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AN EMPIRICAL AND THEORETICAL ANALYSIS OF LEADERSHIP IN TWO EGALITARIAN HORTICULTURAL SOCIETIES

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ABSTRACT

Leadership is a central subject of interest in anthropology and the evolutionary social sciences more generally because of its ubiquity in human societies as well as its role in the evolution of cooperation, social complexity, and social hierarchy. Explaining the variation in the form and functions of leadership across different societies and settings remains a major challenge for social scientists. Although it is often associated with social hierarchy, here I argue that leadership can and does evolve even in egalitarian settings where leaders cannot hope to fully make up the burdens and expenses associated with their service. I further show how norms promoting the devolution of power and authority to leaders can incentivize more effective leadership, albeit at the risk of increasing social inequality and corruption. I explore these dynamics with empirical data from two small-scale farming societies, as well as a game-theoretical model of public service.

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CHAPTER 1: THEORETICAL BACKGROUND AND LITERATURE REVIEW

1.1 Introduction

The evolutionary origin of leadership has been a subject of interest since at least the early 20th century (Mumford, 1906). Leadership is a necessary feature of human social organization, observable everywhere from ritual and hunt leaders in egalitarian hunter-gatherer groups such as the Aka (Hewlett, 1988), to the strict hierarchies of modern bureaucracies and businesses. Many leaders are high-status, prestigious, and occupy privileged positions within a social hierarchy. Accordingly, research on leadership has often focused on the questions of a) what are the qualities of effective leaders and b) what personal benefits are leaders able to generate from their position of relative power. But leaders also play vital roles in many mundane settings, such as community organizing, event planning, coordination tasks, and logistics, that require forming temporary organizational hierarchies not associated with long-term social hierarchies. Not all leadership roles are competitive or aspirational: some can take the form of a public service, which provides a benefit primarily to the group as a whole. This raises the central question of this dissertation: what incentivizes leaders to take on the costs and challenges of public service in the absence of strong hierarchies that guarantee them a privileged share of the collective benefit? I will argue that leadership can and does evolve even when the overall burden placed on the leader outweighs any advantage they gain relative to their followers as a result of their position of relative power. I will further explore how social norms favoring the devolution of power and

authority to leaders can help improve collective outcomes, but also lead to more hierarchical social structures.

In the introduction chapter I will discuss leadership, the role it has played in human evolution, and how it relates to social status and other related concepts. The next two chapters will focus on two egalitarian indigenous societies of lowland Bolivia, the Tsimane and the Moseten. Despite a shared ethnolinguistic heritage, these two populations have distinct political identities and attitudes towards formal leadership which reflect both their different histories of contact with colonizers, missionaries, and other indigenous groups, as well as their current social and economic practices and integration with broader Bolivian society. I begin by comparing the past and present leadership of these two populations, drawing on survey and interview data collected over more than 15 months of fieldwork in 6 communities. I argue that Moseten and Tsimane leaders are best thought of as public servants, with limited tenure and high accountability to community members, whose authority derives principally from their office rather than their individual prestige. Leadership can be beneficial to Tsimane and Moseten communities, but requires heavy upfront investments of the time, effort, and resources which can constitute important barriers to entry. However, there is significantly more engagement with and support for formal leadership in Moseten versus Tsimane communities. This can be attributed both to the distinct cultural and religious forces that have shaped the two populations since the 18th century, as well as the greater ability of Moseten leaders to use their resources to positive effect, for example by lobbying for government investments.

Next, I explore what individual characteristics are associated with leadership. I compare not only former leaders to the rest of the population, but also individuals eager to be

leader in the future, as well as individuals who are perceived by others to be strong candidates for leadership. I find no evidence that former leaders were able to accumulate more wealth than their co-residents, although there is no good strategy for causal inference. I also find that the only strong predictors of whether an individual is named by neighbors as a potential leader are a) whether those neighbors had previously named them as a social partner and b) whether that individual had prior leadership experience. In other words, people put far more stock in their personal experience of their neighbor's leadership abilities than more immediate measures of status such as education or wealth. Finally, I find that, contrary to my predictions, life history variables such as age and number of dependent offspring are not strongly predictive of people's eagerness to become leader. I also find that many subsequently elected leaders had claimed not to want leadership, and that frequently nominated individuals rarely ended up as leaders. This seems to confirm that leadership in Tsimane and Moseten communities is not hotly contested but rather must be negotiated.

Chapter 3 draws on insights from chapters 1 and 2 to generate a game theoretical model of public service with upfront costs to leaders. I show that leadership can evolve so long the benefits generated by leaders outweighs the opportunity costs of leadership, even if those costs are borne disproportionately by leaders. However, groups maximize expected returns when they fully reimburse leaders for the costs of public service, which has implications for the evolution of institutions. I argue that in the Tsimane and Moseten contexts, leaders face challenges in subsidizing the costs of leadership, which may reduce their ability to invest and incentivize corruption. I conclude with predictions generated by the model which can be tested in similar egalitarian contexts.

1.2 Defining leadership and related terms.

In behavioral ecology and evolutionary anthropology, leaders are defined as individuals who have a disproportionate influence on collective behavior (Garfield, von Rueden, et al., 2019; J. E. Smith et al., 2016; C. von Rueden et al., 2014). Building on this definition, I use leadership here to mean a hierarchical, goal-oriented form of social organization. This is distinct from the definition of the term in psychology and business management, which, while not always consistent (Antonakis & Day, 2018, p.5), generally refers to an individual's ability to motivate and influence others (e.g. Reicher et al., 2007). I avoid this definition because it treats leadership as a latent quality of individuals rather than a behavior or a social structure, which makes it harder to measure and quantify and divorces the term leadership from its exercise.

Another point of contention between the fields of anthropology and psychology is the question of whether leadership can be coercive. While psychologists generally exclude coerciveness from definitions of leadership (Reicher et al., 2007), evolutionary anthropologists have typically considered coercion to be one of two major ways for leaders to exert influence, the other being prestige (Cheng et al., 2013; Henrich & Gil-White, 2001). Prestige is conferred voluntarily on individuals with specialized skills, knowledge, or abilities from which others can benefit, and manifests as social deference, respect, or admiration (Henrich & Gil-White, 2001).

Prestige is sometimes presented as a counterpart to dominance, together constituting the 'two ways to the top', two distinct strategies for achieving status and influence (Cheng et al., 2013; Cheng & Tracy, 2014). However, this dichotomy raises problems, since dominance can sometimes be the source of an individual's prestige (Chapais, 2015). Physical dominance

may reliably signal certain leadership abilities, such as consensus building (Glowacki & von Rueden, 2015; von Rueden et al., 2014). Dominant traits in leaders can also be highly valued if they are likely to be applied to individuals who are perceived to threaten the interests of the group. Warfare, for instance, might increase the need for a centralized authority with the power to make military decisions and punish defectors effectively (Boone, 1992; Petersen, 2014). In Ancient Rome, for instance, dictators were granted temporary emergency powers and authority over the senate in response to grave military threats to the Republic (Cohen, 1957). Similarly, among the Yanomamo of Venezuela, known warriors were granted particular reverence during periods of warfare (Chagnon, 1983); and Nambiquara leadership in Brazil became more authoritarian under threat of attacks (Price, 1981).

In practice, all rulers - including despots - rely on delicate networks of support that must be carefully maintained to avoid being overthrown or voted out (de Mesquita et al., 2005). Dominance and abusive behavior are certainly common in certain leaders (Chen Zeng et al., 2022), but coercion without support is likely insufficient to achieve high status, as humans tend to punish abusive social partners with 'leveling mechanisms' such as ostracism, ridicule, insubordination, or violence (Boehm, 1999, 2012), or simply by disengaging with bad actors (Aktipis, 2011). As a result, some have called to divert focus away from *prestige* and *dominance* as primary components of leadership in favor of thinking about leaders in terms of the collective benefits they bring to the group (Chapais, 2015; Garfield et al., 2020). In this view, dominance in leaders is a trait which may generate collective benefits, but brings with it the risk of coercive or oppressive behavior towards in-group members.

1.3 Leadership and the evolution of social hierarchies

Leadership is often discussed in the context of the evolution of social hierarchies and socio-economic inequality (Garfield, von Rueden, et al., 2019; Hooper et al., 2010; Turchin & Gavrilets, 2009). Social rank emerges when individuals vary in the amount of power and influence they have in a society, and since leaders must necessarily exert influence, organizational hierarchies and social hierarchies often overlap. This overlap may emerge through mutually compatible processes. Leaders may emerge from among high-ranking members of already hierarchically differentiated societies, since they benefit disproportionately from that society's productive capacity (Gavrilets & Fortunato, 2014). Alternatively, groups may willingly allow certain individuals to ascend in social rank and achieve positions of leadership in exchange for certain benefits, such as the material generosity displayed by Melanesian Big Men (Sahlins, 1963) or the hunting returns of proficient hunters, who are rewarded with high status in numerous societies (Jaeggi & Gurven, 2013; Smith, 2004)

However, it is important not to conflate organizational hierarchy (leadership) and social hierarchies. Leadership can exist independently of social hierarchy, and many social hierarchies for example, caste systems) are completely unrelated to leadership. Unlike social rank, which is relatively stable over time (although subject to important shifts), leadership is often temporary and opportunistic (Lewis, 1974). In small-scale forager societies, for instance, leaders may emerge as needed to lead hunts or raids, and while repeated success in leadership may lead to higher prestige (Garfield, von Rueden, et al., 2019; von Rueden & van Vugt, 2015), the existence of organizational hierarchy in the context of specific tasks is in no way incompatible with a broadly egalitarian society (von Rueden et al., 2014).

Recent anthropological and archaeological publications have discussed how complex societies have arisen with little social inequality that must nevertheless have had some form of organizational leadership. The Indus Valley, for instance, is known to have had elaborately planned cities with drainage and water supply systems, but no evidence of economic inequality: houses were all similarly sized and burials equally ornate (Green, 2021). Conversely, many social hierarchies are predicated not on leadership but rather on inherited rank, such as systems of nobility or caste. Mounting evidence suggests that the emergence of large-scale socio-economic inequality in human societies is due to ability of some groups to monopolize defensible resources, rather than the increase in productivity associated with the Neolithic transition to agriculture, as has been widely believed since Adam Smith's Wealth of Nations (1776). Gurven et al. (2010) find that in modern horticulturalist groups, intergenerational transmission of wealth inequality is associated with scarce, defensible resources rather than domestication *per se*. Similarly, Mayshar et al (2021) find a causal association between the cultivation of cereal grains – which are harvested once per year and must be stockpiled and defended – and the emergence of inequality, as opposed to the cultivation of tubers, which can be harvested opportunistically and do not store as well outside of the ground.

Finally, conflating leadership with social hierarchy can obscure certain forms of leadership that tend not to translate to social rank, such as teaching, or decision making at the household level (Hagen & Garfield, 2019). This may have caused leadership researchers to underestimate the importance of female leadership in human evolutionary history.

More broadly, leadership needs to be understood in the context not just of the evolution of social hierarchies, but also the evolution of complex cooperation.

1.4 Leadership and the evolution of cooperation

In many non-human social species, leadership is a cooperative behavior much more than it is a dominant one. Animals who find safety in the numbers of shoals or herds often find themselves following whichever individual makes the first move (van Vugt & von Rueden, 2020) for example to avoid a predator or to seek out food or water (Fischhoff et al., 2007). Many eusocial insects, such as ants and bees, often have scouts – which are sterile and subordinate to the queen and the hive - search for sources of food before signaling this information to their colony with pheromones or dances (Czaczkes et al., 2015; Grüter et al., 2008). The disproportionate influence of leaders on group movement and composition has also been noted in many mammals (Smith et al., 2016), fish (Krause et al., 2000; Nakayama et al., 2012; Reebs, 2001), and some birds (Jolles et al., 2013). Numerous social hunters including hyenas (Smith et al., 2015), lions (Heinsohn & Packer, 1995), wolves (Mech, 2000), chimpanzees (de Waal, 1982; Kendal et al., 2015; Mitani, 2009; Wrangham & Glowacki, 2012), and baboons (Bracken et al., 2022; Byrne et al., 1990; Stueckle & Zinner, 2008), social units are led by high-ranking individuals who direct hunts or lead the defense of the group against competitors.

Leadership has likely played an important role in the evolution of cooperation in humans. Human cooperative endeavors are remarkably complex, often requiring long-term, continuous collaboration between large numbers of unrelated individuals. This raises numerous problems which makes organizational hierarchy a particularly effective collective strategy. In general, reaching a group consensus to a problem of collective decision-making may be most efficiently solved by shared decision-making in small groups (Conradt, 2012), but this quickly breaks down when considering time constraints for decision making,

increased group sizes, or varying levels of intransigence among group members (Gavrilets et al., 2016). Leaders can focus collective discussions and ultimately adjudicate in the case of disagreements among the group. This is particularly effective in humans because of language, which can also allow for clear communication between leaders and followers to coordinate on complex tasks (Calvert, 1992; Pietraszewski, 2020). Even when the will to cooperate exists, leaders may be needed to catalyze cooperative activities, serving as the first mover around whom others can coalesce. Historically, leaders have played an important role in the emergence and implementation of important technological developments such as irrigation (Baker, 1998; Carballo et al., 2014; Powers & Lehmann, 2013), which was a major component of the Agricultural revolution that helped establish the earliest city-states in Egypt, Mesopotamia, and China.

Leaders can also resolve collective action problems (Glowacki & von Rueden, 2015; O'Gorman et al., 2009). In any collective cooperative endeavor, non-cooperators can reap the benefits of cooperation without paying any costs, free-riding on the prosocial behavior of the group. This raises the problem of encountering "free-riders" who benefit from collective action without contributing to it (Calvert, 1992; Carballo et al., 2014; Gavrilets & Fortunato, 2014; O'Gorman et al., 2009; M. E. Price & van Vugt, 2014). Cooperative behavior can be maintained providing that groups reward cooperators and punish non-cooperators (for instance through reputational gains and losses), but this in itself is a collective action problem, since both rewarding and punishing other group members is often costly or risky – thus allowing for "second-order" free-riders who contribute to the public good but do not engage in costly punishment of non-cooperators (Boyd & Richerson, 2009; Chudek & Henrich, 2011; Guala, 2012; O'Gorman et al., 2009; M. E. Price & van Vugt, 2014; Smith et

al., 2016). Cooperative behavior can therefore become more and more difficult to maintain as groups get larger, due to the difficulty of maintaining social bonds between larger numbers of individuals (Dunbar, 1993; Gavrilets et al., 2016), lower levels of biological relatedness between individuals in larger groups, and an increased probability of encountering free-riders in large groups as well as an increased incentive to free-ride (Hooper et al., 2010). Leaders can help solve collective action problems including the second order free-rider problem (Hooper et al., 2010; Kaplan et al., 2009; King et al., 2009; O'Gorman et al., 2009) by incurring the cost of punishing non-cooperators (but see (Chudek & Henrich, 2011; Macfarlan et al., 2012; Puurtinen & Mappes, 2009) for other possible solutions). More broadly, leaders can serve as mediator during conflicts, and arbiter of disputes (Garfield et al., 2020). Finally, leaders have important roles as group representatives, allowing for communication, negotiation, and cooperation between groups (Garfield et al., 2020; Garfield et al., 2019)

It is noteworthy that none of the benefits of organizational hierarchy discussed here rely, strictly speaking, on leaders being unusually skillful or knowledgeable. That is, they do not emerge from an asymmetry of information or ability, as is the case with prestige (Henrich & Gil-White, 2001; van Vugt & Smith, 2019). Instead, simply having someone fulfill the role of leader can already provide groups with large benefits. In many cases, then, the value of leadership may be primarily a function of the amount of time, energy, and resources they are willing to invest in leadership.

1.5 Leadership as a public service

Human societies have long grappled with two opposing understandings of the nature of their leaders, with radically different consequences on the relationship between leadership and social hierarchy. In some leaders have ruled over the populace, claiming their power and authority to be derived from their natural, sometimes divine superiority. In socially stratified societies, ranging from sedentary hunter-gatherers such as the Chinookans and the Calusa of North America, to tribal chiefdoms such as those of Iron Age central Asia (Christian, 1998), and the later kingdoms and empires that spanned Afro-Eurasia and the Americas, leaders generally emerged from the higher classes and castes of society. In more egalitarian societies, headmen justified their authority in other ways. Some leaders establish themselves through their physical superiority, their prowess in the hunt (Gurven & Rueden, 2006) or on the battlefield (Chagnon, 1983). Others, such as the Nambiquara leaders in Eastern Brazil, derived their status (and thus their authority) from their superior knowledge of traditional culture, history, territory, and the spiritual and mystical realms (Lévi-Strauss, 1944). Melanesian and Polynesian Big Men maintained their status as leaders with alliances and extravagant displays of generosity (Sahlins, 1963).

