an important role in the lineage religion (Tsai, 2007).

[19] The household registration system has been partially relaxed since the 1980s. The surplus rural laborers pour into cities in search of non-agricultural jobs. In China, rural-to-urban migration is non-voluntary, heavily regulated and controlled by the state (Chan et al., 1999; Poston and Yaukey, 1992). Only official and approved migration ensures urban job opportunities, and accompanying subsidies and benefits (Mallee, 1995). However, migration is granted only when it serves the state's interests or policies (Chan et al., 1999). This makes permanent rural-to-urban migration difficult for rural workers. Most rural workers have to commute between cities and their original villages several times a year.

cooperative behavior (whether it be mutual help or public good provision) has had a significant impact on village structure.

In the results section, we provide more empirical evidence for this assertion. We use different types of villages based on lineage fragmentation to proxy heterogeneity. A variety of individual and village controls are added sequentially into the models to check the sensitivity of our estimates of interest. The identification strategy assumes that conditional on the baseline controls, our measurement of lineage-based heterogeneity is not correlated with other unobserved factors that influence villagers' mutual help and cooperation, and public good provision. To examine these possibilities, we conduct several additional robustness checks in the results section. We use individual level models to examine intra-lineage cooperative behavior and villagers' physical contributions to public goods. These models are presented in subsection 4.1. When we study the impact of lineage-based heterogeneity on the share of the village budget spent on public goods, we use village-level models presented in subsection 4.2.

4.1 Intra-lineage specification

Our basic model for intra-lineage relationships is

$$outcome_{ijp} = \beta_1 TYPE1_{jp} + \beta_2 TYPE2_{jp} + Y_{jp}\delta + X_{ijp}\gamma + \alpha_p + \varepsilon_{ijp} \quad (1)$$

where the subscripts indicate individual *i* in village *j* of province *p*. The outcome variables are latent variables, or respondents' motivation, for monetary and non-monetary intra-lineage mutual help. Because *borrow* is a binary variable, we use a probit model to estimate the regression coefficients. *Help* is a discrete ordinal variable. More specifically, we classify the frequency of non-monetary help into 4 categories, with 3 thresholds. Therefore, we use an ordered probit model to estimate the regression coefficients.

TYPE1 and *TYPE2* are the village-type indicators. Y_{jp} is a vector of other village characteristics that include net income per capita, and its squared form so that we are able to test whether the effect of per capita income on cooperative behavior is stronger or weaker as villages become wealthier. Y_{jp} also includes indicators for mountainous area, suburb, distance to the closest transportation station, distance to the closest transportation terminal, poverty, total population, total planting area, as well as a binary variable indicating whether the village used a canal as its major irrigating method in 1998. X_{ijp} is a vector of individual characteristics, which include age and a quadratic form of age, so that we can examine whether the effect of age on cooperative

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behavior is stronger or weaker as people grow older. It also includes indicators for gender, years of schooling, marital status, cadre, household income, and family size, and binary variables indicating whether the individual belongs to the largest lineage in the village and the number of natural disasters he/she suffered in the past five years (1998-2002). α_p is a vector of province fixed effects that rules out systematic differences between provinces.

If intra-lineage cooperation is more frequent in homogenous villages than in heterogeneous villages, then $\beta_1 > 0$, and $\beta_2 > 0$. The identification strategy in this paper arises from the exogenous predetermined heterogeneity. We use model (1) to examine whether intra-lineage cooperation is more frequent in homogenous villages than in heterogeneous villages. Because the lineage culture is traditionally more predominant in the South than in the North of China, to further refine our identification, we separate the entire sample into two subsamples – Southern provinces and Northern provinces. We apply model (1) to each subsample and investigate whether the difference is stronger in the South than in the North. If the answer is affirmative, this indicates that the lineage-based heterogeneity affects people's cooperative behavior. Moreover, it also suggests that our assumption regarding those in an individual's neighborhood being from the same clan is a reasonable one.

4.2 Cross-lineage specification

The measurements of cross-lineage cooperation include *fulfill,* which is an individual-level outcome, and *share* and *sgrowth*, which are two village-level outcomes. The models for the *fulfill* variable are the same as models (1) except that the fine charged for each missed day of unpaid work is also included in Y_{jp}, in addition to all other village characteristics. The models for the *share* variable are as follows:

$$outcome_{jp} = \beta_3 TYPE1_{jp} + \beta_4 TYPE2_{jp} + Y_{jp}\delta + \alpha_p + \varepsilon_{jp}. \quad (2)$$

If lineage-based heterogeneity discourages people from contributing to public goods, then β_3, and $\beta_4 > 0$.

In 1998, the revised version of the *Organic Law of Village Committees* was officially passed by the National People's Congress and elections quickly spread to villages all over the country. Since then, elected village leaders were more accountable to villagers' decisions. In particular, the provision of public goods is now more aligned with villagers' cooperative behavior. Thus, when

sgrowth is the outcome variable, we aim at examining how the provision of public goods responds to this policy change. The general model is:

$$share_{jpt} = \beta_5 TYPE1_{jp} + \beta_6 TYPE2_{jp} + \beta_7 T + \beta_8 TYPE1_{jp} * T +$$
$$\beta_9 TYPE2_{jp} * T + Y_{jpt}\delta + \varepsilon_{jpt} \quad (3)$$

where T is an year indicator. $T = 1$ if the year is 2002; $T = 0$ if the year is 1998.

In 1998, the model can be rewritten as:

$$share_{jp,1998} = \beta_5 TYPE1_{jp} + \beta_6 TYPE2_{jp} + Y_{jp,1998}\delta + \varepsilon_{jp,1998}. \quad (4)$$

In 2002, we rewrite (4) as

$$share_{jp,2002} = \beta_5 TYPE1_{jp} + \beta_6 TYPE2_{jp} + \beta_7 + \beta_8 TYPE1_{jp} +$$
$$\beta_9 TYPE2_{jp} + Y_{jp,2002}\delta + \varepsilon_{jp,2002}. \quad (5)$$

As $sgrowth = share_{jp,2002} - share_{jp,1998}$, we obtain the following model for the variable *sgrowth* from (5) minus (4):

$$sgrowth = \beta_7 + \beta_8 TYPE1_{jp} + \beta_9 TYPE2_{jp} + \Delta Y_{jp}\delta + \Delta\varepsilon_{jp} \quad (6)$$

where ΔY_{jp} indicates the change of village characteristics from 1998 to 2002.

In a more democratic environment, people are granted more rights to participate in collective decisions. Accordingly, we can expect public-good provisions to increase faster in a more homogenous village because people's decision to cooperate could be better realized in 2002. In other words, β_8 *and* $\beta_9 > 0$.

4.3 Selection on Observables

To mitigate the possibility that other background characteristics may be the driving the relationship between lineage-based heterogeneity and cooperative behavior. Now we examine whether our analysis has selection on observables. To do this, we use the above models plus interaction terms between the type variables and the South/North Dummy (denoted by *T1_S* and *T2_S*). Villager and village characteristics are the left-hand side variables. We test whether those characteristics are different across the three types (evaluated by the coefficients of *TYPE1* and *TYPE2*), and more importantly, whether those differences, if there is any, change from the South to the North (evaluated by the coefficients of *T1_S* and *T2_S*). Table 3 presents the results. Notice that the coefficients of *TYPE1*, *TYPE2*, *T1_S* and *T2_S* for the variable "*SURNAME*" are all significantly

positive. "*SURNAME*" is a dummy indicator which is one if the individual is from the largest lineage in the village and zero otherwise. The four positive coefficients indicate that people in Type 1 and Type 2 villages are more likely than Type 3 villagers to be from the largest local lineage, and this situation is more apparent in the South than in the North. This exactly reflects that Type 1 and Type 2 villages are more homogenous than Type 3 villages and the difference in lineage-based fraction across types of villages is more dramatic in the South than in the North. On top of that, we do not see other variables have the same pattern as *SURNAME*. For the other variables, though the coefficients of *TYPE1* and *TYPE*2 can be statistically different from zero, the coefficients of *T1_S* and *T2_S* are not.[20] The results in Table 3 indicate that the three types of villages can be different in aspects other than the lineage-based fraction. Yet the other differences do not change from the South to the North.

