

# Zapotec cooperative institutions: Exploring the psychological and social mechanisms

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## **Abstract**

The cross-cultural variation in the scale and intensity of human cooperation poses a challenge to classic evolutionary explanations. Confronting popular explanations that eschew “culture”, researchers propose that social norms and institutions culturally evolve to shape cooperation. Here, we examine how institutions shape cooperation by conducting a detailed comparative analysis of two cooperative institutions in a Zapotec community of Oaxaca, Mexico. The first, *gozona*, is a mutual aid institution that supports cooperation in the contexts of agricultural labor and celebrations. The second, *usos y costumbres*, represents a set of traditional political institutions that facilitate the provisioning of public goods. Drawing on ethnography, vignettes, and surveys, we dissect the intertwined, cooperation-sustaining psychological and social mechanisms embodied in these institutions. We find that *gozona* and *usos y costumbres* are governed by different norms, which drive context-specific cooperation; they are not associated with generalized prosociality. Moreover, *gozona* and *usos y costumbres* norms harness distinct but overlapping sets of mechanisms, including reciprocity, interdependence, reputation, and punishment. These results support the view that institutions tap into and recombine diverse cooperation-sustaining mechanisms as they culturally evolve, challenging “culture-free” efforts to explain human cooperation. Indeed, even within a single, small community, different cooperative institutions work in different ways.

## **1. Introduction**

In San Francisco Yateé, a Zapotec village in the mountains of Oaxaca, Mexico, people cooperate in many ways. In steep, hillside plots, friends and neighbors help each other harvest corn and coffee. When a family hosts a wedding, funeral, or saint’s feast, villagers arrive early with contributions of corn, sugar, chocolate, and cash. Many stay all day to help with preparations,

making *tamales*, washing dishes, and carrying firewood. Yateé men regularly work together to benefit the community— constructing a new school, clearing landslides, and putting out wildfires. Moreover, each year a rotating group of men set aside their subsistence or wage labor to fill unpaid civic roles, performing important functions like maintaining the drinking water system and organizing public works projects.

Such intense cooperation is not a given in human societies. Some small-scale societies, such as the Matsigenka of the Peruvian Amazon, struggle to mobilize cooperation beyond the extended family group (Johnson 2003). Meanwhile, while residents of large-scale, Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies readily cooperate with strangers in some domains (e.g., paying taxes, donating blood; Henrich 2020), it is hard to imagine a typical American forgoing a year of salary to work *gratis* to benefit their hometown. Why do the people of Yateé cooperate so intensely with each other, across so many domains?

Variation in the scale, intensity, and domains of cooperation represent a puzzle in human evolution (Henrich and Muthukrishna 2021). Although humans likely have genetically-evolved psychological capacities that support cooperation between, among others, close relatives (kin altruism; Hamilton, 1964) and tit-for-tat partners (direct reciprocity; Trivers, 1971), these mechanisms fail to adequately explain the observed patterns of human cooperation. A full explanation of human cooperation must explain not only our species' ultrasociality (we cooperate more intensely than most other mammals), but also the rapid scaling up of cooperation since the birth of agriculture, and the fact that many of the forces that support human cooperation can also sustain noncooperative or even maladaptive behaviors, including some food taboos and rituals (Chudek and Henrich 2011; Henrich and Muthukrishna 2021).

Our working hypothesis is that cultural evolution, operating in different ways in different contexts, devised a plethora of strategies to scale up cooperation by harnessing aspects of our evolved social psychology. According to cultural evolutionary theory, human minds have evolved to acquire and retransmit culture, including tools, beliefs, rituals, and—crucially—social norms (Henrich 2016; Chudek and Henrich 2011). Social norms are culturally-transmitted standards of behavior that are shared and enforced within a community (e.g. “people should pay their taxes”; “newlyweds should live with the groom’s family”). Social norms are packaged together into institutions, which govern domains such as kinship and religion.

Cultural evolutionary theory suggests that norms and institutions play a crucial role in shaping human cooperation, pulling various psychological and social levers to stabilize cooperation. Psychologically, cooperative institutions foster prosociality as the component norms are internalized (transformed into internal preferences, biases, and heuristics), a process which is facilitated by evolved norm psychology (Chudek & Henrich, 2011; see S1.1). Institutions can likewise tap aspects of human psychology that evolved to support cooperation between close relatives (kin altruism), repeated interaction partners (reciprocal altruism), and individuals whose fitnesses are otherwise intertwined (interdependence psychology) (Henrich & Muthukrishna, 2021, see S1.3). Socially, institutions can leverage mechanisms that sustain costly behaviors within groups, including indirect reciprocity and punishment (see S1.2). Theorists suggest that as institutions culturally evolve, they stitch together different cooperation-sustaining mechanisms. Because each institution travels a distinct cultural evolutionary path—shaped by local social, ecological, and perhaps even domain-specific forces—this process is hypothesized to result in rich institutional diversity, both within and between societies (Henrich and Muthukrishna 2021).

Thus, within a cultural evolutionary framework, norms and institutions are integral to explaining the broad variation in the scale, intensity, and domains of human cooperation.

Some empirical research supports this view. Cross-cultural studies using anonymous, one-shot behavioral economic games reveal relationships between institutions and prosociality (Henrich et al. 2010; Rustagi 2023; Purzycki et al. 2016). Because these games preclude punishment and reputational damage, behavior in this context likely reflects intrinsic motivation—internalized norms (Henrich and Ensminger 2014). Further highlighting the role of internalized norms (emerging as quick, automatic decisions), WEIRD participants exhibit greater cooperation in a one-shot Public Goods Game when under time pressure (Rand, Greene, and Nowak 2012). Moreover, although children across diverse societies show similar patterns of prosociality early in development, they diverge towards local adult behavior during middle childhood, around the same time that they become responsive to novel prosocial norms (House et al. 2020). This suggests an important role for norms in generating cross-cultural variation in prosociality. Finally, studies have revealed that cooperation is shaped by institutions that govern mutual aid (Cronk, Berbesque, et al. 2019), kinship norms (Schulz et al. 2019), collective ritual (Whitehouse and Lanman 2014; Watson-Jones and Legare 2016), common-pool resource management (Ostrom 1990; Lansing 1991), market exchange (Henrich et al. 2010; 2001; Rustagi 2023), and religion (Purzycki et al. 2016). This body of research strongly suggests that norms and institutions lie at the root of cross-cultural variation in cooperation.