With the emergence of states, kingdoms, empires, and the associated institutions, rulers typically justified their position of supreme authority through their association with the divine. In response to and as protection from pushback against their authority by nobles, European monarchs of the pre-Enlightenment era, such as the Sun King Louis XIV of France, claimed a divine right to rule, a mandate from God beholden to no earthly power. Although this specific manifestation is extreme, the association of rulers with divinity and their authority with a Godly mandate has been extremely common throughout human history,

existing in ancient Egypt, Zoroastrian Persia, post-Republic Rome, Imperial China and Japan (where Emperor Hirohito was forced to renounce his claim of being a living deity in order to retain power after World War II).

In direct opposition to the notion of leaders ruling as a result of natural superiority, many societies and thinkers have positioned leaders as public servants, subservient to the interests of the group and whose mandate and authority derives directly from having been chosen – elected – by group members or a subset thereof. This system of leadership is often associated with Greek antiquity, notably Athenian democracy, where - despite citizenship rights being denied to women, slaves, and foreigners - legislation, justice, and administration were all carried out not by permanent rulers but by rotating bodies composed of citizens (Thorley, 2012). For citizens, participation in democratic leadership was not just a right but a duty, expected of all. To ensure that even the poorest citizen could afford to leave his land when called upon, these leaders were provided with a salary that lasted the duration of their tenure. Rather than being considered superior, democratic leaders were considered 'first among equals', a title given to the leader of the Roman Senate during the time of the Republic.

In Western Europe, the idea of authority deriving from a mandate from the people rather than God or some natural superiority was revived and popularized in the Enlightenment. Inspired by Ancient Greek philosophy, the social contract theorists, Locke, Rousseau, and Hobbes, recognized that states and hierarchies, far from being an inherent part of the human condition, emerged from the tendency for humans to organize into large groups of individuals with conflicting interests; for them, the 'state of nature' was solitary, and only through society did hierarchies emerge (Hobbes, 1651; Locke, 1689; Rousseau, 1999). They disagreed, however, about the ideal political solution to the conundrum of human social

organization. Hobbes believed that authoritarian, autocratic rule was the only possible bulwark against anarchy and the 'nasty, brutish and short' lives of our unsocialized ancestors. In contrast, Rousseau and Locke believed that the people should be sovereign, and inspired explicitly anti-monarchist political writings such as Paine's Common Sense (Paine, 1776) and the U.S. Declaration of independence. Many modern liberal democracies refer explicitly to the thoughts and values of enlightenment thinkers, either directly in their constitutions or founding documents ('All men are created equal'), or the vocabulary of their institutions (although this sentiment has not always translated fully in practice, citizenship rights have been denied to women and racial minorities in many countries long after a nominal transition to democracy). Even in liberal democracy, the distinction between public service leadership and oligarchic leadership can be seen in the separation between the public and the private spheres: politicians are referred to as public servants, while leaders in business are not. CEOs are beholden not to the employees they lead but to the stakeholders of the company.

Despite its association with Ancient Greece and the Enlightenment, public service has been a primary element of leadership in societies across the globe throughout history. Representative democracy emerged in North America as early as the 12th century in the form of the Iroquois confederacy, independent of any influence from classical Antiquity. Through the writings of the Baron Lahontan about his discussions with the Native American chief Kondiaronk, Native American conceptions of participatory democracy may even have influenced enlightenment thinkers, including Rousseau (Graeber & Wengrow, 2021). More broadly, public service is one of the most important elements of leadership in small-scale egalitarian societies, which represent a form of social organization with extremely deep roots in our prehistoric and evolutionary past (Cashdan, 1980). Prestigious leaders in these

societies maintain their status in large part by providing benefits to their followers, such as conflict resolution, organizing cooperation, presiding over social or ritual functions, and serving as group representatives (Garfield et al., 2020; Price & van Vugt, 2014). While they may be able to improve or maintain their status in part through coercive or dominant tactics to suppress dissent or opposition, in the absence of wealth inequality groups can punish overly authoritarian leaders with a variety of leveling mechanisms, ranging from insubordination and ridicule to ostracism, corporal punishment, or even execution (Boehm, 1993, 2012; Wrangham, 2021).

1.6 Markets for leadership

When leaders are required to engage in onerous public service as part of their duties or in order to legitimize their authority, this can make the prospect of leadership less appealing. Leaders often incur serious costs in the form of time and cognitive effort invested (Chiu et al., 2021; Hagen & Garfield, 2019). Leadership can also entail risks to reputation and to interpersonal relationships (Zhang et al., 2020). Many evolutionary theories of leadership assume that leaders are able to recuperate the costs they incur, either in the form of a greater share of collective resources, or a less tangible reward such as prestige (Hagen & Garfield, 2019; Hooper et al., 2010; Price & van Vugt, 2014). If they can't, then the supply of willing leaders may not meet the demand, and effective leaders may never materialize. Alternatively, leaders could volunteer their time and effort for the benefit of the group (Archetti, 2009; Diekmann, 1985), particularly if they can do so more effectively or at a lower cost than others, or if they expect others to take over in the future as a form of direct reciprocity.

Leadership can be understood to some extent as the result of market forces, where the supply of leaders (and therefore the competitiveness of the leader position) is determined by both the costs of and barriers to leadership, along with the benefits, including group members' willingness to submit to authority and give leaders prestige and material benefits. This willingness, in turn, is determined in part by the demand for leadership: that is, the perception among group members that leadership is needed or required.

In the following chapter I will explore how differences in the supply of and demand for leadership could have important ramifications on the ability of groups to mobilize collectively, illustrating with a case study of two societies of Bolivian small-scale farmers.

CHAPTER 2: LEADERSHIP AS A PUBLIC SERVICE: INSIGHTS FROM TWO EGALITARIAN BOLIVIAN SOCIETIES

2.1 Introduction

The emergence of institutions and formal leadership is one of the most important questions not only for archaeologists and anthropologists, but in philosophy, history, political science, and numerous other disciplines. While some accounts of the transition from small-scale, relatively egalitarian societies to complex societies with institutionalized leadership have focused on the ability of certain groups to monopolize resources and use them to subjugate others (Mayshar et al., 2021; Turchin & Gavrilets, 2009), 'cooperative' models emphasize that groups may well willingly cede authority to leaders in exchange for enforcing norms (Hooper et al., 2010), or providing guidance and organization (Hagen & Garfield, 2019), and otherwise serving as representative of the group. This form of organization, also called managerial mutualism (Mattison et al., 2016; Smith & Choi, 2007), is particularly effective in societies with large populations or high population density, which face scalar stress (Friesen, 1999): i.e., difficulties in communicating and coordinating across the group, as well as the increased probability of within-group conflicts, which leaders can mediate (Garfield et al., 2020; Glowacki & von Rueden, 2015).

Despite a variety of theoretical models of mutualistic leadership, much of the current empirical research on leadership comes from the fields of management and political science, which are concerned primarily with strictly hierarchical systems with strong competition for

positions of leadership. In smaller, more egalitarian settings, we might expect much greater variation in the willingness of group members to be elevated to positions of leadership, with all of the associated costs. Here I present data from two societies of indigenous Bolivian small-scale farmer, the Tsimane and the Moseten. These two groups share an ethnolinguistic history, as well as many characteristics of their social organization and lifestyles, with nevertheless distinct norms and practices surrounding their formal leadership. In both societies leadership can be extremely burdensome, and although some leaders may enrich themselves corruptly, most community members do not find the costs of leadership to be personally worth the potential reward. However, leaders can provide important benefits to their communities; as a result, there is pressure to find adequate leadership. I argue that, in part due to their distinct histories of colonization and contact with other ethnic groups, and in part due to differences in the costs and benefits of leadership, the Moseten have developed much stronger norms and institutions of leadership, which is reflected in their greater propensity for collective action.

2.2. Ethnographic setting

2.2.1. Tsimane

The Tsimane are an indigenous ethnic group of primarily forager-horticulturalists living in the Beni region of lowland Bolivia. They reside in some 95 villages spread out primarily along the Maniqui and Quiquibey rivers, their subsidiaries, and the roads leading towards the towns of San Borja, Yucumo, and Rurrenabaque. Villages vary in size between 50 and 500 individuals, with a total population of around 16,000 individuals as of 2017

(Gurven et al., 2017). Their primary means of subsistence is slash-and burn agriculture for personal consumption (Gurven et al., 2017). Market integration varies between communities; Tsimane can sell products at the market town of San Borja, although travel time varies greatly by village. Typical Tsimane commercial products include game, fish, plantain, rice, and *jatata* leaves, which are woven into panels for thatching. Wage labor is common; employers are generally non-Tsimane ranch owners or loggers. Tsimane communities are egalitarian in social structure, with no class or caste distinctions and almost no ethnic heterogeneity. No individual holds any coercive power over others within communities; instead, decisions are made and conflicts resolved collectively during general village meetings. Severely anti-social and criminal behavior may be reported to non-Tsimane local authorities, but are often dealt with internally, with outcomes ranging from ostracism, corporal punishment, to, in extreme cases, execution. Collective action is relatively uncommon among the Tsimane. They engage in sporadic collective fishing expeditions, known as *barbasco*, which involves a group of individuals netting a portion of river and introducing a poisonous plant (vashi',conofoto,chito'),which asphyxiates the fish. These expeditions are organized opportunistically, and organizers do not receive a larger share of the catch (von Rueden et al., 2014). Aside from cooperative hunting and fishing, Tsimane organize intra and inter-village soccer matches, sometimes under the leadership of a *secretario de deportes* (secretary of sports), as well as the community maintenance of trails, schools, and communal areas such as meeting halls. They have no documented history of inter-village warfare, although oral history speaks of a war consisting primarily of raiding between Tsimane and Moseten communities prior to the arrival of Franciscan and Jesuit missionaries in the late 18th Century.

The government is responsible for the construction of schools in Tsimane villages, as well as providing school teachers, and NGOs have invested in construction projects, notably of housing and wells. Tsimane villages do hold general meetings in which village activity is discussed, including the clearing out of trails or roads, organizing village or inter-village festivals, dividing horticulture plots or forest areas for logging, and the resolution of intra-village conflicts. It is during similar meetings that Tsimane communities elect *corregidores*, leaders whose role is primarily to organize village meetings and other collective projects, as well as represent the community to visitors and outside entities, including aid projects from NGOs or the Bolivian government. *Corregidores* are not replaced at fixed intervals, and tenures can last between a few weeks and several years. They are not typically required to travel to represent the community, although they may bring village concerns to the Tsimane Gran Consejo, a political body established in 1985 (Caimani Josecita, 2012) which represents the broader interests of the Tsimane to the Bolivian government. *Corregidor* elections first took place in the late 1980s when missionaries from the evangelical New Tribes missions set up posts round Tsimane villages near the town of San Borja, and worked with Tsimane communities to establish more formalized leadership at a time when indigenous groups in Bolivia were organizing for land rights (Zeballos, 2017) Despite their fairly important role, *corregidores* do not have much authority over community members (see Results), and their tenure does not always reflect the power dynamics of any given community: although *corredigores* typically wield more influence over village decisions than others, consensus is still required for any decisions to be made (von Rueden et al., 2014). In addition to the c*orregidor*, prominent offices held by members of the community may include pastors or schoolteachers.

2.2.2. Moseten

The Moseten reside primarily in the Alto Beni region of Bolivia, close to the borders of the La Paz, Beni, and Caranavi departments. The Moseten are considered to be related to the Tsimane: they are the only two ethnic groups belonging to the *Mosetenan* linguistic group (Gordon Jr., 2005)and likely share a long cultural history (Aldazabal, 1988). Both groups refer to all Moseten and Tsimane individuals alike as *chatidye*, or relative. They have been distinct groups since at least the early 19th century, when Jesuit and later Franciscan missionaries (mostly from Spain) established communities in Alto Beni and settled large numbers of Moseten (Godoy, 2015), who had previously lived nomadic, hunter-gatherer lifestyles. The Tsimane, by contrast, had expelled the Jesuit missionaries who had attempted to convert them in during the 17th century (Chicchon, 1992), and remained relatively uncontacted by outside groups until the early 20th century. As a result, the Moseten are almost entirely Catholic, as opposed to the primarily Evangelical Tsimane, and speak Spanish as a primary language. Mosetenan is still spoken by some older individuals, as well as Tsimane immigrants, but is much less common among younger generations despite recent attempts to revive the teaching of it in schools.

The majority of the Moseten population (~3000 individuals) live in the 10 member communities of OPIM (the *Organizacion del Pueblo Indigena Moseten),* one of numerous Bolivian indigenous advocacy organisations, founded in 1996, which make up the population

of the *Tierra Comunitaria de Origen Moseten* (TCO). Their population is concentrated in 10 communities which are all members of OPIM, itself organized under the umbrella of CIDOB, and responsible for the negotiation of land rights over the Moseten indigenous territory in 2001, referred legally as *Tierra Comunitaria de Origen* (TCO) *Moseten* (Zeballos, 2017). The Moseten practice small-scale horticulture for both personal use and commercial purposes. Moseten are the only population in Alto Beni to enjoy tribal land rights over a territory of ~ 100,000 hectares. Up to 20 hectares of arable land in TCO Moseten can be acquired for productive use (rented for an unlimited time) in exchange for a renting fee of 250 Bolivianos (Bs) (~$37 USD), a minimal fee considering a hectare of arable land in the region is sold at ~1700 Bs (~$247 USD).

The Moseten are a smaller population, numbering approximately 5000 individuals in 13 different communities in the Alto Beni region of the department of La Paz, a few hours' drive from San Borja. The Moseten are more heavily integrated into the market economy than the Tsimane. Although they tend to grow rice and manioc for personal consumption, the majority of their crops – namely papaya, citrus, cacao, and plantain – are sold in the neighboring market town of Palos Blancos and in La Paz, where they are transported by independent companies. Moseten communities are interspersed with intercultural villages, populated by Bolivians of a variety of ethnic backgrounds including Quechua, Aymara, Trinitario, and Yuracare. In general there is more contact and intermarriage between Moseten and neighboring ethnic groups than there is in Tsimane communities, with some Moseten communities being comprised of no more than 40% ethnically Moseten individuals. Catholic priests in the early mission communities of the early 19th century appointed *caciques*, leaders whose role has persisted to this day (Zeballos, 2017a). Although priests have not resided in

Moseten villages since the 1960s, the Moseten remain heavily catholic and have a highly structured political system. In addition to the *cacique*, villages elect a *segundo cacique*, the cacique's second-in-command, a treasurer, secretary, and *vocal*, whose role is to physically round up individuals for communal work, community meetings, or to collect taxes or fines. Tenures for these roles usually lasts either one or two years; *caciques* can be elected for more than one term, although rarely consecutively, and generally no more than two. During election meetings, individuals are either nominated or self-nominate, and after lengthy discussions if consensus isn't reached there are vote counts by hand raised, with the winner taking the office of *cacique,* the runner-up taking the role of deputy, and other runners up taking less prestigious roles.

Moseten *caciques* are generally highly respected within their communities and are granted a great deal of authority to settle disputes, implement fines or other forms of punishment for infractions, allocate arable land to community members, and generally make major decisions on behalf of the community. They manage budgets which are received in part from the local government and in part from sporadic taxes raised for specific purposes such as infrastructure development which are discussed in community meetings. Some communities also collectively own resources, such as lumber, which help pay a stipend to offset the *cacique*'s expenses. *Caciques* are expected to leave the community at least once a month to meet with caciques from all the Moseten communities, who form a group known as the *Consejo de Caciques*, or cacique council. *Caciques* are also required on occasion to travel to La Paz for meetings with government officials. In addition to this, they are responsible for all the major projects that might be occurring in the village at any given time. As a result, despite receiving a great deal of authority, there is a great deal of cost associated with the position of *cacique*.

Most individuals in villages do not aspire to be *cacique*; *caciques* as well as high ranking leaders typically state that their motivation is altruistic and complain about the expense and opportunity costs associated with their position.

Despite the total population of the Tsimane outnumbering the Moseten by a factor of 3, the Moseten have received much greater investment from both governments and NGOs than the Tsimane; many Moseten villages are electrified, with well-maintained roads leading to Palos Blancos, and receive funds from the local and national governments for construction or plantation projects. Furthermore, the Moseten have a nationally recognized territory, the Tierra Comunitaria de Origen (TCO) Moseten. This allows the cacique counsel and individual caciques the authority to challenge outsiders who plant crops or chop down lumber within their territory.

