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Cooperation Under Elite Control: Community Policing in Tanzania[†]

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Abstract

I explore whether and how community policing (CP) in Tanzania is associated with people's welfare. When locals voluntarily formed CP, communities had lower likelihood of property being stolen and larger consumption compared to those without CP. However, this consumption premium existed only in its top 20 distribution percentiles. The remaining majority were indifferent to CP but still favored a village leader's communal management. Agricultural wage rates were also higher, and negative economic shocks were effectively absorbed. These findings are not inconsistent with a developed game-theoretic model wherein a politically powerful elite protects his/her property by mobilizing all the citizens to join CP while giving them minimum rents. Elites' individualized monetary incentive may forge the citizens' norms of cooperation, which are welfare-enhancing but primarily benefit the elites. No distinct welfare consequences existed when the government promoted CP.

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1 Introduction

Peace and security are indispensable to economic development; however, political unrest in Africa (e.g., armed conflict, terrorism, and criminal violence) has prevented it from achieving this critical pre-condition (e.g., Hills, 2000). The available personnel and material resources needed to settle public disorder are usually scarce (e.g., Baker, 2009, p.92), and the police are often considered to be one of the most corrupt public institutions (e.g., Scher, 2010). Against this backdrop, relevant researchers and policymakers have long debated the usefulness of community policing (CP) as a possible complement to state policing (e.g., Baker, 2009; Francis, 2012).

The concept of CP was popularized in North America and Europe from the 1980s. It has been disseminated to many African countries due to the efforts of foreign donor governments, international organizations, and NGOs as part of police reform processes. The manner of localizing CP differs across regions (even within a country). It typically involves citizens' contribution to prevention, deterrence, investigation, and resolution. Moreover, it occasionally involves private punishment of criminal cases while maintaining mutual trust and cooperation between police forces and communities. Despite its popularity and potential significance, empirical research aimed at understanding the socioeconomic consequences of CP is scarce, except for numerous case studies.[1] To fill this knowledge gap, this study explores whether and how CP is associated with citizens' welfare. This question is particularly important because in many cases (and unless it declines), CP is considered to assist the economic interests of only locally dominant elites rather than those of a wider community, thereby increasing social inequalities (e.g., Brogden, 2004; Cross, 2016; Ruteere and Pommerolle, 2003).

To demonstrate how social inequalities increase as a result of CP, this study first develops a simple extensive-form game wherein one elite and numerous citizens have the risk of losing their property to crime in a community. In this game, the local elite first proposes to start CP. Compared with the citizens, the elite is assumed to have stronger political power and, thus, bears a smaller cost of organizing a community-wide cooperation when proposing CP. When the citizens are poor and their social marginal return (i.e., the sum of their private marginal return) from their participation in CP is smaller than the corresponding marginal cost, it is difficult for them to maintain CP in a self-enforcing manner. Nevertheless, they may accept the elite's offer if he/she compensates them by providing some rents for those who contribute to CP. Consequently, the elite can initiate CP to protect his/her property by giving minimal rents to them. While the rents can take various forms, the elite is assumed to offer a job to the citizens because it is considered to be a

[1] These examples include Ethiopia (e.g., Di Nunzio, 2014), Kenya (e.g., Skilling, 2016), Mozambique (Kyed, 2010), Nigeria (e.g., Hills, 2014), Sierra Leone (e.g., Baker, 2008), South Africa (e.g., Brogden, 2002), and Tanzania (e.g., Musuguri, 2016).

more credible manner of transferring rents from local elites to the citizens than other alternatives such as income transfer and risk-sharing (e.g., Baland and Robinson, 2008; Robinson and Verdier, 2013). At equilibrium, all the citizens actively work for CP (CP equilibrium).

The model yields several predictions. First, local elites in communities maintaining CP (CP communities) are likely to have stronger political power and, therefore, greater social respect from the citizens than those in communities without CP (no-CP communities). Second, the lower rate of losing property as well as greater total welfare and rent transfers are expected to exist in the CP communities compared with the no-CP communities. While the total welfare in the CP communities is, on average, larger than that in the no-CP communities, its distribution is unequal. Local elites in the CP communities enjoy greater welfare than those in the no-CP communities, whereas the majority of citizens only achieve welfare equivalent to that obtained without CP. This welfare consequence for the citizens is noticeable because in the model, the CP members are ex ante allowed not to make effort, which is unobserved by an elite. In such a situation, an elite needs to provide some information rents for the citizens to induce their effort. However, since CP mutually monitors its members' contribution and helps detect the citizens who shirk, it can ex post eliminate the risk of moral hazard without any information rents being provided to citizens.

Data exploited to empirically test these predictions are sourced from a nationally representative household survey (Tanzania National Panel Survey, TZNPS). It is implemented as part of the World Bank's research project, the Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA). This study uses the first wave of this panel survey (TZNPS 2008—2009) that includes information on whether a self-help security group exists in the surveyed communities. It compares the relevant welfare outcomes between communities forming such a group (i.e., CP communities) and those not forming it (i.e., no-CP communities).

The CP communities are further categorized into two groups depending on (the likelihood of) whether CP was formed with or without the external force by the government. Referring to Dal Bó et al. (2000), this study regards the former (latter) type of CP as exogenous (endogenous) CP. The prevailing view is that institutions are more effective when people voluntarily craft them rather than being forced to do so (e.g., Dal Bó et al., 2000; Sutter et al., 2010). Accordingly, making a distinction between the endogenous and exogenous CPs is likely to render the findings of this study rich and comprehensive.

The historical context of Tanzania, which officially introduced CP in 2006, provides a promising setting for this categorization (e.g., Scher, 2010). Unlike other African countries that adopted a generalized international model, Tanzania's vigilante movements during the 1980s and early 1990s indicate an approach taken for its contemporary CP (e.g., Cross, 2013, 2014, 2016). In response to the rising incidence of violent cattle rustling, village elders in northern Tanzania established a self-

help security group, called Sungusungu (in Swahili), in the early 1980s. Sungusungu fairly quickly spread from one village to another in the Greater Nyamawezi area, an area traditionally settled by the Nymawezi and a few culturally similar ethnic groups (e.g., Abrahams, 1987). Recognizing the value of Sungusungu, the government subsequently promoted the formation of local security groups imitating Sungusungu throughout the country (e.g., Fleisher, 2000; Heald, 2006). Most groups established as a result of the government orders were short-lived because of community members' limited commitment to cooperation and the relevant inter-member conflict (Mwaikusa, 1995, p. 171). However, the manner of facilitating and organizing CP at present is quite similar to that adopted in those days. Sungusungu in the Greater Nyamwezi area has still actively dealt with property crime and local disputes in a self-enforcing manner since the 1980s (i.e., over 30 years). As such, this study regards the endogenous (exogenous) CP communities as those organizing a self-help security group in (out of) the Greater Nyamawezi area.

As demonstrated in the empirical analysis, the likelihood of households losing property to theft, particularly livestock (an important means of savings in rural settings), is significantly lower, by approximately 30 percentage points, in the endogenous CP communities than in the no-CP communities. Compared with the residents in the no-CP communities, those in the endogenous CP communities also enjoy larger consumption per adult equivalent by approximately 37 percentage points, in addition to having more pronouncedly accumulated livestock. However, this consumption premium exists only for the respondents belonging to the top 20% of the consumption distribution, whereas the consumption level of those in the lower percentiles is not significantly different between the endogenous CP and no-CP communities. Despite this unfair welfare distribution, the households in the endogenous CP communities more positively evaluated the performance of a village chairperson than those in the no-CP communities while attending village meetings more frequently. Using the terminology of Putnam (2000), attendance in village meetings is often considered to be a "bridging" social capital that local elites create to control and monitor the citizens. Furthermore, the households in the endogenous CP communities paid significantly higher wages per day for agricultural workers and dealt better with negative economic shocks than those in the no-CP communities. These findings are not inconsistent with the developed model of CP under elite control; however, other interpretations cannot be entirely ruled out. In contrast to these findings, no noticeable welfare difference existed between the exogenous CP and no-CP communities.

The key identification assumption of the empirical analysis is that CP's presence is not related to any attributes affecting the analyzed outcomes once appropriate factors are controlled for. Thus, this study controls for local conditions prior to 1980 because Sungusungu emerged in the early 1980s. First, and specifically for this study, I collected the district-level crime information between 1975 and 1980 from Tanzania's National Bureau of Statistics (NBS) with the help of

Tanzania Police Force (TPF) and applied this requisite control. Another set of controls included a community's historical population density in 1900, 1950, and 1980 (Goldewijk et al., 2010) as well as a community's distances to the travel routes of European explorers in the 18th and 19th centuries and to railway lines in operation during the first decade of the 20th century (Nunn and Wantchekon, 2011). Moreover, a great number of geographic and climate conditions available from the TZNPS at the "household" level were also controlled for. As a factor affecting the distribution of livestock, a community's tsetse suitability index (TSI) in 1977 was also originally estimated and included in regressors.

These pre-determined local conditions had no noticeable correlation with the presence of CP after controlling for the ethnic-territorial fixed effects, administrative regional fixed effects, and a community's GPS coordinates. The ethnic-territorial fixed effects also serve as an important control because they allow the relevant estimates to be identified using data variation within a particular ethnic homeland that shares any political, socio-economic, and cultural influence. Moreover, the households in the endogenous CP communities neither had a higher "bonding" social capital, which unites the citizens of similar social class (Putnam, 2000), nor favored the performance of political leaders (e.g., ward councilors, MPs, village/ward executive officers) other than a village chairperson. Thus, the main findings of this study are unlikely to be driven by general social capital and attitudes toward the government, which might have characterized the endogenous CP communities differently from the no-CP ones.

To the best of my knowledge, this study is the first and only large-scale empirical endeavor to understand the welfare consequences of CP in the developing world within and outside the field of economics. In addition, this study contributes to numerous strands of the extant literature. First, similar to the research on "clientelism" (e.g., Anderson et al., 2015; Baland and Robinson, 2008; Robinson and Verdier, 2013), it shows that a patron (e.g., an elite) gives patronage (e.g., jobs) to a client (e.g., citizens) supporting his/her decision (e.g., CP). This relationship may also explain why local elites can maintain strong political power if their influence is inimical to the citizens from a certain perspective (e.g., Acemoglu et al., 2014; Anderson et al., 2015; see also Mookherjee and Bardhan, 2012 for the relation between the clientelism and elite capture).[2]

Second, this study may also yield an insight into whether elite control in the developing world improves economic efficiency pertaining to the provision of public goods and the citizens' welfare. Apart from prior studies that have evaluated the efficiency of poverty targeting in government programs (e.g., Alatas et al., 2012; Galasso and Ravallion, 2005), relevant empirical research to date remains scarce. This research reveals a similarity to several recent studies, indicating some

[2]For example, CP (e.g., night-time patrol) is costly for the citizens who do not have much property to be protected.

positive perspectives of elite control (e.g., Do et al., 2017; Preciado et al., 2018). Furthermore, it shows a form of tradeoff between efficiency and equity regarding the public goods provided under elite control. This sort of tradeoff may also be seen in other settings, whereby a small number of elites can influence the behaviors of the remaining majority in the relevant societies (e.g., enforcement of international rules pertaining to global environment and trade).

Third, factors inducing people's cooperative norm is a central economic question (e.g., Tabellini, 2008). According to this study, local elites' individualized incentives to gain material resources can be a root cause of people's collective action. In this sense, this study relates to economic research on culture (e.g., Alesina and Giuliano, 2015), specifically to studies examining its origin (e.g., Alesina et al., 2013; Galor and Özak, 2016). Social capital tends to be small in a society with large inequality (e.g., Alesina and Ferrara, 2000; Fehr and Schmidt, 1999). However, this study analyzes great cooperation that may arise in step with an increasing inequality. Since local cooperation is typically unobserved in the real-world setting (Dell et al., 2018, p. 2086), the examination of observable CP may have a striking advantage in this regard.

Fourth, both the experimental and observational studies have previously highlighted a greater effectiveness of endogenously formed institutions than that of exogenously forced ones (e.g., Dal Bó et al., 2000; see also the literature cited therein); however, the reason why this difference arises has been insufficiently understood. This study highlights a function of economic rents transferred from politically powerful to less powerful agents. The differing effectiveness between the endogenous (i.e., Sungusungu) and exogenous CPs may also epitomize concomitant variance between indigenous and state institutions in explaining African economic development, as analyzed in macro-level studies (e.g., Michalopoulos and Papaioannou, 2013, 2014).[3]

More broadly, this study also explores welfare consequences of "community-driven development projects" or "self-help groups" and considers the role of local elites in prompting the formation of these projects/groups (e.g Mansuri and Rao, 2004). Furthermore, it also follows the line of the research in exploring the private provision of public goods (e.g., Bergstrom et al., 1986; Rege, 2004).

The remainder of the paper is structured as follows. Referring to prior case studies and my field surveys on Sungusungu, Section 2 provides the institutional background of CP in Tanzania. Section 3 develops a theoretical model of CP under elite control. Section 4 discusses an empirical strategy to explore welfare consequences of CP. Section 5 provides the data overview. Section 6 presents the empirical findings, with concluding remarks provided in Section 7.

[3]Maintaining law and order in the context of CP includes solving local disputes. Traditional leaders in Africa are responsible for these issues; see Michalopoulos and Papaioannou (2015).

2 CP in Tanzania

In Tanzania, budget shortfalls have lowered the quality of the police services in many ways (e.g., insufficient staffing, deficiencies in facilities and equipment, ruined police stations and posts).[4] Corruption and police brutality, prevailing in this sector and likely related to this funding shortage, have created much negative reputation for the police (e.g., Scher, 2010). To improve its public perception while addressing the rising incidence of violent crime, Tanzania launched a long-term police reform program in 2006. This program encourages citizens to engage in CP, as called Ulinizi Shirikishi (in Swahili), as one of the core strategies (e.g., Cross, 2016; Musuguri, 2016). Under the new legal framework, local leaders are promoted to form and register a self-help security group as CP, which closely works with the police. As per the perception of the police and public, however, Tanzania's contemporary CP is not a new concept. There are considerable similarities in terms of organizing the relevant local initiatives between CP and its historical predecessor (i.e., Sungusungu) sponsored by the ruling party in the 1980s and early 1990s.[5]

Previous studies have referred to Sungunsungu (meaning a species of large black biting ants in Swahili) as village vigilante groups (Abrahams, 1987) or grass-root justice organizations (Paciotti et al., 2005). The first Sungusungu organization was presumed to be established in the early 1980s near the border of Kahama and Nzega districts or on the eastern edge of Kahama District bordering the Shinyanga District in northern Tanzania (Abrahams, 1987). This organization has spread fairly quickly through the Greater Nyamwezi area, whereby the Nyamwezi and a few culturally similar ethnic groups (Sukuma, Sukuwa, Sumbwa, and Kimbu) have historically settled.[6] See a cross in Figure 1 for the origin of Sungusungu, along with a shaded region representing the Greater Nyamwezi area, as drawn from Weidmann et al. (2010)'s map (see subsection 4.1 for the details of this map).[7]

During the economic downturn in the early 1980s, which coincided with the return of troops from Uganda—Tanzania war (1978—1979) and the resultant influx of weapons, armed cattle rustling intensified in Tanzania. Since the state-provided control was ineffective, a group of village elders founded Sungusungu in response to this increasing violent cattle raiding (Bukurura, 1994, 1995a). According to prior studies as well as my field surveys conducted in September 2017 and February 2018 in Shinyanga (a region in northern Tanzania), Sungunsungu is not an organization that allows an individual's discretionary admission and withdrawal by charging membership fees.[8]

[4] The police-to-population ratio in Tanzania is 1 to 1400 compared with the international standards calling for 1 to 400—500 (Scher, 2010).

[5] Tanzania adopted a multi-party system in the early 1990s, and a single party has dominated its politics since then.

[6] The Sukuma and the Nyamwezi are the first and second largest ethnic groups in Tanzania.

[7] I defined this origin as a centroid of Kahama Township Authority, Kahama, Nzega, and Shinyanga districts.

[8] With the help of a local NGO, I conducted a semi-structured questionnaire-based survey for 35 rural respon-

Once a decision to form Sungusungu is made in a village, all able-bodied males (particularly, the youth) must cooperate in its mandatory activities. These include a night-time patrol (done in rotation a few times a week per household), attendance of regular village meetings, reporting of suspicious criminal cases, (if required) pursuit of thieves or stolen property, and so on (e.g., Bukurura, 1994). Villagers who neglect these duties and their families are ostracized till they pay a proper fine to Sungusungu, which pools a fine imposed on the apprehended criminals.[9] The collected fine is typically used to provide food, drink, transportation, and accommodation for those who trace criminals and stolen property; to treat those injured during Sungusungu duties; and to organize the relevant meetings.[10]

Since its establishment, Sungusungu has dealt with property crime (e.g., cattle, goat, and sheep) and disputes pertaining to adultery, debts, witchcraft, and land. Cases of violent crime (e.g., murder) are typically transferred to the police because Sungusungu members are just ordinary citizens armed only with traditional weapons (e.g., wood stick, machete, bow and arrow, and a whistle to raise an emergency alarm) and not particularly trained for CP.[11][12]

Sungusungu's organizational structure is hierarchical, comprising elected leaders (e.g., chief,

dents in Shinyanga Region and collected qualitative information pertaining to Sungusungu. In the 2017 survey, I invited 20 respondents to the NGO's office located in Shinyanga Municipal District, all of whom were from different communities located in Kahama District (2), Kishapu District (2), Shinyanga District (8), and Shinyanga Municipal District (7) as well as Mwanza (1), a capital city of Mwanza Region to the south of which Shinyanga Region exists. In the 2018 survey, I visited eight communities, randomly drawn from communities listed in the 2012 Population and Housing Census, and interviewed one or two people in each community. The 2018 survey resulted in 15 interviews in Kahama District (4), Kahama Township Authority (4), Kishapu District (4), Shinyanga District (1), and Shinyanga Municipal District (2), all of which together constitute the whole Shinyanga Region. The duration of each interview was approximately 60 minutes. To ensure confidentiality and increase data reliability, the interviews were conducted in an environment wherein the respondent was alone with me and one research assistant. Of these 35 respondents, whose age ranged from 22 to 81, 25 were males. The respondents sometimes included a member of the Sungusungu committee in their own communities. Of all the surveyed communities, only one community located close to an urban center did not have Sungusungu. While the respondents (and communities in the 2017 survey) were not randomly selected (i.e., convenience sampling), the collected information showed a certain degree of commonality across the respondents while confirming the findings provided by prior case studies as well as providing new findings for me.