However, the role of norms and institutions in the evolution of human cooperation is debated. Some evolutionary psychologists contend that human cooperation is better understood as the product of specialized cognitive adaptations to a “cognitive niche” (Pinker 2010). According to this hypothesis, humans evolved cognitive mechanisms such as moral emotions, a conditional

cooperation strategy, and a motivation to punish free-riders that allowed our species to thrive in diverse ecologies (Tooby, Cosmides, and Price 2006; Pinker 2010; Price, Cosmides, and Tooby 2002). Burnham & Johnson (2005) argue that the large-scale cooperation that we observe today reflects maladaptive misfiring of cognitive capacities that evolved for cooperation in small, face-to-face groups of our ancestors. Others have suggested that contemporary variation in cooperation is best explained by non-cultural factors, such as ecology (Lamba and Mace 2011). Meanwhile, Boyer & Petersen (2012) theorize that institutions reflect, rather than shape, human psychology, suggesting that humans tend to create or acquire institutions that fit their genetically evolved intuitions. In a review, Kurzban et al. (2015) identify the role of cultural evolution in cooperation as an area of spirited debate.

To contribute to our understanding of the role of institutions in human cooperation, this paper presents a detailed case study of two cooperative institutions in a Zapotec village of Oaxaca, Mexico. *Gozona* is a mutual aid institution that supports cooperation in the contexts of celebrations and agricultural labor. Meanwhile, *usos y costumbres* facilitates the provisioning of public goods that benefit the entire community.

Drawing on ethnographic, vignette, survey, and behavioral economic game data, we use this case study to test predictions from cultural evolutionary theory about how institutions shape cooperation. First, we hypothesized that cooperation in the contexts of *gozona* and *usos y costumbres* is driven by context-specific social norms rather than generalized prosociality. Our results support this hypothesis, providing evidence for the cultural evolutionary view of cooperation. Second, testing the prediction that cooperative institutions stitch together different mechanisms as they culturally evolve, we hypothesized that *gozona* and *usos y costumbres* tap different social and psychological mechanisms to stabilize cooperation. Considering the roles of

reputation, punishment, reciprocity, and interdependence, we find that these institutions rely on overlapping but distinct sets of mechanisms to sustain cooperation. This highlights the diverse ways that cultural evolution can build cooperative institutions. In addition to elucidating how institutions shape cooperation, this paper brings a fresh perspective to bear on institutions that have long interested anthropologists studying Mesoamerica (Mulhare 2000; Monaghan and Cohen 2000).

## 2. Ethnographic background

San Francisco Yateé, known colloquially as Yateé, is a Zapotec community (population 430) in the mountainous Sierra Norte region of Oaxaca (Figure S5, see S2.1 for more detail). A rich mosaic of cooperative institutions structure social life in Yateé, including *compadrazgo* (ritual kinship institution) and *barrios* (voluntary associations that sponsor Catholic celebrations). Here, we focus on *gozona*— a mutual aid institution— and *usos y costumbres*— a set of traditional political institutions.

### 2.1 *Usos y costumbres* (traditional political institutions)

Yateé is politically semi-autonomous, run under what is formally known as “indigenous regulatory systems” (*sistemas normativos indígenas*). Locally called *usos y costumbres* (“customs and traditions”, hereafter *UyC*), the system represents a web of institutions governing citizenship, community service, collective decision-making, and ingroup justice. The contemporary *UyC* system is the product of centuries of transformation. While political organization in Oaxacan Pre-Columbian civilizations was stratified— with authority and land tenure concentrated in the hands of ruling kin groups— 20<sup>th</sup> century anthropologists encountered small, egalitarian communities with collective land rights and strong, place-based identities (Chance 1989; Chassen-López 2004). Scholars argue that this fundamental shift in social organization was spurred by Spain’s “divide

and conquer” approach to dealing with the indigenous population of Mexico. The Spanish Crown intentionally broke up larger civilizations and lineages into small, place-based units, granting them rights, legal identities, and some autonomy, while also extracting tributes and forced labor (Chance 1989; Chassen-López 2004). Today, there is broad institutional variation across Oaxacan indigenous communities (Curtin et al. 2024), likely generated over the centuries as each community traveled a unique cultural evolutionary path.

### **2.1.1 The cargo system**

The *cargo* system is a defining feature of social organization in indigenous communities throughout Oaxaca (Monaghan and Cohen 2000) and Mesoamerica more broadly (Cancian 1965; Mulhare 2000; Carrasco 1961). This institution consists of a hierarchical ladder of unpaid, civil-religious posts (*cargos*, lit. “burdens”) that each citizen must ascend over the course of adulthood. *Cargo*-holders administer crucial public goods, including public safety, infrastructure, and drinking water.

The *cargo* system is a hybrid institution. Although partially a Spanish import to Colonial Mexico, the institution likely built on pre-existing indigenous practices. Based on analyses of Aztec records, Carrasco (1961) argued that age-graded “ladder” systems existed for warriors, priests, and merchants— although it remains unclear whether similar systems existed in Pre-Conquest Oaxaca (Chance & Taylor, 1985). Moreover, although the top, most prestigious *cargo* positions are Spanish, some lower *cargos*, which often involved providing personal services to top *cargo*-holders, likely had indigenous origins. Supporting this idea, some of these *cargos* have indigenous names (e.g. *topil*) (Chance and Taylor 1985; Chance 1989).

In Yateé, men typically serve 12 *cargos*, totaling about 8.5 years of service (Table 1). At the bottom of the ladder, youths begin their career as *topil*, running errands for elder *cargo*-holders

and guarding the municipal building. Moving up the ladder, the costs and responsibilities of *cargos* rise. For example, “the Authorities” comprise a group of four top *cargo*-holders whose duties include organizing public works projects, managing the town’s money, and adjudicating conflicts. The Authorities work all day, every day for the entire year, precluding any subsistence or wage labor. Their duties also include hosting social gatherings for the community, implying substantial financial outlays. Serving *cargos* is one of the essential duties of a male citizen of Yateé. Citizens are named to *cargos* by the Communal Assembly; serving when called upon is obligatory.

As shown in Table 1, the *cargo* system organizes citizens into age-classes. This age-class system, though common cross-culturally (Bernardi 1985), is unusual within the contemporary Oaxacan context. These groups serve as a locus of organization in several aspects of civic life, including the Communal Assembly and *tequios* (communal labor).

### ***2.1.3 Communal Assembly***

The Communal Assembly of citizens holds the highest power. While the Authorities have influence during their year, the Communal Assembly ultimately rules. The Authorities must bring issues to the Assembly to decide. The Assembly keeps a vigilant eye on the Authorities, swiftly imposing punishment if they err.