2.3. Methods

2.3.1. The Tsimane Health and Life History Project

The ethnographic insight on Tsimane and Moseten leadership presented in this chapter owes a great deal to the collective experience of the Tsimane Health and Life History Project (THLHP), an anthropological and biomedical project that has conducted field research in Tsimane communities since 2002 and Moseten communities since 2015 (Gurven et al., 2017). Most of its activities are coordinated by a mobile team consisting of at least one physician, one biochemist, and several field assistants. This team periodically visits all 90+ Tsimane communities and 10 Moseten communities on a cycle of 1-2 years, providing medical care and collecting survey and health data, with a focus on individuals 40+. As a

result, I was able to draw on several years of demographic, census, and household wealth and income data.

The THLHP has deep ties to the Tsimane and Moseten communities and their main leadership bodies, the *Gran Consejo Tsimane*, and the *Organisacion del Pueblo Indigena Moseten (OPIM)*, with whom the THLHP has formal agreements that are revised and updated every 2 or 3 years. I have worked as a member of THLHP since July of 2015, spending approximately 60% of my 18 months in the field alongside the TLHLP mobile team. In total, I have visited 6 Tsimane and 8 Moseten communities, each time interacting with the village leadership on behalf of THLHP. In particular, I traveled with the mobile team in 2016 during the first complete round of data collection in the Moseten communities of OPIM, during which time one of my primary tasks was communicating both with the central OPIM leadership and the elected representatives of the individual communities. I also introduced the team and our work at the community meetings we took part in when we first arrived at each village, and at an inter-village Cacique council meeting. During these events I was able to converse with leaders from all communities, and developed amicable relationships with several different administrations of the OPIM. As a result, I was able to witness, take part in, and discuss how the communities' and the OPIM leaderships functioned, its benefits and its flaws.

It is also through the THLHP that I was able to recruit field assistants, two of whom had previously worked with the mobile team conducting surveys, and two of whom were recommended by a current field assistant. All four continued to work with THLHP after I left and three continue to work with THLHP as of January 2022 as interviewers and translators. They are all from Tsimane communities, and one was serving as the community leader

(*Corregidor*) during the time he worked with me. Tsimane translators were invaluable sources of ethnographic insight into the function of *corregidores*.

2.3.2. Data collection

I conducted a pilot study in two Moseten communities (M1 and M2) in July and August of 2016, with a total of 61 adults. I stayed initially with the THLHP team in M1 before integrating a community household in M2. I conducted interviews by visiting households and enquiring after the adult residents. The pilot interviews focused on personal histories and attitudes towards leadership. In 2017 and 2018, I returned to M1 and M2 as well as 2 other Moseten communities (M3 and M4). I later visited two Tsimane communities, T1 and T2, with two translators, one of whom had previously worked with me in M1, M2, and M4, and the other of whom had worked for THLHP in the past. Based on the full census of these communities that I compiled with the help of the THLHP team and the local authorities I can confirm my total population coverage: 79/300 adults (27%) in M1, 75/99 adults (75%) in M2, 40/52 (77%) in M3, 21/34 (62%) in M4, 79/123 of adults (64%) in T1, and 47/96 in T2 (49%), for a total of 341 interviews.

In Moseten communities, meetings are recorded and minutes are taken by the *secretario de actas*, including when new administrations are elected. Using these records (which I was able to request for M1, M2, and M3), in combination with the interviews, which recorded each respondent's history of leadership, I was able to put together timelines of the leadership of each community. Unfortunately, some of the records were incomplete, and the vote counts for each election were only recorded for M3. While asking about leadership histories, we also asked subjects to rate positive and negative aspects of each role, and we asked them about their willingness to enter a position of leadership in the future. We also

enquired about people's participation in meetings, church, and collective work, and their financial contributions to the community, including the intended target of those contributions. Finally, we asked subjects to rate the likelihood that they would turn to the community leader to help resolve a conflict with either another community member or an outsider, and we also asked whether they believed that corruption had been a significant problem in the community.

Household wealth and income data were collected using instruments developed in collaboration with THLHP members. Households were defined as family units which shared a kitchen or ate together on most days. Subjects were asked to list their household assets from an itemed checklist, and provide information about their house or houses, including the materials used for construction and whether it was connected to running water or electricity. The market and retail value of the houses and wealth items were established using local prices ascertained with the help of translators, THLHP members, and trusted field informants. For household income, subjects were asked about their agricultural returns for the past year, as well as any wage labor they or other household members had engaged in, any sales they had made (e.g., of game, fish, timber), revenue from their store, taxi business, or restaurant, and debts. Bolivians over the age of 60 are also eligible for a monthly payment of 200 Bolivianos, which we also enquired about.

Table 1. Descriptive statistics

	TSIMANE	MOSETEN
% Adults who ever occupied a cargo	21% (95% CI 14-28%)	47% (95% CI 40-55%)
Average Total Tenure length	1.5 years	2.5 years
Average # monthly meetings attended	1.7	3
Average # monthly hours on community work	2.3	7.4
% Adults who contributed financially to the community past month	30%	60%
# Financial contributions that went directly towards leader expenses	2/35	16/77
Average Household Wealth	$4080 (95% CI: $3583-$4582)	$7520 (95% CI: $6891-$8153)
Average Household Annual Income	$5968 (95% CI: $5330-$6608)	$8524 (95% CI: $6645-$10403)
Average community budget from communal properties	$0	$1400

2.4. Results

As expected, leadership played a far greater role in Moseten communities than in Tsimane communities. 47% of Moseten adults had ever held a position of leadership (95% CI 40-55%), including leading committees on potable water or schooling, with a median duration of 2.5 total years in office. In contrast, only 21% of Tsimane adults had held similar positions (95% CI 14-28%), with a median duration of 1.5 years in office. On average, people in Moseten communities attended 3 village meetings per month, versus 1.7 for Tsimane communities (Poisson GLM, $p < 0.0001$), and spent 7.4 (95% CI 6.1-8.7) hours

doing community work, versus 2.3 (95CI 1.9-2.7). The vast majority of community work time was spent clearing roads and communal areas, namely the school, main square, meeting hall, or church. However, a small minority of people in Moseten communities also dedicated significant time to building housing for schoolteachers and maintaining or expanding access to potable water.

Attitudes towards leadership were markedly different between Moseten and Tsimane communities. The Moseten refer to the cacique as the '*maxima autoridad'* in the community, automatically granting them deference, especially during community meetings. As a result, a planned question asking participants whose voice carried most weight in community meetings had to be abandoned, despite being commonly asked in Tsimane communities (e.g. Alami et al., 2020), because participants invariably answered: *'el cacique'*. This authority is vested in the office of the *cacique* rather than in any individual. In practice, this can be seen in the self-reported willingness of participants to go to the community leader in the case of conflicts both with other community members and outsiders (figure 1). Specifically, the Tsimane are much less likely than the Moseten to claim they would 'always' involve their Corregidor in the case of a dispute, either internal or external, and much more likely to 'never' involve the corregidor in the case of an internal dispute (69%, 95% CI: 61-77%).

Moseten community members contributed significantly more financially to their leader's expenses and to the community in general. 60% of Moseten participants reported having given money to the community in the past month, versus 30% of Tsimane. Moseten donations went towards improving the school (including building housing for schoolteachers), road maintenance, and for *cacique* and *OPIM* expenses. The vast majority of Tsimane donations were from one of the two communities (T1), which was in the middle of

constructing a new road to town, which cut the travel time to town from over 3 hours by boat to less than 30 minutes by car. T1 had also recently had a church-organized gathering to which 30% of donations went. Only 2 of the 35 donations reported in Tsimane communities went directly towards paying for the leader's expenses, versus 16 of the 77 Moseten donations. Part of the discrepancy in community donations may be explained by lower wealth in the Tsimane communities, who had an average household wealth of $4080 (95% CI: $3583-$4582), versus $7520 for Moseten households (95% CI: $6891-$8153). Moseten communities also earned more on average, with average annual household incomes of $8524 (95% CI: $6645-$10403) versus $5968 (95% CI: $5330-$6608). However, there was an extremely large difference in both incomes and community contributions between the two Tsimane communities. Community T1 had average annual incomes of $7550 and contributed an average of $14 in the past month to community efforts, against $3194 average annual income and less than $1 contributed to community projects for community T2. This was driven largely by sales of fish and timber in community T1, which was only possible due to the relatively recent road.

Tsimane leaders had no budget allocated to them for any of their work, while *caciques* of Moseten communities M1, M2, and M3 had annual budgets of $2500, $2900, and $2200 respectively. The source of these budgets were partly community contributions, partly income from collective resources, either a collectively owned citrus or cacao field, lumber exploitation, or fish farm. This was the source of some friction, with 44% of Moseten respondents saying there were or had been some problems with corruption in the community, and a further 25% claiming these problems were serious.

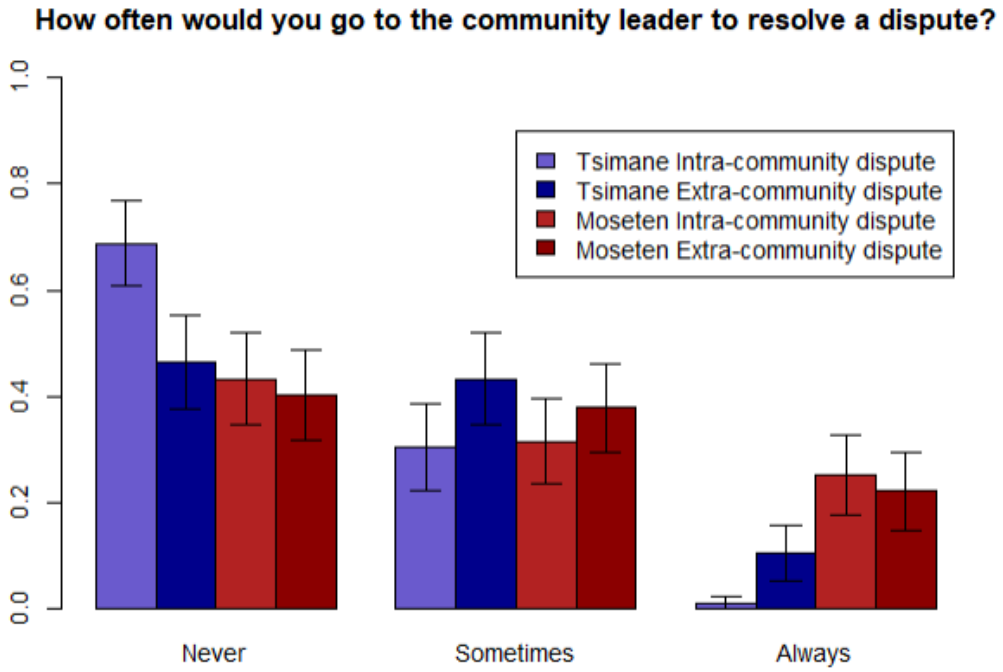


Figure 1. Percentage of respondents claiming to "never", "sometimes", or "always" involve the community leader in the case of a dispute

As might be expected given the difference in status and authority of Moseten *caciques* relative to Tsimane *corregidores*, only 3% of Tsimane (95% CI: 0%-6%) reported that they would like to become leader in the future, versus 15% of Moseten (95% CI: 9%-21%, see figure 2). The main reasons cited for not wanting to become leader were opportunity costs (‘*no tengo tiempo’, ‘tengo trabajo’, ‘tengo hijos’)* and the responsibility of the job of leader, followed by concerns about incompetence (‘*no tengo buenas ideas’, ‘no hablo bien’, ‘no se leer y escribir’)*. Job satisfaction was also higher among Moseten, with 55% saying they mostly enjoyed their work versus 27% of Tsimane.

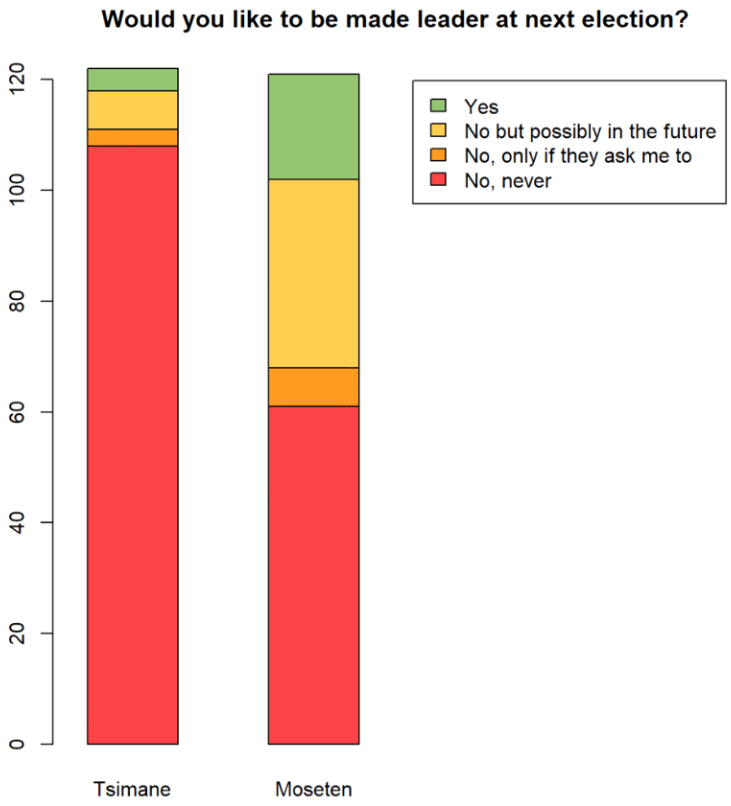


Figure 2. Self-reported enthusiasm for leadership

2.5. Discussion

Both Moseten *caciques* and Tsimane *corregidores* are first and foremost public servants. These leaders are expected to take on significant responsibilities, and 85% of Moseten and 97% of Tsimane are unwilling to take their place. These responsibilities include a lot of travel to other communities and to town for meetings with the indigenous leadership organizations (the *Gran Consejo Tsimane* and *OPIM*). It also entails a great deal of public speaking, as leaders are expected to organize and lead multiple monthly community meetings. Leaders are generally required to read and write, including in Spanish, which is a

barrier for many, especially in Tsimane communities (see next chapter). As a result, community members typically cite expense, time, opportunity costs, and the burdens of responsibility as primary obstacles to leadership. Both Moseten and Tsimane leaders have limited tenures, and much of their authority derives directly from their office, particularly among the Moseten, where the *cacique* – whoever they may be – is considered the primary authority figure within the community (*'la maxima autoridad')*. Leaders themselves are generally more than happy to cede their office to a new candidate at the end of their term and are sometimes removed from office prematurely without much resistance. Although Moseten spend more time in various positions of leadership than Tsimane over the course of their lives, Tsimane *corregidores* have much longer tenures relative to those of Moseten caciques, which typically last one or two years. This reflects the generally lower levels of enthusiasm for leadership roles among Tsimane, which is itself attributable in part to the lower prestige and authority of Tsimane *corregidores*, the additional expense of traveling from more remote communities, and the lack of a leadership budget in the form of consistent payments from community members or any collectively owned resource. In both Tsimane and Moseten communities it can sometimes be difficult to find willing candidates for leadership, especially in smaller villages. While some communities resolve this by extending terms, sometimes indefinitely, one Moseten village instituted a system of household rotation, such that every year, five predetermined households are required to put forward one family member, who jointly form that year's leadership committee, consisting of a *cacique*, second-in-command, secretary, treasurer, and *vocal* (see ethnographic section).

There are many factors underlying the relative poverty of Tsimane communities, including their relatively low rates of literacy and Spanish speaking, high fertility, lower

access to town, as well as the discrimination they face in much of the Spanish-speaking region (Alami et al., 2018). However, considering their superior numbers, and the fact that their indigenous rights organization was founded some 7 years before the equivalent Moseten organization, the relative success of Moseten communities remains a point of interest. Since 2001, Moseten communities have been able to jointly lobby for collective ownership of a protected territory, the *Tierra Comunitaria de Origen* (TCO) Moseten, electrify 7/10 communities, build roads and cellphone towers in all 10 communities, connect their communities to potable water sources, build high quality schools and soccer fields with stands, lobby local governments to send doctors, nurses, and police officers to be posted in many of the communities, and receive numerous development grants from both the Bolivian government and NGOs. They have also fielded candidates in both local and national elections, with some success. In contrast, only ~10 Tsimane communities out of 90 are electrified, most lack access to roads and clean water, and may face shortages of schoolteachers. Tsimane *corregidores* seem to be able to accomplish less during their tenure, due to a lack of resources and community support. Tsimane communities are also hampered by corruption at the level of the *Gran Consejo Tsiman*, which has a history of not disbursing funds that were due to go to the communities. This corruption cannot easily be challenged by village *corregidores* as a result of their general lack of authority and resources. In contrast, there is a great deal of supervisory oversight in Moseten communities, both by community members to prevent corruption among the village leadership, and by *caciques* to prevent corruption among the *OPIM* general leadership. As a result, while Moseten communities have seen numerous important infrastructure projects developed in their communities since the 1990s and received a number of government grants to help with establishing commercial

agricultural fields, many Tsimane communities have languished, especially further from town. This is particularly striking given that Tsimane outnumber Moseten by more than 4 to 1, and even elected a Tsimane man to the mayorship of the main market town, where he served for years before being imprisoned for corruption.