[9] If a villager had any social communication with those ostracized, (s)he (and the families) was ostracized. This sort of ostracism often continues for a while because people do not always have immediate money in hand.

[10] However, the stocked amount of the fine appears to be small as long as Sungusungu effectively prevents the incidence of crime due to its patrol and other activities (i.e., on the path of CP equilibrium).

[11] According to my field interviews, a whistle plays an important role in Sungusungu's activities. For example, when a robber or a thief attacks villagers, they or witnesses to the incidence can call for help of all community members by blowing the whistle. If villagers fail to hurry to the scene of the crime, this results in penalty (e.g., ostracism, fine). Furthermore, Sungusungu had a special bell. If a bell is tolled, followed by a blown whistle, this is a signal of crimes in the neighboring villages.

[12] In my survey, Sungusungu and the police had ambivalent feelings about their relationship. For example, Sungusungu sometimes beats or slashes criminals to death. This is because people do not fully trust the police. In fact, it is common for local people to see a case wherein criminals taken to the police by Sungusungu walk around on the street a few days later due to corruption. Therefore, criminal cases are sometimes resolved only by Sungusungu. However, since Sungusungu does not have any modern weapons, it needs protection from the police in cases of serious crimes (e.g., murder, crimes involving guns, and so on). While the police warns Sunusungu against taking private and brutal sanctions, it appreciates their effectiveness because of its limited resources.

assistant chief, secretary/treasurer, and chief commander), a group of elders (e.g., advisors for the leaders), and ordinary members (Nkonya, 2008, p. 131), with the former two establishing its committee at the village level.[13] In my survey, all the villagers had a *de jure* right to elect or to be elected as committee members in a regular election (e.g., every five years) although the *de facto* right may be limited to a small number of local elites.[14] When a term of office is not stipulated, an election is held as needed. Committee members are selected by all villagers via a show of hands at a public meeting. They work under the control of a village chairperson, who is eventually in charge of all social matters occurring in a village. With advice given by a village chairperson and village elders, the committee hears and investigates allegations of crime; judges whether the accused are guilty; and determines the relevant punishment (e.g., fine, ostracism, and whip). The committee members are usually unpaid but earn a certain level of social respect.

Some researchers have regarded this hierarchical system as a reconstruction of traditional institutions that existed among the Nyamwezi and Sukuma ethnic groups. These groups are similar in general culture and in political organizations (Abrahams, 1967; Cory, 1954). In an area settled by these groups, around 30 to 50 chiefdoms existed before being abolished in 1963 (Bukurura, 1995b). The superordinate-subordinate relationship was maintained between the chiefs and citizens.[15][16] The Nyamwezi and Sukuma areas are also considered to be the most successful cases of the colonial indirect rule in Tanzania, which gave local chiefs considerable executive and judicial powers (Austen, 1968, pp. 233—253; Hailey, 1979, pp. 242—244).

While the government initially attempted to prohibit Sungusungu, it later found Sungusungu's ideology to be consistent with Tanzania's socialism and incorporated it into the legal framework by amending the People's Militia Act in 1989. Shortly thereafter, local security organizations

[13] While Sungunsung in each village has its own leadership and autonomy in its activities, it builds a large cooperative network with that in other villages; it establishes the relevant committees and regularly holds the corresponding meetings at ward and district levels, which comprise the lower-level leaders. According to Abrahams (1987), this network covers an area of approximately 50,000 square miles, with a population of around four million. Owing to this large network, it is common that Sungusungu successfully captures cattle thieves in places far away from the scene of the crime (Paciotti et al., 2005). For example, once cows are stolen in a village, this information fairly quickly spreads through the region by letter (carried by messengers) or mobile/text messages (as has been the case more recently). The stolen cows can be identified by the brand on their bodies, and those who are absent from one village during criminal incidence in another village are often found to be thieves.

[14] It is possible for the elected leaders to extend their tenure with no restriction on its length provided that they are re-elected.

[15] In these chiefdoms, a chief and his headmen had the right to distribute land among their subjects as well as to call on their subjects to work for community projects producing local public goods (e.g., road maintenance, bush-clearing) (Abrahams, 1967, pp. 100—104). In addition, one of the most important political functions in these chiefdoms was a chief's court (or chiefdom court), a formal judicial organization, whereby he and his court elders settle disputes concerning theft, adultery, divorce, inheritance, and child custody (Abrahams, 1967, p. 130). Less serious disputes involving threats to a community's solidarity and cooperation were handled at neighborhood courts organized by village elders before the cases were transferred to the higher chiefdom courts; these neighborhood courts reveal much similarity to the justice system of Sungusungu (Abrahams, 1965).

[16] In this area, cooperation extending beyond the boundaries of villages and chiefdoms was also common, as found in several community-level organizations (e.g., secrete societies) (e.g., Bukurura, 1994).

modeled on Sungusungu, called "state-sponsored Sungusungu," were promoted by the government throughout the country (Fleisher, 2000; Heald, 2006). However, most of these organizations had difficulty in sustaining people's cooperation (Mwaikusa, 1995, p. 171) and died down in a short time. The introduction of the multiparty system in 1992 accelerated its decline because people supporting the opposition parties refused the concept of Sungusungu directly linked with the ruling party's policy (Cross, 2013; Cross, 2016). Sungusungu in the Greater Nyamwezi area has remained active up to the present.

Officially, CP today differs from Sungusung. However, many similarities exist in its organizational forms. For example, it presumes nightly patrols by all or young people, monetary contributions toward equipment (e.g., torches), and management by a locally elected security committee (Cross, 2016). Consequently, those responsible for the police reform and the citizens perceive that contemporary CP originates from Sungusungu waged by the government during the 1980s and early 1990s (Cross, 2013). In Cross (2016), which is most closely related to the present research, she conducted semi-structured interviews in three subwards in Mwanza, Tanzania's second largest city. She argued that if it exists, CP imposes considerable costs on the citizens while primarily enabling a distinct group of local elites to achieve material gains. According to her, CP is also likely to deteriorate (e.g., the size of patrols and its geographical coverage are reduced) if local leaders are incapable.

[Here, Figure 1]

3 A model of CP under elite control

This section develops a theoretical framework that helps us understand how CP is associated with several welfare outcomes, particularly focusing on local elites' political power when initiating CP. The relevant propositions are proved in Section S.1 in the supplemental appendix.

3.1 Set-up

Consider a community with two types of agents: an elite (E) and numerous citizens (C). The size of the citizens' population is normalized as one. An agent (either E or C) has property $b \geq 0$ (e.g., cattle). The agent may lose this property to a crime with exogenous probability $p \in (0, 1)$. This probability depends not only on crime incidence but also on the likelihood of arresting a criminal and recovering the property. The lower quality of the police services may make this probability high.

In this community, both agents are allowed to propose CP. However, it is costly for the proposer to set up and organize CP (i.e., negotiation with community members and settlement of disputes). The cost is assumed to be $\rho_E > 0$ for the elite, whereas a citizen who proposes CP incurs $\rho_C \approx \infty$. The exogenous cost ρ measures the degree of an agent's political power, which is needed to facilitate community projects. Thus, it is assumed that the elite has stronger political power than the citizens (i.e., $\rho_E < \rho_C$). Only to highlight this perspective, the elite is ex ante assumed to be as wealthy as the citizens (i.e., $b_E = b_C = b$). Because of their weak political power (i.e., $\rho_C \approx \infty$), the citizens never propose CP.

The sequence of actions taken by the agents is as follows (see Figure 2). First, the elite proposes to start CP. Since it is costly for the citizens to work for CP (e.g., work at night on patrols or lookout and attendance at village meetings), the elite provides some endogenously determined rents $w = w_v \geq 0$ for the citizens who join CP. Presumably, an offer of jobs (e.g., agricultural jobs) is used as a way of transferring the rents. This is because in practice, it is more credible than an offer of any other types of rent transfers (e.g., Baland and Robinson, 2008; Robinson and Verdier, 2013), although the subsequent empirical analysis cannot rule out possible alternatives such as ex-post insurance transfers (e.g., Anderson et al., 2015). In the face of an offer of CP, the citizens decide whether to accept it (action v). If they accept, they expend privately known effort $e = e_v$; they devote themselves to CP (i.e., $e_v = \bar{e}_v$) or shirk from it (i.e., $e_v = \underline{e}_v$). The cost of effort is denoted as $c > 0$. Those who shirk are detected with probability γ, which is the fraction of the citizens who accept CP and expend effort; thus, it is endogenously determined. The detected shirkers are not allowed to receive the wage w_v and lose their property with probability p. The CP can reduce the probability that the elite, the citizens who make effort, and the citizens who shirk but are not detected lose their property to a crime from p to the level of $p(1-\gamma)$.

Alternatively, an elite can also employ one citizen as a security guard and can choose the endogenous amount of wage $w = w_g \geq 0$. The citizen decides whether to accept this offer (action g). If he accepts, he may or may not make the effort $e = e_g$ to protect the elite's property. If such effort, which is unobserved by the elite, is expended (i.e., $e_g = \bar{e}_g$), the elite's property is protected with probability one,[17] otherwise, (i.e., $e_g = \underline{e}_g$) it is lost with probability p. However, the elite is able to detect a guard who shirks with exogenous probability $q \in (0, 1)$. If the elite detects the guard, then the guard is not able to receive the wage w_g. The security guard incurs the cost c when choosing $e_g = \bar{e}_g$. Since the guard works to protect the elite's property, the guard, whether making effort or shirking, loses own property with probability p.

When the elite proposes neither CP nor a security guard (which refers to $w = 0$ for a notational

[17] This assumption excludes the case that the elite employs numerous guards because it is more costly than employing one.

purpose), the citizens have two choices. First, they make effort (i.e., $e = e_s$) to self-protect their property with certainty, whose cost is assumed to be c (action s). Otherwise, they do nothing (i.e., $e = 0$) to protect their property (action r). Consequently, the strategy profile taken by both agents can be characterized as $(w,\ e,\ z)$, whereby $z \in (v, g, s, r)$ refers to choices taken by the citizens. Since the elite differs from the citizens only in terms of political power, the elite makes the same choice to protect the property as the citizens while choosing $w = 0$.

The corresponding payoffs $v_i(\cdot, \cdot, \cdot)$ of an agent i (either E or C) are demonstrated as follows:

$$
\begin{aligned}
v_E(w_v, \bar{e}_v, v) &= v_E(w_v, \underline{e}_v, v) = (1 - p(1-\gamma))(b - (\gamma + (1-\gamma)^2)w_v) - \rho_E && (1)\\
v_C(w_v, \bar{e}_v, v) &= (1 - p(1-\gamma))(b + w_v) - c, && (2)\\
v_C(w_v, \underline{e}_v, v) &= (1 - p(1-\gamma))(1-\gamma)(b + w_v) + (1-p)\gamma b, && (3)\\
v_E(w_g, \bar{e}_g, g) &= b - w_g, && (4)\\
v_E(w_g, \underline{e}_g, g) &= (1-p)(b - (1-q)w_g), && (5)\\
v_C(w_g, \bar{e}_g, g) &= (1-p)(b + w_g) - c, && (6)\\
v_C(w_g, \underline{e}_g, g) &= (1-p)(b + (1-q)w_g), && (7)\\
v_E(0, e_s, s) &= b - c, && (8)\\
v_C(0, e_s, s) &= b - c, && (9)\\
v_E(0, 0, r) &= (1-p)b, && (10)\\
v_C(0, 0, r) &= (1-p)b. && (11)
\end{aligned}
$$

Admittedly, the per person cost of making an effort to protect property does not vary across the strategies $\bar{e}_v$, $\bar{e}_g$, and e_s at the fixed level of c. This assumption is made only for analytical simplicity. More realistic assumptions (e.g., this cost decreases with γ when CP is formed) do not alter the model's nature of the force at work.

[Here, Figure 2]

3.2 CP equilibrium

First, assume that $pb < c$. This assumption has three meanings. First, people tend to be impoverished (e.g., small b). Second, as the size of the citizens' population is normalized to one, this assumption implies that their marginal social gain from CP (i.e., the sum of their private marginal gain) is smaller than the relevant marginal cost. Thus, this fails to satisfy the Samuelson condition in the public goods literature. Third and inevitably, it also implies that the citizens'

private marginal gain from CP is smaller than the corresponding marginal cost, which gives them an incentive to free ride on others' contribution to CP unless a job is withdrawn as a punishment. Due to these assumptions, this study first analyzes the formation of CP in a conservative setting, whereby the citizens are less likely to start it voluntarily. Then, it can be shown as follows:

Proposition 1 *When $pb < c$ and $\rho_E < 2pb - c$, the strategy profile $(w_v = c - pb, \bar{e}_v, v)$ is subgame perfect, whereby the equilibrium probability of the agents losing the property is zero, along with their payoffs of $v_E = (1-p)b + 2pb - c - \rho_E$ and $v_C = (1-p)b$. When $pb < c$ and $\rho_E \geq 2pb - c$, the strategy profile $(0, 0, r)$ is subgame perfect, whereby the equilibrium probability of the agents losing the property is p, along with their payoffs of $v_E = v_C = (1-p)b$.*

When the elite has strong political power (i.e., $\rho_E < 2pb - c$), all the citizens actively work for CP, reaching the profile $(w_v = c - pb, \bar{e}_v, v)$ along with $\gamma = 1$. Since the citizens receive rents from the elite, they have an incentive to expend effort on CP. To reduce the probability of losing the property, the elite has an incentive to propose CP by providing minimum rents for the citizens. Notably, the citizens are ex ante allowed to shirk from CP duties. However, such risk of moral hazard is ex post absent because the citizens mutually monitor their participation. Consequently, the elite is able to initiate CP by providing no information rents for the citizens, i.e., $v_C(w_v = c - pb, \bar{e}_v, a) = v_C(0, 0, r) = (1-p)b$.

Assuming that people are wealthy enough to self-protect their property and that the citizens' marginal social gain from CP is equal to or greater than their marginal cost, namely, $pb \geq c$,

Proposition 2 *When $pb \geq c$ and $\rho_E < c$, the strategy profile $(w_v = 0, \bar{e}_v, v)$ is subgame perfect, whereby the equilibrium probability of the agents losing the property is zero, along with their payoffs of $v_E = b - \rho_E$ and $v_C = b - c$. When $pb \geq c$ and $\rho_E \geq c$, the strategy profile $(0, 0, s)$ is subgame perfect, whereby the equilibrium probability of the agents losing the property is zero, along with their payoffs of $v_E = v_C = b - c$.*

Once again, a politically powerful elite (i.e., $\rho_E < c$) can induce the citizens to join CP and benefit from it (i.e., $b - \rho_E > b - c$). As one stark difference from the proposition 1, the elite no longer has to transfer rents to the citizens because CP also benefits (more precisely, does not hurt) them without those rents. Since people self-protect their property in a community having no politically powerful elite, no difference exists in the rate of crime between the CP and no-CP communities.

3.3 Predictions

In reality, two types of communities, $pb < c$ and $pb \geq c$, are presumed to exist. Comparing communities that have similar economic conditions (e.g., p, b, c) (namely, after controlling for those characteristics in an empirical analysis), the following tendency is expected in the data.

1. An elite in CP communities has stronger political power than that in no-CP communities.
2. The rate of losing property in CP communities is lower than that in no-CP communities.
3. The total welfare in CP communities is larger than that in no-CP communities, as seen from $2(1-p)b + 2pb - c - \rho_E > 2(1-p)b$ when $pb < c$ or $2b - c - \rho_E > 2(b-c)$ when $pb \geq c$.
4. Inequality of welfare in CP communities is greater than that in no-CP communities. Compared with the elite in no-CP communities, the elite in CP communities gains from CP, i.e., $(1-p)b + 2pb - c - \rho_E > (1-p)b$ when $pb < c$ or $b - \rho_E > b - c$ when $pb \geq c$, whereas the citizens in CP communities achieve the same level of utility as the citizens in non-CP communities, i.e., $(1-p)b$ when $pb < c$ or $b - c$ when $pb \geq c$.
5. The citizens in CP communities receive larger rents from the elite, as possibly measured by jobs, than those in no-CP communities, i.e., $w_v = c - pb > w = 0$ when $pb < c$.