During an assembly, male citizens sit organized by group (Figure S7), debate issues, and vote by raised hand. A quorum (at least 50%) of active citizens must be present for a decision to be made; the decision of the majority prevails. Failure to attend an assembly is punished with a fine (amount determined within each group). Around 16 regular assemblies are convened per year to discuss public works; plan the annual patron saint festival; and name the following year’s *cargo*-holders. The Authorities can also call *ad hoc* assemblies to deal with pressing issues (see S2.2).

TABLE 1. The *Cargo* System of San Francisco Yateé

Age-class ("Group")	<i>Cargo</i>	Primary Function(s)	Duration
<i>Bi wego'</i> ("Youths")	1. <i>Topil</i> *	When a young man leaves school, he is called to join the first group, <i>bi wego'</i> ("Youths"), where he serves his first two <i>cargos</i> . <i>Topiles</i> and <i>policías</i> run errands for the Authorities; guard the municipal building; respond to minor community matters.	6 months
	2. <i>Policía</i> *		1 year
<i>Bi' yez</i> ("Young citizens")	3. <i>Mayor de vara</i> *	Upon marriage, a man passes into <i>bi' yez</i> ("Young citizens"). <i>Mayores de vara</i> intervene when <i>topiles/policías</i> cannot resolve an issue (e.g. fights, unruly drunkard, car accident).	6 months
	4. Committee		1 year
	5. Commission		1-1.5 months
<i>Benne' gole yez</i> ("Elder citizens")	6. <i>Regidor</i> *	Intervene when <i>mayores de vara</i> cannot resolve an issue; can stand in for a member of Authorities in their absence	1 year
	7. Committee		1 year
	8. Commission		1-1.5 months
	9. One of the following ("the Authorities"):		
	<i>Agente municipal</i> *	Plan and organize public works projects; deal with paperwork and government bureaucracy	
	<i>Suplente del agente</i> *	Town treasurer; assist <i>Agente</i> with administration of public works	1 year
	<i>Alcalde Unico Constitucional</i> *	Adjudicate interpersonal conflicts (e.g. marital or property disputes); impose fines; collect taxes ( <i>cooperaciones</i> )	
	<i>Suplente del alcalde</i> *	Oversee public street lighting; assist <i>Alcalde</i> with conflict adjudication	

TABLE 1. The *Cargo* System of San Francisco Yateé (*continued*)

Age-class ("Group")	<i>Cargo</i>	Primary Function(s)	Duration
	10. Committee		1 year
	11. Commission		1-1.5 months
	12. One of the following:		
<i>Benne' gole xwan</i> ("Elder and older men")	<i>Sindico</i> *	Oversee and advise Authorities; solve serious issues and calm tensions within community; has power to impose punishments; oversees safety and maintenance in town (e.g. calls <i>tequios</i> )	1 year
	<i>Mayordomo</i>	Watch over the Catholic Church (sleep at Church, open it in the morning, freshen flowers, etc.); ring the church bells; sponsor the celebrations of <i>Semana Santa</i> (Easter Week)	
<i>Reservados</i> ("Reserves")	Those who have passed the age of 65 no longer serve <i>cargos</i> .		

**Notes:** The *cargo* system consists of a hierarchical ladder of unpaid, civil-religious posts (*cargos*, lit. "burdens") that each male citizen must ascend over the course of adulthood. Within this system, men are organized into age-classes called "groups"; as they complete *cargos*, they move up in group. *Cargos* marked with "\*" denote those in the *cabildo*, or town hall. The men of the *cabildo* work closely during their year of service, for example independently accomplishing small *tequios*, facilitating assemblies, and maintaining public safety. The four committees in Yateé administer public goods: School Committee, Drinking Water Committee, Health Clinic Committee, and Communal Mill Committee. The commissions relate to the annual patron saint festival: Kitchen Commission, Rodeo Commission, Dance Commission, Sports Commission, and Band Commission. Yateé formally gained the legal right to communal land tenure in the 1970s, prompting the creation of the Commissariat of Communal Lands and Supervisory Board. The Commissariat manages the town's communal resources, including land, firewood, and sand. The Commissariat comprises three *cargos*: Treasurer, Supervisory Councilor, and President, rising from the *bi' yez*, *benne' gole yez*, and *benne' gole xwan* groups, respectively. Each of these *cargos* can replace a *cargo* on the traditional ladder.

### **2.1.4 *Tequio***

*Tequio* is communal labor for the benefit of the community (Figure 1A). All male citizens must give *tequio*, although older men do lighter labor. *Tequios* are organized by group: each group is assigned to meet a goal (e.g. transport 30 bags of sand from the river for a construction project), which they self-organize to accomplish. Many important public works in Yateé were accomplished by *tequio*, including the construction of the municipal building, sewerage system, and piped water system. The Authorities may also call emergency *tequio*, for example to clear a landslide or contain a wildfire. All citizens also do an annual *tequio* to clear the boundary— a 6-meter-wide gap in vegetation (Figure S8)— between Yateé and its neighbors. In a region where land is communally controlled and territorial disputes commonly erupt between communities, clearing the boundary ensures that everyone knows where it is. It also helps prevent wildfire from spreading in from neighboring communities, thus delivering an important public good.

### **2.1.5 *Citizenship***

The town is the primary locus of identity for many indigenous Oaxacans (Dennis 1987; Nader 1964; Monaghan and Cohen 2000; Martínez 2013), and the people of Yateé are no exception. With this identity comes strict rules of membership. A citizen of Yateé has the right to cultivate communal lands, extract resources such as firewood, and receive drinking water and sewerage services to their house. In exchange, citizens must serve and support their community. Active male citizens of the Communal Assembly (men up to age 65) must (1) attend assemblies and vote, (2) serve *cargos*, (3) give *tequio*, and (4) pay a town tax (*cooperación*, lit. “cooperation”). Widows and unwed mothers— with no husband to do their part— must likewise give light *tequio* and pay a tax. As in many Oaxacan communities (Martínez 2013), traditionally only Yateé natives

were considered citizens. However, likely because of the small population and heavy flow of outmigration, today Yateé incorporates immigrant men as active citizens after about 6 months of residence. After several years, they may gain full rights. In 2022, there were 106 men on the roster of active citizens and an additional 31 men on the roster of “retired” citizens (*reservados*). Migrant men living elsewhere were not included on these rosters, but they still owe *cargos* and taxes.