Despite these challenges, Tsimane communities are experiencing some development and new economic opportunities, particularly since the spread of cheap boat motors (*peque peques)* in the past decade, which allow for much faster travel to town (Gurven et al., 2017). There has also been progress with the construction of infrastructure in communities closer to the market town of San Borja, notably roads, wells, housing, and some electrification. The Tsimane community T1 built a road in 2018 which allowed the *corregidor* to visit town approximately 5 times faster and cheaper than before, and villagers were making a large amount of new income from selling fish in town which they had not been able to do before. This new infrastructure and disposable income made a noticeable difference to the amount of financial contributions villagers from T1 were able to make to the community relative to villagers from T2, a community approximately twice the distance from San Borja but with no access to a road. T1 was also able to mobilize its community members to help clean and maintain the newly built road, which provided a clear benefit to all villagers. As this area continues to develop, I expect to see a coevolution of infrastructure and leadership in Tsimane villages and would not be surprised to see much greater community engagement in positions of leadership in the future and a larger pool of candidates for leadership as the benefits of public service become increasingly apparent.

2.6. Conclusion

The Tsimane and the Moseten provide a case study of how leadership in egalitarian societies responds to market-like forces of supply and demand. When the cost of leadership is high, the supply of willing leaders may fall short of the demand, leading to stagnant or ineffective leadership (such as is the case in some Tsimane communities) or strong social pressures to enter into leadership (as in the case of the Moseten). In Moseten communities, tenure lengths for leaders are generally short, so villagers only have to serve a year or two at the most. One community, which long struggled with a shortage of willing leaders, implemented a turn-taking system to ensure that every household would put forward members to engage in leadership duties. These leadership shortages occur despite the fact that, relative to Tsimane leaders, Moseten leaders are afforded a great deal of respect and authority and are able to leverage larger budgets to help mitigate the costs of leadership. In turn, this is due to greater demand for leadership in Moseten communities, which comes from a) higher rates of literacy and Spanish proficiency relative to Tsimane communities which allows them to better engage with the Bolivian government; b) greater need to manage inter- and intra-community conflicts due to the relative high density of their communities and the high value of their arable land, and c) more experience with institutional leadership as a result of their history of contact with Catholic missionaries and other indigenous groups. However, despite the strong differences in leadership norms between Moseten and Tsimane communities, I also observed a striking contrast between the Tsimane communities T1 and T2, despite the fact that they are geographically close and of similar size, as members of T1 had much higher incomes and contributed much more to the community work efforts and budget. This difference appears to be entirely due to the presence of a recently built road

connecting the village to the market town, coupled with the large numbers of canoe motors that allowed members of T1 to engage in lucrative downriver fishing. This indicates that norms surrounding collective action and leadership may react remarkably quickly to changes in incentives from new economic opportunities. Future research will examine systematically whether economic development in Tsimane communities is accompanied by changes in leadership norms.

Finally, an important consequence of the costs associated with leadership among Tsimane and Moseten farmers is that leadership is rarely decided by a contest among the most qualified candidates. Rather, many who might make effective leaders are not willing to pay the opportunity costs of accepting the position of village leader. As a result, leaders are selected from among the minority of community members who are willing to take on – if only temporarily – these costs. In the following chapter I ask: what are the characteristics of individuals who seek out leadership in Tsimane and Moseten communities? Do they match the characteristics of individuals who are considered to be strong candidates for leadership by their neighbors?

CHAPTER 3: INCENTIVES AND BARRIERS TO VOLUNTEERING FOR PUBLIC SERVICE IN EGALITARIAN RURAL SOCIETIES

3.1. Introduction

Public service is a vital component of leadership in many societies. Administration, resource management, conflict resolution, and law enforcement are all necessary in some form to the functioning of complex human societies (Turchin & Gavrilets, 2009), which have rapidly become widespread on earth in the period since the late Neolithic. All these tasks require a serious investment of time and resources and can easily be performed incompetently. Throughout history, human societies have generally either been ruled, through often authoritarian means, by oligarchs for whom leadership is simply the price to pay for maintaining their social superiority and privilege; or led by public servants, for whom competence in leadership is the foundation of their authority and who are beholden to the public they serve. Although the capacity for domination likely extends deep into our evolutionary past (Singh & Glowacki, 2021), most Paleolithic human societies were likely relatively egalitarian, led when applicable by prestigious or well-regarded member of the community who would face defiance, mockery, or violence if they were perceived as incompetent or unjust (Boehm, 1999).

Being a public servant, then, entails both costs, which must be met, as well as risks, which must be minimized or buffered. Leaders may be rewarded with social status (Hagen & Garfield, 2019; Price & van Vugt, 2014), but status can be achieved through means other than public service, such as wealth or social connections. When individuals volunteer for leadership in contexts where success requires public approval, we would expect that these

volunteers have weighed the burdens of leadership and the potential risk of failure or public disapproval against the potential benefits, both the public benefits they generate as leader as well as the private benefits, such as elevated status, social connections, experience, power, or wealth. These costs, risks, and potential benefits are not likely to be uniform within any given group; instead, certain individuals will have more to gain, less to lose, and a higher probability of success in leadership than others, leading to variation in how enthusiastic individuals are to volunteer for public service. Furthermore, we can expect variation in how willing the public is to accept different candidates for leadership, which should in turn factor into their enthusiasm, since it affects their probability of success.

Ultimately, public servants emerge from a specific subsection of groups who are both willing to shoulder the risks and burdens of leadership, and acceptable to the rest of the group. Here, we assess the traits that make individuals enthusiastic and/or desirable leaders in Tsimane and Moseten communities. Previous research among the Tsimane has indicated that elected *corregidores* are physically stronger and wealthier than the general Tsimane population, and that they have more kin and exchange partners. I complement this research first by including the Moseten as a second sample. Because of the greater role that Moseten *caciques* play in everyday community life, the greater authority they have in community meetings, their ability to both mobilise and punish community members, and their greater access to resources and budgets, we might expect both higher motivation of would-be leaders and more scrutiny of potential leaders by community members. On the other hand, the more intense workload of Moseten leaders may discourage potential candidates.

The second complementary element that we add to von Rueden et al (2014) is that beyond comparing current leaders with non-leaders, we look here to explain what makes

certain individuals attractive as prospective future leaders, and also what predicts a willingness or desire to enter public service in the future.

3.2. Predictions

H1: Life history, relational capital, and wealth characteristics will affect the ability of individuals to bear the cost of public service.

P1.1: Age will negatively predict enthusiasm for future leadership. Younger individuals are likely to benefit more from any reputational benefits to leadership and are more likely to be able to bear the costs of frequent travel, confrontations, and leading work initiatives.

P1.2: Number of dependent offspring will negatively predict enthusiasm, with infants having a greater impact on women and children. Leaders are likely to incur significant opportunity costs in terms of childcare, food acquisition, or other forms of labor.

P1.3: Size of social networks will positively predict enthusiasm for leadership. Having a large social support group within a community is likely to increase a leader's authority, thereby decreasing the likelihood of costly confrontations or negative reception to their decision-making. Conversely, though, individuals who have arrived recently in a community and have smaller support networks may be more eager for an opportunity to increase their reputation within the community.

P1.4: Wealthier individuals will be more likely to seek leadership. Wealthier individuals will be better able to bear the cost of leadership or may be more likely to benefit from public goods.

H2. Community members select leaders according to their personal ties with that individual and their perceived suitability to the role.

P2.1 Community members will nominate wealthier, more educated, and more experienced individuals with larger social networks to leadership positions, especially in Moseten communities.

P2.2 Community members are more likely to nominate individuals belonging to their personal social network. Prospective leaders are more attractive to those with whom they already have a social tie, since these people likely have positive feelings towards them and may expect to benefit from having a friend or work partner as leader.

3.3. Data collection

Data collection took place between October 2017 and August 2018. Interviews were conducted by myself (Edmond Seabright, ES) and a total of 4 research assistants (Lorgio Canchi, LC; Alberto Vie, AV; Arnulfo Cari, AC; and Juan Dino Cari, JDC). We obtained permission to do research from both *OPIM* and the *Gran Consejo Tsiman,* and the community leaders of the villages in question. Censuses of 4 Moseten and 2 Tsimane communities were updated from previous versions compiled by ES and other members of the THLHP. Communities were informed of our presence during a community meeting during which we presented our objectives and the nature of our surveys. We initially took appointments for interviews before seeking out participants door to door. We attempted to sample all adults over the age of 18 or who were heads of household. We sought a representative sample of men and women, and a representative sample across age groups. Participants were compensated with gifts of dry pasta, salt, and cooking oil worth approximately 5 USD.

3.3.1. Political interview

Participants were asked to list their history of public service in the community with details pertaining to each role or position. They were also asked whether they were interested in the position of *corregidor* or *cacique* at the next leadership election, or if they would prefer a different role, or none. If they answered no to all of these questions they were asked if they might hypothetically wish to become leader in the future. Participants were also asked about community work and financial contributions to the community. Finally, participants were asked to list up to 5 possible candidates from among other members of the community that would make good leaders at the following change of leadership. In community M3, candidates for leadership were selected each year from among 5 predetermined households instead of the full community. This system was implemented in the late 2000s as a result of a scarcity of volunteers for leadership. M3 is a small community of 32 households as of 2018. As a result, asking people to nominate potential candidates and discuss their own enthusiasm for leadership was unsuccessful, as the process was considered rotational. As a result, we abandoned these questions for this subsample.

3.3.2. Household wealth, education, and income

Household wealth and income data were collected using instruments developed in collaboration with THLHP members. Households were defined as family units which shared a kitchen or ate together on most days. Subjects were asked to list their household assets from an itemed checklist, and provide information about their house or houses, including the materials used for construction and whether it was connected to running water or electricity. The market and retail value of the houses and wealth items were established using local

prices ascertained with the help of translators, THLHP members, and trusted field informants. For household income, subjects were asked about their agricultural returns for the past year, as well as any wage labor they or other household members had engaged in, any sales they had made (e.g. of game, fish, timber), revenue from their store, taxi business, or restaurant, and debts. Bolivians over the age of 60 are also eligible for a monthly payment of 200 Bolivianos, which we also enquired about.

3.3.3. Social Network data

Participants were asked to free-list social partners for 10 separate dimensions of social networks, including: *Who would lend you money in case of an emergency? With whom do you share food? With whom do you engage in reciprocal field work? With whom do you participate in social events?* These questions were developed in collaboration with the ENDOW project (*https://endowproject.github.io/*) with the aim of being both locally relevant to the populations, and comparable across several dozen small-scale societies which are collaborating on the project.

3.4. Analyses

Statistical analysis was conducted in R version 4.1.2 using the "lme4" package. To estimate the probability that an individual i would nominate an individual j from the community, I fit a Bernouilli Generalized Linear Mixed Model (GLMM), with the following predictor variables: population (Tsimane vs. Moseten), age, age squared, wealth, years of education, previous number of years spent in leadership, and overall network degree centrality of individual j, as well as a binary term for whether individual i had nominated j for in any of the network questions. The age squared term improved model fit as measured by

AIC, BIC, and deviance. This model also included random intercept terms for the ID of the potential nominee j as well as the community.

Binomial GLMs were also used to model the probability of wanting to be elected as leader at the following opportunity, and to compare former leaders with the rest of the population. All of these models included age, age squared, sex, and population (Tsimane or Moseten) as controls, and were also run with an interaction between the predictor variable and population, in case the associations were only present in one of the two groups. The predictor variables tested were: previous time spent in leadership, years of education, log-wealth, log-income, degree of trust in leaders (between 0 and 4, where 0 means never involving leaders in disputes and 4 meaning always involving them), a dummy variable for whether the respondent was originally from the community, and finally their number of dependent offspring (with an interaction term for sex, since I hypothesized that dependent offspring would pose a particular barrier to women). I also used log-linear regression to test whether previous time in leadership was associated with greater current day wealth or income.

3.5. Results

None of the predicted variables had any association with the stated desire to become leader (table 2), with or without an interaction term for the population. Moseten (both men and women) were significantly more likely to claim enthusiasm for leadership in all models. However, age was not significant, either as a linear predictor or with a second order polynomial. Among the Tsimane sample, only 4 total individuals out of 125 claimed to be interested in becoming leader. All four were men, but they varied in age between 16 and 70

Table 2. Model estimates of Bernouilli Generalized Linear Model predicting the probability of being eager to take on the position of leader at the next election.

	Dependent variable: **Stated eagerness to become leader**							
	Log-odds ratios (SE)							
Independent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age	0.132 (0.107)	0.110 (0.105	0.093 (0.134)	0.057 (0.122)	0.014 (0.129)	0.129 (0.105)	0.136 (0.104)	0.084 (0.122)
Age^2	-0.002 (0.001)	-0.001 (0.001	-0.001 (0.001)	-0.001 (0.001)	-0.0001 (0.001)	-0.002 (0.001)	-0.002 (0.001)	-0.001 (0.001)
Sex=Male	1.540** (0.581)	1.519* (0.569	1.960** (0.799)	1.878** (0.802)	2.041** (0.813)	1.519** (0.564)	1.494** (0.565)	2.949** (1.379)
Population=Tsimane	- (0.626)	- (0.663	- (0.735)	-1.448* (0.767)	-1.294* (0.772)	- (0.625)	- (0.710)	- (0.757)
Time In Leadership	-0.016 (0.067)							
Trust In Leader		0.221 (0.185						
Wealth (log)			-0.084 (0.284)					
Income (log)				0.009 (0.102)				
Years Of Education					0.114 (0.080)			
From Community						-0.616 (0.492)		
Degree Centrality							-0.097 (0.094)	
# Dependent Offspring								0.006 (0.796)
Male*#Offspring								-0.197 (0.838)
Constant	- (2.353)	- (2.365	-4.115 (3.792)	-4.261 (3.179)	-4.161 (3.153)	- (2.346)	- (2.310)	-5.057* (3.020)
Observations	248	248	209	200	170	245	248	197
Log Likelihood	-64.455	-	-45.869	-43.776	-42.138	-62.904	-63.927	-39.939

Note: *p <0.1; **p<0.05; ***p<0.01

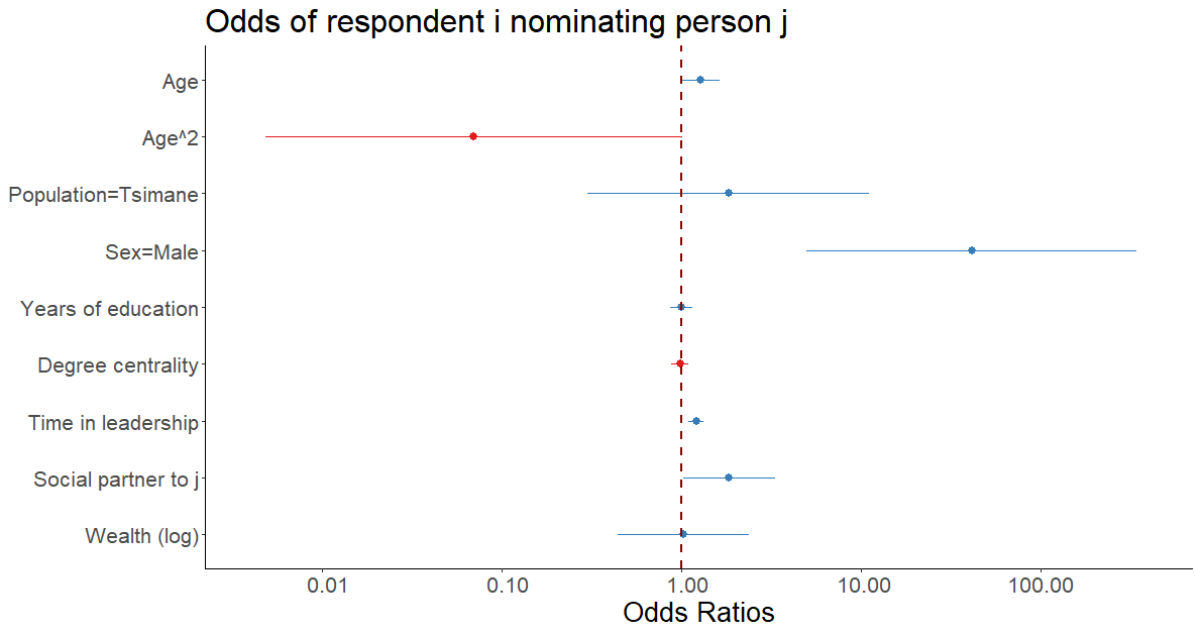


Figure 3: Model estimates from GLMM predicting the probability that a respondent I will nominate a co-resident of their community j

and in education between 0 and 12 years of schooling. The Moseten sample who claimed to want to become leader was similarly varied, although it included a larger number of women (5 out of 23).