The third and fourth predictions may be noteworthy. While elite capture is often presumed to be detrimental to economic development, a community's total welfare increases as a result of CP under elite control. However, the citizens cooperate only to benefit the elite, which increases inequality between them. In other words, only to increase his own welfare, an elite facilitates every community member who would not gain much from the CP to work for it. All the citizens still support such elite control (more precisely, they are indifferent between the cases of forming and not forming CP).

While not explicitly modeled, the relevant collective action may induce the citizens' generalized norms of cooperation as indicated in the Sungusungu context (Paciotti et al., 2005) or elsewhere (e.g., Gneezy et al., 2016).[18] In addition, the rents provided by the elite for the citizens may enhance the citizens' social respect for the elite (e.g., gift exchange), as argued in the study by Acemoglu et al. (2014). These possibilities may reduce the elite's cost of organizing CP (i.e., ρ_E). Moreover, an elite's improved wealth may allow him to more easily transfer his resources to the citizens. Consequently, CP may be persistent and sustainable once it is established in a self-enforcing manner.

[18] Paciotti et al. (2005) conducted an ultimatum game in rural Tanzania to explore the difference in pro-social behavior between two ethnic groups, the Pimbwe and Sukuma, whereby the Sukuma successfully formed Sungusungu and the Pimbwe failed.

This study does not exclude other mechanisms sustaining CP. For example, the strict penalties imposed on the citizens (e.g., ostracism, fines) may also serve a function.[19] However, these alternative mechanisms do not necessarily explain why many poor citizens actively work for CP while paying punishment costs (i.e., solving the second-order free-riding problem) when their private and social marginal gain from CP is small (i.e., $pb < c$), as observed in my field surveys on Sungusungu in Shinyanga. According to prior studies (e.g., Fehr and Schmidt, 1999), great cooperation is also less likely to arise concomitantly along with increasing inequality.[20] If the data supports all the aforementioned predictions, it may be difficult to consider that the developed mechanism does not play a role at all.

4 Empirical strategy

4.1 Specification

This study uses cross-sectional data drawn from the TZNPS 2008—2009 although the TZNPS is a long-term household panel survey, as detailed in Section 5. This survey included a community-survey module, whereby the question of "Is there any form of citizens' militia in this community? (sungusungu, migambo, etc.)" was administered to village representatives. These included a village/block chairperson, a village/ward executive officer, and a group of sub-village chairpersons.[21] Plausibly assuming that the surveyed respondents refer to this citizens' militia as CP, this study compares the relevant welfare outcomes between communities forming the militia (CP communities) and those not forming it (no-CP communities). More precisely, for a household (or an

[19] As an alternative mechanism, the cost of working for CP may be larger for the youth compared with that for the elderly people. According to my field surveys on Sungusungu in Shinyanga, only the male youth (e.g., aged 18 to 30 or 40 years) engaged in night-time patrol in a few villages. In addition, the amount of people's wealth is also likely to increase with age. Together, a young man may actively work for CP even if he receives no gain from it. This may hold true because his active participation in young age may ensure that he gains from CP in his old age. By that time, he may accumulate large property, and at that time, the younger generation would protect his property through CP activities from which he is exempted. Since this inter-temporal substitution between the present and future welfare is theoretically possible, the subsequent empirical analysis explores the distributional welfare consequences after controlling for the respondents' age.

[20] According to Fehr and Schmidt (1999, p. 846), "if the public good is more valuable to some of the players, there will in general be a conflict between efficiency and equality ... if the game is sufficiently asymmetric, it is impossible to sustain cooperation even if a [a player's marginal private return from a contribution to the public goods] is very large or if players can use punishments."

[21] The migambo, as also called people's militia, is another type of self-help security group that was instituted in 1965 by the government. According to my field interviews in Shinyanga, it is a group of people trained by local military officers for a certain period of time while being allowed to possess guns and receive some allowance. Those who completed the military training are, with a certificate probing its completion, often recruited to the police, military force, or private security companies. The citizens' participation in migambo is much more voluntary than that in Sungusungu and contemporary CP. See also Cross (2013, pp. 46-47).

individual) i in a community j, this study estimates the relevant outcomes y_{ij} as

$$y_{ij} = \alpha_1 + \alpha_2 D_{1j} + \alpha_3 D_{2j} + \alpha_4 \mathbf{x_{ij}} + \epsilon_{ij}, \tag{12}$$

whereby D_{1j} and D_{2j} are indicators that equal one if the community j maintains CP, which was created voluntarily by the residents (i.e., endogenous CP) and by the external coordination of the government (i.e., exogenous CP); the reference group is no-CP communities. As indicated from Section 2, this study refers to CP communities located within (outside) the Greater Nyamawezi area as the endogenous (exogenous) CP. The vector $\mathbf{x_{ij}}$ contains several determinants of the outcomes specific to this household (or individual) and its community, in addition to ethnic-territorial fixed effects, as detailed below, administrative regional fixed effects (26 groups), and the GPS coordinates of the surveyed communities. ϵ_{ij} is a stochastic error. The equation (12) is primarily estimated by the the ordinary least squares (OLS), whereby the standard errors are robust to heteroskedasticity and clustered to allow for arbitrary correlations across households (or individuals) within a community.

The D_{1j} and D_{2j} do not necessarily reflect differing intensity of its activities across communities.[22] However, these indicators are unlikely to suffer from measurement noise because CP's presence, which requires many and possibly, all community members' contributions, involves less ambiguity.

The TZNPS provides no information on the respondents' ethnicity. However, two maps provided by Murdock (1959) and Weidmann et al. (2010) are available to identify whether a community is located within the Greater Nyamwezi area or areas primarily settled by particular ethnic groups. First, Weidmann et al. (2010)'s map relies on data drawn from the classical Soviet Atlas Narodov Mira (Bruk and Apenchenko, 1964), which builds on a major project by Soviet ethnographers charting global ethnic groups in the 1960s. They categorized Tanzania into 28 major ethnic territories. On this map, the Greater Nyamwezi area, i.e., ethnic territories historically settled by the Nyamwezi, Sukuma, Sukuwa, Sumbwa, and Kimbu are apparently identified as one area called "(wa)nyamwezi."[23] Second, Murdock (1959), as sourced from Nunn (2008), more narrowly defined ethnic homelands (53 groups), including homelands corresponding to each of those five ethnic groups. Due to the difficulty faced when estimating ethnic homelands in general, this study avoids a hasty judgment about which of these studies have provided more precise estimates. Instead, to make the yielded findings robust to a comprehensive definition of the Greater Nyamawezi area,

[22] In my field survey in Shinyanga, people in one village joined night-time patrol only during the time of harvest or drought, i.e., periods in which the likelihood of thefts occurring tends to be high due to the abundance or shortage of food crops. Another village also stopped the night-time patrol in 2016 because no serious crime happened for a long time.

[23] The "wa" in Swahili means people.

this study regards it as either Weidmann et al. (2010)'s "(wa)nyamwezi" area or Murdock (1959)'s ethnic homelands settled by those five ethnic groups. As these areas on the two maps remarkably overlap, the "(wa)nyamwezi" territory is reported in Figure 1; see a shaded area.

This study refers to the well-known Demographic and Health Surveys program funded by the U.S. Agency for International Development, which constructs a household's wealth index by considering the types of water access, sanitation facilities, and materials used for housing construction (`http://www.dhsprogram.com/topics/wealth-index/Wealth-Index-Construction.cfm`). Accordingly, the vector $\mathbf{x_{ij}}$ includes variables pertaining to a household's main source of drinking water in the rainy (11 categories) and dry seasons (11 categories), its main toilet facilities (five categories), and materials of wall (seven categories), roof (seven categories), and floor (three categories) exploited for a household's main dwelling. Further, this vector contains the respondents' and/or a household head's age, gender, education, religion (four categories), and household size as well as an indicator for households residing in urban areas. This urban indicator is important because it appears to be more difficult for urban residents to maintain cooperative behavior compared with people in rural areas because the former includes a number of internal migrants coming from different parts of Tanzania, who belong to different ethnic groups and are unlikely to share the same culture; police services are also more accessible in urban rather than rural areas.

In the presence of the ethnic-territorial fixed effects, the present specification identifies the α_2 and α_3 by comparing CP and no-CP communities within an area primarily settled by a particular ethnic group;[24] the ethnic-territorial fixed effects represent any influence of cultural and socioeconomic factors existing in the relevant areas. The benchmark analysis relies on Weidmann et al. (2010)'s classification for these fixed effects, whereby ethnic subgroups of similarity are grouped into one broad category; see also subsection 6.1.4.

4.2 Controlling for pre-determined conditions

To identify the main coefficients of interest, in this study, it is assumed that conditional on appropriate controls, CP is randomly present across communities (i.e., selection on observables). In addition to the ethnic-territorial fixed effects, administrative regional fixed effects, and a community's GPS coordinates, to increase the plausibility of this assumption, the adequate controls should represent pre-determined local conditions that might have affected the theoretical factors maintaining CP (i.e., p, b, c in Section 3), namely those prior to 1980 considering the emergence of Sungusungu in the early 1980s. These controls are briefly explained in this subsection while rele-

[24] The α_2 and α_3 in specification (12) correspond to $\beta_2 + \beta_3$ and β_2 in an alternative specification as follows: $y_{ij} = \beta_1 + \beta_2 D_j + \beta_3 D_j \times S_j + \beta_4 \mathbf{x_{ij}} + \epsilon_{ij}$, whereby D_j and S_j are indicators for communities forming CP and for communities located within the Greater Nyamwezi area, respectively.

gating the detailed explanation to Section S.2 in the supplemental appendix. Since the formation of CP in most communities, particularly Sungusungu, precedes the TZNPS, reverse causality is an issue of less concern in the present analysis.

4.2.1 Historical controls

From Tanzania's NBS with the help of TPF, in September 2018, I obtained a paper-based map of districts existing in 1975 (93 groups), which are different from those at present, in addition to annual information on any crime that occurred in each of those districts between 1975 and 1980. Three types of crime, namely, offenses against a person (five categories), offenses against property (17 categories), and offenses against state security and public tranquility (nine categories till 1979 and 14 categories in 1980) are recorded in the obtained data. I digitized this information and then calculated an annual average number of all crime incidences in each district during those periods. After georeferencing the obtained map and identifying a district to which each TZNPS community belongs to, those average numbers were assigned to that community. The TZNPS communities were located in 76 districts of 1975, yielding about 5 communities per district, on average. Thus, across-community crime-data variation is tenable to the present empirical analysis.

Second, relying on data provided by Nunn and Wantchekon (2011), a community's distances to the nearest points of travel routes of European explorers between 1768 and 1894 and of railway lines in the first decade of the 20th century, as drawn from Century Company (1911), were also calculated and exploited as further controls. These controls are relevant because during colonial periods, the police was primarily placed in areas that attracted economic interest of European colonizers (e.g., Killingray, 1986, p. 414).

Third, the exploited controls also included a community's estimated population density in 1900, 1950, and 1980, as sourced from the HYDE 3.1, which provides estimates of historical population from 10000 BC to 2005 AD with a spatial resolution of 5-minute longitude/latitude in raster format (Goldewijk et al., 2010). I assigned the value of a raster point to each community in its closest proximity on this population map.

4.2.2 Geographic and climate controls

A great number of geographic and climate conditions pertaining to climatology (i.e., temperature and precipitation), soil, and terrain are also included in the $\mathbf{x_{ij}}$. The soil-quality variables include nutrient availability (five groups), nutrient retention capacity (five groups), rooting conditions (seven groups), oxygen availability to roots (five groups), excess salts (five groups), toxicity (five groups), and field-management constraint (seven groups), whereas the terrain-related variables

represent elevation (m), slope (percent), and terrain roughness (12 groups). All these variables, publicly available at the "household" level from the TZNPS, are exploited as controls, assuming that these conditions have not noticeably changed over time.

Second and relatedly, I estimated a community's TSI in 1977, which is supposed to measure the fitness of the livestock, particularly cattle that is an important savings opportunity in rural settings, to local ecological conditions. To construct the TSI, I followed a methodology developed by Alsan (2015), exploiting information on temperature and relative humidity in 1977, as sourced from the Twentieth Century Reanalysis Project V2c (Compo et al., 2011, `https://www.esrl.noaa.gov/psd/data/20thC_Rean/`).[25]

5 Data

Data exploited in this study is drawn from the TZNPS, conducted as part of the LSMS-ISA of the World Bank. The TZNPS is a nationally representative household panel survey that includes four waves as of now. This survey provides information on various topics such as agricultural and non-agricultural income generating activities, expenditures, and a wealth of other socio-economic indicators. This study primarily exploits the data drawn from the TZNPS's first wave (i.e., TZNPS 2008—2009) carried from October 2008 to October 2009 because only this wave provides information on whether a community has citizens' militia.[26]

In the TZNPS 2008—2009, a stratified random sampling protocol was exploited. This involved two stages. In the first stage, its enumeration areas (EAs) were selected from the 2002 Population and Housing Census. This was followed by the second-stage selection of households from the respective EAs (see Sandefur, 2009 for the details). This sample design results in surveying 16,709 respondents residing in 3,265 households located in 409 EAs. While the TZNPS's community survey module included the question pertaining to citizens' militia, the survey team occasionally had difficulty in identifying the relevant "community," particularly in urban compared with rural EAs because the former do not always have discernible community boundaries. For this or possibly other reasons, the information on citizens' militia is available only for 305 EAs in the public

[25] Since this data has a relatively low resolution (2.0 degree latitude × 2.0 degree longitude), alternatively, I exploited indexes of the predicted areas of suitability for tsetse flies in 1999 provided by three species groups (fusca, morsitans, and palpalis) from Wint and Rogers (2000) (`http://ref.data.fao.org/map?entryId=f8a4e330-88fd-11da-a88f-000d939bc5d8&tab=about`) with a 5 km resolution. While these indexes have a higher resolution, the relevant input data exploited to estimate these indexes includes several information (e.g., population density, cattle density), which might have been affected by the presence of CP. Therefore, in this study, these alternative indexes were used only to check the robustness of the findings. While the results are available upon request, exploiting these alternative indexes did not alter the key implications of this study.

[26] Data and relevant documents are publicly available at `http://microdata.worldbank.org/index.php/catalog/76`.

domain. Moreover, the TZNPS provides information pertaining to the aforementioned geographic and climate conditions only for households residing in 386 EAs. Furthermore, 7 EAs, whose ethnic information was not clearly discerned from Weidmann et al. (2010)'s map, were also excluded from the present analysis. As a result, this study primarily analyzes 11,907 individuals belonging to 2,331 households in 292 EAs (when the regression analysis controls for these factors), although the sample size somewhat varies depending upon other variables used for the analysis. See also subsection 6.2.6 for the relevant issue. Hereinafter, EAs are interchangeably regarded as "villages" or "communities."

For the sample individuals [panel (A)], households [panel (B)], or communities [panel (C)], summary statistics for several variables are reported in Table 1, along with tests for equality of means between the CP and no-communities. The CP communities are further categorized into endogenous and exogenous ones. The endogenous CP communities represent significantly less-developed societies compared with the no-CP ones. They are located in more rural areas, characterized by less historical population density, less crime rate in the late 1970s, and more abundant agricultural jobs. The residents possess much larger numbers of livestock and more frequently rely on neighbors or self-help groups for financial sources as well as attend several meetings held within a community. The residents in the endogenous CP communities are also less educated and poorer and have more family members than those in the no-CP communities. The exogenous CP communities reveal the in-between characteristics although the residents enjoy larger consumption than those in the no-CP communities, on average.

[Here, Table 1]

6 Empirical findings

6.1 Main results

6.1.1 Crime

The estimation results of crime incidence are reported in columns (a) through (f) in Table 2. In the TZNPS, crime-related information is available from both the "Household and Individual Questionnaire (HIQ)" and "Agricultural Questionnaire (AQ)," with the former administered to all the surveyed households and the latter only to agricultural households. In several estimations, hereinafter, an indicator for agricultural households, which refers to the surveyed households to which the AQ was administered, is included in regressors. The HIQ collects information on major three items stolen from households in the last 12 months. In the AQ, the number of all the

livestock stolen in the last 12 months is asked. An indicator estimated in columns (a) and (b) refers to households who reported any cases of theft reported in both the HIQ and AQ. Indicators estimated in columns (c) and (e) (and in columns (a) to (d) in Table S.1 in the supplemental appendix) are sourced from the AQ. In columns (d) and (f) (and those in columns (e) to (k) in Table S.1), information discernible from the HIQ is exploited.

First, an indicator for households that had any property stolen in the last 12 months was estimated in column (a), including ethnic-territorial fixed effects, administrative regional fixed effects, and a community's GPS coordinates in regressors. In column (b), the aforementioned historical controls (i.e., the average annual number of crime events occurring between 1975 and 1980, historical population density, and distances to travel routes of early European explorers and to railway lines in the early 20th century) and geographic and climate controls (i.e., temperature, precipitation, soil-quality, terrain, and TSI) as well as several household characteristics are additionally controlled for. The estimated correlation between the endogenous CP and the likelihood of any property being stolen displays a stable pattern between these columns, and this likelihood is significantly smaller in the endogenous CP communities by about 30 percentage points than that in the no-CP communities. This smaller probability pertains to the effectiveness of CP, which works not only to prevent the incidence of theft but also to return the stolen property.