## 2.2 *Gozona* (mutual aid institution)

*Gozona* (Yateé Zapotec: *wzon*) is a mutual aid institution. *Gozona* has traditionally been practiced in Zapotec communities throughout the Sierra Norte (Nader 1964; Cruz Díaz 1982; de la Fuente 1949), and similar institutions exist in other Oaxacan groups, such as *guelaguetza* among Central Valley Zapotecs (Stephen 2005) and *saa sa'a* among Mixtecs (Monaghan 1990). Although little is known about the history of *gozona* in the Sierra Norte, archival and archaeological evidence suggests that *guelaguetza* dates to the Pre-Columbian period among Central Valley Zapotecs



**Figure 1. Community members cooperate.** (A) Men do *tequio* to clear a small landslide from the main road. (B) Women make bean *tamales* for a *convivio*. They pat out *masa* (corn dough), smear it with bean paste, form *tamales*, and wrap them in banana leaves. Some of this labor is *gozona*. Source: C.M. Curtin.

(Flores-Marcial 2015). In Yateé, *gozona* facilitates mutual aid in several domains, including celebrations and agricultural labor.

### **2.2.1 Celebration gozona**

*Gozona* occurs most frequently in the context of social gatherings, such as weddings, funerals, and *convivios* (festive gatherings hosted by a household to which all community members are typically invited). A family may voluntarily host a *convivio*, for example as part of the ritual of donating a bull for the annual patron saint festival. However, many *convivios* are hosted by top *cargo*-holders as part of their official duties. A *convivio* typically involves music, dancing, a procession, and one or more special meals. The major cost of hosting a *convivio* therefore stems from the need to provide and prepare a huge quantity of food. Here enters *gozona*.

The process of *gozona* begins with a public announcement made over the town's loudspeakers, inviting citizens to the host's house to help with preparations. On the appointed day, community members arrive bearing contributions such as cash, dried corn, beans, sugar, coffee, cacao, and salt. The host stations himself in the kitchen to receive the contributions and record them in a notebook. Some people stay to work, which the host also records. Women help prepare the food, wash dishes, and clean tables (Figure 1B), while men carry firewood, hang a tarp to protect the *convivio* from the elements, and slaughter the pig or bull. During the days when people do *gozona*, the host shows respect and gratitude by providing food and drink. At these festive "work parties," people gossip, share meals, and perhaps enjoy an alcoholic beverage. Notwithstanding, they work very hard.

The hosts reciprocate *gozona* by "returning the help". *Gozona* does not need to be reciprocated in exact kind— a pound of cacao for a pound of cacao— but it must be reciprocated in a time of need. Bringing by some bread on a normal Tuesday does not count. Rather, the help must

be returned when the person is hosting their own *convivio*, wedding, or funeral. The process of returning the help can take years: one informant reported that she was still working on returning the help for a *convivio* hosted 12 years earlier.

Importantly, *gozona* must be given freely. For example, informants describe *gozona* as “help from the heart” and say that it is “our pleasure to help”. Informants make a clear distinction between *gozona* and help that is given as part of a formal duty. For example, the host may seek out a woman to serve as head cook or request that the *mayordomos* of the church bring a saint’s statue to the *convivio*. To make the request, the host gifts food and beverage to “give respect” to the person. However, their help is not *gozona* because it has been formally requested or is part of official *cargo* duties. Instead, *gozona* must be freely offered. It must also be voluntarily reciprocated. People do not speak of *gozona* as being “owed”, and one cannot demand that someone reciprocate it.

### **2.2.2 Harvest gozona**

“Harvest *gozona*” or “work *gozona*” is another traditionally important setting for *gozona*. This *gozona* is used for labor-intensive agricultural tasks that are difficult to accomplish alone, such as harvesting coffee, planting corn, or weeding fields. The mechanics of harvest *gozona* differ significantly from celebration *gozona*. Here, when a person needs help, he or she approaches a friend, family member, or other social partner to ask if they would like to “do *gozona*”. The person being asked can decline. The partners come to an agreement about the exchange. Usually, days of labor are exchanged (e.g. 2 days of labor in the asker’s fields, which he or she will reciprocate by working 2 days in the acceptor’s fields when they need help). Thus, this type of *gozona* is predicated on a more formal agreement. In keeping with this formality, informants speak of harvest

*gozona* as being “owed” and “paid”. Harvest *gozona* still exists in Yateé, but informants report that it is declining.

### **2.2.3 Other forms of gozona**

Yateé engages in music *gozona*– the exchange of bands between communities during patron saint festivals (S2.3). In the past, *gozona* was also common during housebuilding, but this institution has disappeared (S2.4).

## **3. Methods**

Building on our ethnographic work (S3.1), we studied the nature of these institutions using three core methods: vignettes, surveys with psychological scales, and a behavioral economic game with institution priming.

### **3.1 Social norm vignettes**

To quantify norms about *gozona* and *UyC*, women ( $N = 22$ ) responded to three vignettes about *gozona*, while men ( $N = 23$ ) responded to three vignettes about *UyC*. The *gozona* vignettes featured a protagonist who failed to (1) offer celebration *gozona* when the need was announced, (2) reciprocate celebration *gozona*, and (3) reciprocate harvest *gozona*. The protagonist in the *UyC* vignettes (1) skipped an emergency *tequio*, (2) refused to serve a *cargo*, and (3) did a poor job in his *cargo*. All participants also responded to three control vignettes about norm violations unrelated to *gozona* or *UyC*, such as disrespecting an elder.

After each vignette, participants were asked to rate how good or bad the action was; how good or bad other people in the community would think it was; how it would affect their reputation; and whether they should be rewarded or punished (5-point response scales; details in S3.2). After the *gozona* vignettes, participants were also asked how likely it was that other people in the

community would help the protagonist in the future. Finally, participants responded to a free-response question, “What do you think of [the protagonist’s] action?”.

To capture overall strength of normative beliefs, we averaged across all vignettes and responses within each domain, creating a *Gozona* Judgment Index, *UyC* Judgment Index, and Control Judgment Index (details in S3.2). Indices were standardized; higher value indicates a harsher judgment.

### **3.2 Survey measures**

Participants completed surveys that included questions about demographics, prosociality, and participation in *gozona* and *UyC*-related activities (Table 2, see S3.3 for details).

### **3.3 Priming experiment**

To probe for specific evidence of internalized norms driving cooperation, we employed a priming paradigm. A prime is an unconscious reminder of a concept. Participants played an anonymous 4-player Public Goods Game twice: once after hearing control vignettes, and once after hearing prime vignettes related to *gozona* (women) or *UyC* (men) norm violations (see SA2.3 for details). We hypothesized that the unconscious reminder of the institutions would activate internalized cooperative social norms, leading participants to cooperate more in the Public Goods Game.