Just as men were more likely to be enthusiastic about leadership, men were overwhelmingly more likely to be nominated in both Tsimane and Moseten contexts (figure 3). Community members preferred candidates who were neither too young nor too old, which is consistent with qualitative accounts people gave of the qualities they looked for in leaders. However, education, wealth, and popularity (as measured by degree centrality) were not predictive of being nominated. Other than age and sex, the only variables which predicted nominations at all were a) whether the nominator listed the nominee as a social partner, and b) overwhelmingly, the amount of previous experience in positions of leadership (see figure 3). Every extra year in former positions of public service increased people's odds of being nominated by 21% (OR= 1.21, 95% CI: 1.10-1.34).

Comparing former *caciques* and *corregidores* to others did not reveal them to be more wealthy, more popular, or more educated (table 3). To confirm this, I ran loglinear models on wealth and income with time spent in public service and former community leader status as predictors (table S1). While education was a significant predictor of wealth (but not income), neither measure of past leadership had a significant effect, suggesting that leaders are not easily able to turn their public service into material wealth.

Table 3. Model estimates of Bernouilli Generalized Linear Model predicting the probability of having been leader in the past

	Dependent variable: **Been community leader in the past (1/0)**			
	(1)	(2)	(3)	(4)
Age	0.202* (0.104)	0.176 (0.118)	0.177 (0.164)	0.256* (0.150)
Age^2	-0.002* (0.001)	-0.001 (0.001)	-0.002 (0.002)	-0.002 (0.001)
Sex=Male	3.222*** (0.753)	3.148*** (0.761)	19.133 (1,599.520)	2.934*** (0.764)
Population=Tsimane	-1.631*** (0.629)	-1.924*** (0.673)	-2.606*** (0.879)	-2.174*** (0.800)
Degree centrality	0.039			
Log-wealth		0.593 (0.388)		
Log-income			0.149 (0.142)	
Years of Education				0.004 (0.059)
Constant	-9.274*** (2.720)	-13.714*** (4.586)	-25.120 (1,599.526)	-10.190**
Observations	303	264	202	223
Log Likelihood	-78.057	-65.606	-37.598	-57.948
Akaike Inf. Crit.	168.113	143.212	87.195	127.896

Note: *p<0.1; **p<0.05; ***p<0.01

3.6. Discussion

Surprisingly, wealth, income and education had little association with leadership. Individuals who claimed to want to become leaders were broadly representative of the populations as a whole, with the exception of being largely male. No Tsimane women wanted to be leader, and 5/23 of the Moseten villagers who stated their enthusiasm for leadership were women. Stated preference for leadership in this interview turned out to not be especially relevant to the fact of actually entering leadership, either: of 3 individuals who I interviewed who went on to become *cacique* in future elections, only 1 had claimed to want to become *cacique* in my interview. This suggests either a) that they were not being forthright in their interview, b) that the desire to become leader is not a long-held ambition but rather decided much closer to the actual elections or c) that communities are having to convince somewhat unenthusiastic candidates to become leader. From my ethnographic understanding of people's attitudes towards leadership, all three explanations are plausible and mutually inclusive.

The profile of attractive candidates for leadership was also surprising. People overwhelmingly nominated middle-aged men – which is not surprising – but education and number of social ties were not predictive of being nominated. Instead, favored candidates were those who had previous experience in leadership, despite these individuals not displaying any greater enthusiasm for the position. People were slightly (although not significantly) more likely to nominate wealthier individuals, which tracks with people's responses in focus groups and my pilot study on the attractive qualities of leaders: *caciques* and *corregidores* require economic stability to be able to travel regularly to town. Only one

woman in each population received any nominations, despite female *caciques* being increasingly common in Moseten communities.

However, much like stated enthusiasm, being nominated for leadership was not predictive of eventual leadership. Of the 6 Moseten *caciques* elected in communities M1, M2, and M4 since the end of the study, only 2 had received any nominations whatsoever. None of the most highly nominated individuals (nominated more than 5 times) were eventually elected. This suggests that rather than a straightforward popularity contest, Moseten leadership elections are complex negotiations between community members who are looking for an experienced leader, and potential candidates who may feel ambivalent about the prospect of leadership. Actual leaders may emerge from individuals who are both somewhat acceptable to community members as well as somewhat keen, but not superlatively so. Ambitious individuals benefit from engaging in low levels of public service to prove their abilities to the community, but these individuals may not find community leadership to be sufficiently high achieving and go on to seek other positions, such as local government.

Previous time in leadership, either as community leader or in other positions of public service, were not predictive of current wealth or income. This contrasts with previous research among the Tsimane, which found that *corregidores* were slightly wealthier than average (von Rueden et al., 2014). One explanation for this discrepancy is the relatively small sample of Tsimane former leaders in communities T1 and T2. Furthermore, T1 was experiencing a recent influx of new income due to the recently built road, which may have eclipsed former wealth disparities. Because of the shorter tenures of Moseten leaders, it is likely difficult for them to accumulate a significant amount of wealth, if at all. Several

Moseten leaders claimed that the requirements to travel and the time spent away from their field meant that taking on the role of leader was a significant financial burden. However, most Moseten interviewed claimed that the corrupt appropriation of public funds by leaders was at least somewhat of a problem. Longer term longitudinal analysis of leadership and wealth is needed to conclude whether leadership can actually be leveraged into greater material wealth or whether it is a financial burden.

Two years after data collection I interviewed a woman who was elected *cacique* of community M1, the largest Moseten community I sampled. In my initial round of data collection she had claimed to have no interest in the role, as she was too old. She did indicate that she would accept the role if asked, but she was not nominated by a single person in my sample at the time of my interviews. However, during the election another community member suggested her name after several others demurred, and after a certain amount of pressure from the community she accepted.

3.7. Conclusion

The results presented in this and the previous chapter illustrate the complexity of leadership in settings where leaders are expected to act as public servants. None of the people who were most commonly named by their co-residents as potential future leaders acceded to the position in the three years following the initial round of data collection. People's stated enthusiasm for leadership was also a poor predictor of future leadership, suggesting that the outcomes of leadership elections are unknown even to villagers until very late in the process. In many cases eventual leaders go into election meetings unaware that they will even be

nominated, let alone elected. This speaks to the general low supply of leaders and of the villagers' need to pressure or convince competent candidates to accept the position. This also may explain why community members do not seem to particularly worry about features such as education, wealth, or community of origin when thinking of suitable candidates. Instead, the only variable that reliably predicted whether someone was likely to be named as a good candidate for leadership was their prior experience in leadership roles.

Many studies of leadership focus primarily on the qualities that make for attractive or competent leaders. However, these assume to some extent that popularity or competence is the primary obstacle to leadership. As we have seen, this is not always the case – individuals may also need motivation to take on the burdens of leadership. This raises a number of questions. How much motivation is needed to outweigh the costs of public service? To what extent do groups benefit from providing that motivation, either in the form of a direct reimbursement of any costs associated with public service, or in some indirect form such as prestige? What obstacles might there be to a perfect form of managerial mutualism, where neither leaders nor followers are exploited? In the next chapter I explore these questions using a game theory approach.

CHAPTER 4: THE COSTS OF PUBLIC SERVICE: A GAME-THEORETICAL APPROACH

4.1. Abstract:

Understanding the dynamics of leadership in human groups is an important endeavor in many of the behavioral and political sciences. Leaders often provide benefits at an immediate net cost to themselves, a function of leadership we refer to as 'public service'. It is generally assumed that the costs of public service are recuperated by leaders, either in the form of prestige (Hagen & Garfield, 2019; Price & van Vugt, 2014), in-kind repayment (Hooper et al., 2010), direct fitness benefits such as mating opportunities (von Rueden et al., 2011) or a larger share of collective production (Gavrilets & Fortunato, 2014). However, some models demonstrate that public service leadership can emerge even at a net cost to the leader relative to other group members (Archetti, 2009; Shen et al., 2010). Here we explore in detail the circumstances under which this kind of leadership can emerge. Leadership is modeled as a costly behavior with collective benefits which one and only one group member can volunteer to undertake. Groups can collectively opt to incentivize volunteering with a payment, which can exceed the total costs of leadership. We find that public service leadership can emerge without full repayment of leadership costs, provided the benefits of leadership outweigh the opportunity costs. However, if groups can reimburse the leader, it is in their interest to do so, and even to cede them a slightly higher proportion of total production. If leaders must expend additional resources to collect their payment, leadership can break down, suggesting that societies may benefit from establishing formal leadership institutions to help enforce collective support of public service leadership. Finally, we find that when leaders can choose to invest more or less of their time into public service, groups

may be incentivized to under-compensate leaders in order to select for more heavily invested leaders. All group members benefit most when the interests of leaders and followers are aligned.

4.2. Introduction

Leadership is a hierarchical form of social organization where one or more individuals have an outsized influence on the behavior of the group (von Rueden et al., 2014; von Rueden & van Vugt, 2015). Many social animals coordinate their movement and behavior around specific leaders; eusocial insects, for instance, often have scouts search for sources of food before signaling this information to their colony with pheromones or dances(Czaczkes et al., 2015; Grüter et al., 2008). The disproportionate influence of leaders on group movement and composition has also been noted in many mammals (Smith et al., 2016), fish (Krause et al., 2000; Nakayama et al., 2012; Reebs, 2001), and some birds (Jolles et al., 2013).

Human cooperative endeavors are particularly complex, often requiring long-term, continuous collaboration between large numbers of unrelated individuals. This raises numerous problems which makes organizational hierarchy a particularly effective collective strategy. First, leaders can resolve collective action problems (Glowacki & von Rueden, 2015; O'Gorman et al., 2009). In any collective cooperative endeavor, non-cooperators can reap the benefits of cooperation without paying any costs, free-riding on the prosocial behavior of the group. By delegating to leaders the costs of monitoring and punishing non-cooperation or norm violation, groups can avoid the second-order collective action problem that would arise if this responsibility were shared equally among group members (Hooper et

al., 2010; O'Gorman et al., 2009). Leadership in humans is further facilitated by language, which can allow for clear communication between leaders and followers to coordinate on complex tasks (Calvert, 1992; Pietraszewski, 2020). Leaders can also increase in-group cohesion by serving as mediators during conflicts, and as arbiters of disputes (Garfield et al., 2020), building consensus and facilitating collective decision making. Finally, they serve as points of contact for outsiders and representatives of other groups, both in contexts of conflict and cooperation, peace-making, or trade.

Unsurprisingly, leadership in one form or another is near ubiquitous in human societies (Garfield et al., 2019; Lewis, 1974). Even in relatively acephalous, egalitarian small-scale societies, leadership can emerge temporarily and opportunistically during activities such as hunting (Alvard & Nolin, 2002; Friesen, 1999), fishing (von Rueden et al., 2014), or warfare (Price, 1981; von Rueden & van Vugt, 2015), and certain individuals may gain leadership status through particular skills or specializations, such as shamanism or midwifery (Hagen & Garfield, 2019). Meanwhile, leadership and organizational hierarchy is a necessary element of all chiefdoms and states, which are defined by having one or three administrative levels – respectively – above the local community (Earle, 1991; Turchin & Gavrilets, 2009).

The benefits of leadership derive from two sources. The first is the embodied capital of the leader: this includes traits such as charisma, judiciousness, education, communication skills, ability to command authority, etc. This embodied leadership is intimately tied with prestige, since the qualities that make someone prestigious may also make them effective leaders, and prestige itself may lend authority which is part of embodied leadership. Prestige is sometimes contrasted with dominance as alternative ways to achieve high status (Cheng et

al., 2013; Henrich & Gil-White, 2001; van Vugt & Smith, 2019). This dichotomy has been challenged, however, as traits which facilitate dominance (such as larger body size, athleticism, aggressiveness, etc.) can help leaders achieve their goals (Durkee et al., 2021), and can therefore form part of a more general leadership ability (Chapais, 2015; Garfield et al., 2020).

The second source of leadership benefits derives from the willingness of leaders to engage in costly acts of public service. Monitoring and punishing non-cooperators and norm-violators, for example, is a major challenge for cooperative endeavors because of the costs they entail, which is why they are generally delegated to individuals in positions of authority (Glowacki & von Rueden, 2015; O'Gorman et al., 2009; but see Guala, 2012). Leadership may require fixed investments, financial, physical or cognitive (Hagen & Garfield, 2019), and it also often entails opportunity costs, when time is invested which might otherwise be spent productively furthering one's individual interests. If there are disagreements within a group about how best to lead, there may be a cost associated with merely proposing a plan of leadership; this is common in electoral systems where candidates for office require an investment of capital with no guarantee of acceding to office. Thus, a major challenge for understanding the evolution and nature of leadership involves explaining how it is incentivized, given these costs.

One possibility is that leadership costs are fully recuperated by leaders. In some models, leadership is fully transactional (e.g. Hooper et al., 2010) and the costs of leadership are repaid directly by followers in the form of taxes or a larger share of collective production. The "service-for-prestige" (Price & van Vugt, 2014) hypothesis suggests that leaders make up their investment with an improved social status, which they can leverage into fitness

benefits such as access to more or higher quality mating partners or a broader social support network to buffer uncertainty. There is evidence that social status and political influence correlates with health and reproductive fitness in 33 small-scale societies (von Rueden et al., 2014a, 2014b; von Rueden & Jaeggi, 2016). However, the data on these outcomes are not clear: one analysis of 8 small-scale societies found no clear evidence that leadership in 4 distinct domains (collective movement, food acquisition, within-group conflict resolution, and between-group interactions) led to more beneficial outcomes for leaders than other group members (Smith et al., 2016); research from the Tsimane in both experimental and naturalistic (fishing) settings found no direct benefit to leaders. This is the alternative possibility: that leaders do not recuperate the full costs of their leadership from other group members, instead allowing them to disproportionately benefit from the returns to leadership. In a game theoretical (GT) framework, this is known as the volunteer's dilemma (Archetti, 2009; Diekmann, 1985; Shen et al., 2010; Smith et al., 2016).

A volunteer's dilemma occurs when all members of a group stand to benefit if at least 1 person pays a small cost. In the volunteer's dilemma, defection by all parties is not a Nash equilibrium, since a rational actor who knows that no-one else in the group is going to volunteer will do so themselves. In most formulations of the Volunteer's Dilemma, individuals make a decision about whether or not to volunteer while ignorant of the intentions of other group members; in this circumstance equilibria can still be reached with a mix of volunteers and defectors (Archetti, 2009; Diekmann, 1985; Shen et al., 2010). If actors *can* communicate their intentions, however, an equilibrium can be reached if group members assign the responsibility of volunteering to a single individual, by indicating that they will refuse to do so themselves. In human societies, this suggests that individuals *will*

perform a costly action which benefits the group provided that a) the personal benefit outweighs the cost and b) those individuals know that no-one else will perform it, or, perhaps more realistically, that no-one else will perform it *effectively*. The volunteer's dilemma has also been shown to be a valid evolutionary model of leadership in groups where collective production is distributed unequally, because high-ranking individuals have greater incentives to increase collective production (Gavrilets & Fortunato, 2014).

In many cases, however, the volunteer's dilemma falls short because it precludes any transfer of resources from group members to the volunteer, as is assumed by cooperative models of leadership. Despite a recent surge of interest in these models (e.g. Garfield, Hubbard, et al., 2019; Garfield & Hagen, 2020), we still lack a coherent framework for understanding how the costs of leadership are absorbed in societies without robust institutions or large imbalances of power between rulers and followers. If services are exchanged for prestige, for instance, then how much prestige is enough? Can large amounts of inequality evolve simply through a voluntary surrender of resources in exchange for leadership?

Here we build a model of leadership which centers on the costs that leaders pay to fulfill their role, the collective benefits they generate, and the ability or willingness of group members to compensate the leaders for their efforts. We propose to examine leadership as emerging from a tacit negotiation between group members, who may benefit from leadership, and would-be leaders, who must decide whether to self-nominate for the role. The potential collective benefit of leadership is weighed up against the personal costs associated, as well as the willingness and ability of group members to make up for these costs, and individuals step up to leadership accordingly. We examine leadership costs of 4 distinct types: candidacy costs, fixed costs, opportunity costs, and extraction costs, with a view to answering the

following questions: 1. When does leadership emerge? 2. At what rates are players self-nominating for leadership? And 3. Can 'altruistic' leadership emerge where the payoff to the leader is lower than the payoff to followers, and how?