The probability of the livestock and non-livestock being stolen is separately estimated in columns (c) and (d). The corresponding estimation results of these items' break down are reported in Table S.1 in the supplemental appendix. In Table S.1, the relation between the endogenous CP and the incidence of theft is negative for most items, and the statistical significance is more pronounced for the livestock, particularly the ruminants (i.e., cattle, goat, and sheep). This result is copied and pasted in column (e) in Table 2. This finding confirms the origin of Sungusungu, i.e., dealing with cattle rustling, as described in Section 2. In addition, the theft of the livestock is more common in rural than urban areas, whereas this relationship is opposite for the non-livestock. In contrast to the incidence of theft, an effective role played by the endogenous CP in reducing an assault was not clearly found in column (f) in Table 2 (although the coefficient is still negative), whereby an indicator for households whose member was attacked in the last 12 months was estimated. This finding may be attributed to the rare incidence of these events, as shown at the bottom of Table 2 (see the mean y if no CP).

While the statistical significance is not always strong, there is also a negative relation between the exogenous CP and the incidence of theft, but its magnitude is much smaller than that corresponding to the endogenous CP. This difference between the endogenous and exogenous CPs may corroborate the implication of prior studies, namely that an institutional rule works well when people voluntarily choose it rather than being imposed on them (e.g., Dal Bó et al., 2000).

[Here, Table 2]

6.1.2 Welfare

Applying the methodology proposed by Collier et al. (1986) (pp. 70—73) for Tanzania, this study estimates consumption per adult equivalent and relates it with the presence of CP in columns (g) and (h) in Table 2. This measure reflects nutritional requirements that vary by gender and age of typical individuals compared to consumption per capital (i.e., a household's consumption divided by the number of its members).[27] Apart from several variables reported at the individual level (i.e., gender, age, and education), the controls used in these columns correspond to those in columns (a) and (b). In column (i), the consumption per capital is also estimated. All these results indicate a significantly higher level of consumption in the endogenous CP communities compared with that in the no-CP communities. According to the result in column (h), this consumption premium reaches 37 percentage points. A similar consumption premium is absent in the exogenous CP communities.

In rural societies (e.g., Shinyanga, as surveyed by myself), a household accumulates livestock as a means of savings. Therefore, the number of livestock was estimated in columns (j) and (k). In the TZNPS, the livestock information is available from both the HIQ and AQ. The analysis in column (j) exploits the total number of livestock reported, with no breakdown in "Household Assets" section of the HIQ, whereas the number of ruminants (i.e,. cattle, sheep, and goat) owned by a household was discerned from the AQ and estimated in column (k).[28] As indicated in the results, the surveyed households in the CP communities have more livestock than those in communities having no CP. This tendency is more pronounced in the endogenous CP communities, and this difference reaches approximately 19 ruminants. This magnitude is significant as the sample households in the no-CP communities possess two ruminants, on average (see the bottom of the table). According to my field interviews in Kahama District of Shinyanga, the market price of one cattle was approximately 300,000 to 500,000 Tanzanian shilling (TSH). The estimated ruminants do not necessarily represent only cattle, and the value of TSH varies over time. Nevertheless, the exhibited increase in the livestock is apparently non-negligible as the mean annual expenditures per adult equivalent in the endogenous CP communities is about 510,000 TSH (Table 1).

This study conducts quantile regression for the consumption equation, and Figure 3 reports the relevant coefficients. The coefficients pertaining to the endogenous and exogenous CPs, i.e.,

[27] A household's consumption includes food consumption and non-food consumption. The consumption data has been cleaned by the TZNPS team, and the resulting data file is publicly available.

[28] The relevant analyses excluded four households, whereby a difference between the reported number of the livestock in the HIQ and the corresponding number in the AQ is more or less than 100. Once these outliers are excluded, these numbers revealed similar values of its mean of 3.55 (4.44) and standard deviation of 16.21 (18.53) in the HIQ (AQ). See also Figure S.2 in the supplemental appendix for the scatter plots of these values.

α_2 and α_3 in equation (12), are reported with 95% confidence intervals in the left-hand and right-hand panels, respectively. As seen from the left-hand panel, the consumption premium in the endogenous CP communities exists only for the respondents belonging to the top 20% of the consumption distribution. It is statistically significant for the top 10% (at 7%) and the next 10% (at 14%) and is remarkably large; in the endogenous CP communities, the respondents belonging to the top 10% enjoy more than five times larger consumption than those in the no-CP communities. Notably, this premium is "not negative" for the majority of the respondents existing at the lower percentiles even though they supposedly work for CP and incur the relevant cost (e.g., time, labor, injury risk by encountering armed criminals, and money to support its activities). This finding indicates that the non-wealthy may be receiving some compensation for their contribution to CP, which is consistent with the theoretical implication, as described in Section 3.

While no statistical significance exists, the relevant consumption premium in the exogenous CP communities also gets larger as the respondents' consumption level increases from the low to high percentiles, as indicated from the right-hand panel of Figure 3. Unlike those in the endogenous CP communities, the respondents belonging to the lower percentiles in the exogenous CP communities obtain "negative" consumption premium. This may suggest that the elites provide no appropriate rent transfer for the citizens participating in CP. This transfer may be absent because CP is possibly promoted by the government. This absence may also explain the limited effectiveness of the exogenous CP in preventing crime and increasing people's welfare, as found in Table 2.

[Here, Figure 3]

6.1.3 Elite control

As the model in Section 3 predicted, CP is likely to arise in communities, wherein local elites have strong political power. In column (a) (only with a control of ethnic-territorial fixed effects, administrative regional fixed effects, and a community's GPS coordinates) and column (b) (with a full set of controls) in Table 3, this study estimates an indicator, which equals one if the surveyed household approved of or strongly approved of the job done by a village chairperson and zero otherwise; a village chairperson is in charge of all social issues and has political power within a community. The households in the endogenous CP communities revealed stronger support for a village chairperson's performance compared with those in the no-CP communities. The households in the exogenous CP communities showed significantly negative support for a village chairperson's communal management. Recalling the right-hand panel in Figure 3, the respondents belonging to the lower percentiles in the exogenous CP communities had "negative" consumption premium. This unfavorable welfare consequence may explain the negative assessment for a village chairperson's

performance prevailing in the exogenous CP communities.

In columns (c) and (d) (with a similar set of controls used in columns (a) and (b), respectively), this study estimates an indicator, which equals one if the surveyed households attended village meetings in the last 12 months. This outcome has two meanings. First, it may be seen as another proxy for local elites' political power. Putnam (2000) refers to the attendance at village meetings as a measure of "bridging" social capital that links citizens with elites. A study conducted by Acemoglu et al. (2014) in Sierra Leone also provided evidence suggesting that village elites use these meetings as a form of social control, which in turn facilitates citizens' respect for them. Second, since successful cooperation requires villagers' close communication, local elites may exploit village meetings to encourage social interaction. According to my field interviews in Shinyanga, whether it is men or women, all able-bodied adult villagers were required to attend general meetings regularly held (a few times a year) by the Sungusungu committee as well as any meetings it convoked in times of emergency.[29] The estimation results indicated that the residents in the endogenous CP communities more frequently attended village meetings than those in the no-CP communities, which is less evident in the exogenous CP ones.

According to the theoretical prediction in Section 3, local elites in the CP communities transfer their rents to citizens to effectively organize CP. Offering a well-paid job is one credible way that makes such a rent transfer possible. In Table 3, this study estimates how many days the sample households employed workers for agricultural jobs (i.e., land preparation and planting, weeding, and harvesting) in the 2008 long rainy season [columns (e) and (f)] as well as the corresponding total wage paid after controlling for the total days employing workers [columns (g) and (h)]. These pieces of information are available only for agricultural households, and the AQ, administered only to those households, provides the former information by gender, along with the latter information collected only in the total amount. As the results in columns (e) and (f) show, there is no evidence suggesting that the days hiring workers significantly differed between the CP and no-CP communities. However, the households in the endogenous CP communities paid significantly higher wages per day, as found in column (g) (with a limited set of controls) and column (h) (with a full set of controls). Referring to the result in column (h), the daily wage payment is approximately 8.3% higher in the endogenous CP communities than that in the no-CP communities. The days hiring workers might not have differed significantly between these communities because a demand for external labor force usually exists only at the particular time (e.g., weeks) of agricultural seasons. However, the households in the endogenous CP communities might have employed more workers or hours in each day at possibly greater worker wage or hourly rates compared with those in the

[29] Failing to attend these meetings resulted in ostracism.

no-CP communities.[30]

With a limited or full set of controls, this study explores in columns (i) and (j) whether negative economic shocks that struck the respondents in the past five years have differently affected the present welfare levels between the CP and no-CP communities. Indicators were constructed for three major types of shocks, namely, health shock (i.e., a household member's chronic/severe illness, accident, or death), climatic shock (i.e., drought or floods), and crop shock (i.e., crop disease or crop pests). As indicated in the results, the level effects of these shocks are not negative because the respondents may have their own strategies to cope with them (e.g., income smoothing, self-insurance). Nevertheless, compared with the respondents in the no-CP communities, those in the endogenous CP communities benefited from the health shock, which seems to be more idiosyncratic than the remaining shocks usually common to all community members. One interpretation of this is that local elites in the endogenous CP communities may be offering their rents to their fellow villagers who experienced negative economic shocks, particularly when those shocks are individual-specific; thus, it is easy to identify those who are suffering.

[Here, Table 3]

6.1.4 Robustness checks

For the main binary outcomes and the number of livestock analyzed in Table 2 and Table 3, probit and negative binomial models were estimated, respectively, and the corresponding marginal effects were reported in Table S.2 in the supplemental appendix (see also Table S.3 in the supplemental appendix for the distribution of the livestock). The greater amount of the possessed livestock pertaining to the endogenous CP communities is statistically less robust; however, the relevant coefficient is still positive while keeping a similar magnitude to that obtained by OLS.

In Table S.3 in the supplemental appendix, the ethnic-territorial fixed effects relying on Weidmann et al. (2010)'s classification were also replaced with those based on Murdock (1959)'s. Since the latter classification of ethnic homelands is finer than that of Weidmann et al. (2010), the exploitation of these alternative fixed effects is expected to improve the efficiency of the estimates. However, it may also produce selection bias attributed to unobserved characteristics pertaining to a particular ethnic homeland because not all the narrowly defined homelands have TZNPS communities that form and do not form CP. Nevertheless, these exercises did not alter the aforementioned implications.

[30] I also exploited the inverse hyperbolic sine transformation (e.g., Burbidge et al., 1988) for the total wage paid, rather than the logarithmic transformation. The estimation results, available upon request, yielded similar implications to those obtained in columns (g) and (h).

6.2 Threats to statistical inference

With the aim of verifying that the aforementioned findings are not entirely attributed to possible confounding factors, several exercises are performed.

6.2.1 Balance test

This study regressed the z-score of the pre-determined local conditions, whose original values were used as regressors in the previous analysis, on indicators for the CP communities after controlling for the ethnic-territorial fixed effects, administrative regional fixed effects, and a community's GPS coordinates. The corresponding coefficients are reported in Figure 4 with 95% confidence intervals. Most variables were well balanced between the endogenous and no-CP communities. These variables also did not significantly differ between the exogenous and no-CP communities, except for whether their soil quality was characterized as "ocean" or not. Overall, no systematic difference regarding these factors exists between the CP and no-CP communities.

[Here, Figure 4]

6.2.2 Falsification test

It is possible that a strong police force might have reduced the likelihood of crime incidence in the CP communities. In Table 4, this study estimates the numbers of police officers who work in a community [column (a)], who arrived in the last 12 months [column (b)], and who left in the last 12 months [column (c)] as well as an indicator for the sample households that approve of or strongly approve of the job of a chief police officer [column (d)]. The results show no significant differences in these outcomes between the CP and no-CP communities.

The households in the endogenous CP communities might have positively assessed a village chairperson's job because they support "any" political leaders. In columns (e) to (h) in Table 4, similar indicators pertaining to the performance of ward councilors, MPs, village executive officers (appointed by the government), and ward executive officers (appointed by the government) were estimated. There is no evidence suggesting that the households in the endogenous CP communities have positive attitudes toward the government in general.

The frequent attendance at village meetings in the endogenous CP communities may be just one proxy for the area's generally high social capital rather than a sign of strong political power of local elites who command great authority and social respect. In columns (i) to (q) in Table 4, various outcomes representing a form of "bonding" social capital, which links people of similar social status (Putnam, 2000), and "collective" action were estimated. This analysis shows no

systematic relation between the presence of CP and these outcomes. For example, attending farmers' cooperative meetings, savings and credit cooperatives (SACCOS) meetings, and school meetings exhibits no statistically significant relation with the presence of CP because unlike the village meetings, attending these meetings is a villager's voluntary decision and unlikely to be an economic interest of local elites.

People in the endogenous CP communities might have enjoyed greater welfare because they were doing so as part of a general trend even before the emergence of Sungusung in the early 1980s. However, first, no significant difference was observed in the historical population density in 1900, 1950, and 1980 between the endogenous and no-CP communities, as analyzed in subsection 6.2.1. Hence, we may reject this possibility because the population density is likely to measure economic prosperity (e.g., Acemoglu et al., 2002) and so, by extension, citizens' welfare.

Second, relying on the Population Census 1988, which appears to provide the earliest census information tenable to the present empirical analysis, this study also relates the census respondents' educational attainment to an indicator for districts, which contains the CP communities surveyed in the TZNPS 2008—2009;[31][32] the exploited data, which refers to 10% of the total population, is available from the "Integrated Public Use Microdata Series (IPUMS), International: Version 7.0" (Minnesota Population Center, 2018).[33] While the respondents' expenditures are not available from the Census, their educational attainment may alternatively reflect a household's financial capacity and welfare.

More precisely, the relevant analysis limited its attention to those who were aged above 25 years in 1988 (i.e., aged above 17 years in 1980) because the respondents' median (mean) value of the completed years of education is two (2.96) years and approximately 97% of them attain less than eight years; thus, those belonging to this age cohort are quite likely to have completed their schooling prior to 1980. This approach is similar to that adopted in the study by Oster (2012). The estimation results, as reported in Table S.4 in the supplemental appendix, revealed no significant association between the respondents' educational attainment and the corresponding indicators.[34]

[31] The data collected in Tanzania's Population and Housing Census 1978 was, whether paper-based or in electronic form, unavailable at the household level according to my interview with a principal statistician of the NBS in September 2017.

[32] The districts and regions are categorized in 114 and 23 groups in the relevant analyses, respectively. The IPUMS project publicly releases the relevant maps at `https://international.ipums.org/international/gis.shtml`.

[33] See `https://international.ipums.org/international-action/sample_details/country/tz#tz1988a` for the details of the Population Census 1988.

[34] An implicit assumption underlying this analysis is that all those aged above 17 years in 1980 survived and continued to reside in the same location till 1988. If people's migration decision and mortality were affected by the formation of CP in the early 1980s, these exercises may not be so useful. To mitigate such influence, I introduced a male dummy and age with an indicator for the districts, which contain the CP communities. These interaction terms may control for the CP-induced selection into migration and mortality to some extent. Additionally, controlling for these interaction terms did not alter the obtained implications.

[Here, Table 4]

6.2.3 Assessment of bias attributed to unobservables

Referring to Oster (forthcoming), I assessed the importance of omitted variables that share covariance properties with the pre-determined local conditions (i.e., historical controls, geographic and climate controls), as explained in subsection 4.2. When estimating the value showing this importance, as denoted δ (i.e., a coefficient of proportionality on selection assumptions), she suggested employing the value of R-squared obtained from a hypothetical regression of the outcome on the treatment, observed, and unobserved controls as $R_{max} = 1.3\ \tilde{R}$. Following this guide, the corresponding δ values for the coefficients pertaining to the CP communities are reported at the bottom of Table 2 and Table 3. The positive values imply that the influence of unobserved controls would have to be δ times greater than that of the pre-determined conditions to explain the estimated correlations. Typically, $\delta > 1$ implies a robust result. When the values are negative, unobservables would have to be negatively correlated with the local conditions, implying that controlling for unobservables increases the magnitude of the estimates. As indicated in the results, the previous implications are likely to be robust to the influence of possible unobservables.

6.2.4 Multiple hypothesis testing

For each of the endogenous and exogenous CPs, I conducted multiple hypothesis testing and checked whether its statistical relationships with the nine key outcomes, as selected to avoid the relevant tests being too conservative (e.g., Schochet, 2008), are jointly identified in a significant manner. Table S.5 in the supplemental appendix reports the original p-values, in addition to the adjusted p-values exploiting Bonferroni's, Holm (1979)'s step-down, and Hochberg (1988)'s step-up adjustment procedures. These tests do not account for dependency across tests when controlling the familywise error rate (e.g., Schochet, 2008) and suffer from low statistical power. Nevertheless, these exercises still yielded similar implications to those obtained before.

6.2.5 Crime spillover and Conley (1999)'s standard errors

A community's effective CP might have encouraged criminals to avoid that community and commit a crime in its surrounding areas. Having no information on the intensity of CP in a community's neighboring areas prevents this study from addressing this potential spillover. However, this concern is relevant only if CP succeeds in preventing a crime and solely affects the magnitude of the relevant estimates; therefore, this concern does not reject the overall implications of this study.