5 Main Empirical Results

In this section, we first explore how lineage-based heterogeneity affects intra-lineage cooperation and cross-lineage cooperation using our baseline models. The results are robust after we sequentially introduce a number of different controls. We then provide additional evidence to support our analysis. In addition, for the individual level model, we cluster the standard errors by village; for the village level model, we cluster the standard errors by county.

5.1 Intra-lineage and Cross-lineage Cooperation

Using model (1), we examine the impact of lineage-based heterogeneity on intra-lineage relationships. Our goal is to investigate whether *borrow* or *help* is more likely to occur in Type 1 or Type 2 villages than in Type 3 villages. The main regression results are reported in Table 4. Columns (1) and (4) illustrate the most basic regression results which compares the impact of the three types of village structure on intra-lineage cooperation in rural areas. Columns (2), (3), (5) and (6) examine the sensitivity of the results to the inclusion of additional individual and village controls that can potentially have an impact on cooperative behavior. The results from column (1) to (3) show that the estimated relationship between lineage-based homogeneity and the frequency

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[20] Expect for the Age variable, one possible reason is that the One Child Policy is more strictly enforced in the North of China (Davis and Harrell, 1993).

of monetary mutual help is positive and significant, which is also robust to a variety of controls. To be more explicit, if we re-run regression (3) using a probit model, the marginal probit coefficients of *TYPE1* and *TYPE2* calculated at the means indicate that frequent monetary help among lineage members is more likely to occur in Types 1 or 2 villages than in Type 3 villages by 9.3 and 6.7 percentage points, respectively.[21] The results from column (4) to (6) report similar results for non-pecuniary help. Villagers from Type 1 or 2 villages are more likely to offer physical help to lineage members than villagers from Type 3 villages.

Tables 4 also report the coefficients of several interesting individual variables. First, *borrow* increases with age while *help* does not. One explanation is that older people simply have more money to help. Another explanation is that lending is less likely to occur if there is asymmetric information about the riskiness of the borrowers. Because older people are more experienced and may have more information about other lineage members, they may be more likely to offer monetary help than younger people. Non-pecuniary help, although it consumes time, is less risky. Asymmetric information plays a less important role here. Similar explanations can be applied to the association between being a cadre and *borrow/help*. Second, gender and marital status both have a significant negative relationship with *borrow* while their association with *help* is not significant. This may indicate that in rural China, women or married villagers are more risk-averse. Third, the coefficients of *HHINCOME* are not significant for either monetary or non-monetary reciprocity within a lineage, thus, implying that it does not seem to be the case that people with larger monetary budgets tend to help other lineage members more, giving more credence to the asymmetric information explanation. *Cadre* is positively associated with monetary help but not non-monetary help. Asymmetric information is not an issue for a cadre because usually a cadre member possesses larger information networks. However, working for the government indicates they have less spare time to help others physically. Both *borrow* and *help* are positively associated with family size. Due to economies of scale, larger families may have more information about other lineage members and also have more people available to provide help.

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[21] Probit results are not reported here because linear models are more transparent and the clustering works better with linear models. The Probit results are available upon request.

5.2 Cross-lineage Relationships

Next, we use model (2) to test whether homogeneous villages are more willing to contribute to public goods than heterogeneous villages and present the main results in Table 5. The outcome variables are *fulfill* for columns (1) to (3), *share* for columns (4) to (5) and *sgrowth* for columns (6) to (7). Recall that *fulfill* is an individual-level outcome variable measuring the respondent's physical contribution to public goods, while the other two outcomes are village-level outcomes regarding the share of the village budget spent on public goods. So there are individual controls from columns (1) to (3). Column (1), (4) and (7) illustrate the most basic regression results which compares the impact of the three types of village structure on cross-lineage cooperation in rural areas. The other columns examine the robustness of the results to the inclusion of additional village controls as same as those included in Table 4. The results from Table 5 show that the estimated relationship between lineage-based homogeneity and collective action is generally positive and significant. This is also robust to a variety of controls. To be more explicit, column (3) reports that Type 1 villages averagely completed more required unpaid labor days than Type 3 villages by 8.9 percentage points but this coefficient is not significant. Column (5) shows that Type 1 and Type 2 villages spend more of the village budget on public goods than Type 3 villages by, respectively, 3.9 and 3.3 percentage points. The estimated coefficient of *TYPE2* is only marginally significant. The above evidence indicates that cross-lineage cooperative behavior is more likely to occur in homogeneous villages than in heterogeneous villages.

Columns (6) to (7) provides additional evidence for the above discussion, which examine how lineage-based heterogeneity affected the change of *share* from 1998 to 2002. As shown in column (7), the increase in the share of the village budget that was spent on public goods is larger in Type 1 villages than Type 3 villages by 3.1 percentage points. As China continues to make progress in switching to a democratic electoral process, median voters play increasingly more important roles in village affairs. Thus, over time, their opinions are better accepted when the village committees make decisions about how much to spend on public goods. Formal institution performs better with the help of lineage culture. Thus accordingly, in 2002, we observe there was a greater increase in the share of the village budget spent on public goods in the more homogeneous villages.

5.3 Comparison between the South and North

In this section, we split the entire sample into two subsamples – the South and the North, to re-examine the association between lineage-based heterogeneity and cooperative behavior in rural China. In Table 6, the odd columns report the regression results for all of the cooperation variables using the sample in the South while the even columns use the sample in the North. Notice here the South (North) represents provinces with relatively stronger (weaker) lineage culture.

In Table 6, column (1) and (3) imply mutual help, either monetary or non-monetary, happens more frequently in Type 1 villages or Type 2 villages than in Type 3 villages in the South. By contrast in column (2) and (4), there is no evidence that lineage-based heterogeneity has an impact on mutual help in the North. Columns (5) to (10) show the results for cross-lineage mutual help. Column (5) reports that in the South, Type 1 and Type 2 villages completed more required unpaid labor days than Type 3 villages did by respectively, 15.2 and 10.7 percentage points. Column (7) shows that Type 1 and Type 2 villages spend a greater share of the village budget on public goods provision than Type 3 villages do by, respectively, 3.4 and 2.5 percentage points. The coefficient of *TYPE1* is marginally significant while the coefficient of *TYPE2* is not. Column (9) shows that when we restrict the sample to the South, the share of public goods spending increases more in Type 1 and Type 2 villages than in Type 3 villages by, respectively, 4.2 and 4 percentage points. In columns (6), (8) and (10), the coefficients are no longer significant when we restrict the sample to the North.