To answer these questions, we propose a game-theoretical (GT) model of leadership based on the elementary framework of the volunteer's dilemma (Archetti, 2009; Diekmann, 1985). In this framework, leadership is something one can either volunteer for, or abstain from. Thus, leadership is not a long-term attribute of an individual, but individuals are presented with multiple opportunities to volunteer for leadership and must find the optimal rate at which to do so. In a GT framework, this optimal rate can be represented as the Nash equilibrium population level rate of volunteering $\hat{v}$, defined such that the expected payoff of volunteering is equal to the expected payoff of abstaining. In other words, when a population reaches the optimal volunteering rate $\hat{v}$, no individual can expect a greater payoff by switching strategies, and so $\hat{v}$ is at an equilibrium. Using this framework, we can examine how the optimal volunteering rate $\hat{v}$ responds to different ecological conditions, namely: how valuable leadership is, how costly it is to the leader, and how easily groups are able to reimburse the leader. Furthermore, we shall focus on the question of whether leaders receive greater or smaller payoffs than followers. We call leadership where leaders receive a smaller payout than followers, as they do in a volunteer's dilemma model, *altruistic leadership*. We are attempting to answer the following questions: when does leadership emerge, and of those cases, when is leadership *altruistic.*

4.3. The model

Each round, players are sorted at random into groups of size n and are each presented with the opportunity to volunteer for leadership (simultaneously, for simplicity's sake). If no

one volunteers, the group is said to be acephalous for the duration of the round, each player receives only the returns to their individual production, C_P. This is the *acephalous* payout:

$$w(Acephalous) = C_P \qquad (1)$$

If at least one group member volunteers, and followers benefit from having a leader, one is selected from among the candidates at random (again for simplicity). Volunteering is associated with a cost C_V, which is generally greater or equal to 0. The leader then invests a certain proportion I * C_P (0 <= I <= 1) of their individual production into their leadership duties. This represents the opportunity cost of leadership. In exchange, all players receive the benefit of leadership, defined as L * I, where L is the maximum possible benefit of leadership and I is the proportion of individual production C_p invested by the leader. Followers then transfer back some amount of the returns to leadership, denoted E for extraction, such that E <= L*I. E is the total amount of leader benefit that is extracted by the leader and is distributed across all players. Thus, followers receive the following payout:

$$w(Follower) = L * I - \frac{E}{n} + C_P \qquad (2)$$

Finally, the leader receives the same benefit as the followers, plus the extraction amount E, which is devalued by the cost of extraction C_E. They also receive their individual production C_P, devalued by the proportion invested (I). Finally, they must pay the volunteering cost C_V, and some fixed cost of leadership C_L. We shall discuss the nature of these different costs of leadership in the following section. Thus, the payoff for leaders is:

$$w(Leader) = L * I + E * \left(C_E + \frac{1}{n}\right) + C_P * (1 - I) - C_L - C_V \qquad (3)$$

Variable	Name	Description
L	Leadership benefit	The maximum value each group member can receive from having a leader
I	Investment	The proportion the leader invests into leadership vs. individual production
E	Extraction	The proportion of leadership benefit the leader keeps for themself
C_P	Individual production	Non-leaders receive this amount by default, leaders must invest a proportion of this (determined by I) and convert it to collective production Can be thought of as the opportunity cost of leadership.
C_E	Cost of extraction	The rate by which the leadership benefit is devalued by extraction
C_L	Cost of leadership	Fixed amount leader pays
C_V	Cost of candidacy	Cost of volunteering for the election phase
n	Group size	Randomly drawn from the population prior to volunteering phase
N	Population size	
v	Volunteer rate	% people in the population who adopt the "volunteer" strategy
$\hat{v}$	Equilibrium volunteer rate	Percentage of people volunteering such that no one benefits from switching strategy
E*	Optimal leader payment	
$w(V\|v)$	Return to volunteering	The expected relative fitness payout (w) to volunteering (V) given the volunteer rate v.

Table4. Table of variables used in the text

In this model, the benefit of leadership L, as well as the costs associated with it (C_P, C_E, C_L, and C_V) are exogenous and uniform across players. This means we assume equal embodied leadership and opportunity costs across individuals. Future work will include analysis of the roles of individual heterogeneity implied by the model framework.

4.4. The math

To solve for the optimal volunteering rate $\hat{v}$ we must set the payoff of volunteering, given the average volunteering rate in the population, $w(V|v)$, equal to the payout of abstaining given that same rate:

$$Set\ \hat{v} \quad s.t. \quad w(V|\hat{v}) = w(\bar{V}|\hat{v}) \qquad (4)$$

To calculate $w(V|v)$ we must first calculate the probability of being elected, having volunteered:

$$P(Elected|V, v) = \frac{1}{1+v*(n-1)} \qquad (5)$$

which gives the following:

$$w(V|v) = P(Elected|V, v) * w(Leader) + \big(1 - P(Elected|V, v)\big) * (w(Follower) - C_V) \qquad (6)$$

Similarly, to calculate the payoff from abstaining, $w(\bar{V}|v)$, we first calculate the probability of having no volunteers, given not volunteering:

$$P(Acephalous|\bar{V}, v) = (1 - v)^{n-1} \qquad (7)$$

which gives the following:

$$w(\bar{V}|v) = P(Acephalous|\bar{V},v) * w(Acephalous) + \big(1 - P(Acephalous|\bar{V},v)\big) * w(Follower) \quad (8)$$

We can now solve for the equilibrium rate of volunteering, $\hat{v}$, by substituting (6) and (8) into equation (4), which, reduced, gives the following equation:

$$P(Elected|V,v) * [w(Leader) - w(Follower) + C_V] \; - \; C_V = \; P(Acephalous|\bar{V},v) * [w(Acephalous) - w(Follower)] \quad (9)$$

To solve for $\hat{v}$ algebraically we must first consider the condition where both sides of this equation are equal to 0. This occurs in two situations: either $P(Acephalous|\bar{V},v) = 0$, which from (7) means $\hat{v}$=1: i.e., everyone volunteers; or it means that $w(Acephalous) = w(Follower)$, which means that any benefit from leadership is being extracted in full by the leader. In this case, we can solve for $\hat{v}$:

$$\hat{v} = \frac{w(Leader) - W(Follower)}{C_V * \big(1 + \hat{v} * (n-1)\big)} \quad (10)$$

If $C_V = 0$ this is undetermined, but in that case, it follows that $\hat{v} = 1$ when w(Leader) > w(Follower), since there is no downside to volunteering and only a possible benefit to being elected.

Now that we have solved for the case where leaders provide no benefit, we can turn to the more interesting case where leaders do provide some benefit to the group, in which case

$w(Acephalous) < w(Follower)$. Now we can solve for $\hat{v}$ by substituting the values of $w(Acephalous)$, $w(Follower)$, and $w(Leader)$ from (1), (2), and (3) into equation (9), which gives:

$$\frac{E*C_E - C_p*I - C_F}{(1+\hat{v}*(n-1))} - C_v = \left(\frac{E}{n} - L*I\right) * (1-\hat{v})^{(n-1)} \qquad (11)$$

Equation (11) tells us the conditions under which leadership can evolve under the assumptions of our model (mutual benefits between leaders and followers, equal distribution of group production, and homogenous costs of and returns to leadership among all candidates). The right-hand side of the equation represents the risk to abstaining: the probability that everyone else in the group also abstains multiplied by the cost of losing the leadership multiplier. The left-hand side of the equation represents the risk of volunteering: the payoff to being leader, conditional on success, minus the guaranteed cost of candidacy.

When v=0, this simplifies to this condition:

$$E * \frac{C_E*n-1}{n} - I(C_p - L) - C_F - C_v = 0 \qquad (12)$$

Condition (12) says that so long as the payoff to leaders exceeds the costs, some volunteering will emerge, i.e. $\hat{v}>0$. In contrast, when v=1, condition (9) reduces to

$$E * C_E - I * C_P - C_F = n * C_v \qquad (13)$$

In words, this means that 100% of the population will volunteer for leadership if the payoff of leadership is greater than the all the costs, including the cost of volunteering every round

despite only being selected with frequency 1/n. As groups become larger, a smaller proportion are expected to aspire to leadership as even small costs to volunteering (such as the risk of frustrating rivals) add up to make the rewards of leadership unappealing.

4.5. Optimizing leadership from the perspective of the group

We now consider the case where group members have full control over E; in other words, players can set the amount of collective production that will be paid to the leader and they do so before the volunteering phase. From equation (14) we know that no one will volunteer if the payoff to the leader is smaller than the payoff of having no leader. Therefore, players are incentivized to increase E such that enough players will volunteer. This has diminishing returns, as more candidates does nothing but reduce efficiency, so there should be an optimal value of E which maximizes the expected payoff of not volunteering $w(\bar{V})$ (equation (9)), which is also the average payoff for all values of $\hat{v}$ except 1. To find this optimal incentive E* we set:

$$\frac{dw(\bar{V})}{dE} = \frac{(1-\hat{v})^{n-1}-1}{n} - \frac{\partial \hat{v}}{\partial E} * \left(\frac{E}{n} - L * I\right) * (n-1) * (1-\hat{v})^{n-2} = 0 \qquad (14)$$

This expression has no solution for the case where $\hat{v} = 1$: if everyone is volunteering, the incentive has already been set too high and now there is a free-for all competition to be leader. From a group perspective, this is an unviable solution. We must have $\hat{v}<1$, and we have also set $n>1$ and $E/n < L*I$ (leaders can't extract more than they produce, and we have

already explored the case where E/n = L*I). As a result, we can solve for the partial derivative of $\hat{v}$ with respect to E.

We know that $\hat{v}$ must satisfy equation (12), so we can differentiate both sides of this equation with respect to E to get the following equality:

$$\frac{C_E}{1+\hat{v}*(n-1)} + \frac{\partial \hat{v}}{\partial E} * \frac{(E*C_E - P*I - C_F)*(n-1)}{(1+\hat{v}*(n-1))^2} = \frac{(1-\hat{v})^{n-1}}{n} + \frac{\partial \hat{v}}{\partial E} * \left(L * I - \frac{E}{n}\right) * (n-1) * (1-\hat{v})^{n-2} \quad (15)$$

Substituting the solution to $\frac{\partial(\hat{v})}{\partial E}$ from (15) into (16) and rearranging we find the following equality:

$$\frac{E^* * C_E - I*C_p - C_F}{E^* - L*I*n} = \frac{n*\left(C_E - \frac{1+v*(n-1)}{n}\right)*(1-\hat{v})^{n-2} * (1+\hat{v}*(n-1))^2}{(1-\hat{v})^{n-1}-1} \quad (16)$$

For reasons of mathematical complexity, we refrain from solving equation (16) analytically. Instead, we simulate the outcomes of $\hat{v}$ with respect to our ecological parameters using R version 4.1.2.

4.6. What if volunteers' investment responds to incentive?

We also consider a case where leaders vary in their rate of investment I. We have hitherto assumed that the proportion of their individual production that leaders must invest is fixed. If players vary in how much they plan to invest if elected, then they will consequently vary in how much it would benefit them to volunteer. As a result, the average willingness to invest of volunteers will differ from that of the general population. We can calculate the average

investment rate of volunteers I^* by taking the average of all possible I from 0 to 1, weighted by the equilibrium volunteer rate $\hat{v}$ for that I (see figure 5). Formally,

$$I^* = \int_0^1 I * \hat{v} dI \qquad (17)$$

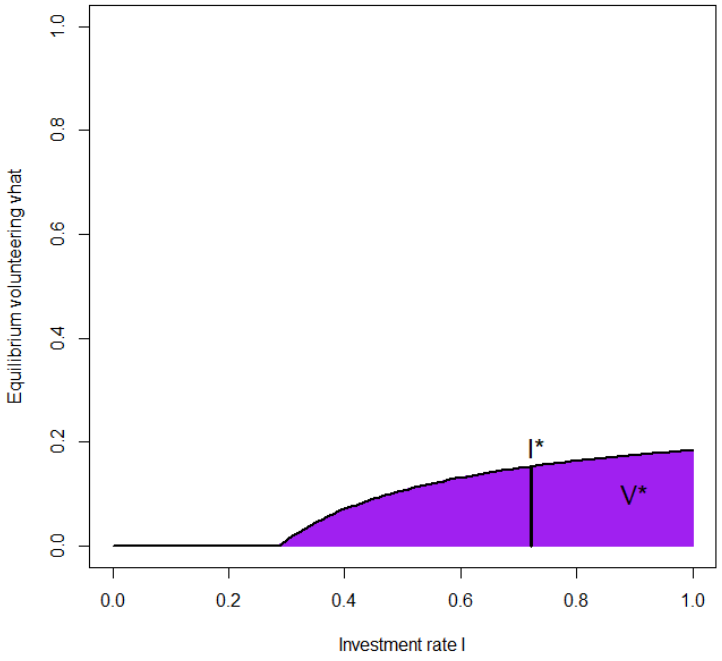


Figure 2. Predicted equilibrium volunteering rate $\hat{v}$ as a function of rate of investment I, for E=3, C_P=2, L=6, C_L=2, C_V=0.5. The mean of this distribution is the optimal investment rate for volunteering players I*, and the optimal volunteering rate is area under the curve v*

Similarly, the equilibrium volunteer rates over all possible investment rates is:

$$v^* = \int_0^1 \hat{v} dI \qquad (18)$$

Again, we do not attempt to solve this analytically, but results are simulated and shown below.

4.7. Results

4.7.1. The opportunity costs of leadership Cp

There is an important relationship between the opportunity cost C_P of leadership and the collective benefits of leadership. Effectively, the ratio of L/ C_P represents the value of converting investment in personal production to investment in leadership. Higher opportunity costs require equivalently high returns to leadership for volunteering to emerge (figure 3).

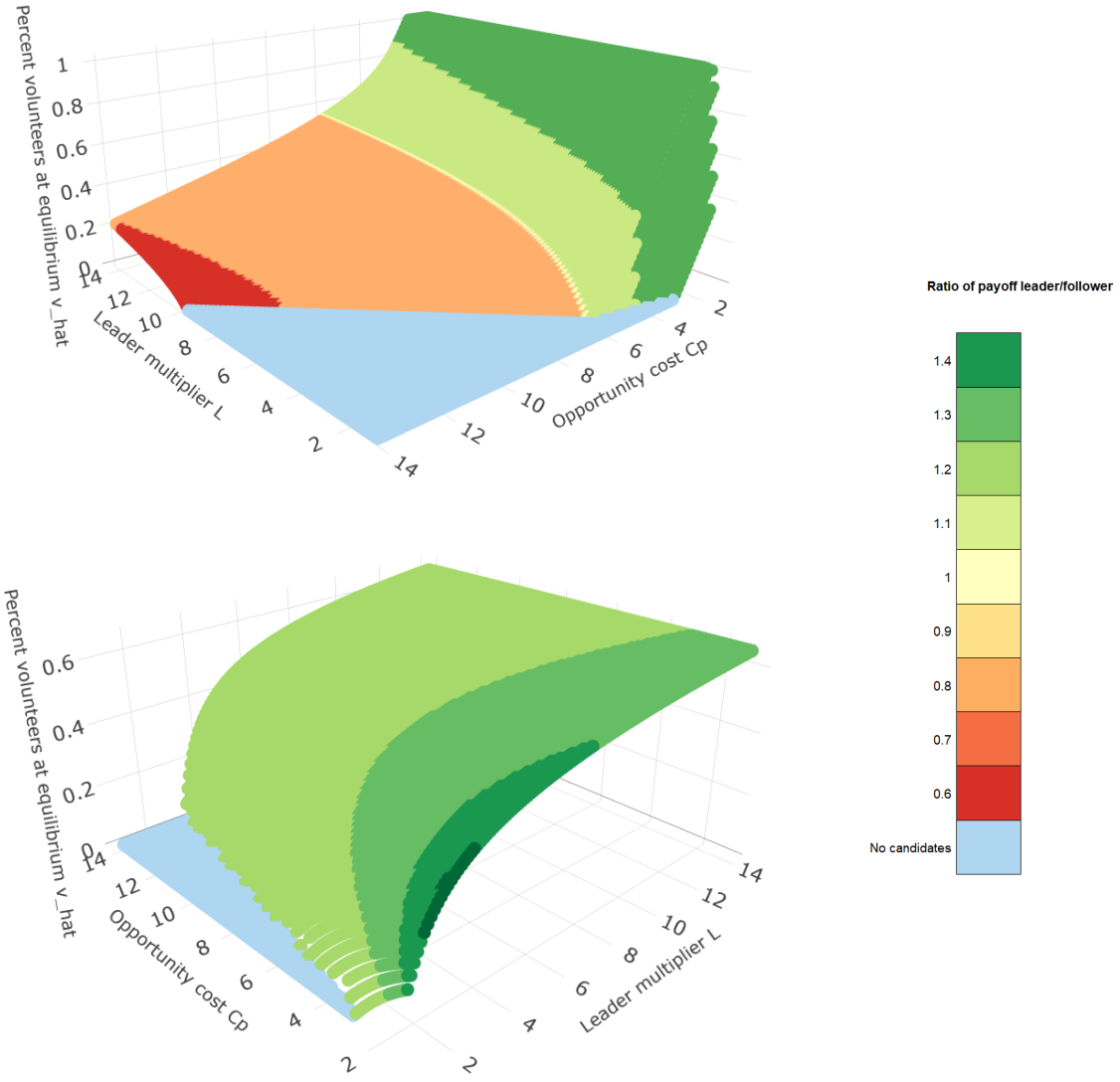


Figure 3. Equilibrium volunteering rates as a function of Leader multiplier (L) and opportunity cost (C_P). Other variables set at the following: Ce=1 I=0.5, C_V= 0.5, C_L=0.5, n=5. Extraction E is fixed at E=4 in fig. 3.a, and optimized to E* in figure 3.b. In the blue zone, leadership is too costly for leaders and no-one volunteers. The color scale represents the relative payoff of leaders to volunteers: in green zones, leaders have higher payoff than followers. In red regions, players volunteer despite a lower expected payoff as leader relative to group-mates (but higher in absolute terms).