However, this issue may still cause spatial correlation of the standard errors beyond a community. Therefore, this study allows for the cross-sectional spatial correlation (500 km) by utilizing Conley (1999)'s spatial heteroskedasticity and autocorrelation consistent (HAC) standard errors. The estimation results, as reported in Table S.6 in the supplemental appendix, did not alter the overall implications of the findings. If any, the statistical significance of the estimates pertaining to the endogenous CP is more evident than before.[35]

6.2.6 External validity

As explained in Section 5, I primarily analyzed 292 EAs out of 405 EA surveyed in the TZNPS. This study considers this issue as pertaining to the representativeness of the analyzed sample rather than pertaining to the internal validity of the estimates (i.e., selection). Nevertheless, several outcomes analyzed in this study are regressed on an indicator for these 292 EAs, an EA's GPS coordinates, and regional fixed effects, and the coefficients on this indicator are reported in Table S.7 in the supplemental appendix. According to the results, the households in the analyzed EAs have negative attitudes toward political leaders in general. Thus, in the previous analysis, the households in the endogenous CP communities positively assessed a village chairperson's job relative to those in the no-CP communities within this sub-sample. With this exception, no noticeable difference between the analyzed EAs and the remaining ones exists regarding variables relevant to crime, welfare, and elite control.

7 Conclusion

This study examines whether and how CP is associated with citizens' welfare. To obtain the testable predictions, a simple game-theoretic model was first developed, whereby one elite, who is politically powerful and solely desires to protect the property, can mobilize every community member to participate in CP by transferring minimum rents to the citizens. While CP effectively reduces the likelihood of losing property to crime and improves a community's total welfare, this welfare gain is received only by the elite at the equilibrium.

Exploiting data drawn from a nationally representative household survey performed in Tanzania in 2008—2009, I showed that the households in the endogenous CP communities had their property stolen with a significantly smaller probability than those in the no-CP communities. The residents in the endogenous CP communities also achieved significantly larger consumption and savings,

[35] To estimate the spatial HAC standard errors, I exploited a Stata command, `my_reg2hdfespatial.ado`, developed by Berman et al. (2017) based on Hsiang et al. (2011) (`ols_spatial_HAC.ado`) and its extension by Thiemo Fetzer (`reg2hdfespatial.ado`).

as measured by the amount of possessed livestock. However, only the respondents belonging to the top 20% of the consumption distribution obtained this welfare gain while rendering those in the lower percentiles indifferent to the practice of CP. Nevertheless, the surveyed households in the endogenous CP communities compared with those in the no-CP communities still supported the work of a village chairperson more evidently and attended village meetings more frequently. Moreover, a daily wage payment for agricultural jobs was greater, and negative economic shocks were better dealt with in the endogenous CP communities than in the no-CP communities.

All these findings are not inconsistent with the predictions provided by the developed theoretical model. In other words, when an elite is politically powerful, the individualized incentive to seek for material gains may create a clientelistic relation between the elite and citizens and prompt citizens' cooperation while improving a community's total welfare. This apparently positive influence of elite control should, however, be treated with caution. First, the total welfare may improve primarily or only when there is serious inefficiency concerning the state provision of public goods. The private provision of public goods on the initiative of local elites may not necessarily be socially optimal. Second, the improved total welfare may not be equally distributed between the elites and the citizens. The elite control is likely to benefit largely (and quite possibly) only the elites.

Since this study exploits data drawn from the TZNPS 2008—2009, it might have been conducted before Tanzania's police reform that started in 2006 becomes in full swing. Nevertheless, it still found no noticeable welfare difference between the exogenous CP and no-CP communities. As often claimed, a social institution seems to be more effective when it is voluntarily formed, not implemented in a top-down manner. The elite control and the relevant rent transfers may explain why the endogenously crafted and exogenously facilitated institutions differ in their effectiveness in a certain real-world setting.

One question that remains unanswered in this study is where an elite's political power comes from. Making its mechanism endogenous in the developed theoretical model would not alter the predictions tested in this study while still highlighting one perspective of CP, i.e., cooperation under elite control. Nevertheless, its power may have several origins ranging from pre-colonial ethnic institutions likely characterized by geographic and climate factors (e.g., Alsan, 2015; Fenske, 2014; Michalopoulos and Papaioannou, 2015) to colonial administration (e.g., Acemoglu et al., 2014) as well as political competition during a multiparty system (e.g., Cross, 2013), and so on. One fruitful line of future research may be to address this important question.

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Table 1: Summary statistics

	Endogenous CP			Exogenous CP			No CP		
	Mean	Std.	No. of obs.	Mean	Std.	No. of obs.	Mean	Std.	No. of obs.
(A) Individual-level									
One if male	0.48	0.49	1526	0.47	0.49	7610	0.48	0.49	3047
Age (years)	20.85***	18.33	1526	22.67	19.04	7610	23.24	19.04	3047
Education (years)	2.02***	3.21	1526	2.51**	3.58	7610	2.69	4.08	3047
Annual expenditures per adult equivalent (mil. TSH)	0.51***	0.33	1526	0.68***	0.61	7610	0.59	0.57	3047
(B) Household-level									
One if any stolen	0.32**	0.46	232	0.35***	0.47	1588	0.23	0.42	583
One if attacked	-	-	-	0.00	0.06	1588	0.00	0.04	583
No. of cattle, goat, sheep	13.99***	37.62	193	4.09***	19.63	1177	2.02	5.28	356
One if approve of or strongly approve the job of									
a village chairperson	0.71***	0.45	232	0.66***	0.47	1587	0.21	0.41	582
a chief police officer	0.30	0.46	232	0.24	0.43	1587	0.24	0.43	582
a ward councilor	0.61	0.48	232	0.51**	0.49	1587	0.57	0.49	582
a MP	0.50	0.50	232	0.46**	0.49	1586	0.51	0.50	580
a village executive officer	0.63***	0.48	232	0.52***	0.49	1587	0.16	0.37	581
a ward executive officer	0.51***	0.50	232	0.42***	0.49	1587	0.71	0.45	583
No. of days hiring any labor and total wage paid in the long rainy season 2008									
Male (days)	8.73***	29,26	187	4.60***	13.85	1068	2.19	7.05	322
Female (days)	12.00**	32.11	187	7.07	20.23	1068	6.99	15.77	322
Wage (10,000 TSH)	4.47	14.42	187	2.54	8.13	1068	2.95	10.26	322
One if attended meetings in 12 months									
Village	0.59***	0.49	231	0.55***	0.49	1586	0.26	0.44	583
Farmers' cooperative	0.19***	0.39	232	0.11***	0.31	1586	0.06	0.23	582
SACCOS	0.12*	0.32	232	0.10***	0.31	1585	0.07	0.26	583
School	0.43***	0.49	232	0.38***	0.48	1586	0.31	0.46	583
Religiosity (scale 1 – 5)	3.00***	1.58	232	3.56***	1.21	1587	4.33	1.16	583
One if a SACCOS member	0.06	0.24	232	0.05	0.22	1588	0.05	0.22	583
One if borrowed in the 12 months from									
Neighbors	0.08***	0.27	232	0.01***	0.13	1588	-	-	583
Self-help groups	0.03***	0.17	232	0.00**	0.06	1588	-	-	583
One if head male (dummy)	0.74	0.43	232	0.74	0.43	1588	0.74	0.43	583
Head age (years)	46.04	14.80	232	44.45***	15.75	1587	47.13	14.68	583
Head education (years)	4.56***	3.51	232	5.49	3.66	1588	5.79	4.36	583
Household size	6.57***	4.35	232	4.78***	2.50	1588	5.22	2.84	583
One if rural	0.75***	0.42	232	0.60***	0.48	1588	0.53	0.49	583
Temperature (× 10 °C)	228.12***	7.04	232	227.84***	26.14	1374	254.00	29.14	509
Precipitation (mm)	891.00***	100.62	232	1070.82***	281.60	1374	1434.48	279.94	509
Elevation (m)	1199.29***	79.69	232	828.27***	579.06	1374	267.66	576.77	536
Slope (percent)	2.92**	2.49	232	5.59***	5.23	1374	3.42	3.01	536
(C) Community-level									
No. of police officers									
Currently work	35.75**	40.12	29	32.26***	57.46	199	62.56	62.71	69
Arrived in 12 months	7.75	15.94	29	5.40**	12.79	199	9.28	13.34	67
Left in 12 months	4.58*	7.23	29	2.28***	3.50	199	8.37	13.45	69
TSI in 1977	0.93***	0.12	29	0.16***	1.02	199	-0.71	0.73	73
Community investment projects	0.75**	0.43	29	0.60	0.53	199	0.53	0.50	73
One if had in 2007 or 2008	0.75***	0.44	28	0.82***	0.38	198	0.45	0.50	73
Money raised from com. members (mil. TSH)	7.69*	13.82	27	8.27***	16.29	175	2.77	7.22	66
Mean no. of crime b/w 1975 and 1980	141.93***	42.12	29	369.59	388.75	198	386.93	252.09	72
Population density									
1980	22.35***	12.04	29	548.42***	1130.16	199	3512.17	3793.65	73
1950	6.67***	4.00	29	61.84***	117.98	199	544.42	367.64	73
1900	3.10***	1.88	29	27.92***	53.80	199	242.40	167.92	73
Distance (km) to									
Travel routes of European explorers	2.61***	3.63	29	11.57***	12.56	199	7.85	6.70	73
Railway lines	43.55***	10.31	29	45.61***	18.62	199	29.85	15.29	73

Note: The equality of means between the groups are examined by T-tests. *** denotes significance at 1%, ** at 5%, and * at 10%. For both the communities having citizens' militia inside and outside the Greater Nyamwezi area, the reference group is no-CP communities.

Table 2: Crime incidence and welfare (OLS)

Dependent var.	One if any stolen	One if any stolen	One if any livestock stolen	One if stolen and the major items include non-livestock	One if cattle, goat, sheep stolen	One if attacked (major)	log of exp. per adult equiv.	log of exp. per adult equiv.	log of exp. per capita	No. of livestock from the HIQ	No. of cattle, goat, sheep from the AQ
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Endogenous CP	-0.328***	-0.303***	-0.225**	-0.195	-0.147***	-0.006	0.518***	0.372**	0.424***	19.605***	18.777***
	(0.079)	(0.082)	(0.102)	(0.119)	(0.030)	(0.006)	(0.138)	(0.153)	(0.158)	(6.717)	(7.219)
Exogenous CP	-0.044	-0.088**	-0.071	-0.032	0.010	-0.007	-0.077	0.026	0.004	3.810**	4.433**
	(0.043)	(0.042)	(0.046)	(0.036)	(0.016)	(0.005)	(0.104)	(0.061)	(0.062)	(1.483)	(1.732)
Male	-	-	-	-	-	-	-	-0.006	0.011	-	-
								(0.007)	(0.007)		
Age (years)	-	-	-	-	-	-	-	0.001*	0.001**	-	-
								(0.001)	(0.001)		
Education (years)	-	-	-	-	-	-	-	0.010***	0.012***	-	-
								(0.002)	(0.002)		
Head male	-	-0.002	0.027	-0.002	0.009	0.001	-	0.020	0.022	0.507	1.044
		(0.025)	(0.023)	(0.021)	(0.008)	(0.002)		(0.034)	(0.036)	(1.292)	(1.554)
Head age (years)	-	-0.001**	0.000	-0.002**	0.000	0.000**	-	-0.001	0.001	0.021	0.052**
		(0.001)	(0.001)	(0.001)	(0.000)	(0.000)		(0.001)	(0.001)	(0.029)	(0.025)
Head education	-	0.003	-0.001	0.003	0.000	-0.000	-	0.013***	0.014***	-0.199	-0.336*
(years)		(0.003)	(0.003)	(0.003)	(0.001)	(0.000)		(0.004)	(0.004)	(0.131)	(0.172)
Household size	-	0.002	0.008*	-0.002	0.004**	0.000	-	-0.020	-0.022	1.957**	2.527**
		(0.004)	(0.004)	(0.003)	(0.002)	(0.000)		(0.017)	(0.018)	(0.903)	(1.110)
Rural	-	-0.002	0.061*	-0.070**	-0.002	-0.004	-	-0.077*	-0.110**	2.214	1.667
		(0.038)	(0.033)	(0.035)	(0.011)	(0.006)		(0.046)	(0.047)	(1.367)	(1.615)
Agricultural HH	-	0.092**	-	-0.033	-	-0.001	-	0.024	0.035	-0.633	-
		(0.037)		(0.034)		(0.003)		(0.045)	(0.047)	(1.184)	
Othre HH controls	NO	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES
Historical controls	NO	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES
Climate/geography	NO	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES
GPS coordinates	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Ethnic-territorial FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Unit of obs.	hh.	hh.	hh.	hh.	hh.	hh.	ind.	ind.	ind.	hh.	hh.
Mean y if no CP (not log)	0.234	0.229	0.175	0.119	0.009	0.001	595348.2	557528.2	465268.6	1.226	2.027
Oster (forthcoming)'s δ											
Endogenous CP	-	8.000	8.117	-4.769	-8.949	-2.457	-	2.321	3.167	-9.157	-14.204
Exogenous CP	-	-4.045	16.142	-1.973	9.241	-3.901	-	-0.215	-0.032	418.753	-18.995
R-squared	0.065	0.113	0.103	0.130	0.136	0.055	0.343	0.475	0.491	0.230	0.261
No. of obs.	2403	2104	1585	2104	1585	2104	12183	10828	10828	2103	1584

Notes: (1) Figures ( ) are standard errors. *** denotes significance at 1%, ** at 5%, and * at 10%. (2) Standard errors are robust to heteroskedasticity and clustered residuals within each community.

Table 3: Elite control (OLS)

Dependent var.	One if approve or strongly approve the job of a village chairperson	One if approve or strongly approve the job of a village chairperson	One if attend village meetings in the 12 months	One if attend village meetings in the 12 months	No. of days hiring any labor (male)	No. of days hiring any labor (female)	Log $(1+y)$ total wage paid	Log $(1+y)$ total wage paid	log of exp. per adult equiv.	log of exp. per adult equiv.
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Endogenous CP	0.489***	0.485***	0.339***	0.345***	6.614	-2.903	2.378***	2.118**	0.363**	0.290**
	(0.080)	(0.084)	(0.103)	(0.070)	(4.643)	(5.475)	(0.729)	(0.890)	(0.159)	(0.131)
Exogenous CP	-0.123***	-0.128***	0.025	0.085*	0.620	-0.441	-0.429	-0.276	-0.094	0.029
	(0.046)	(0.046)	(0.038)	(0.051)	(1.518)	(2.685)	(0.274)	(0.362)	(0.117)	(0.073)
Endogenous CP										
× Health shock	-	-	-	-	-	-	-	-	0.295**	0.260*
									(0.127)	(0.146)
× Climatic shock	-	-	-	-	-	-	-	-	0.011	0.000
									(0.121)	(0.132)
× Crop shock	-	-	-	-	-	-	-	-	0.093	0.098
									(0.114)	(0.107)
Exogenous CP										
× Health shock	-	-	-	-	-	-	-	-	0.072	0.022
									(0.092)	(0.084)
× Climatic shock	-	-	-	-	-	-	-	-	0.032	-0.074
									(0.102)	(0.077)
× Crop shock	-	-	-	-	-	-	-	-	-0.006	0.059
									(0.091)	(0.081)
Health shock (dummy)	-	-	-	-	-	-	-	-	-0.088	0.041
									(0.084)	(0.077)
Climatic shock (dummy)	-	-	-	-	-	-	-	-	-0.047	0.125*
									(0.092)	(0.069)
Crop shock (dummy)	-	-	-	-	-	-	-	-	-0.014	-0.032
									(0.081)	(0.072)
Male	-	-	-	-	-	-	-	-	-	-0.007
										(0.007)
Age (years)	-	-	-	-	-	-	-	-	-	0.001*
										(0.000)
Education (years)	-	-	-	-	-	-	-	-	-	0.010***
										(0.002)
Head male	-	-0.003	-	0.051**	1.319	2.480**	-	0.070	-	0.031
		(0.023)		(0.024)	(0.952)	(1.191)		(0.193)		(0.032)
Head age (years)	-	0.000	-	0.001	0.017	0.009	-	-0.010*	-	-0.002
		(0.001)		(0.001)	(0.023)	(0.033)		(0.005)		(0.001)
Head education (years)	-	-0.002	-	0.004	0.123	0.077	-	-0.000	-	0.014***
		(0.003)		(0.003)	(0.133)	(0.187)		(0.028)		(0.004)
Household size	-	0.005*	-	0.003	0.125	0.112	-	0.051	-	-0.024*
		(0.003)		(0.004)	(0.211)	(0.248)		(0.034)		(0.014)
Rural	-	0.002	-	0.126***	1.660	0.518	-	0.104	-	-0.085*
		(0.034)		(0.043)	(1.494)	(1.834)		(0.249)		(0.045)
Agricultural HH	-	0.023	-	0.087**	-	-	-	-	-	0.022
		(0.036)		(0.038)						(0.045)
Log (1 + no. of days hiring any labor)										
Male	-	-	-	-	-	-	1.139***	1.086***	-	-
							(0.118)	(0.121)		
Female	-	-	-	-	-	-	2.467***	2.427***	-	-
							(0.087)	(0.092)		
Other HH controls	NO	YES	NO	YES	YES	YES	NO	YES	NO	YES
Historical controls	NO	YES	NO	YES	YES	YES	NO	YES	NO	YES
Climate/geography	NO	YES	NO	YES	YES	YES	NO	YES	NO	YES
GPS coordinates	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Ethnic-territorial FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Unit of obs.	hh.	hh.	hh.	hh.	hh.	hh.	hh.	hh.	ind.	ind.
Mean y if no CP (not log)	0.219	0.216	0.262	0.279	2.312	7.312	29587.58	31757.05	595348.2	557528.2
Oster (forthcoming)'s δ										
Endogenous CP	-	3.578	-	15.861	3.042	-0.934	-	4.177	-	-
Exogenous CP	-	1.018	-	-1.331	0.624	1.594	-	1.142	-	-
R-squared	0.349	0.399	0.317	0.371	0.147	0.183	0.704	0.726	0.346	0.484
No. of obs.	2401	2102	2400	2102	1473	1473	1577	1473	12183	10828

Notes: (1) Figures ( ) are standard errors. *** denotes significance at 1%, ** at 5%, and * at 10%. (2) Standard errors are robust to heteroskedasticity and clustered residuals within each community.