### **3.4 Data analysis**

We used multiple regression to explore the relationship between normative beliefs about *gozona* and *UyC* and various psychological and behavioral outcomes. To maximize power in our small samples, we leveraged repeated measures. Questions about prosocial psychology and *gozona* participation were repeated several months after the initial survey as part of another study, resulting

TABLE 2. Survey measures

Variable	Measure	Description	Source
Willingness to Help (Generalized Altruism)	Altruism	“I would help a fellow community-member, even if they could never return the help” (5-point scale, “strongly disagree” to “strongly agree”)	Original
Likelihood of Donating to Sick Child	Altruism	Responding to a vignette, participants reported their likelihood of donating to the family of a sick child for hospital bills (5-point scale, “very unlikely” to “very likely”).	Original
Shared Fate Index	Fitness Interdependence	Measure of perceived interdependence. Scale includes items like, “When my community feels good, I feel good” and “My community and I rise and fall together” (5-point scale, “strongly disagree” to “strongly agree”). To create the scale, we averaged across 5 items (Cronbach’s $\alpha = 0.77$ [95% CIs 0.68, 0.87]).	Ayers et al. (2023)
Willingness to Offer <i>Gozona</i>	<i>Gozona</i> Participation	Responding to a vignette, participants reported their likelihood of bringing food or other support to a widow after her husband’s death (5-point scale, “very unlikely” to “very likely”), a common context for <i>gozona</i> .	Original
Willingness to Attend Emergency <i>Tequio</i>	<i>Usos y Costumbres</i> Participation	Responding to a vignette, participants were asked how likely they would be to attend an emergency <i>tequio</i> to help fix the main road after a landslide (5-point scale, “very unlikely” to “very likely”).	Original
Frequency of <i>Tequio</i> Attendance	<i>Usos y Costumbres</i> Participation	Participants reported how often they attend <i>tequio</i> (5-point scale, “never” to “always”)	Original

TABLE 2 (continued). Survey measures

Variable	Category	Description	Source
Frequency of Communal Assembly Attendance	<i>Usos y Costumbres</i> Participation	Participants reported how often they attend Communal Assembly (5-point scale, “never” to “always”)	Original
Attended Most Recent Communal Assembly	<i>Usos y Costumbres</i> Participation	Participants reported whether they attended the most recent assembly (Yes/No)	Original

*Notes:* For more details about these measures, please refer to the Supplemental Materials (S3.3).

in two observations per participant. Questions about participation in *UyC* activities were asked only once. We standardized and stacked the three continuous measures of *UyC* participation, resulting in three observations per participant.

Our analysis used Linear Mixed Effects Regression with random intercepts for participants (R package lme4, version 1.1–23; see S3.5 for details). Most models control for age, educational attainment, and material security. When analyzing *UyC* participation, we controlled for educational attainment, wage labor participation dummy variable, and status as a *Reservado* (over 65, no longer required to participate).

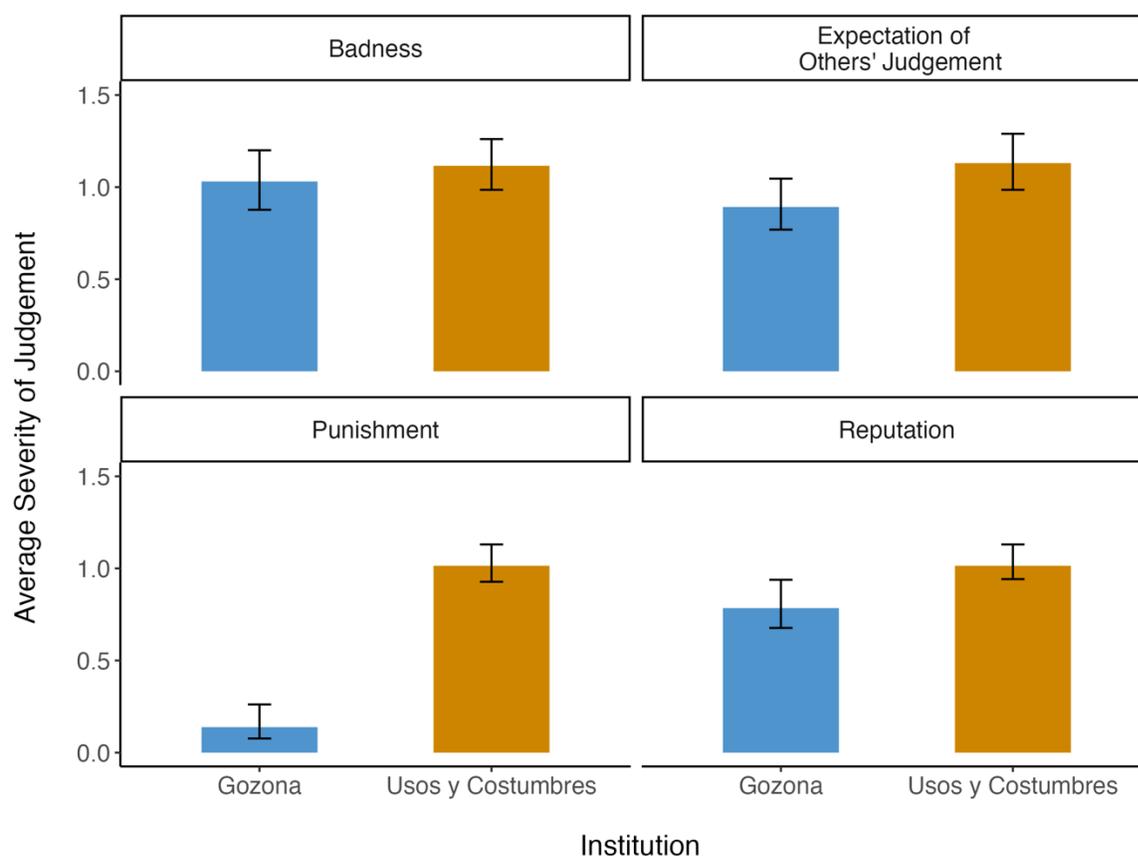
## 4. Results and discussion

To elucidate if and how these culturally-evolved institutions shape cooperation, we begin by establishing that behaviors related to *gozona* and *UyC* are associated with the social norms described above. Then, we consider how these costly norms are stabilized. Finally, we consider whether these institutions tap aspects of evolved psychology, including direct reciprocity and interdependence psychology.

### 4.1 *Gozona* and *usos y costumbres* are governed by social norms

Is cooperation in the domains governed by *UyC* and *gozona* governed by social norms? In vignettes, Figure 2 shows that participants judged violations in both contexts as “bad” (*gozona* mean = 1.03, bootstrapped 95% CIs (BCIs) [0.88, 1.20]; *UyC* mean = 1.12 [0.99, 1.26]) and expected that other community members would feel similarly (*gozona* mean = 0.89 [0.77, 1.05]; *UyC* mean = 1.13 [0.99, 1.29]). That is, it is common knowledge that people *should* cooperate in these domains. Importantly, cooperation in *UyC* and *gozona* is also enforced (see Section 4.3).