Our results show that overall in the South, the association between lineage-based homogeneity and intra/cross-lineage behavior is positive and significant. In the North, however, the significance goes away. This provides additional evidence to the causal impact of lineage-based heterogeneity on cooperation.[22]

5.4 Robustness Checks

The discussion so far indicates that within-lineage reciprocity, whether monetary or non-monetary, is more likely to occur in homogeneous villages than in heterogeneous villages. However this

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[22] Note that in a Type 1 village, two random villagers are more likely to be in the same lineage. So there may be a concern that even if there is no causal relation between heterogeneity and intra-lineage cooperation, individuals are still more likely to be helping their lineage members. Our results from the South and the North exclude this possibility. We would not observe the differences in cooperative behavior between the South and the North, because if the above concern was true Type 1 villagers in the North would be helping their lineage members more frequently as well.

result may arise because of unobserved variables. So in this section, we conduct alternative tests to address this problem.

5.4.1 Job Characteristics

From the early 1970s, a large number of rural workers in China started to look for a job in urban areas. This does not affect our identification strategy since the Chinese government has a strict migration policy whereby migrants in China do not have access to institutional assistance from local governments. However, one may be concerned that due to the rapid industrial development in the southern part of China, stronger lineage networks make it easier for rural migrants to find a job in the urban area, because of which rural migrants may need more help from their lineage members, especially to take care of their family. To address this concern, we control for the respondents' job categories and working locations.[23] These results are reported in Table 7.

In all specifications in Table 7, we include individual controls, village controls and province fixed effects as in the baseline models. Column (1), (4) and (7) include job category dummies only; column (2), (5) and (8) include working location dummies only; column (3), (6) and (9) include both. Using sample data from the South, our results indicate that the coefficients on type variables are consistent in all specification with and without job characteristic controls.

5.4.2 Village Leader Quality

Another concern maybe an omitted variable capturing the quality of village leaders. In imperial China, a village was actually a lineage system. Lineage heads were responsible both for administration and public affairs. After 1949, lineage systems were reorganized into an administrative village and lineage heads were no longer in charge of village affairs. However, if strong lineages are correlated with good qualities such as leadership or intelligence, then those qualities may at the same time affect village affairs such as public good provision. To address this concern, we include village head and the party secretary characteristics into our baseline model and check how the results are affected. Those characteristics include age, education, management experience, non-agriculture experience and years in office. These results are reported in Table 8.

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[23] Job category includes agriculture, forestry, miners, industry, construction, transportation, commerce, restaurants, marketing, real estate, public service, personal service, health, education, scientific research, finance, government and others. Working location includes (1) within village; (2) out of village, within township; (3) out of township, within county; (4) out of county, within province; (5) out of province

In all specifications we include village controls and province fixed effects as in the baseline models in addition to leaders' quality controls. Column (1) includes individual controls since this specification is individual level. Using sample data from the South, the results show that the coefficients on type variables are similar to the results in the odd columns of Table 6.

5.4.3 Membership in the Largest Lineage in a Homogeneous Village

An individual's lineage is much like an organization to which he or she belongs in that the members tend to know each other quite well, and have information about each other's social and economic activities. The importance of lineage organizations increases in the presence of asymmetric information or other market imperfections. Accordingly, such an organization can enforce/facilitate informal transactions because it directs both punishment and reciprocity at not only the individual, but also at the members of his/her group (La Ferrara, 2003). Moreover, the enforcement may be stronger as the size of the lineage increases (Pan, 2012).[24] In a large lineage where everyone knows everyone else, due to clustering over generations, a deviant may be denied future exchanges not only with the person in ready to exchange or requiring assistance, but also with other lineage members. In other words, the cost of defection potentially rises as the size of the lineage increases. Consequently, reciprocity will occur more often in large lineages than in small lineages. Not surprisingly, note that the size of a lineage in a homogeneous village, on average, is greater than a lineage in a heterogeneous village. This explains why there is more frequent reciprocity in homogenous villages than in heterogeneous villages.

To further test this hypothesis, we use the following model to investigate whether the cooperative behavior is more frequent in the largest local lineage than in the other smaller lineages in the same village:

$$outcome_{ij} = \beta_{23}SURNAME_{ij} + X_{ij}\gamma + \alpha_j + \varepsilon_{ij} \qquad (7)$$

where $outcome_{ij}$ again are the latent variables for *help* or *borrow* for individual i in village j. $SURNAME_{ij}$ is a binary variable that is 1 if the individual i belongs to the largest lineage in village j. X_{ij} is the same vector of individual characteristics as in model (1). α_j is a vector of village fixed effects. The variable of interest for this model is $SURNAME_{ij}$. We expect that $\beta_{23} > 0$, which measure the average treatment effect of belonging to the largest lineage on mutual reciprocity. We

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[24] According to Posner's (1980) study of institutions in primitive societies, the reciprocity among lineage members can be regarded as a form of implicit contract that says, "*I help you today because I expect you to help me tomorrow*."

restrict our sample to Type 1 villages because the size difference between the largest lineage and other lineages is the greatest in Type 1 villages.

The results are presented in Table 9. Columns 1 to 3 report the coefficients for *borrow* while columns 4 to 6 report ordered probit coefficients for *help*. We use the entire sample in columns 1 and 4. Columns 2 and 5 restrict the sample to the respondents from the South of China, while columns 3 and 5 restrict the sample to those from the North of China. Columns 1 and 4 demonstrate that belonging to the largest lineage has a positive and significant effect on both monetary and non-monetary help. When we use the regional subsamples, the coefficient of *SURNAME* is statistically insignificant for monetary help (columns 2 and 3). However, for non-monetary help, bearing the largest surname has a positive effect in the South, while it has no effect in the North (columns 5 and 6). These results provide evidence that within-lineage reciprocity increases with the size of the lineage.

Taken together, these results can serve as additional evidence that the relationship between lineage-based heterogeneity and cooperative behavior is not driven by unobserved omitted variables.

5.5 Other Economic Outcomes[25]

We have shown that lineage-based heterogeneity is negatively associated with both intra- and cross-lineage cooperative behavior. It is then conceivable that when people cooperate with each other, over time this greater cooperation can have an impact on other types of economic outcomes. To make our analysis stronger, in this section we further explore how lineage-based heterogeneity affects other economic outcomes in rural villages. Specifically, we examine its impact on villagers' financial assets and income, outflow of rural migrant workers and village education. Table 10 reports the results of this analysis. Again, model (1) is used for individual level analysis while model (2) is used for village level analysis.

The outcome variable in column (1) is *assets*, which measures the logarithm of the respondent's total financial assets at the end of 2002. The results show that belonging to the Type 1 village increases the amount of financial assets by 14.1 percentage points while belonging to the Type 2 village increases the amount of financial assets by 14.5 percentage points. The estimates are both significant at 1 percent level. The outcome variable in column (2) is *income*, measuring

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[25] We thank an anonymous referee for suggesting the idea for the analysis presented in this section.

the logarithm of the respondent's income from farming, fishing and forestry. Most villagers in rural China follow these occupations and need intensive cooperation. The results in column (2) also suggest that lineage-based homogeneity has a positive impact on villagers' income. Both of the estimates are significant at 1 percent level.

Column (3) reports how lineage-based heterogeneity affect the percentage of rural-urban migrants in their home villages. Rural to urban migrants are registered in rural areas but working and living in the cities for at least 180 days per year (Zhong and Zhao, 2013). Since the Chinese government has a strict migration policy whereby rural to urban migrants in China do not have access to institutional assistance from local governments, these workers usually have to rely on connections from their villages to look for a job in the cities. Therefore we expect lineage-based homogeneity should have a positive impact on rural-urban migration. Thus columns (3) uses *migrants* as the outcome variable which measures the percentage of rural to urban migrants in a village. The results show that belonging to the most homogeneous village, or a Type 1 village, increases the migration rate by 2.38 percentage points. Belonging to a Type 2 village, increases the migration rate by 1.83 percentage points. Both estimates are significant at 5 percent level.