Table 4: Falsification test (OLS)

Dependent var.	No. of police officers			One if approve or strongly arpprove the job of					
	Work	Arrived in the 12 months	Left in the 12 months	Chief police officer	Ward councillor	MP	Village executive officer	Ward executive officer	
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	
Endogenous CP	44.834	0.383	3.561	-0.065	-0.108	-0.218*	0.102	-0.111	
	(28.696)	(8.137)	(3.379)	(0.091)	(0.151)	(0.129)	(0.118)	(0.129)	
Exogenous CP	-4.375	2.020	-4.863	0.072	0.020	0.008	-0.069*	-0.024	
	(37.632)	(3.849)	(6.504)	(0.049)	(0.052)	(0.046)	(0.038)	(0.048)	
Unit of obs.	com.	com.	com.	hh.	hh.	hh.	hh.	hh.	
Mean y if no CP	62.565	9,283	8.376	0.260	0.600	0.558	0.172	0.216	
R-squared	0.377	0.417	0.488	0.157	0.190	0.170	0.347	0.262	
No. of obs.	283	282	284	2103	2103	2101	2102	2104	
Dependent var.	Frequencies of attendance at religious services in the 12 months (scale 1 – 5)	One if attend in the 12 months			One if a member of SACCOS	One if borrowed in the 12 months from		One if had any investment projects in 2007 or 2008	Money raised from community members in the investment projects (mil. TSH)
		farmers' cooperative meetings	SACCOS meetings	school meetings		neighbors /friends	self-help groups		
	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)
Endogenous CP	-0.017	0.078	-0.012	0.013	0.075*	0.026	0.019	0.079	-4.828
	(0.230)	(0.051)	(0.047)	(0.163)	(0.041)	(0.033)	(0.012)	(0.398)	(6.651)
Exogenous CP	-0.141	0.009	-0.017	0.028	-0.013	0.013	-0.000	-0.035	0.433
	(0.153)	(0.034)	(0.033)	(0.074)	(0.025)	(0.008)	(0.006)	(0.126)	(3.598)
Unit of obs.	hh.	hh.	hh.	hh.	hh.	hh.	hh.	com.	com.
Mean y if no CP	4.299	0.058	0.071	0.323	0.057	0.000	0.000	0.452	2.778
R-squared	0.433	0.166	0.097	0.179	0.136	0.163	0.105	0.507	0.524
No. of obs.	2104	2102	2102	2103	2104	2104	2104	287	261
HH controls	YES (hh.)	YES (hh.)	YES (hh.)	YES	YES	YES	YES	YES (hh.)	NO
Historical controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Climate/geography	YES	YES	YES	YES	YES	YES	YES	YES	YES
GPS coordinates	YES	YES	YES	YES	YES	YES	YES	YES	YES
Ethnic-territorial FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: (1) Figures ( ) are standard errors. *** denotes significance at 1%, ** at 5%, and * at 10%. (2) Standard errors are robust to heteroskedasticity and clustered residuals within each community.

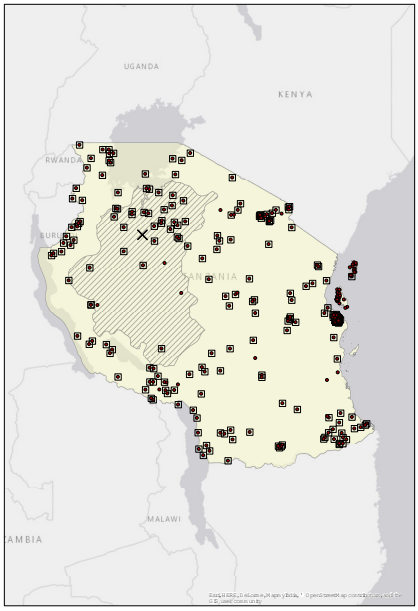

Figure 1: TZNPS communities (dot) and the Greater Nyamwezi area (shaded area)

Notes: (1) Each dot represents a TZNPS community, and communities forming CP are highlighted with a square. (2) The shaded area corresponds to the Greater Nyamwezi area as sourced from Weidmann et al. (2010)'s map.

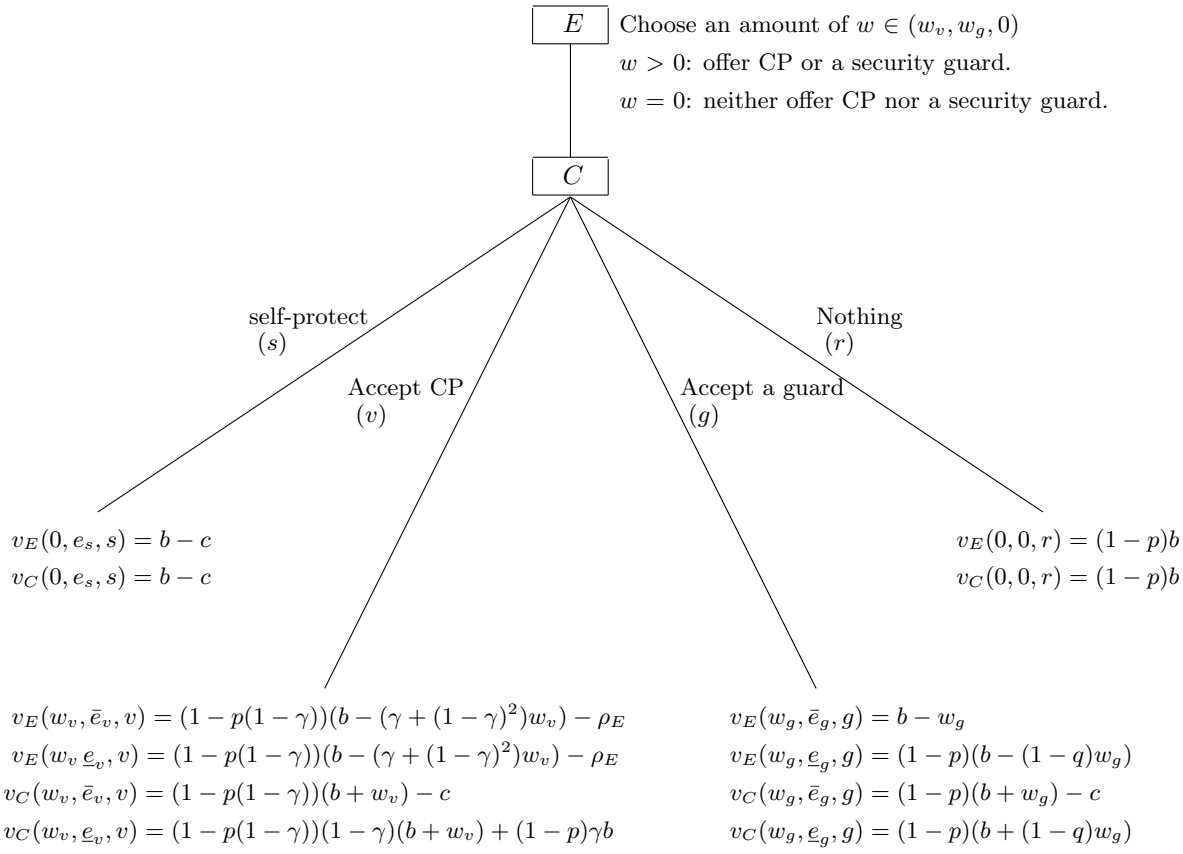

Figure 2: CP game

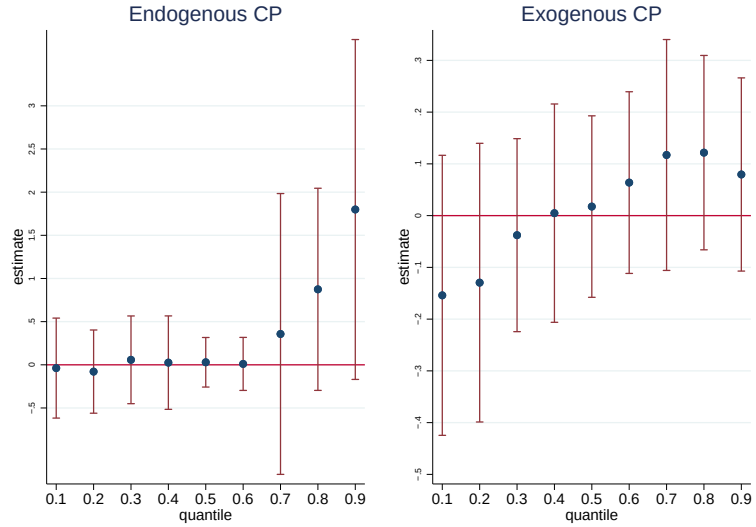

Figure 3: Quantile regression coefficients: log of expenditures per adult equivalent (TSH)

Notes: (1) This figure reports quantile regression coefficients corresponding to α_2 and α_3 in equation (12) with 95% confidence intervals. (2) Standard errors are robust to heteroskedasticity and clustered residuals within each community. (3) The exploited regressors are the same as those exploited in column (h) in Table 2.

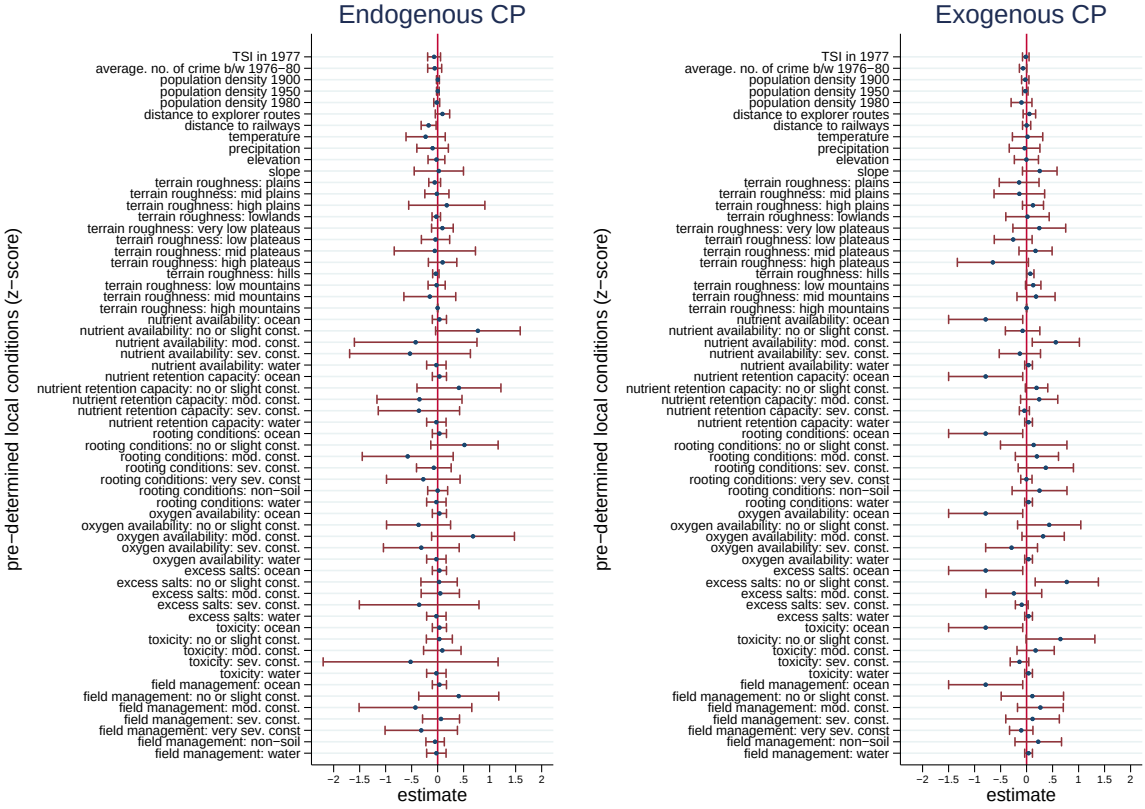

Figure 4: Balance test: pre-determined local conditions (z-score)

Notes: (1) In this figure, each of the pre-determined local conditions (z-score) were regressed by OLS on indicators for CP communities after controlling for ethnic-territorial fixed effects, administrative regional fixed effects, and a community's GPS-coordinates. This figure reports those coefficients pertaining to the CP communities with 95% confidence intervals. (2) Standard errors are robust to heteroskedasticity and clustered residuals within each community.

Supplemental appendix

S.1 Proof

Proof of proposition 1

Since $pb < c$, $b - c < (1-p)b$. So, the citizens never choose action s. To encourage the citizens to make effort when they choose action g, it must be the case that $(1-p)(b+w_g) - c \geq (1-p)(b + (1-q)w_g)$, i.e., $w_g \geq w_g^A \equiv \frac{c}{(1-p)q}$. Also, the citizens prefer action g and make effort rather than choose action r when $(1-p)(b+w_g) - c \geq (1-p)b$, i.e., $w_g \geq w_g^B \equiv \frac{c}{1-p}$. Similarly, the citizens prefer action g and shirk rather than choose action r when $(1-p)(b+(1-q)w_g) \geq (1-p)b$, i.e., $w_g \geq w_g^C \equiv 0$. Note that $w_g^C < w_g^B < w_g^A$.

When $w_g < w_g^A$, the citizens shirk when they choose action g. Since $(1-p)(b+(1-q)w_g) \geq (1-p)b$, the citizens prefer to choose action g and shirk rather than choose action r. Given this action, an elite obtains $(1-p)(b-(1-q)w_g)$. He maximizes this utility by choosing $w_g = 0$, yielding $v_E = (1-p)b$. When $w_g \geq w_g^A$, the citizens make effort when they choose action g. Since $(1-p)(b+w_g) - c > (1-p)(b+w_g^B) - c = (1-p)b$, the citizens prefer to choose action g and make effort rather than choose action r. Given this action, an elite obtains $b - w_g$. He maximizes this utility by choosing $w_g = w_g^A$, yielding $v_E = b - \frac{c}{(1-p)q}$. Since $(1-p)b - \left(b - \frac{c}{(1-p)q}\right) = \frac{c}{(1-p)q} - pb > \frac{c-pb}{(1-p)q} > 0$, an elite prefers not to propose a security guard.

To encourage the citizens to make effort when they choose action v, it must be the case that $(1-p(1-\gamma))(b+w_v) - c \geq (1-p(1-\gamma))(1-\gamma)(b+w_v) + (1-p)\gamma b$, i.e., $w_v \geq w_v^A \equiv \frac{\frac{c}{\gamma} - \gamma pb}{1-p(1-\gamma)}$. Also, the citizens prefer action v and make effort rather than choose action r when $(1-p(1-\gamma))(b+w_v) - c \geq (1-p)b$, i.e., $w_v \geq w_v^B \equiv \frac{c-\gamma pb}{1-p(1-\gamma)}$. Similarly, the citizens prefer action v and shirk rather than choose action r when $(1-p(1-\gamma))(1-\gamma)(b+w_v) + (1-p)\gamma b \geq (1-p)b$, i.e., $w_v \geq w_v^C \equiv \frac{-\gamma pb}{1-p(1-\gamma)} < 0$.

See the left-hand panel of Figure S.1 for the w_v^A and w_v^B. First, consider the region A, whereby the citizens prefer to make effort rather than shirk when choosing action v. Making effort is also preferable to action r. Thus, this case results in $\gamma = 1$, whereby an elite obtains utility $b - w_v - \rho_E$. He maximizes this utility by choosing minimum $w_v = c - pb$, yielding $v_E = b - c + pb - \rho_E = (1-p)b + 2pb - c - \rho_E$. Second, in the regions B and C, the citizens prefer to shirk rather than make effort when choosing v. Not making effort is also preferable to action r. Thus, this case results in $\gamma = 0$, whereby an elite obtains utility $(1-p)(b-w_v) - \rho_E$. An elite maximizes this utility by choosing $w_v = 0$, yielding $v_E = (1-p)b - \rho_E$.

Now, compare an elite's utility $(1-p)b$, $(1-p)b + 2pb - c - \rho_E$, and $(1-p)b - \rho_E$. When $\rho_E < 2pb - c$, the strategy profile $(w_v = c - pb, \bar{e}_v, v)$ is subgame perfect, otherwise, the strategy profile $(0, 0, r)$ is subgame perfect.

Proof of proposition 2

Since $pb \geq c$, $b - c \geq (1-p)b$. So, the citizens never choose action r. To encourage the citizens to make effort when they choose action g, it must be the case that $(1-p)(b+w_g) - c \geq (1-p)(b+(1-q)w_g)$, i.e., $w_g \geq w_g^A \equiv \frac{c}{(1-p)q}$. Also, the citizens prefer action g and make effort rather than choose action s when $(1-p)(b+w_g) - c \geq b - c$, i.e., $w_g \geq w_g^D \equiv \frac{pb}{1-p}$. Similarly, the citizens prefer action g and shirk rather than choose action s when $(1-p)(b+(1-q)w_g) \geq b - c$, i.e., $w_g \geq w_g^E \equiv \frac{pb-c}{(1-p)(1-q)}$. Here, $w_g^E - w_g^D = \frac{qpb-c}{(1-p)(1-q)}$ and $w_g^D - w_g^A = \frac{qpb-c}{(1-p)q}$.