Free responses add color to these quantitative findings. Participants called the *gozona* violators “lazy”, “ignorant”, and “selfish” and expressed disdain for the *UyC* violators’ lack of solidarity. For example, participants explained that he’s “taking advantage of the town”, “it’s a lack of respect [...] and a mockery of the citizens”, and “the town is a team– to not accept the *cargo* means that you don’t want to be part of the team”. These results suggest that the protagonists were indeed breaking social norms– failing to live up to local cooperative standards– and as a result inspiring intense displeasure among participants. These free-responses also give the



**Figure 2. Average severity of judgements about *gozona* and *usos y costumbres* norm violations.** Pooling across three *gozona* (blue) and three *usos y costumbres* (orange) vignettes, panels show average judgements about how bad the action was; how bad other community members would think it was; how bad of a person others would judge the protagonist to be; and how severely he/she should be punished. A score of “0” corresponds to a neutral judgement, “1” corresponds to “bad”/ “punished”, and “2” corresponds to “very bad”/ “highly punished”. Error bars represent (bootstrapped 95% confidence intervals).

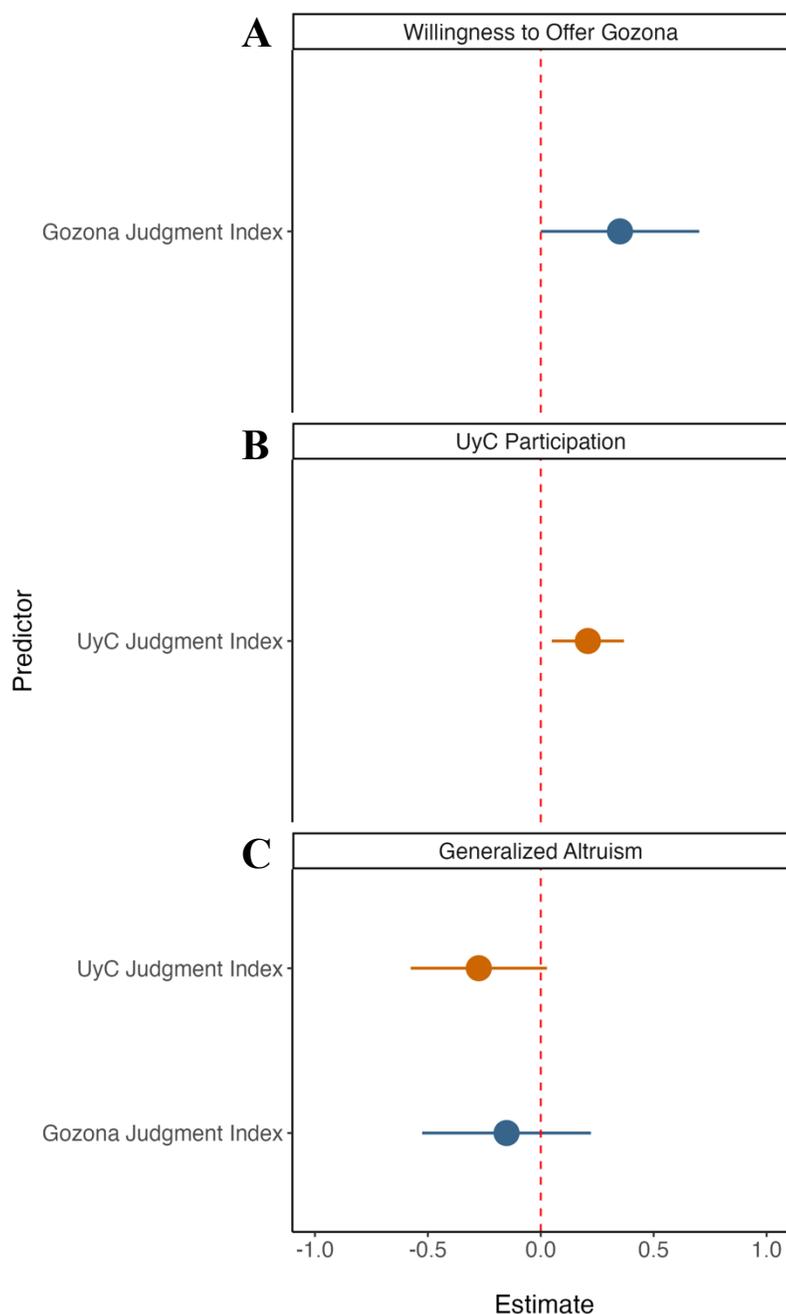
impression of internalized norms, with violations spurring negative gut reactions (see S4.2 for further ethnographic evidence of norm internalization).

However, we observed no effect of the priming manipulation designed to probe for evidence of internalized norms driving cooperation. Consistent with other work using priming experiments in field contexts (Purzycki et al. 2022), we suspect that the cognitive load associated with the Public Goods Game wiped out any potential priming effects (see S4.3).

#### 4.2 Norms correspond to domain-specific cooperation

*Gozona* and *UyC* norms apply only to specific contexts. The severity of participants' normative judgments about *gozona* and *UyC* is associated with a greater willingness to cooperate within each respective domain— but not with generalized prosociality. Figure 3A shows that, among women, a one standard deviation increase in our *Gozona* Judgment Index is associated with a 0.35 standard deviation increase (95% CIs [0.00, 0.70]) in people's willingness to offer *gozona* to a new widow. This suggests that women who hold stronger norms about *gozona* are more likely to participate in *gozona*. Figure 3B shows that, among men, a one standard deviation increase in *UyC* Judgment Index is associated with a 0.21 [0.05, 0.37] standard deviation increase in *UyC* participation— self-reported frequency of attending Communal Assembly, attending *tequio*, and willingness to attend an emergency *tequio* to fix a washed-out road. This suggests that men who hold stronger norms about *UyC* are more motivated to participate in their duties as citizens of Yateé.