Since China enacted the nine-year compulsory education in 1986, almost every village in China has a primary school. So column (4) investigates the existence of a junior high school in a village instead, and tests whether there is a relationship between lineage-based heterogeneity and the availability of educational resources which can be viewed as a local public good. We use *school* as the outcome variable. It is a dummy variable that is equal to one if a junior high school is located in the village. The marginal probit coefficients calculated at the means are reported in column (4). The results show that a Type 1 village is 11.7 percent more likely to have a junior high school than a Type 3 village while a Type 2 village is 9.49 percent more likely to have a junior high school than a Type 3 village. Generally, the above results suggest that the lineage culture not only fosters cooperation, but also improves economic outcomes.

6. Conclusion

This paper studies the relationship between lineage-based heterogeneity and the nature of cooperative behavior in Chinese villages. Rural China provides an excellent environment for this study because China's central government arbitrarily grouped adjacent lineages into administrative

villages during the communist movement. As a result, some villages are composed of one, or a few large lineages, while others are composed of a number of small lineages. The exogenously-determined lineage structure within a village presents a pseudo-experiment in lineage-based heterogeneity.

Using data from the 2002 CHIPS survey, we define three types of villages: Types 1 through 3, which range from most homogenous (Type 1) to most heterogeneous (Type 3). We find that people in Types 1 or 2 villages are more likely than those in Type 3 to have both intra-lineage and cross-lineage cooperation. In terms of intra-lineage cooperation, we find that monetary and non-monetary reciprocity among lineage members are more likely to occur in Types 1 and 2 villages than in Type 3 villages. With regard to cross-lineage cooperation, villagers from Types 1 and 2 villages are found to fulfill higher percentage of the requirement of free labor than those from Type 3 villages. We also find that Types 1 and 2 villages spend a greater share of the village budget on public goods relative to Type 3 villages, and the share of public goods in the village budget also grew faster in Type 1 villages compared to Type 3 villages during 1998 to 2002.

This paper adds to the existing empirical literature on the relationship between cooperation and diversity by simultaneously examining intra-group and cross-group cooperative behavior. We first study physical and monetary cooperation among villagers. In our analysis, we provide a channel through which heterogeneity affects the provision of public goods, because lineage-based heterogeneity and the share of the village budget spent on public goods are both measured at a micro-geographic level, i.e., the village level. All these taken together provide evidence that lineage structure can also be viewed through Fukayama's (2011) tribalism lens, adding to our growing understanding of what constitutes the glue that holds societies together. A future direction for this research is to understand how income distribution between lineages affect mutual help and public good provision.

Although, we use two different dependent variables to study intra-lineage and cross-lineage cooperation, we have a single source of variation in the independent variable – the degree of homogeneity in the village. Since we are using relatives and neighbors to approximate lineage members, there may still be some concerns about the difference between intra-group and cross-group cooperative behavior. A follow-up study that uses more specific questions to gather data about lineage members and distinguishes them from non-lineage members could reinforce our findings. Nevertheless, our study provides significant evidence that the lineage system continues

to play an important role in the growth and development of rural China. Informal norms associated with lineage affiliation guide villagers' behavior, and can actually serve as a good substitute for some types of formal institutions in rural China. It is not a rare phenomenon that lineage authorities help mediate disputes involving violence between lineage members. This is sometimes even more effective than formal policing and enforcement. Thus, our findings suggest that policy-makers can utilize the power of large lineages to promote the provision of public goods and enhance the effectiveness of rural development. Indeed, we find that Type 1 villages do better not only in terms of financial assets and income but are also more likely to have a junior high school in the village.

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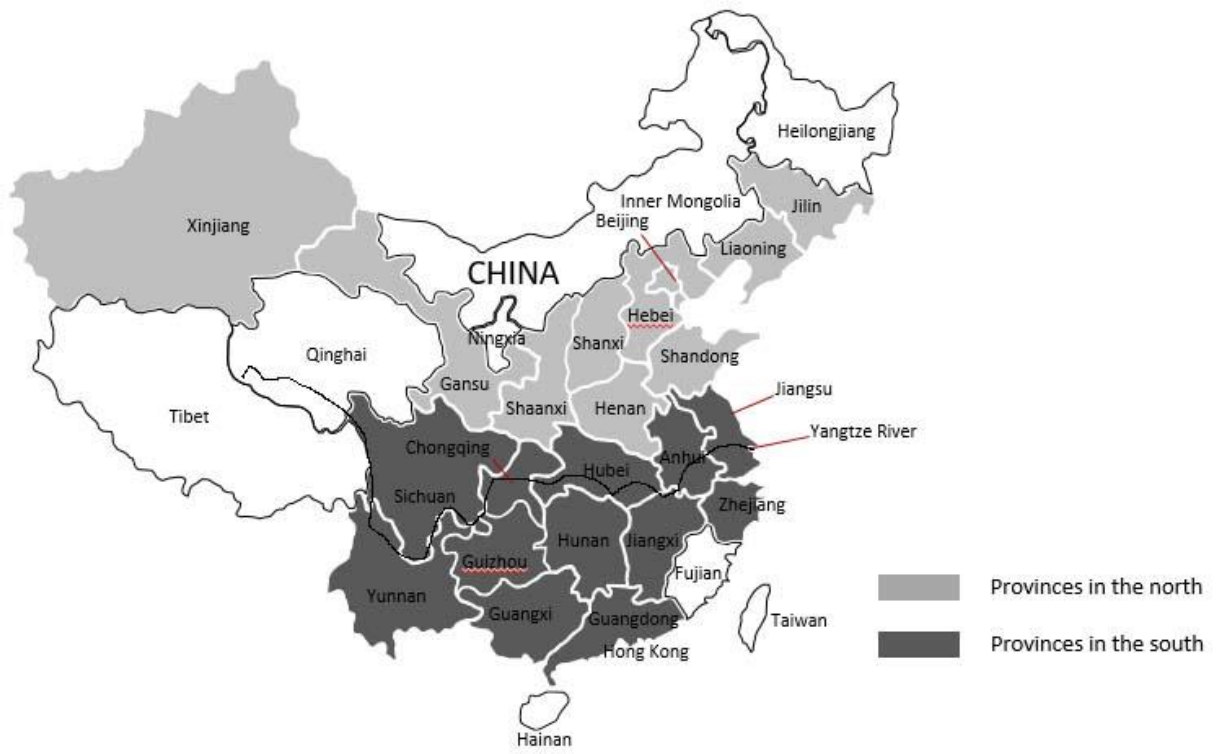
Figure 1. The Surveyed Provinces in China