Figure 3.a illustrates the impact of the L-P ratio on the emergence of leadership. Here leaders invest 50% of their personal production C_P and receive an extraction payment of E=4. Below the line Cp=6, this extraction covers all the costs of leadership, so candidates for leadership emerge with low L and leaders benefit disproportionately. Above this line, the extraction no longer covers the costs of leadership, so now followers benefit disproportionately from leadership – a volunteer's dilemma. In figure 3.b, players select an optimal rate of leader repayment E*. Here leadership emerges very easily because there is no cost associated with E* (i.e. C_E=1), and so E can be used to cover all of the other costs of leadership C_P,C_F, and C_V. The leader payoff is always greater than the follower payoff here, although the ratio approaches 1 as C_P increases. This suggests that when the benefits of leadership are easily fungible and distributable among group members, it is beneficial to the group to compensate leaders by more than they invest (i.e., set w(Leader)>w(Follower)) to guarantee sufficiently high participation rates.

4.7.2. The cost of extraction C_E

The cost of extraction C_E has a large effect on the ability of leaders to recuperate the costs of their service. C_E represents inefficiencies associated with reimbursing leaders, such as the costs of enforcing taxation. Effectively, when C_E = 0 it is impossible to transfer any resources from groups to leaders and the model reduces to a volunteer's dilemma. When C_E=1, groups are able to efficiently reimburse leaders for any costs they incur, and in this case, they can maximize their payoff by doing so in full (see figure 4.b). However, in practice it can be difficult to enforce reimbursement. Even though groups *collectively* maximize their returns by reimbursing leaders, followers are *individually* incentivized to defect, meaning that

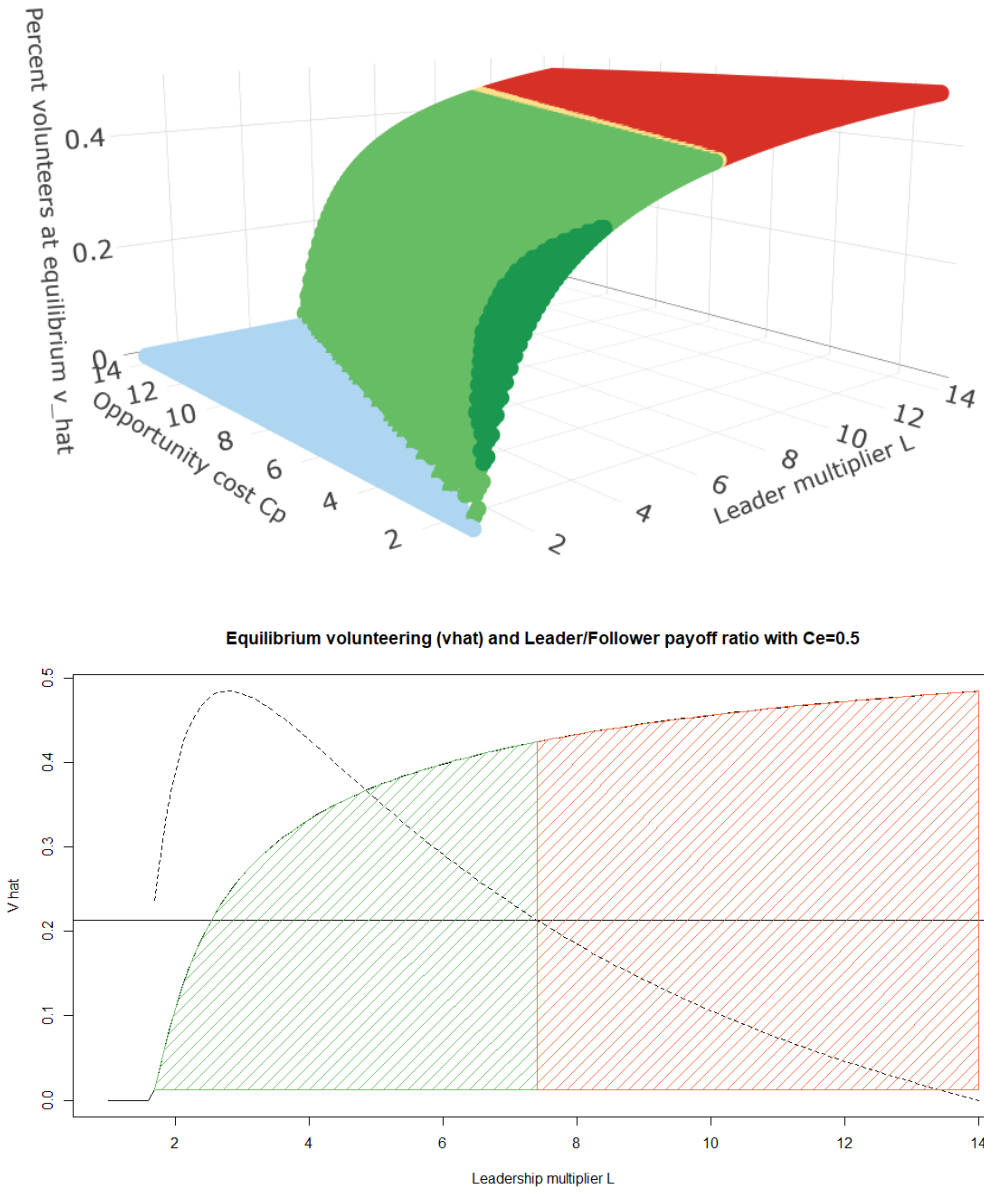
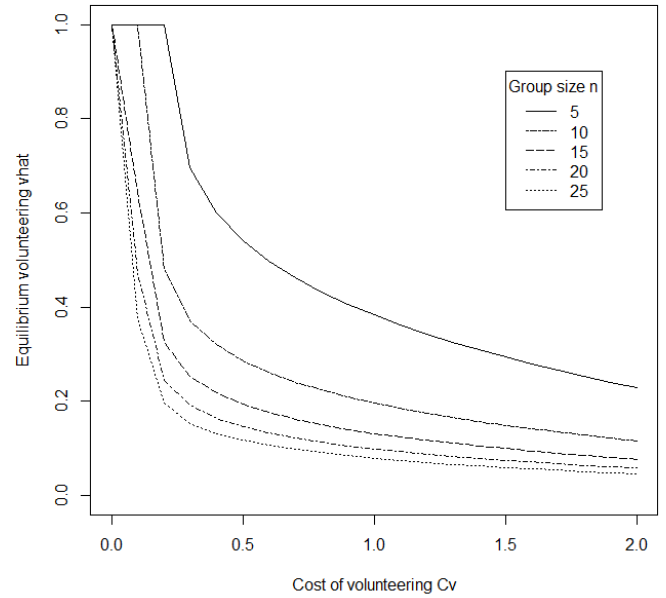


Figure 4. Costly leadership emerging when Ce <1. In red zones leaders receive lower payoffs than followers.

leaders have to expend additional resources to punish defectors or to enforce cooperation, leading to $C_E < 1$. This is particularly likely when the benefits of leadership are not immediate or fungible. For example, if the primary public service provided by leaders is conflict mediation, or inter-group negotiation, it may take some time before the value of this service is realized, and when it is it may take the form of something intangible, such as group safety or harmony, and thus not easily distributable in a way that compensates the leader for their time and effort. When $C_E<1$, transfers to leaders are possible, but costly, and whether leaders volunteer altruistically or not depends on the other parameters, notably the ratio between L and C_P, and the values of C_F and C_V.

4.8. The cost of volunteering C_V

From equation (6) we can see that the cost of candidacy (C_V) has a higher marginal effect on $\hat{v}$ at higher rates of volunteering and drops out when v=0 (condition (13)), because there is no risk of losing an election and therefore no cost of volunteering that isn't already priced into the leader payoff. If the expected leader payoff is larger than the expected follower payoff (w(Leader)>w(Follower)), then volunteering should fix at 100% unless $C_V > 0$. In most realistic contexts the presence of large proportions of a population vying for a small number of profitable leadership positions should generate costs of candidacy through competition. As figure 4a illustrates, even small costs of candidacy can keep volunteering rates low in large groups (see also equation (14)).



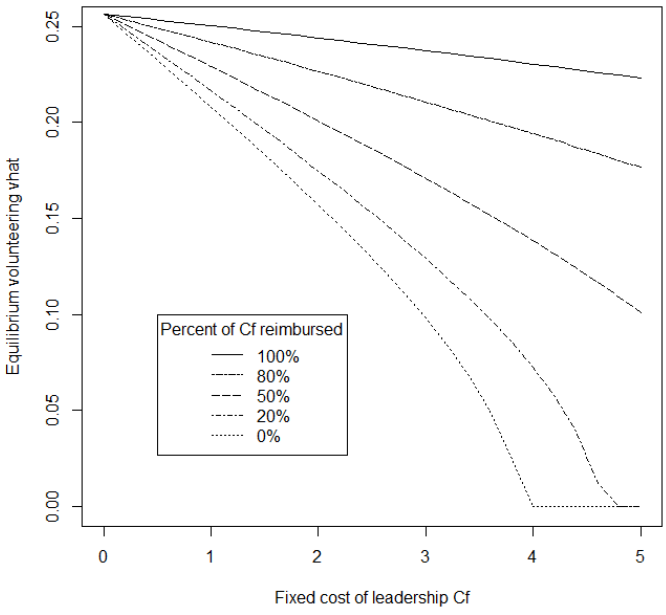


Figure 5. Equilibrium volunteering $\hat{v}$ as a function of the cost of volunteering C_V. As group size increase, even small C_V can lead to low overall rates of volunteering. 4b. Equilibrium volunteering $\hat{v}$ as a function of the fixed costs of volunteering C_f. if E is set to a proportion of C_F, essentially reimbursing the leader, the negative effect of Cf on volunteering is mitigated.

4.9. The fixed costs of leadership CL

The fixed costs of leadership (C_L), much like the cost of candidacy C_V and the opportunity costs of leadership (C_P), make volunteering less likely by reducing the payoff to leadership. Provided the benefits of leadership are fungible and easily distributed, C_L has minimal impact on leadership. Figure 4.b. illustrates the effect of C_L on the equilibrium volunteering $\hat{v}$, which can be mitigated by increasing the extraction rate E to cover a portion of C_L. It is noteworthy that even when E covers 100% of the fixed costs of leadership, increasing these costs still leads to a lower volunteering rate. These costs represent inefficiencies in leadership and lower the relative advantage of having a leader to begin with, which makes the risk of no leadership less costly. When players are allowed to optimize E*, C_L becomes largely irrelevant, since groups can simply cover the fixed costs from the collective payoff. This is possible unless either $C_F > L*I$ in which case the entire enterprise is not worth the cost, or there is some cost to extracting resources from the collective payoff.

4.10. Optimal investment I*

An interesting result emerges when leaders differ in their personal willingness to invest. Here we calculate the expected willingness to invest of volunteers as $I^* = \int_0^1 I * \hat{v}\, dI$. When the ratio between L and C_p is high – that is, when the personal returns to leaders of public service is higher than the returns to individual production – there can be a negative effect of E on the expected rate of investment I* (figure 6.a). This is because when a smaller proportion of the costs are being reimbursed, it is not worth incurring the fixed costs C_F and C_V unless I is high. As a result, the optimal payment E* is lower than it would be if the investment rate I is

fixed and exogenous, and this can lead to altruistic leadership (figure 6.b.). Effectively, when leaders vary in how much they are willing to invest in leadership, promising higher rewards to leaders may attract less effective candidates, which in our model leads to lower payoffs because there is no mechanism for distinguishing between leadership capabilities. This effect would be blunted if groups were able to select more invested leaders.

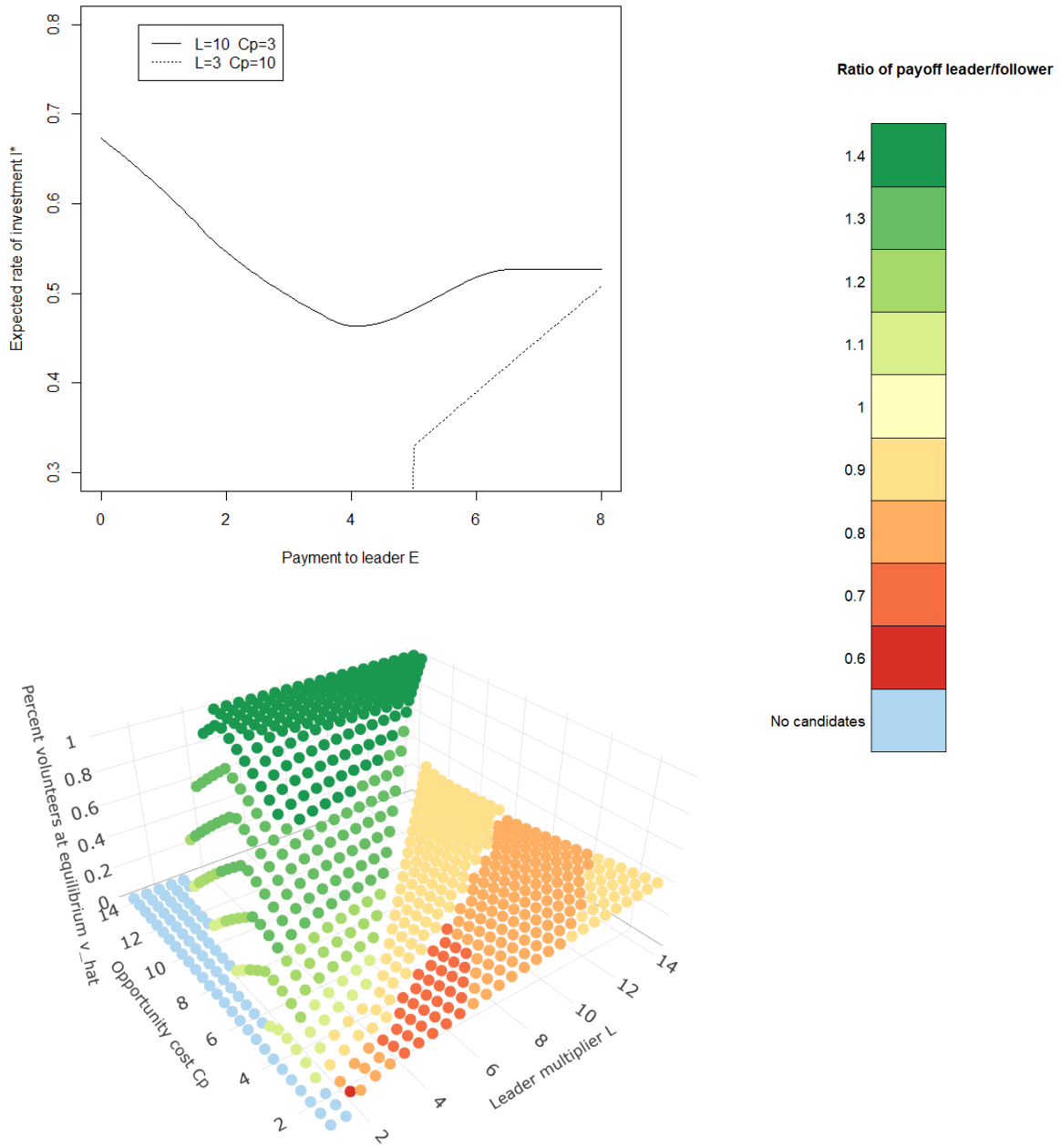


Figure 6. Expected rate of investment I* as a function of group payment E. When Cp > L, players require a minimum E to volunteer and I* increases with E. When L > Cp, however, volunteering with high I can be beneficial, but the expected I* decreases with E.