In Figure 3C, we see that neither the *Gozona* Judgment Index ( $\beta = -0.15[-0.53, 0.22]$ ) nor the *UyC* Judgment Index ( $\beta = -0.27[-0.58, 0.03]$ ) is positively associated with generalized altruism. If anything, *UyC* Judgment Index may be *negatively* associated with generalized altruism— participants who make harsher judgments about *UyC* norm violations report less



**Figure 3. Normative beliefs about *gozona* and *usos y costumbres* are associated with domain-specific, but not generalized, prosociality.** Plots show coefficients and 95% confidence intervals from LMER models with random intercepts for participant. **(A)** Coefficients on the *Gozona* Judgment Index when predicting willingness to offer *gozona* to a new widow (2 observations of outcome per participant from several months apart). **(B)** Coefficients on the *Usos y Costumbres* Judgment Index when predicting self-reported frequency of attendance at Communal Assembly, self-reported frequency of attendance *tequio*, and willingness to attend an emergency *tequio* (stacked outcomes, three observations per participant). **(C)** Coefficients on the *Usos y Costumbres* Judgment Index and *Gozona* Judgment Index when predicting willingness to help a community member, even if they could never return the help (2 observations of outcome per participant from several months apart). Models in panels A and C include controls for education, age, and material security. The model in panel B includes controls for education, wage labor, and age above 65. All variables are standardized.

willingness to help a community member who might never return the help. Similarly, neither index is associated with willingness to donate to the family of a sick child (*Gozona*:  $\beta = 0.02$  [-0.44, 0.49]; *UyC*:  $\beta = -0.06$  [-0.40, 0.28]). This suggests that the relationship between norm judgements and willingness to cooperate in *gozona* or *UyC* can be explained neither by demand effects, nor by generalized prosocial inclinations. If demand effects or general prosociality were driving the results, we'd expect to see positive associations between norm judgements and other measures of prosociality. Instead, these results suggest that *UyC* and *gozona* norms drive domain-specific cooperation, consistent with our hypothesis.

### **4.3 How are these norms sustained, given that they involve costly actions?**

People spend time, energy, and money to participate in *UyC* and *gozona*, while foregoing opportunities and risking injury (e.g. clearing landslides). Participants were clear about these costs: for example, in describing *UyC*, informants spoke strongly of service as a “burden.” When asked whether people “like” serving *cargos*, very few informants agreed, despite the potential for an interview demand effect. While several mentioned feeling pride in serving their town, most responses invoked obligation, for example: “whether you want to or not, it’s required”, “it’s not that they like it– it’s obligatory”, “*cargos* are very burdensome, very difficult”, and “no one escapes from *cargos*.” Given these costs, why do the people of Yateé continue to cooperate in these domains? How are *gozona* and *UyC* norms sustained? Here, we explore this question.

#### ***4.3.1 Reputation and indirect reciprocity***

In indirect reciprocity, individuals modulate their behavior towards a target based on that target’s past record– that is, their reputation. When a person violates a cooperative norm, their reputation suffers, leading to targeted exploitation (negative indirect reciprocity, Bhui et al., 2019)

or loss of future help (positive indirect reciprocity, Panchanathan & Boyd, 2004). The threat of these outcomes motivates adherence to the costly, cooperative norm. In line with formal models (Panchanathan and Boyd 2004; Bhui, Chudek, and Henrich 2019), lab-based experiments (Nowak and Sigmund 2005), and studies in small-scale societies (Glowacki and Lew-Levy 2022) that demonstrate the power of indirect reciprocity to stabilize cooperation, we found that reputation plays a role in both *UyC* and *gozona*.

First, ethnographic evidence suggests that defections are socially costly. Men who fail to adequately fulfill their *UyC* duties lose social status. For example, several informants relayed the story of a man who recently served as one of the Authorities. The community judged his performance as unsatisfactory. The Assembly voted to briefly throw him in jail and has since then rejected him— he has lost his right to speak in assemblies; no group accepts him; he is not called to *tequio*; and it is unclear if he will ever serve his final *cargo*. Describing another recent case in which a top *cargo*-holder failed to adequately fulfill his duties, one informant described the man’s great shame and loss of social standing, explaining, “No one pays attention to him, because his image is tarnished— he fell very low.” The reputational costs of defecting in *UyC* are heavy.

Likewise, community members who defect in *gozona* suffer social consequences. Some informants reported that community members would withhold support from a person who fails to reciprocate *gozona*. For example: “The people say that it isn’t fair, so the people don’t go when [the defector] needs a favor.” According to some, this is also true of people who consistently fail to offer *gozona*— they will not receive help when they need it. In contrast, informants agree that people who do lots of *gozona* get lots of support in return.

Vignette data presented in Figure 2 corroborate this ethnographic evidence, showing that defections in *gozona* and *UyC* damage a person’s reputation. Participants reported that community

members would think that an *UyC* defector was a “bad” person (mean judgment = 1.01, BCI[0.94, 1.13]) and a *gozona* defector was a somewhat bad person (mean = 0.78[0.66, 0.92]).

Our vignette data also confirm that *gozona* defections can lead to the loss of future support. On average, *gozona* defectors were judged to be somewhat unlikely to receive future support (mean = 0.55[0.25, 0.86]). Moreover, *gozona*-related reputational damage predicts expected loss of future help. A one standard deviation increase in expected reputational damage is associated with 0.28[0.07, 0.52] standard deviation decrease in the expected likelihood that the protagonist will receive help in the future. In contrast, expectations of others’ judgments about how bad the action is does not strongly predict likelihood of future help ( $\beta = 0.14[-0.07, 0.36]$ ). So, the effect is specific to expected reputational damage, providing compelling evidence that *gozona* social norms are stabilized by positive indirect reciprocity.

In line with predictions from formal models of norm stabilization via indirect reciprocity (Bhui et al., 2019; Panchanathan & Boyd, 2004), gossip is an important mechanism for disseminating information about who cooperates and who does not. People keep a keen eye out for non-cooperators, particularly in the context of *UyC*; in the words of one informant, “the community is watching.” When they observe something that doesn’t meet their standards, they gossip and complain about it. For example, when the Authorities committed an error involving the mismanagement of town funds for a public works project, this was the topic of intense gossip and discussion, spilling into several assemblies. While ultimately resolved, informants reported that the Authorities’ image was “very badly tarnished.” Although less evidence about *gozona* emerged, informants suggested that “everybody knows” who helps and who does not, suggesting a substantial role for gossip.

### 4.3.2 Punishment

In punishment, individuals pay a cost to sanction a violator. The threat of facing punishment for defecting motivates individuals to adhere to cooperative norms. Formal modeling has revealed that punishment can stabilize cooperation in a variety of ways, including when people copy each other's tendency to punish (Henrich and Boyd 2001); people can coordinate their punishment (Boyd, Gintis, and Bowles 2010); groups pool resources beforehand to ensure violators are sanctioned (Sigmund et al. 2010); punishment acts as a costly signal of trustworthiness (Jordan et al. 2016); or there are graduated sanctions with the possibility of ostracism for repeat offenders (Noblit and Henrich 2023). Our data show that punishment is an important stabilizing mechanism in *UyC*, but not *gozona*.