Type 1: Most dominating
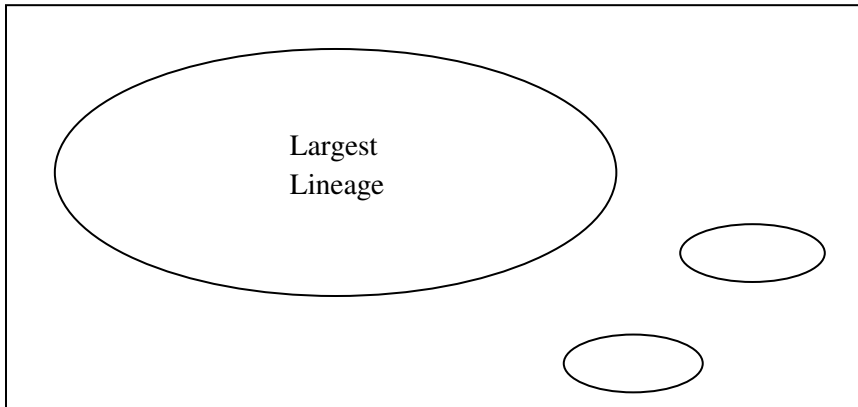

Type 2: Moderately dominating
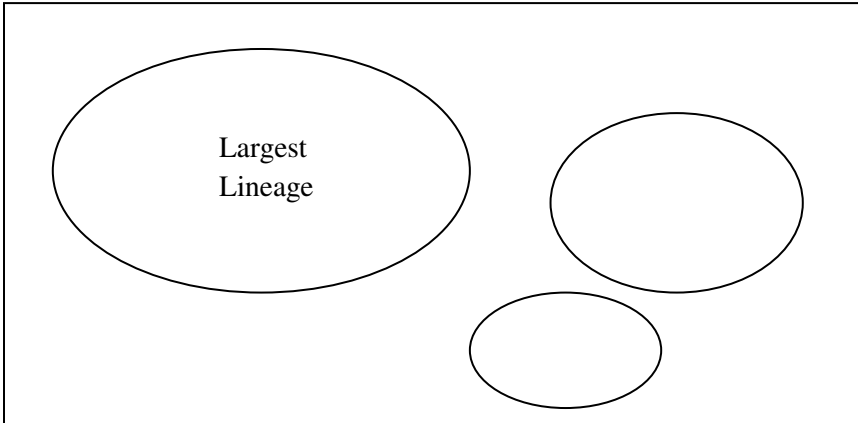
Type 3: Least dominating
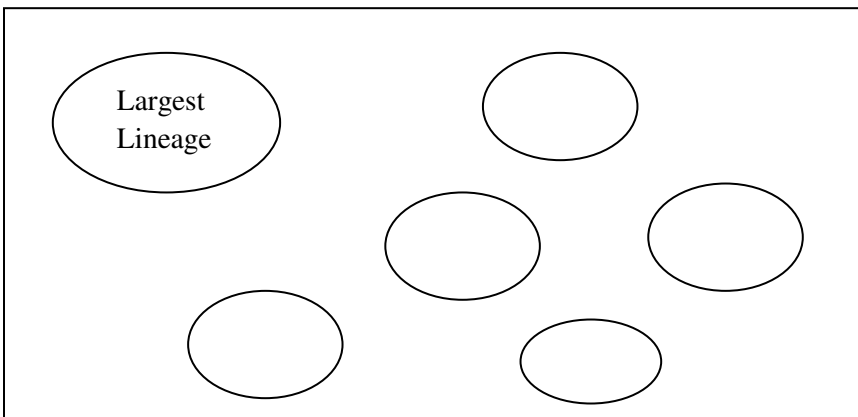
Figure 2. Three Types of Villages by Lineage Structures

Table 1 Summary Statistics

	Definition	Mean (Std. Dev.)			Obs,
		All	South	North	
Dependent Variable					
Borrow	=0 if none/few or sometimes; =1 if often or very often	0.383 (0.486)	0.387 (0.487)	0.379 (0.486)	9180
Help	=0, 1, 2, or 3. The smallest value of help is 0, which means the respondent answers "non/few" or "sometimes" to all three categories (help farming, help house building and help taking care of others); the largest value of help is 3, which means the respondent answers "often" or "very often" to all the three categories	1.645 (1.026)	1.575 (1.037)	1.731 (1.007)	9180
Fulfill	=1 if the respondent physically fulfills the assigned collective working requirement without paying any penalty; =(actually completed unpaid working days/ required unpaid working days) if not	0.891 (0.285)	0.881 (0.298)	0.903 (0.268)	9180
Share	the share of the village budget spent on education, medical system, and other public goods	0.149 (1.767)	0.141 (0.170)	0.157 (0.183)	779
Sgrowth	change of *share* from 1998 to 2002	-0.005 (0.166)	-0.006 (0.154)	-0.003 (0.176)	769
Independent Variable (Village Characteristics)					
TYPE1	=1 if one largest lineage dominates in the village; =0 if not	0.299 (0.458)	0.302 (0.460)	0.295 (0.457)	961
TYPE2	=1 if five largest lineages dominate in the village; =0 if not	0.368 (0.483)	0.398 (0.490)	0.335 (0.472)	961
MOUNTAIN	=1 if in mountainous area; =0 if in hilly or plain area	0.505 (0.500)	0.650 (0.478)	0.341 (0.474)	959
SUBURB	=1 if the suburb of a city/middle of city; =0 if not	0.080 (0.272)	0.051 (0.220)	0.113 (0.317)	961
DISTANCE TO TRANSPORTATION	Distance from the closest transportation terminals in kilometers	5.449 (8.236)	5.062 (7,674)	5.883 (8.811)	938
DISTANCE TO COUNTY	Distance from the nearest county in kilometers	24.128 (21.054)	26.519 (22.166)	21.699 (19.442)	955
POVERTY	=1 if the village is in a county designated as a province or national level poverty county or in a town designated as a province level poverty town; =0 if not	0.317 (0.466)	0.363 (0.481)	0.266 (0.442)	961
POPTOTAL	Population of the village in 2002	1811.825 (1185.602)	1928.862 (1307.258)	1691.578 (1033.645)	961
VINCOME	2002 net income per capita (in yuan) of the village	2453.4 (1497.472)	2860.242 (1711.333)	2035.351 (1094.09)	951
PLANTAREA	2002 total planting area (in mu) for the village	3553.328 (2928.316)	3011.117 (2503.255)	4109.295 (3216.957)	953
CANAL98	=1 if using canal as a major irrigating method in 1998; =0 if using well	0.692 (0.462)	0.901 (0.299)	0.442 (0.497)	908

(Continued on next page)

Table 1: Summary Statistics (continued)

	Definition	All	South	North	Obs.
Independent Variable (Village Head Characteristics)					
YEARS IN OFFICE	= number of years the village head has been in office	5.197 (0.499)	5.315 (5.112)	5.061 (4.827)	960
AGE	=1 if the age of the village head is 29 or less; =2 if the village head is 30-34; =3 if village head is 35-39; =4 if village head is 40-44; =5 if village head is 45-49; =6 if village head is 50-54; =7 if village head is 55 or above	4.518 (1.449)	4.456 (1.476)	4.589 (1.416)	960
EDUCATION	=1 if the educational level of the village head is primary school or less; =2 if junior middle school; =3 if senior middle school; =4 if technical secondary school; = 5 if college or above	2.463 (0.914)	2.450 (0.869)	2.478 (0.962)	960
MANAGEMENT EXPERIENCE	=1 if the village head has enterprise management experience of ; =0 if otherwise	0.381 (0.486)	0.365 (0.482)	0.399 (0.490)	960
NON-AGRI BUSINESS EXPERIENCE	=1 if the village head has operating nonagricultural family business experience ; =0 if otherwise	0.409 (0.492)	0.405 (0.491)	0.413 (0.492)	960
Independent Variable (Party Secretary Characteristics)					
YEARS IN OFFICE	= the number of years the party secretary has been in office	7.123 (6.787)	6.950 (6.287)	7.320 (7.312)	960
AGE	=1 if the age of the party secretary is 29 or less; =2 if party secretary is 30-34; =3 if party secretary is 35-39; =4 if party secretary is 40-44; =5 if party secretary is 45-49; =6 if party secretary is 50-54;=7 if party secretary is 55 or above	4.860 (1.409)	4.767 (1.441)	4.965 (1.366)	960
EDUCATION	=1 if the educational level of the party secretary is primary school or less; =2 if junior middle school; =3 if senior middle school; =4 if technical secondary school; = 5 if college or above	2.583 (1.004)	2.547 (0.939)	2.623 (1.073)	960
MANAGEMENT EXPERIENCE	=1 if the party secretary has enterprise management experience ; =0 if otherwise	0.387 (0.487)	0.372 (0.484)	0.404 (0.491)	960
NON-AGRI BUSINESS EXPERIENCE	=1 if the party secretary has operating nonagricultural family business experience; =0 if otherwise	0.459 (0.496)	0.467 (0.499)	0.450 (0.498)	960