4.11. Discussion

This model examines the conditions under which groups can incentivize costly altruistic behavior by individual volunteers. This kind of costly behavior is a crucial component of leadership. In a sample of 59 populations with ethnographies recorded in HRAF, Garfield, Syme et. al. (2020) find that the most prevalent dimensions of leadership cross-culturally were conflict resolution, organizing cooperation, providing council and direction to followers, and engaging in social functions. Leadership of this sort can be extremely burdensome; demanding time and cognitive effort (Chiu et al., 2021) and entailing risks to reputation and to interpersonal relationships, particularly if it attracts blame for poor outcomes (Zhang et al., 2020).

Our model explores the conditions under which individuals would be willing to take on these costs, focusing on different kinds of leadership costs, such as costs associated with personal productivity (opportunity costs), and inefficiencies associated with recovering leadership costs. We show that voluntary cooperative leadership can emerge under a broad range of conditions as long as groups can agree to reimburse leaders for the costs they incur. Even assuming no variation in leadership skill, groups benefit from compensating leaders by an equal or greater amount than they invested. That is, even non-extraordinary leaders should end up benefitting slightly more from the fruits of their leadership. However, ‘altruistic’ leadership, where leaders do not recoup the full cost of their actions, can still emerge if there are obstacles in place preventing groups from easily reimbursing the leader.

For example, if leadership directly increases production of some transferable resource, such as hunting returns, then leaders can be easily compensated with a share

proportional to their investment. On the other hand, the benefits of norm-enforcement or conflict mediation are not fungible, even though the time investment, cognitive burden, and social risks may be high. If the benefits of leadership are contingent on a number of risk factors and externalities, as they might be in warfare for instance, the role of leader may be unenviable. In egalitarian societies, where compensating a leader materially - with a salary, for instance - is impractical, leaders may be rewarded with prestige (Hagen & Garfield, 2019; Henrich & Gil-White, 2001; Price & van Vugt, 2014), but the value of that prestige depends on how easily it can be converted to fitness benefits, so costly leadership is also a perfectly reasonable outcome to expect in societies with little material wealth.

We show that the probability of volunteering for leadership depends on the ratio between the costs associated with being a leader, and the value to the group of having a leader. All else equal, leadership is more likely to emerge as the value to the group increases. However, under our assumption of no coercion, this increase in the rate of volunteering is not associated with a larger skew of resources being allocated towards the leader (see figure 3). On the contrary, as the value of leadership increases it can become worthwhile for individuals to volunteer for leadership despite not recuperating the full cost of their investment. Leaders only tend to benefit disproportionately when the fixed and opportunity costs of leadership are low.

We also explore how incentives change when players vary in how much of their time they are willing to invest in public service (See figure 6). Counter-intuitively, followers can sometime optimize their payoff by under-compensating leaders in this case. This occurs when the marginal benefit of the public service exceeds the opportunity cost, and so leaders must invest more into public service than their personal economic endeavors in order to make

up for the fixed costs of leadership (e.g. personal risks and expenses). If these fixed costs are already subsidized, however, then less heavily invested leaders will be attracted to volunteer for public service, despite a worse performance. In effect, under-compensating leaders selects against opportunistic leaders.

Finally, our model has implications for the evolution of institutional leadership. In this framework, groups maximize returns by collectively subsidizing the costs associated with public service. However, this may be complicated when the benefits of public service are not fungible. Free-riders may resist participating in the leader subsidies, and although in principle leader can use their authority to punish these free-riders and/or extract their contribution forcibly, this additional cost causes inefficiencies which can undermine the incentive to volunteer for leadership. Institutionalized leadership can overcome this problem through taxation, which can be calibrated to cover any additional costs associated with punishing free-riders. This suggests that groups can organically develop norms favoring institutional leadership when the benefits of having a leader are high, for example with increasing scalar stress.

4.12. Limitations

For the sake of simplicity, we have omitted several factors in our model which likely have important effects in real-world scenarios. The most important of these is the heterogeneity in leadership abilities and costs, which can generate obvious candidates for leadership, making the volunteering process less relevant, and can also lead to a greater skew in the distribution of collective production in order to compensate highly skilled leaders.

However, most of the effects presented here should hold in situations of leadership heterogeneity, since incompetent leaders will simply never be picked and therefore the model will reduce to a pool of volunteers among the competent leaders.

Another simplification we make is to assume that all group members benefit equally; in reality, leaders can distribute resources unevenly in order to maximize benefits for themselves while maintaining a critical threshold of support among the group with a small group of powerful allies. This effect has been explored in existing papers, however (Archetti, 2009; Gavrilets & Fortunato, 2014), so we did not feel the need to reproduce it here. It is noteworthy that even without this kind of coercion, and no heterogeneity in leadership ability, our model still shows that the optimal strategy for groups is to compensate leaders for their investment.

Finally, our model of leader selection, in which leaders are chosen randomly from a pool of volunteers, may not fully reflect leader selection in most real-world contexts. For instance, groups can apply social pressure or increase incentives to leaders strategically if and when there is a risk of having no volunteers.

4.13. Conclusion

Our primary goal with this model was to explore under what ecological circumstances individuals would volunteer for public service leadership; whether they would do so without being fully compensated for their investment; and what the optimal rate of reimbursement is for maximizing group returns. We find that as the as leadership becomes more valuable to group well-being or production, it becomes more likely that individuals will volunteer for

leadership. However, this does not necessarily mean that the distribution of resources will skew towards leaders. Instead, this will depend primarily on how easy it is to transfer resources from group members to leaders. When no obstacles to leader reimbursement exist, the optimal strategy for groups is to incentivize volunteers by committing to grant leaders a slightly larger share of total production. When reimbursing leaders is costly, for example if the benefits of leadership are non-fungible and no institutions exist to impose taxation or other forms of collective transfers of resources, individuals may be more reluctant to volunteer, but will still do so if the collective benefits are high enough.

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CHAPTER 5. SUMMARY AND CONCLUSION

In this dissertation I have argued that public service leadership in egalitarian settings emerges in response to market forces: when there is a demand for leaders, groups can incentivize their members to assume leadership by deferring to the leader's authority, both individually and through social and cultural norms. Without strong social hierarchies, serving as leader may not be the preferred behavioral strategy for most or even many people, as the costs associated with leadership – particularly the opportunity costs – can be extremely high.

In chapter II, I compared the history, ecology, and leadership institutions of the Tsimane and the Moseten. I showed that despite a shared ethno-linguistic history and similar social organizations, these two groups had radically different approaches to leadership. Moseten leaders (*caciques)* are highly respected and have a fair amount of authority to organize the community and mandate financial contributions. Community members defer to the *cacique* in case of conflict, including with members of the same community. In contrast, Tsimane communities prefer to resolve conflicts independently. Tsimane are also much less likely to engage in community labor overall, preferring to work either for their immediate family or with a reciprocal labor network. Unsurprisingly, Moseten are much more likely to engage with some form of community leadership, and to be willing to take on the role of village leader if asked. In contrast, very few Tsimane displayed any interest whatsoever in community leadership.

I further argued that these differences in institutional leadership and norms for collective action may have contributed to the relative success of Moseten communities over the past three decades in achieving significant infrastructure projects and receiving grants and

land rights from the government, despite having formed an indigenous rights group 7 years later than the Tsimane, who outnumber the Moseten by more than 4 to 1. The origins of the differences between Tsimane and Moseten communities may date back to the 19th century, when Jesuit missionaries forcibly settled the Moseten and established strict hierarchies. But today, the obstacles to greater Tsimane political representation, cooperation, and development are principally structural, socio-economic, and geographic. The Tsimane remain much less literate and fluent in Spanish than the Moseten, which hampers their ability to communicate with outsiders and government entities and severely limits their pools of prospective leaders. Their communities are spread out over a much larger area than Moseten communities and many lie several hours away from the nearest market town, which makes travel expensive and limits many Tsimane communities to a purely subsistence lifestyle. In these conditions it's no wonder that formal leadership isn't taken as seriously: there is little that a formally elected *corregidor* can do that couldn't be achieved via traditional collective deliberation.

My future research will aim to more formally test this hypothesis by measuring the impact of economic development in Tsimane communities on leadership and collective action norms and practices. One of the two Tsimane communities I surveyed had recently built a road which cut down travel time and expense to the market town by more than four fifths. Already during this field season villagers there were earning more money through fishing and contributing some of that money as well as physical labor to collective projects at a far greater rate than their neighboring community with much worse access to town. I hope to use longitudinal data on economic development collected by the Tsimane Health and Life History Project to test whether this pattern holds across communities.

Despite the differences between Tsimane and Moseten approaches to institutional leadership, there was a consensus in both groups that leadership is an onerous task, best suited to those who wish to improve conditions for their community. The most frequent objection to the idea of becoming leader was that it was too much responsibility; the second most frequent was that being elected leader would mean abandoning one's family and field. In Chapter III, I set out to characterize the traits of people who seek out leadership, and the traits of people who are sought after as potential leaders. I reasoned that, given the apparent burdens, individuals who sought out leadership would be primarily younger, wealthier, more popular, and have fewer children than the average, since they would be best placed to lead effectively and to incur the smallest costs. I found no evidence for this. Men were much more likely to claim to be eager for leadership, as were the Moseten as whole relative to the Tsimane. None of the other predictor variables were at all associated with self-reported enthusiasm. This null result seems to reflect the fact that self-reported enthusiasm for leadership was actually a fairly poor predictor of eventually being elected leader. Of the surveyed individuals who went on to be elected in their communities, more claimed to not want to be leader than to want it. This indicated either that people were not forthcoming in their answers to me, or that they changed their mind a lot over time, or possibly that signaling eagerness to engage in community public service is easier to do when one's probability of actually being nominated is low.

To explore the traits of sought-after leaders, I asked respondents to name up to five community members who would be a "good choice" for leader at the next cycle. I predicted that popular choices would be relatively wealthier, more popular, more educated, and more experienced, and I further predicted that people would preferentially nominate individuals

with whom they already had a personal connection. I found greater support for this hypothesis, but not across the board: popular nominees were not wealthier, more popular, or – very surprisingly – more educated than average. Instead, the relevant variables were a) being also named as a social partner by the nominator in the social networks interview, and b) having previous experience working in leadership. Prior experience was by far the most important predictor of being nominated besides being male. However, much like self-reported enthusiasm for leadership, popularity in this naming exercise turned out to not be a very good predictor of future leadership. As of 2022, none of the most popular nominees – who received 10 or more nominations in total – have been elected to lead their respective communities, and most had claimed not to want to become leader in the first place. Instead, some fairly unlikely candidates emerged as leaders, including two women who had said in their interview that they were not interested in leadership. Taken together, these results indicate that leadership elections in Tsimane and Moseten communities do not have pre-determined candidates with measurable popular support. In fact, the most popular candidates tend to have other priorities. As a result, leaders are often selected from a pool of competent adults, generally middle-aged, hopefully with prior experience, who often need to be convinced to take the position.

I found no evidence that former leaders were any wealthier or had higher incomes than average community members. Unfortunately, it was not possible to properly infer a causal relationship between being elected leader and future wealth, as these variables are endogenous. However, the fact that former *caciques* and *corregidores* were not significantly wealthier or poorer than their co-residents suggests that, at the very least, leadership in these

settings is not strongly lucrative. In the future, I hope to leverage longitudinal wealth data to estimate the effect of serving a term as community leader on personal finances.

Finally, in chapter IV, I developed a game theoretical model of public service leadership to explore how exogenous ecological factors could impact the emergence of a collaborative form of leadership. The model solution is the Nash equilibrium between two strategies, volunteering for leadership or abstaining. This equilibrium rate of volunteering, $\hat{v}$, is at 0 when the personal cost of being a leader exceeds any benefit of the public service. $\hat{v}$ exceeds 0 when there is enough incentive for a least some individuals to volunteer for leadership, which can occur even if leaders shoulder a disproportionate amount of the costs – because the alternative would be to risk not having a leader at all. Many forms of everyday leadership follow this pattern: projects require organizing, logistics require managing, and unless someone volunteers to take on the task it will not get done. In the context of Tsimane and Moseten leadership this may sound unrealistic, since communities can simply keep holding meetings until a leader is selected. However, unenthusiastic or incompetent leadership may well have similar effects to no leadership at all. More than one leader and former leader told me they had accepted the position to remedy the perceived incompetence or corruption of the previous leadership.

Next, the model asks: if groups can help leaders shoulder the cost of public service, would that incentivize more people to volunteer, and more importantly, how much should groups offer to pay? Here we find a new result: to maximize their own payoffs as followers, groups should offer to fully compensate leaders for the costs of public service, such that in the end leaders receive a slightly higher payout than followers. This may accurately reflect the status quo in Moseten communities, where former leaders are slightly but not

significantly wealthier than average, adjusting for age. On the other hand, the data are also consistent with a different scenario presented by the model: if leaders cannot be compensated for their investment without some loss of efficiency, then they can end up shouldering the majority of the costs themselves. In the case of the Tsimane and the Moseten, this loss of efficiency could occur when leaders spend additional time and resources enforcing the agreed-upon contributions of community members. As a result, every Boliviano raised is devalued by the number of resources expended on raising it (for a graphical representation of this result see figure 4).

Finally, it's possible that leaders vary in the amount to opportunity cost they are willing to pay as leader. If so, our model finds that groups may actually wish to avoid overpaying leaders in order to select only for highly invested leaders who are willing to make up the costs of leadership through sheer commitment to the public good. This result speaks to an important component of leadership generally, which is that groups thrive when the interests of their leaders align with their own.

In the future, I will test the theoretical predictions of this model in experimental settings, first in laboratory and then field conditions. I also hope to expand some elements of the model, including relaxing the assumptions of homogeneity of costs and benefits and adding nuance to the election system.

The systems of leadership I describe in this dissertation are by no means representative of all forms of leadership. Nevertheless, in egalitarian or democratic settings a great deal of collective activity relies on the initiative and good will of temporary leaders, directors, and managers. What this dissertation argues is that early forms of leadership may have preceded status hierarchies, which developed in part to help motivate people to take on

otherwise costly group-beneficial tasks. I hope to motivate further research on the role of public service as a form of cooperation in human societies.

6. APPENDIX

Table S1. Log-linear regressions predicting current wealth and income

	Dependent variables:			
	Log-wealth Log-odds ratios		**Log-income** Log-odds ratios	
Independent variables:	(1)	(2)	(3)	(4)
Age	0.060*** (0.013)	0.060*** (0.013)	0.021 (0.048)	0.020 (0.048)
Age^2	-0.001*** (0.0001)	-0.001*** (0.0001)	-0.0002 (0.001)	-0.0002 (0.0005)
Sex=Male	-0.079 (0.084)	-0.098 (0.084)	-0.166 (0.312)	-0.207 (0.316)
Population=Tsimane	-0.445*** (0.094)	-0.420*** (0.096)	-0.013 (0.343)	0.026 (0.352)
Years of education	0.029*** (0.010)	0.030*** (0.010)	0.032 (0.046)	0.033 (0.045)
Time in leadership	0.009 (0.014)		0.004 (0.048)	
Former Cacique		0.165 (0.128)		0.240 (0.519)
Constant	7.350*** (0.317)	7.327*** (0.311)	7.821*** (1.181)	7.816*** (1.169)
Observations	222	222	166	166
R^2	0.330	0.334	0.007	0.009
Adjusted R^2	0.311	0.315	-0.030	-0.029
Residual Std. Error	0.578 (df = 215)	0.576 (df = 215)	1.843 (df = 159)	1.842 (df = 159)
F Statistic	17.658*** (df = 6; 215)	17.970*** (df = 6; 215)	0.194 (df = 6; 159)	0.228 (df = 6; 159)

Note: *p<0.1; **p<0.05; ***p<0.01

Table S2: model estimates of Bernouilli GLMM with random intercepts for ID and community

	Dependent variable:
	Log odds of respondent i nominating
Age	0.248*
	(0.129)
Age^2	-2.655*
	(1.364)
Population=Tsimane	0.607
	(0.923)
Sex=Male	3.728***
	(1.078)
Years of education	0.006
	(0.074)
Degree centrality	-0.013
	(0.055)
Time in leadership	0.195***
	(0.051)
Named as partner	0.618**
	(0.302)
Log Wealth	0.029
	(0.428)
Constant	-15.007***
	(3.922)
Observations	9,478
Log Likelihood	-444.214
Akaike Inf. Crit.	912.429
Bayesian Inf. Crit.	998.310
Note:	*p<0.1; **p<0.05; ***p<0.01

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