Consider the case of $pb \geq \frac{c}{q}$, whereby $w_g^E \geq w_g^D \geq w_g^A$. Then, when $w_g < w_g^A$, the citizens shirk when they choose action g. Since $(1-p)(b+(1-q)w_g) \leq (1-p)(b+(1-q)w_g^E) = b - c$, the citizens prefer to choose action s rather than choose g and shirk, in which case, an elite obtains utility $b - c$. When $w_g^A \leq w_g < w_g^D$, the citizens make effort when they choose action g. Since $(1-p)(b+w_g) - c \leq (1-p)(b+w_g^D) - c = b - c$, the citizens prefer to choose action s rather than choose g and make effort, in which case, an elite obtains utility $b - c$. When $w_g \geq w_g^D$, the citizens make effort when they choose action g. Since $(1-p)(b+w_g) - c \geq (1-p)(b+w_g^D) - c = b - c$, the citizens prefer to choose action g and make effort rather than chose action s. Given this action, an elite obtains $b - w_g$. He maximizes this utility by choosing $w_g = w_g^D$, yielding $v_E = b - \frac{pb}{1-p}$. Since $b - \frac{pb}{1-p} \leq b - \frac{c}{1-p} < b - c$, an elite prefers not to propose a security guard.

Consider the case $c \leq pb < \frac{c}{q}$, whereby $w_g^E < w_g^D < w_g^A$. Then, when $w_g < w_g^E$, the citizens shirk when they choose action g. Since $(1-p)(b+(1-q)w_g) < (1-p)(b+(1-q)w_g^E) = b - c$, the citizens prefer to choose action s rather than choose g and shirk, in which case, an elite obtains utility $b - c$. When $w_g^E \leq w_g < w_g^A$, the citizens shirk when they choose action g. Since $(1-p)(b+(1-q)w_g) \geq (1-p)(b+(1-q)w_g^E) = b - c$, the citizens prefer to choose action g and shirk rather than choose action s. Given this action, an elite obtains $(1-p)(b-(1-q)w_g)$. He maximizes this utility by choosing $w_g = w_g^E$, yielding $v_E = b - c$. When $w_g \geq w_g^A$, the citizens make effort when they choose action g. Since $(1-p)(b+w_g) - c > (1-p)(b+w_g^D) - c = b - c$, the citizens prefer to choose action g and make effort rather than chose action s. Given this action, an elite obtains $b - w_g$. He maximizes this utility by choosing $w_g = w_g^A$, yielding $v_E = b - \frac{pb}{(1-p)q}$. Since $b - \frac{pb}{(1-p)q} < b - \frac{pb}{1-p} \leq b - \frac{c}{1-p} < b - c$, an elite prefers not to propose a security guard.

To encourage the citizens to make effort when they choose action v, it must be the case that $(1-p(1-\gamma))(b+w_v) - c \geq (1-p(1-\gamma))(1-\gamma)(b+w_v) + (1-p)\gamma b$, i.e., $w_v \geq w_v^A \equiv \frac{\frac{c}{\gamma} - \gamma pb}{1-p(1-\gamma)}$. Also, the citizens prefer action v and make effort rather than choose action s when $(1-p(1-\gamma))(b+w_v) - c \geq b - c$, i.e., $w_v \geq w_v^D \equiv \frac{pb(1-\gamma)}{1-p(1-\gamma)}$. Similarly, the citizens prefer action v and shirk rather than choose action r when $(1-p(1-\gamma))(1-\gamma)(b+w_v) + (1-p)\gamma b \geq b - c$, i.e., $w_v \geq w_v^E \equiv \frac{\frac{pb-c}{1-\gamma} - \gamma pb}{1-p(1-\gamma)}$.

Here, consider two cases: $\frac{c}{pb} \leq \frac{3}{4}$ and $\frac{3}{4} < \frac{c}{pb}$. When $\frac{c}{pb} \leq \frac{3}{4}$, see the middle panel of Figure S.1 for the w_v^A, w_v^D, and w_v^E. First, consider the regions A and F, whereby the citizens prefer to make effort rather than shirk when choosing action v. Making effort is also preferable to action s. Thus,

this case results in $\gamma = 1$, whereby an elite obtains utility $b - w_v - \rho_E$. He maximizes this utility by choosing minimum $w_v = 0$, yielding $v_E = b - \rho_E$. Second, in the regions B and C, the citizens prefer to shirk rather than make effort when choosing v. Not making effort is also preferable to action s. Thus, this case results in $\gamma = 0$, whereby an elite obtains utility $(1-p)(b - w_v) - \rho_E$. He maximizes this utility by choosing $w_v = \frac{pb-c}{1-p}$, yielding $v_E = b - c - 2(pb - c) - \rho_E$. Third, in the region D, the citizens prefer to shirk rather than make effort when choosing v. Not making effort is less preferable to action s. Thus, the citizens choose action s and an elite obtains utility $b - c$. Fourth, in the region E, the citizens prefer to make effort rather than shirk when choosing action v. Making effort is less preferable to action s. Thus, the citizens choose action s and an elite obtains utility $b - c$. Now, compare an elite's utility $b - c$, $b - \rho_E$, and $b - c - 2(pb - c) - \rho_E$. When $\rho_E < c$, an elite prefers the strategy profile $(w_v = 0, \bar{e}_v, v)$ to the strategy profile $(0, 0, s)$.

When $\frac{3}{4} < \frac{c}{pb} \leq 1$, see the right-hand panel of Figure S.1 for the w_v^A, w_v^D, and w_v^E. First, consider the regions A and G, whereby the citizens prefer to make effort rather than shirk when choosing action v. Making effort is also preferable to action s. Thus, this case results in $\gamma = 1$, whereby an elite obtains utility $b - w_v - \rho_E$. He maximizes this utility by choosing minimum $w_v = 0$, yielding $v_E = b - \rho_E$. Second, in the regions B and C, the citizens prefer to shirk rather than make effort when choosing v. Not making effort is also preferable to action s. Thus, this case results in $\gamma = 0$, whereby an elite obtains utility $(1-p)(b - w_v) - \rho_E$. He maximizes this utility by choosing $w_v = \frac{pb-c}{1-p}$, yielding $v_E = b - c - 2(pb - c) - \rho_E$. Third, in the regions D and E, the citizens prefer to shirk rather than make effort when choosing v. Not making effort is less preferable to action s. Thus, the citizens choose action s and an elite obtains utility $b - c$. Fourth, in the region F, the citizens prefer to make effort rather than shirk when choosing action v. Making effort is less preferable to action s. Thus, the citizens choose action s and an elite obtains utility $b - c$. Now, compare an elite's utility $b - c$, $b - \rho_E$, and $b - c - 2(pb - c) - \rho_E$. When $\rho_E < c$, an elite prefers the strategy profile $(w_v = 0, \bar{e}_v, v)$ to the strategy profile $(0, 0, s)$.

Taking the two cases together, when $\rho_E < c$, the strategy profile $(w_v = 0, \bar{e}_v, v)$ is subgame perfect, otherwise, the strategy profile $(0, 0, s)$ is subgame perfect.

S.2 Geo-variables

S.2.1 Crime between 1975 and 1980 (community-level variables)

The crime data at the 1975 district level (93 groups), which occurred between 1975 and 1980, was sourced from Tanzania's NBS with the help of TPF. This data provides three types of crime, namely, offenses against persons, offenses against property, and offenses against state security and public tranquility. After georeferencing the paper-based district map in 1975, which is also obtained from the NBS and identifying a district to which each TZNPS community belongs to, an annual average number of all crime incidences in each district during those periods was assigned to that community.

The offenses against persons includes murder, rape, child desertion, unnatural offense, and child stealing. The offense against property includes theft fire arm; armed robbery; robbery with violence; breaking; theft of a motorcycle; theft of a motor vehicle; counterfeit bank notes; stock theft; theft in a bank; theft in parastatal organization; theft in cooperative union; theft in local government; theft in central government; theft in political parties; other theft; arson; and fire accident. The offense against state security and public tranquility includes cannabis sativa; khat; smuggling government trophies; corruption; illicit local liquor; manufacturing of instruments of local liquor; unlawful possession of fire arms; unlawful possession of ammunition till 1979; and those involving cocaine, heroin, Mandrax, cannabis resin, and morphine in 1980.

S.2.2 Historical population density (community-level variable)

This study considers population density in 1900, 1950, and 1980, as sourced from the History Database of the Global Environment (HYDE) 3.1, which provides its historical estimates from 10000 BC to 2005 AD with a spatial resolution of 5-minute longitude/latitude in raster format (Goldewijk et al., 2010). I assigned the value of a raster point to each TZNPS community in its closest proximity on this data.

S.2.3 Distance to travel routes of European explorers (community-level variable)

A TZNPS community's distance to the nearest point of travel routes of European explorers between 1768 and 1894, provided by Nunn and Wantchekon (2011).

S.2.4 Distance to railway lines in the early 20th century (community-level variable)

A TZNPS community's distance to the nearest point of railway lines based on Century Company (1911), provided by Nunn and Wantchekon (2011).

S.2.5 Climatology (household-level variable)

Mean temperature: average annual temperature (multiplied by 10 °C) based on monthly climate data between 1960 and 1990 sourced from University of California, Berkeley. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.
Mean precipitation: average annual precipitation (mm) based on monthly climate data between 1960 and 1990 sourced from University of California, Berkeley. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.

S.2.6 Soil and terrain (household-level variable)

Elevation: elevation (m) based on the Shuttle Radar Topography Mission (SRTM) 90 m data sourced from the National Aeronautics and Space Administration. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.
Slope: slope (percent) based on the SRTM 90 m data sourced from the U.S Geological Survey. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.
Terrain roughness: categorical variables for terrain roughness based on the SRTM 90 m data sourced from LSMS-ISA. Terrain types include (a) plains (reference group); (b) mid-altitude plains; (c) high-altitude plains; (d) lowlands; (e) platform (very low land); (f) low plateaus; (g) mid-altitude plateaus; (h) high plateaus; (i) hills; (j) low mountains; (k) mid-altitude mountains; (l) high mountains. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.
Nutrient availability: categorical variables for nutrient availability based on "Harmonized World Soil Database" sourced from the Food and Agriculture Organization of the United Nations, classified as (a) ocean (reference group); (b) no or slight constraint; (c) moderate constraint; (d) severe constraint; and (e) water. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.
Nutrient retention capacity: categorical variables for nutrient retention capacity based on "Harmonized World Soil Database" sourced from the Food and Agriculture Organization of the United Nations, classified as (a) ocean (reference group); (b) no or slight constraint; (c) moderate constraint; (d) severe constraint; and (e) water. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.

Rooting conditions: categorical variables for rooting conditions based on "Harmonized World Soil Database" sourced from the Food and Agriculture Organization of the United Nations, classified as (a) ocean (reference group); (b) no or slight constraint; (c) moderate constraint; (d) severe constraint; (e) very severe constraint: (f) mainly non-soil; and (g) water. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.

Oxygen availability to roots: categorical variables for oxygen availability to roots based on "Harmonized World Soil Database" sourced from the Food and Agriculture Organization of the United Nations, classified as (a) ocean (reference group); (b) no or slight constraint; (c) moderate constraint; (d) severe constraint; and (e) water. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.

Excess salts: categorical variables for excess salts based on "Harmonized World Soil Database" sourced from the Food and Agriculture Organization of the United Nations, classified as (a) ocean (reference group); (b) no or slight constraint; (c) moderate constraint; (d) severe constraint; and (e) water. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.

Toxicity: categorical variables for toxicity based on "Harmonized World Soil Database" sourced from the Food and Agriculture Organization of the United Nations, classified as (a) ocean (reference group); (b) no or slight constraint; (c) moderate constraint; (d) severe constraint; and (e) water. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.

Field-management constraint: categorical variables for field-management constraint based on "Harmonized World Soil Database" sourced from the Food and Agriculture Organization of the United Nations, classified as (a) ocean (reference group); (b) no or slight constraint; (c) moderate constraint; (d) severe constraint; (e) very severe constraint; (f) mainly non-soil; and (g) water. See "TZNPS_Geovariables_Y1.pdf" available in the TZNPS data.

S.2.7 Tsetse suitability index (community-level variable)

An index constructed following an instruction provided by Table C.1 in Alsan (2015)'s ONLINE APPENDIX. I used temperature and relative humidity in 1977 as the input data and created the index. The input data on temperature and relative humidity in 1977 was sourced from the Twentieth Century Reanalysis Project V2c (Compo et al., 2011, `https://www.esrl.noaa.gov/psd/data/20thC_Rean/`), which provides the relevant information with a resolution of 2.0 degree latitude $\times$ 2.0 degree longitude in raster format. I assigned the value of a raster point to each TZNPS community in its closest proximity on this data.

Table S.1: Crime incidence: Breakdown (OLS)

Dependent var.	One if livestock stolen			
	cattle, goat, sheep	pig	chicken, turkey, rabbit	Other (e.g., donkey, dog)
	(a)	(b)	(c)	(d)
Endogenous CP	-0.147***	-0.013	-0.198*	0.013
	(0.030)	(0.012)	(0.104)	(0.019)
Exogenous CP	0.010	0.004	-0.054	-0.017*
	(0.016)	(0.006)	(0.050)	(0.010)
Mean y if no CP	0.009	0.000	0.163	0.006
R-squared	0.136	0.093	0.110	0.084
No. of households	1585	1585	1585	1585

Dependent var.	One if stolen and the major items include non-livestock such as						
	things you carry, e.g., wallet, purse, or book	mobile, watch, or jewellery	bycycle or other vehicle	things in your home, e.g., radio, furniture, dishes, etc.	crops at home or farm	things belonging to children	other
	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Endogenous CP	0.002	-0.075*	-0.080	-0.066	0.000	0.001	0.058
	(0.019)	(0.040)	(0.065)	(0.052)	(0.037)	(0.003)	(0.044)
Exogenous CP	0.020*	-0.026	-0.015	-0.001	0.009	-0.002	-0.014
	(0.010)	(0.023)	(0.012)	(0.020)	(0.017)	(0.002)	(0.021)
Mean y if no CP	0.011	0.031	0.023	0.023	0.017	0.000	0.019
R-squared	0.061	0.134	0.092	0.085	0.123	0.073	0.084
No. of households	2104	2104	2104	2104	2104	2104	2104
HH controls	YES	YES	YES	YES	YES	YES	YES
Historical controls	YES	YES	YES	YES	YES	YES	YES
Climate/geography	YES	YES	YES	YES	YES	YES	YES
GPS coordinates	YES	YES	YES	YES	YES	YES	YES
Ethnic-territorial FE	YES	YES	YES	YES	YES	YES	YES
Region FE	YES	YES	YES	YES	YES	YES	YES

Notes: (1) Figures ( ) are standard errors. *** denotes significance at 1%, ** at 5%, and * at 10%. (2) Standard errors are robust to heteroskedasticity and clustered residuals within each community.

Table S.2: Robustness to non-linear models

Dependent variables:	Estimated model	Endogenous CP Marginal effect	Endogenous CP Standard errors	Exogenous CP Marginal effect	Exogenous CP Standard errors	R-sqd.	No. of obs.
One if any stolen	Probit	-0.294***	(0.085)	-0.089**	(0.042)	0.093	2094
One if any livestock stolen	Probit	-0.193**	(0.081)	-0.063	(0.047)	0.100	1547
One if cattle, goat, sheep stolen	Probit	Computational failure					
One if stolen an the major items include non-livestock	Probit	-0.173	(0.129)	-0.040	(0.037)	0.139	2059
One if attacked	Probit	Computational failure					
No. of livestock from the HIQ	Negative binomial	19.614	26.778	24.006	20.284	0.161	2103
No. of livestock from the AQ	Negative binomial	Computational failure					
One approve or strongly approve the job of a village chairperson	Probit	0.472***	(0.086)	-0.171***	(0.055)	0.178	1753
One attend the village meetings in the last 12 months	Probit	0.326***	(0.070)	0.078*	(0.047)	0.310	2101

Notes: (1) Figures ( ) are standard errors. *** denotes significance at 1%, ** at 5%, and * at 10%. (2) Standard errors are robust to heteroskedasticity and clustered residuals within each community. (3) All the corresponding controls are included in regressors.