(Continued on next page)

Table 1: Summary Statistics (continued)

	Definition	All	South	North	Obs.
Independent Variable (Personal Characteristics)					
FEMALE	=1 if female; =0 if male	0.255	0.230	0.285	8032
		(0.436)	(0.421)	(0.452)	
AGE	Age of the respondent	45.354	45.552	45.109	8032
		(10.692)	(10.806)	(10.544)	
MARRIAGE	=1 if the respondent is married; =0 otherwise	0.951	0.945	0.958	8032
		(0.215)	(0.227)	(0.200)	
CADRE[A]	=1 if the respondent is a cadre; =0 if not	0.160	0.166	0.152	8032
		(0.366)	(0.372)	(0.359)	
EDUCATION[B]	The respondent's years of schooling	7.010	6.787	7.287	8032
		(2.716)	(2.738)	(2.661)	
HHINCOME	Total net household income (in yuan) in 2002	10704.25	12308.3	8903.212	8027
		(8594.038)	(10037.08)	(6128.024)	
HHSIZE	Total number of residents living in household for 6 months or more	4.100	4.143	4.025	8032
		(1.306)	(1.296)	(1.314)	
SURNAME	=1 if respondent belongs to the largest lineage; =0 if not	0.412	0.406	0.420	8029
		(0.492)	(0.491)	(0.493)	
PAST DISASTER	Number of natural disasters suffered in the past five years (1998-2002)=1 if none; =2 if one; =3 if two; =4 if three or more	1.990 (1.108)	1.798 (1.010)	2.228 (1.176)	7980

Note:

a. In 2002, 1 USD= 8.2770 Yuan , according to *China Statistical Yearbook 2011*

b. "Cadre" means administrators in China. In both Russia's and China's revolutionary eras, this word refers to a group of leaders active in promoting the revolution of the communist party. It no longer has any revolutionary implications in today's China.

c. If there is a missing value, we replace it with a value estimated from education level. For example, if the education level is college or above, years of schooling = 17; if the education level is professional school, years of schooling = 14; if the education level is middle level professional, technical or vocational school, years of schooling = 12; if the education level is senior middle school, years of schooling = 12; if the education level is junior middle school, years of schooling = 9; if the education level is 4 or more years of elementary school, years of schooling = 5; if the education level is 1-3 years of elementary school, years of schooling = 2; if the education level is illiterate or semi-illiterate, years of schooling = 0.

Table 2: Share of Each Village Type for Each Province

Provinces	Number of Villages	Village Types		
		Type1	Type2	Type3
Northern Provinces				
Beijing	16	0.375	0.313	0.313
Hebei	37	0.622	0.324	0.0541
Shaanxi	37	0.514	0.405	0.0811
Shanxi	40	0.350	0.500	0.150
Gansu	32	0.313	0.375	0.313
Shandong	63	0.587	0.317	0.0952
Henan	53	0.283	0.679	0.0377
Xinjiang	80	0.0500	0.0375	0.912
Liaoning	45	0.0889	0.444	0.467
Jilin	48	0.0208	0.167	0.813
Southern Provinces				
Jiangsu	44	0.0682	0.386	0.545
Zhejiang	53	0.566	0.189	0.245
Anhui	44	0.295	0.386	0.318
Jiangxi	43	0.302	0.535	0.163
Chongqing	20	0.0500	0.300	0.650
Sichuan	50	0.260	0.360	0.380
Hubei	52	0.288	0.481	0.231
Hunan	45	0.267	0.467	0.267
Guangdong	53	0.509	0.321	0.170
Yunnan	26	0.154	0.308	0.538
Guangxi	40	0.275	0.525	0.200
Guizhou	40	0.300	0.500	0.200

Table 3: Selection on Obervables

Dependent Variables: individual characteristics and village characteristics

Dep. Var.	Independent variables								Obs
	Type1		Type2		T1_S		T2_S		
Individual Characteristics									
AGE	1.681**	[0.714]	1.131*	[0.623]	0.027	[1.001]	-0.514	[0.869]	6,840
MARRIAGE	-0.001	[0.011]	-0.015	[0.011]	-0.008	[0.016]	-0.004	[0.016]	6,840
CADRE	0.016	[0.029]	0.009	[0.023]	0.014	[0.037]	0.012	[0.033]	6,816
EDUCATION	0.172	[0.189]	-0.148	[0.177]	-0.077	[0.241]	0.064	[0.219]	6,840
HHINCOME	0.04	[0.050]	-0.027	[0.058]	-0.074	[0.083]	0.001	[0.076]	6,836
HHSIZE	0.13	[0.099]	-0.003	[0.087]	-0.045	[0.136]	0.017	[0.114]	6,840
SURNAME	**0.406***	**[0.049]**	**0.079***	**[0.044]**	**0.145***	**[0.060]**	**0.139***	**[0.052]**	6,839
PAST DISASTER	-0.026	[0.156]	0.099	[0.129]	0.126	[0.190]	0.086	[0.165]	6,774
Village Characteristics									
SUBURB	-0.034	[0.026]	-0.019	[0.027]	-0.013	[0.047]	-0.008	[0.040]	733
MOUNTAIN	-0.056	[0.076]	0.039	[0.067]	-0.041	[0.106]	0.005	[0.086]	733
DISTANCE TO TRANSPORTATION	-0.188	[1.480]	2.551*	[1.535]	-0.216	[1.642]	-2.559	[1.698]	718
DISTANCE TO COUNTY	-4.075	[4.404]	-1.821	[3.748]	6.217	[5.328]	2.138	[4.974]	729
POVERTY	-0.036	[0.088]	0.064	[0.074]	0.174	[0.123]	0.054	[0.104]	733
POPTOTAL	-0.121	[0.122]	-0.1	[0.089]	-0.07	[0.162]	0.098	[0.115]	733
VINCOME	-0.067	[0.068]	-0.132**	[0.066]	-0.016	[0.103]	0.116	[0.090]	727
PLANTAREA	-0.188	[0.151]	0.053	[0.105]	0.14	[0.223]	0.048	[0.176]	729
CANAL98	-0.09	[0.058]	-0.067	[0.069]	0.014	[0.080]	0.086	[0.076]	694
PENALTY	3.484	[2.766]	1.795	[2.368]	-4.276	[3.030]	-0.524	[2.713]	153
Village leaders(the party secretary)									
YEARS IN OFFICE	0.921	[1.030]	-0.806	[0.806]	-2.204	[1.376]	1.406	[1.247]	733
AGE	0.115	[0.223]	0.001	[0.219]	-0.187	[0.306]	0.231	[0.288]	733
EDUCATION	-0.213	[0.213]	-0.147	[0.158]	0.029	[0.246]	0.119	[0.201]	733
MANAGEMENT EXPERIENCE	-0.013	[0.093]	0.072	[0.089]	-0.139	[0.108]	-0.168	[0.108]	733
NON-AGRI BUSINESS EXPERIENCE	0.002	[0.094]	-0.025	[0.079]	-0.148	[0.118]	-0.051	[0.101]	733
Village leaders(village head)									
YEARS IN OFFICE	-0.294	[0.644]	-0.852	[0.600]	-0.179	[0.948]	0.331	[0.917]	726
AGE	0.711***	[0.264]	0.336	[0.207]	-0.822**	[0.346]	-0.519*	[0.285]	729
EDUCATION	-0.305*	[0.160]	-0.357**	[0.147]	0.1	[0.193]	0.236	[0.184]	729
MANAGEMENT EXPERIENCE	-0.084	[0.071]	-0.074	[0.071]	-0.035	[0.092]	-0.037	[0.093]	729
NON-AGRI BUSINESS EXPERIENCE	-0.029	[0.085]	-0.098	[0.068]	-0.016	[0.112]	0.143	[0.095]	729