Table S.3: Ethnic-territorial fixed effects based on Murdock (1959)'s classification

Dependent var.	One if any stolen	One if any livestock stolen	One if stolen and the major items include non-livestock	One if cattle, goat, sheep stolen	One if attacked (major)	log of exp. per adult equiv.	No. of livestock from the HIQ	No. of cattle, goat, sheep from the AQ
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Endogenous CP	-0.348***	-0.356***	-0.133***	-0.158**	-0.011*	0.250**	11.074**	10.854**
	(0.079)	(0.070)	(0.030)	(0.077)	(0.005)	(0.124)	(4.715)	(4.548)
Exogenous CP	-0.074*	-0.100**	-0.022**	-0.001	-0.002	-0.093	0.134	-0.878
	(0.041)	(0.045)	(0.011)	(0.037)	(0.005)	(0.067)	(1.595)	(2.054)
R-squared	0.119	0.123	0.143	0.138	0.064	0.476	0.256	0.282
No. of obs.	2065	1555	1555	2065	2065	10600	2064	1554
Dependent var.	One if approve or strongly approve the job of a village chairperson	One if attend village meetings in the 12 months	No. of days hiring any labor (male)	No. of days hiring any labor (female)	Log of 1+ total wage paid	log of exp. per adult equiv.		
	(i)	(j)	(k)	(l)	(m)	(n)		
Endogenous CP	0.439***	0.327***	5.610	-3.946	1.657***	0.184		
	(0.098)	(0.075)	(3.903)	(5.934)	(0.513)	(0.126)		
Exogenous CP	-0.109**	0.045	0.587	-1.788	-0.043	-0.080		
	(0.049)	(0.048)	(1.488)	(3.002)	(0.315)	(0.082)		
Endogenous CP								
× Health shock	-	-	-	-	-	0.233		
						(0.147)		
× Climatic shock	-	-	-	-	-	0.001		
						(0.134)		
× Crop shock	-	-	-	-	-	0.106		
						(0.112)		
Exogenous CP								
× Health shock	-	-	-	-	-	-0.005		
						(0.086)		
× Climatic shock	-	-	-	-	-	-0.034		
						(0.082)		
× Crop shock	-	-	-	-	-	0.017		
						(0.083)		
Health shock (dummy)	-	-	-	-	-	0.047		
						(0.078)		
Climatic shock (dummy)	-	-	-	-	-	0.089		
						(0.075)		
Crop shock (dummy)	-	-	-	-	-	-0.006		
						(0.074)		
Log (1 + no. of days hiring any labor)								
Male	-	-	-	-	1.050***	-		
					(0.123)			
Female	-	-	-	-	2.444***	-		
					(0.092)			
R-squared	0.397	0.385	0.160	0.182	0.734	0.484		
No. of obs.	2063	2063	1443	1443	1443	10600		
Individual controls	NO	NO	NO	NO	NO	YES	NO	NO
HH controls	YES	YES	YES	YES	YES	YES	YES	YES
Historical controls	YES	YES	YES	YES	NO	YES	YES	YES
Climate/geography	YES	YES	YES	YES	NO	YES	YES	YES
GPS coordinates	YES	YES	YES	YES	YES	YES	YES	YES
Ethnic-territorial FE	YES	YES	YES	YES	YES	YES	YES	YES
Region FE	YES	YES	YES	YES	YES	YES	YES	YES

Notes: (1) Figures ( ) are standard errors. *** denotes significance at 1%, ** at 5%, and * at 10%. (2) Standard errors are robust to heteroskedasticity and clustered residuals within each community.

Table S.4: Falsification test: Educational attainment, Population Census 1988 (OLS)

Dependent var.	Education (years) (Age $\geq$ 25)	One if completed primary school (Age $\geq$ 25)	One if lliterate (Age $\geq$ 25)
	(a)	(b)	(c)
Districts including the TZNPS communities forming CP (dummy)			
Centroid located within the Greater Nyamwezi area	-0.469	-0.046	-0.062
	(0.432)	(0.052)	(0.056)
Centroid located outside the Greater Nyamwezi area	-0.175	-0.020	-0.016
	(0.133)	(0.014)	(0.019)
Districts including the TZNPS	-0.087	-0.016	-0.001
communities (dummy)	(0.294)	(0.038)	(0.014)
Male	1.979***	0.209***	0.330***
	(0.031)	(0.004)	(0.005)
Age	-0.091***	-0.012***	-0.012***
	(0.002)	(0.000)	(0.000)
GPS coordinates	YES	YES	YES
Ethnic-territorial FE	YES	YES	YES
Region FE	YES	YES	YES
R-squared	0.286	0.234	0.266
No. of individuals	810276	817309	817307

Notes: (1) Figures ( ) are standard errors. *** denotes significance at 1%, ** at 5%, and * at 10%. (2) Standard errors are robust to heteroskedasticity and clustered residuals within each district. (3) The position of a district's centroid is exploited as the GPS coordinates.

Table S.5: Multiple-hypothesis testing (OLS)

	Coefficient	Original p-values	Adjusted p-values			R-sqd	No. of obs.
			Bonferroni	Holm (1979)	Hochberg (1988)		
Dependent variables:	(a)	(b)	(c)	(d)	(e)	(f)	(g)
(A) Endogenous CP							
One if any stolen	-0.303***	(0.000)	(0.002)	(0.001)	(0.001)	0.113	2104
One if attacked	-0.006	(0.299)	(1.000)	(1.000)	(0.596)	0.055	2104
Log of exp. per adult equivalent	0.372**	(0.016)	(0.139)	(0.077)	(0.072)	0.475	10828
No. of livestock	19.605***	(0.004)	(0.034)	(0.022)	(0.022)	0.230	2103
One if approve or strongly approve the job of a village chairperson	0.485***	(0.000)	(0.000)	(0.000)	(0.000)	0.399	2102
One if attend village meetings in the 12 months	0.345***	(0.000)	(0.000)	(0.000)	(0.000)	0.371	2102
No. of days hiring any labor							
Male	6.614	(0.156)	(1.000)	(0.466)	(0.466)	0.147	1473
Female	-2.903	(0.596)	(1.000)	(0.597)	(0.596)	0.183	1473
Log (1 + total wage paid)	2.118**	(0.018)	(0.162)	(0.077)	(0.072)	0.726	1473
(B) Exogenous CP							
One if any stolen	-0.088**	(0.035)	(0.317)	(0.246)	(0.246)	0.113	2104
One if attacked	-0.007	(0.202)	(1.000)	(1.000)	(0.869)	0.055	2104
Log of exp. per adult equivalent	0.026	(0.668)	(1.000)	(1.000)	(0.869)	0.475	10828
No. of livestock	3.810**	(0.011)	(0.096)	(0.085)	(0.085)	0.230	2103
One if approve or strongly approve the job of a village chairperson	-0.128***	(0.006)	(0.051)	(0.051)	(0.051)	0.399	2102
One if attend village meetings in the 12 months	0.085*	(0.095)	(0.854)	(0.569)	(0.569)	0.371	2102
No. of days hiring any labor							
Male	0.620	(0.683)	(1.000)	(1.000)	(0.869)	0.147	1473
Female	-0.441	(0.870)	(1.000)	(1.000)	(0.869)	0.183	1473
Log (1 + total wage paid)	-0.276	(0.447)	(1.000)	(1.000)	(0.869)	0.726	1473

Notes: (1) Figures *** denotes significance at 1%, ** at 5%, and * at 10%, corresponding to the original p-values based on the estimation results reported in Table 2 and Table 3. (2) The regressors include all controls exploited in Table 2 and Table 3.

Table S.6: Spatial HAC standard errors (OLS)

Dependent var.	One if any stolen	One if any livestock stolen	One if stolen and the major items include non-livestock	One if cattle, goat, sheep stolen	One if attacked (major)	log of exp. per adult equiv.	No. of livestock from the HIQ	No. of cattle, goat, sheep from the AQ
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Endogenous CP	-0.263***	-0.222***	-0.151	-0.139***	-0.003	0.418***	17.792***	16.560***
	(0.047)	(0.074)	(0.119)	(0.017)	(0.004)	(0.096)	(4.909)	(4.270)
Exogenous CP	-0.102**	-0.075**	-0.044	0.010	-0.008	0.010	4.261***	4.939***
	(0.040)	(0.037)	(0.043)	(0.015)	(0.005)	(0.080)	(1.523)	(1.105)
No. of obs.	2104	1585	2104	1585	2104	10828	2103	1584
Dependent var.	One if approve or strongly approve the job of a village chairperson	One if attend village meetings in the 12 months	No. of days hiring any labor (male)	No. of days hiring any labor (female)	Log of 1+ total wage paid	log of exp. per adult equiv.		
	(i)	(j)	(k)	(l)	(m)	(n)		
Endogenous CP	0.491***	0.368***	5.854	-2.194	2.152***	0.328***		
	(0.049)	(0.038)	(4.643)	(3.976)	(0.748)	(0.091)		
Exogenous CP	-0.123**	0.087**	1.056	-0.861	-0.302	0.015		
	(0.053)	(0.043)	(1.483)	(2.201)	(0.279)	(0.074)		
Endogenous CP								
× Health shock	-	-	-	-	-	0.257***		
						(0.088)		
× Climatic shock	-	-	-	-	-	0.006		
						(0.104)		
× Crop shock	-	-	-	-	-	0.099		
						(0.093)		
Exogenous CP								
× Health shock	-	-	-	-	-	0.023		
						(0.045)		
× Climatic shock	-	-	-	-	-	-0.081		
						(0.087)		
× Crop shock	-	-	-	-	-	0.061		
						(0.076)		
Health shock (dummy)	-	-	-	-	-	0.041		
						(0.043)		
Climatic shock (dummy)	-	-	-	-	-	0.130*		
						(0.067)		
Crop shock (dummy)	-	-	-	-	-	-0.036		
						(0.068)		
Log (1 + no. of days hiring any labor)								
Male	-	-	-	-	1.085***	-		
					(0.158)			
Female	-	-	-	-	2.428***	-		
					(0.164)			
No. of obs.	2102	2102	1473	1473	1473	10828		
Individual controls	NO	NO	NO	NO	NO	YES	NO	NO
HH controls	YES	YES	YES	YES	YES	YES	YES	YES
Historical controls	YES	YES	YES	YES	YES	YES	YES	YES
Climate/geography	YES	YES	YES	YES	YES	YES	YES	YES
GPS coordinates	YES	YES	YES	YES	YES	YES	YES	YES
Ethnic-territorial FE	YES	YES	YES	YES	YES	YES	YES	YES
Region FE	YES	YES	YES	YES	YES	YES	YES	YES

Notes: (1) Figures ( ) are standard errors. *** denotes significance at 1%, ** at 5%, and * at 10%. (2) Conley (1999) standard errors, allowing for spatial correlation across communities within 500 km radius, are exploited.

Table S.7: Correlation between an indicator for the analyzed sample EAs and several outcomes (OLS)

	Coefficient	Standard errors	Unit of obs	R-sqd.	No. of obs.
One if any stolen	-0.005	(0.020)	hh	0.037	3265
One if any livestock stolen	-0.002	(0.020)	hh	0.026	2429
One if cattle, goat, sheep stolen	-0.000	(0.008)	hh	0.020	2429
One if stolen and the major items include non-livestock	-0.019	(0.018)	hh	0.043	3265
One if attacked	0.000	(0.002)	hh	0.009	3265
Log of exp. per adult equivalent	0.015	(0.045)	ind.	0.264	16709
No. of livestock	1.040	(0.868)	hh	0.068	3264
No. of cattle, goat, sheep	1.676	(1.146)	hh	0.071	2428
One if approve or strongly approve the job of a village chairperson	-0.066***	(0.020)	hh	0.326	3263
One if attend village meetings in the 12 months	-0.012	(0.024)	hh	0.269	3261
No. of days hiring any labor					
Male	0.334	(0.829)	hh	0.022	2240
Female	1.087	(1.084)	hh	0.024	2240
Log (1 + total wage paid)	-0.258	(0.270)	hh	0.026	2240
No. of police officers					
Work	5.825	(14.806)	com.	0.191	304
Arrived in the 12 months	-1.390	(1.436)	com.	0.245	300
Left in the 12 months	0.855	(1.093)	com.	0.398	302
One if approve or strongly approve the job of					
a chief police officer	-0.063**	(0.025)	hh.	0.053	3259
a ward councilor	-0.073***	(0.024)	hh.	0.109	3263
a MP	-0.071***	(0.025)	hh.	0.092	3260
a village executive officer	-0.072***	(0.024)	hh.	0.266	3262
a ward executive officer	-0.071***	(0.023)	hh.	0.181	3264
Frequencies of attendance at religious services in the 12 months	-0.094	(0.069)	hh	0.207	3263
One if attend in the 12 months					
farmers' cooperative meetings	-0.029*	(0.017)	hh	0.061	3262
SACCOS meetings	-0.019	(0.015)	hh	0.026	3262
school meetings	-0.040*	(0.024)	hh	0.068	3263
One if a member of SACCOS	0.010	(0.009)	hh	0.021	3265
One if borrowed in the 12 months					
neighbors/friends	0.011***	(0.004)	hh	0.069	3265
self-help groups	-0.001	(0.004)	hh	0.014	3265
One if had any investment projects in 2007 or 2008	-0.089**	(0.039)	com.	0.376	405
Money raised from community members in the investment projects (mil. TSH)	0.466	(0.891)	com.	0.246	366

Notes: (1) This table reports coefficients on an indicator for the analyzed sample EAs (292 EAs), which arise from regressing the reported outcomes on this indicator, a EA's GPS coordinates, and regional fixed effects. (2) Figures ( ) are standard errors. *** denotes significance at 1%, ** at 5%, and * at 10%. (3) Standard errors are robust to heteroskedasticity and clustered residuals within each EA.

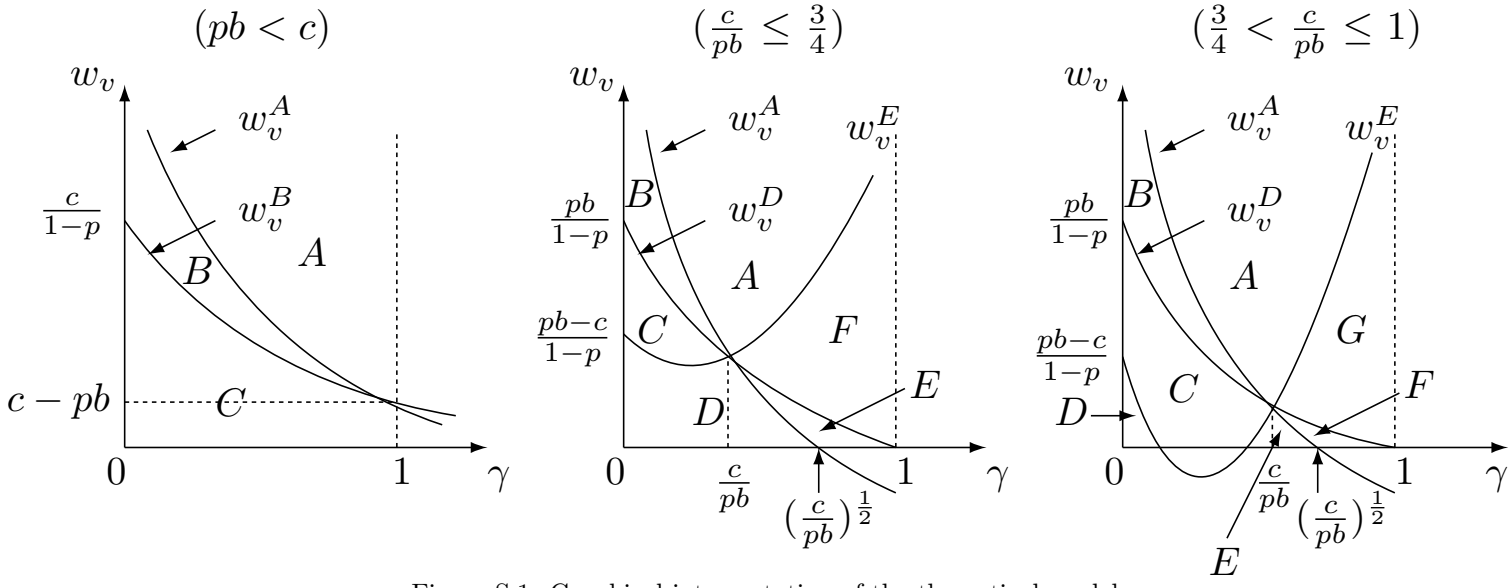

Figure S.1: Graphical interpretation of the theoretical model

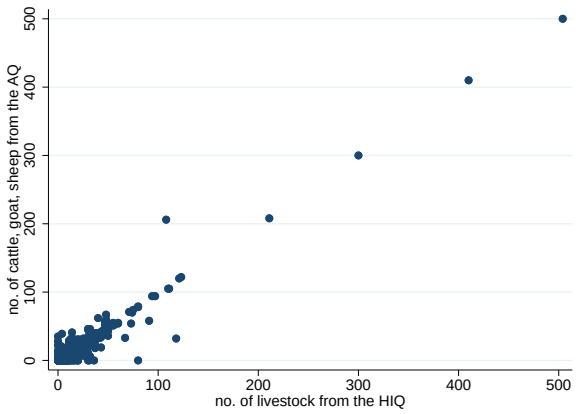

Figure S.2: Consistency of the livestock information between the HIQ and the AQ

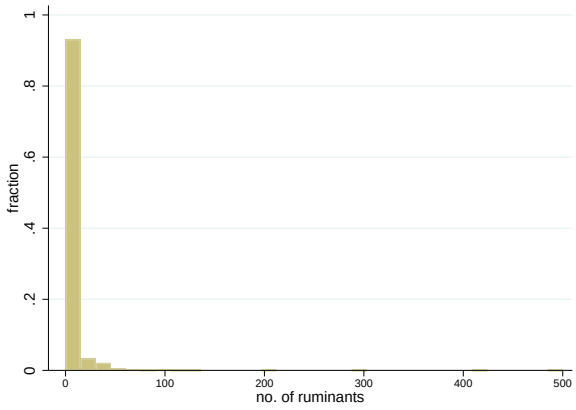

Figure S.3: Distribution of ruminants (i.e., cattle, sheep, goat)