Note: *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. Clustering of the residuals is at the county level. All specifications include province dummies

Table 4: Lineage-based Heterogeneity and Intra-lineage Cooperative Behavior

Dependent Variables: *borrow* and *help*

	borrow			*help*		
	(1)	(2)	(3)	(4)	(5)	(6)
TYPE1	0.0715**	0.0722**	0.0909***	0.139**	0.152**	0.175**
	(0.0284)	(0.0292)	(0.0309)	(0.0688)	(0.0691)	(0.0745)
TYPE2	0.0645**	0.0597**	0.0653**	0.134**	0.131**	0.115*
	(0.0270)	(0.0270)	(0.0283)	(0.0621)	(0.0618)	(0.0664)
AGE		0.0111***	0.0106***		0.0140*	0.0129
		(0.00386)	(0.00404)		(0.00783)	(0.00807)
AGE^2		-0.000155***	-0.000151***		-0.000238***	-0.000216**
		(4.08e-05)	(4.24e-05)		(8.55e-05)	(8.74e-05)
FEMALE		-0.0395**	-0.0337**		-0.0484	-0.0193
		(0.0155)	(0.0164)		(0.0370)	(0.0364)
MARRIAGE		-0.0338	-0.0450		-0.0787	-0.0942
		(0.0288)	(0.0298)		(0.0600)	(0.0607)
CADRE		0.0360**	0.0348**		-0.00287	0.00197
		(0.0153)	(0.0159)		(0.0417)	(0.0363)
EDUCATION		-0.00456*	-0.00499*		-0.0130**	-0.00988*
		(0.00248)	(0.00262)		(0.00554)	(0.00588)
HHINCOME		-0.0362***	-0.0141		-0.0610**	-0.0103
		(0.0118)	(0.0120)		(0.0257)	(0.0262)
HHSIZE		0.0322***	0.0271***		0.0388***	0.0240**
		(0.00522)	(0.00544)		(0.0117)	(0.0120)
SURNAME		-0.00753	-0.0160		-0.0305	-0.0449
		(0.0173)	(0.0179)		(0.0380)	(0.0395)
PAST DISASTER		0.0153*	0.0122		0.0116	-0.0103
		(0.00859)	(0.00924)		(0.0200)	(0.0215)
SUBURB			0.0291			-0.00597
			(0.0472)			(0.0993)
MOUNTAIN			0.0203			0.0861
			(0.0256)			(0.0627)
DISTANCE TO COUNTY			0.000154			0.00152
			(0.000602)			(0.00159)
POVERTY			0.0222			-0.0405
			(0.0272)			(0.0659)
POPTOTAL			0.0367*			0.00420
			(0.0211)			(0.0499)
VINCOME			0.573			0.842
			(0.434)			(0.975)
VINCOME^2			-0.0414			-0.0684
			(0.0281)			(0.0635)
PLANTAREA			-0.0106			0.000555
			(0.0155)			(0.0344)
CANAL98			0.0117			0.0829
			(0.0283)			(0.0675)
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,032	7,941	7,367	8,032	7,941	7,367
R-squared	0.021	0.036	0.045	0.053	0.065	0.068

Note: *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. Coefficients are based on OLS estimates. Clustering of the residuals is at the village level. All specifications are individual analysis.

Table 5: Lineage-based Heterogeneity and Cross-lineage Cooperative Behavior

Dependent Variables: *fufill, share* **and** *sgrowth*

	fufill			*share*		*sgrowth*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TYPE1	0.0958*	0.0762	0.0894	0.0322**	0.0394**	0.0343**	0.0312*
	(0.0561)	(0.0554)	(0.0572)	(0.0143)	(0.0162)	(0.0153)	(0.0182)
TYPE2	0.0877*	0.0793*	0.0696	0.0219	0.0333*	0.0195	0.0228
	(0.0459)	(0.0455)	(0.0465)	(0.0169)	(0.0179)	(0.0153)	(0.0165)
AGE		0.00408	-0.000610				
		(0.0127)	(0.0123)				
AGE^2		-5.46e-05	-5.92e-08				
		(0.000157)	(0.000149)				
FEMALE		-0.00446	-0.00206				
		(0.0289)	(0.0291)				
MARRIAGE		-0.00591	0.0170				
		(0.0522)	(0.0544)				
CADRE		0.0101	-0.00634				
		(0.0296)	(0.0270)				
EDUCATION		-0.000249	0.00210				
		(0.00461)	(0.00491)				
HHINCOME		-0.0439*	-0.0351				
		(0.0230)	(0.0242)				
HHSIZE		0.0101	0.000568				
		(0.0114)	(0.0123)				
SURNAME		0.0651**	0.0427				
		(0.0326)	(0.0365)				
PAST DISASTER		0.0302*	0.00483				
		(0.0170)	(0.0187)				
Village controls	No	No	Yes	No	Yes	No	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,424	1,406	1,282	760	695	737	680
R-squared	0.303	0.320	0.346	0.124	0.152	0.034	0.048

*** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. Coefficients are based on OLS
estimates. Column (1) to (3) are individual level analysis and residuals are clustered at the village level.
The others are village level analysis and residuals clustered at the county level.

Table 6: Lineage-based Heterogeneity and Cooperative Behavior: South-North Comparison

	Borrow		*Help*		*Fufill*		*Share*		*Sgrowth*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	South	North	South	North	South	North	South	North	South	North
TYPE1	0.125***	0.0491	0.217**	0.0728	0.152**	-0.0744	0.0344*	0.0441	0.0420*	0.0160
	(0.0383)	(0.0539)	(0.0984)	(0.111)	(0.0695)	(0.0914)	(0.0194)	(0.0292)	(0.0249)	(0.0275)
TYPE2	0.0837**	0.0519	0.188**	-0.0316	0.107*	-0.126*	0.0251	0.0357	0.0395*	-0.00212
	(0.0341)	(0.0499)	(0.0851)	(0.103)	(0.0601)	(0.0679)	(0.0184)	(0.0334)	(0.0198)	(0.0274)
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Village controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,242	3,125	4,242	3,125	811	471	387	308	382	298
R-squared	0.059	0.049	0.083	0.055	0.385	0.390	0.215	0.120	0.068	0.077

Note: *** denotes $p<0.01$, ** denotes $p<0.05$, and * denotes $p<0.1$. Coefficients are based on OLS estimates. Column (1) to (6) are individual level analysis and residuals are clustered at the village level. The others are village level analysis and residuals are clustered at the county level.

Table 7: Robustness Check: Job Characteristics

	Borrow			Help			Fulfill		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
TYPE1	0.125***	0.128***	0.128***	0.214**	0.218**	0.217**	0.161**	0.156**	0.164**
	(0.0384)	(0.0384)	(0.0386)	(0.0981)	(0.0977)	(0.0976)	(0.0694)	(0.0694)	(0.0695)
TYPE2	0.0832**	0.0855**	0.0851**	0.184**	0.190**	0.186**	0.114*	0.111*	0.118*
	(0.0341)	(0.0341)	(0.0341)	(0.0850)	(0.0848)	(0.0847)	(0.0600)	(0.0606)	(0.0605)
Job Category	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Working Location	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Individual Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,242	4,242	4,242	4,242	4,242	4,242	811	811	811
R-squared	0.061	0.060	0.062	0.087	0.086	0.089	0.399	0.390	0.402

Note: *** denotes $p<0.01$, ** denotes $p<0.05$, and * denotes $p<0.1$. Coefficients are based on OLS estimates. Clustering of the residuals is at the village level. All specifications are individual analysis.

Table 8: Robustness Check: Village Leaders' Quality

	Fulfill (1)	*Share* (2)	*Sgrowth* (3)
TYPE1	0.165**	0.0369*	0.0454*
	(0.0699)	(0.0194)	(0.0256)
TYPE2	0.131**	0.0255	0.0403*
	(0.0625)	(0.0177)	(0.0205)
Leaders' Quality	Yes	Yes	Yes
Individual Controls	Yes	No	No
Village controls	Yes	Yes	Yes
Province FE	Yes	Yes	Yes
Observations	811	383	378
R-squared	0.433	0.240	0.088

Note: *** denotes $p<0.01$, ** denotes $p<0.05$, and * denotes $p<0.1$. Coefficients are based on OLS estimates.
Column (1) is an individual analysis and residuals are clustered at the village level. The others are village level analysis and residuals are clustered at the county level.

Table 9: Intra-lineage Cooperation in Type 1 Villages
Dependent Variable: *Borrow* and *Help*

	Borrow			*Help*		
	(1)All	(2)South	(3)North	(4)All	(5)South	(6)North
SURNAME	0.286*	0.248	0.24	0.360**	0.660***	0.118
	[0.167]	[0.244]	[0.235]	[0.169]	[0.225]	[0.265]
AGE	0.045	0.004	0.123**	0.06	0.072	0.099
	[0.039]	[0.054]	[0.057]	[0.047]	[0.077]	[0.063]
MARRIAGE	0.1	0.956**	-1.062**	-0.256	0.547	-1.263**
	[0.327]	[0.426]	[0.524]	[0.333]	[0.385]	[0.580]
CADRE	-0.097	-0.430*	0.365	0.288	-0.008	0.656**
	[0.173]	[0.232]	[0.317]	[0.184]	[0.239]	[0.282]
EDUCATION	0.000	0.009	-0.021	-0.04	-0.009	-0.065
	[0.029]	[0.039]	[0.047]	[0.027]	[0.034]	[0.044]
HHINCOME	0.07	0.211	-0.212	-0.007	0.068	-0.082
	[0.134]	[0.183]	[0.214]	[0.144]	[0.216]	[0.176]
HHSIZE	0.082*	0.137**	0.063	0.038	-0.021	0.091
	[0.049]	[0.066]	[0.080]	[0.048]	[0.070]	[0.069]
PAST DISASTER	0.03	0.072	-0.066	-0.023	-0.098	0.011
	[0.107]	[0.136]	[0.178]	[0.093]	[0.114]	[0.157]
Village FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of villages	277	168	109	262	159	103
Observations	904	542	362	993	604	389

Note:
*** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. Coefficients are based on probit estimates (*borrow*) and ordered probit estimates (*help*). Clustering of the residuals is at the village level. All specifications are individual level analysis and include village dummies.

Table 10: Lineage-based Heterogeneity and Other Economic Outcomes
Dependent Variables: *Assets, Income, Migrant* and *Education*

	Individual level		Village level	
	Assets	*Income*	*Migrants*	*School*
	(1) OLS	(2) OLS	(3) OLS	(4) Probit
TYPE1	0.141***	0.0694***	0.0238**	0.117**
	(0.0303)	(0.0176)	(0.00984)	(0.0531)
TYPE2	0.145***	0.0983***	0.0183**	0.0949**
	(0.0261)	(0.0149)	(0.00783)	(0.0420)
AGE	-0.00693*	0.0210***		
	(0.00359)	(0.00192)		
AGE^2	8.23e-05*	-0.000229***		
	(4.22e-05)	(2.27e-05)		
FEMALE	0.0267	-0.0297**		
	(0.0216)	(0.0125)		
MARRIAGE	0.0706*	-0.137***		
	(0.0367)	(0.0194)		
CADRE	-0.187***	0.0623***		
	(0.0414)	(0.0218)		
EDUCATION	0.0129***	0.00193		
	(0.00390)	(0.00225)		
HHSIZE	0.0541***	0.110***		
	(0.00850)	(0.00463)		
SURNAME	0.0379*	-0.00869		
	(0.0227)	(0.0127)		
PAST DISASTER	-0.0606***	0.0174***		
	(0.0110)	(0.00534)		
SUBURB	-0.287***	-0.279***	-0.00608	-0.000391
	(0.0534)	(0.0361)	(0.0143)	(0.0616)
MOUNTAIN	-0.420***	-0.138***	0.0340***	-0.0450
	(0.0263)	(0.0177)	(0.0117)	(0.0401)
DISTANCE TO COUNTY	-0.000219	0.000337	9.97e-05	-7.39e-05
	(0.000539)	(0.000244)	(0.000186)	(0.000696)
POVERTY	-0.851***	-0.152***	-0.00433	0.0510
	(0.0262)	(0.0132)	(0.0115)	(0.0359)
POPTOTAL	-0.105***	-0.242***	0.00900	0.188***
	(0.0293)	(0.0189)	(0.0101)	(0.0373)
VINCOME	-8.883***	0.385	-0.0411***	-0.0491
	(0.444)	(0.313)	(0.0134)	(0.0423)
PLANTAREA	0.00559	0.240***	0.00435	-0.0663***
	(0.0210)	(0.0157)	(0.00518)	(0.0162)
CANAL98	0.246***	0.124***	0.0185	0.0381
	(0.0400)	(0.0203)	(0.0151)	(0.0404)
Province FE	YES	YES	YES	YES
Observations	17,436	18,932	469	422
R-squared	0.337	0.225	0.263	0.288

Note: *** denotes p<0.01, ** denotes p<0.05, and * denotes p<0.1. Column (1) to (2) are individual level analysis and residuals are clustered at the village level. The others are village level analysis and residuals are clustered at the county level. Coefficients from column (1) to (3) are based on OLS estimates. Coefficients in column (4) are marginal probit coefficients calculated at the means. *Assets* measures the total amount of financial assets of the respondents. *Income* measures the respondents' income from farming, fishing and forestry. *Migrants* measures the percentage of rural-urban migrants in each village. *Education* is a dummy variable which is equal to one if there is a junior high school located in the village.