The topic of sanctions frequently arose in interviews and casual conversation about *UyC*. Some violations merit a predetermined sanction meted out by the citizen's group or Authorities, while others are punished by the Assembly's collective decision. Cash fines are the most common sanction. For example, each group annually decides how much to fine their members for missing *tequio* or assembly, ranging from \$100MXN(~\$5USD) - \$300MXN(~\$15USD) in 2022. Each group self-polices, collects fines, and redistributes the money within the group, rewarding those who attended everything with the largest share— a stick and a carrot. Highlighting the institutionalized nature of these sanctions, vignette free responses revealed high agreement about what sanction would be appropriate for skipping an emergency *tequio*: 81% said the protagonist should be fined and 10% said he should be fined and jailed. Meanwhile, the Assembly collectively punishes the Authorities for errors, with recent examples including steeply fining them for mismanaging community funds (\$4.5); fining and removing an *agente* from his *cargo* due to

alcoholism; shaming and removing an *agente* from his *cargo* for failing to fulfill ritual duties; and jailing and stripping an *alcalde* of his rights as a citizen after a bad performance.

Repeat offenders are subject to graduated sanctions. For example, migrants living in Los Angeles sometimes refuse to serve their required *cargos*. The first couple of times that a migrant refuses, the Assembly fines him \$15,000MXN (~\$840USD). If he continues to refuse, the community cuts his house's access to water and sewerage. If he still refuses, he is formally expelled from the community, meaning that he may never return; his family cannot sell or transfer ownership of his lands; and he cannot be buried in the town cemetery (whereas most migrants are repatriated for burial). The community most recently expelled a migrant for repeatedly refusing to serve *cargos* in 2017. Vignette free responses about what punishment would be appropriate for refusing to serve a *cargo* capture the variation in possible sanctions on this graduated scale: 60% mentioned fines, 15% service cutoff, and 10% expulsion.

Vignette data confirm that sanctioning is an integral element of *UyC*, but not *gozona*. While norm violations in these two domains were judged as similarly bad and reputation-damaging, only *UyC* violations were judged as punishment-worthy. Nearly all participants thought that *UyC* violations should be punished, while very few thought that *gozona* violations should be punished (Figure 2). Responses to the control vignettes, which were presented to both men and women, suggest that this difference cannot be explained by sex differences in people's willingness to punish (see S4.6). Rather, this pattern seems to reflect a real difference in the role of punishment in these two institutions.

Based on our data, we can only speculate about how punishment stabilizes cooperation in the context of *UyC*. Given that some decisions about punishment are made by the Assembly, coordinated punishment (Boyd, Gintis, and Bowles 2010) seems likely. During an assembly,

citizens voice their opinions, including suggesting specific punishments for the violation under discussion. Others signal approval with whistles and cheers. This broadcasting of intent to punish is a key feature of coordinated punishment, where individuals only punish when others signal their intent to do so (Boyd, Gintis, and Bowles 2010). Ultimately, citizens vote by raised hand, providing a final opportunity to confirm that others are choosing to punish. We also see compelling evidence of ostracism (Noblit and Henrich 2023) in the system of graduated sanctions with the possibility of expulsion from the community; and for pool-punishment (Sigmund et al. 2010) in the institutionalized nature of some sanctions.

Finally, while third-party mediation (Singh and Garfield 2022; Wiessner 2020) exists in Yateé (Table 1; S4.7), we found no evidence for third-party mediation in the enforcement of *UyC*.

#### **4.4 Do these institutions tap aspects of human evolved psychology?**

In addition to stitching together different cooperation-sustaining mechanisms, cultural evolutionary theory suggests that institutions can exploit features of our evolved psychology to further enhance cooperation (Henrich and Muthukrishna 2021). Here, we show that *gozona* norms likely tap evolved psychologies for direct reciprocity and interdependence. Meanwhile, we find little evidence that *UyC* norms harness evolved psychology.

##### ***4.4.1. Gozona harnesses an evolved psychology for direct reciprocity***

Research in small-scale societies (Jaeggi et al. 2016; Ready and Power 2018; Apicella et al. 2012) suggests that direct reciprocity— the tendency to cooperate with a partner in a tit-for-tat manner— plays an integral role in dyadic cooperation. Because *gozona* is a reciprocity-based institution, norms for *gozona* likely tap evolved psychology for direct reciprocity. The clearest evidence comes from the fact that people use notebooks to meticulously record the *gozona* that

they receive when they host a celebration or funeral. As they “return the help”— a process that may take years— they cross names off the list. This suggests a strong role for tit-for-tat accounting in celebration *gozona*, facilitated by cultural technology (written records). Similar systems have been observed in other societies, such as funeral gifting among the Chaldeans (Henrich and Henrich, 2007). Illustrating that people in Yateé think about *gozona* in terms of direct reciprocity, one informant laid it out clearly: “If the person doesn’t return the favor, well, why would I go help them again? I won’t go anymore. If he came to help me, I’ll return the favor. If we went once and they didn’t return the favor, there ends the circle of *gozona*.” Crucially, people use this tit-for-tat approach in the context of *gozona*, but not in all the other domains of life where it might apply.

There is some evidence that third parties play a role in stabilizing *gozona* direct reciprocity. Formal models have revealed that direct reciprocity is not particularly stable under realistic real-world conditions, including when partners make alternating rather than simultaneous decisions (Park, Nowak, and Hilbe 2022) and when perception errors are frequent (Boyd and Mathew 2021). In communities with shared norms, third-party adjudication can stabilize otherwise flimsy direct reciprocity (Boyd and Mathew 2021). As we’ve seen in the vignette results, people in Yateé take an interest in *gozona* violations in which they are not involved— judging these violations and the perpetrators as “bad”. Free responses further reveal that third parties strongly disapprove when someone fails to reciprocate *gozona*. Responding to the vignettes in which someone failed to reciprocate celebration *gozona* or harvest *gozona*, 41% and 60% of participants, respectively invoked reciprocity. Comments included, “it’s bad, one must know how to reciprocate support” and “it was bad because he agreed to do *gozona*— he had to return the favor, or close the *gozona*”. Together, this evidence suggests that social norms, operating via third-party observers, help stabilize *gozona* direct reciprocity.

However, direct reciprocity does not seem to play a role in *UyC*. A priori– and based on theory (Boyd and Richerson 1988)– there is little reason to expect that direct reciprocity would be involved in *UyC*, since this institution facilitates larger-scale cooperation rather than dyadic cooperation. Indeed, ethnographic interviews yielded no evidence of reciprocal altruism in *UyC* and no one alluded to direct reciprocity in *UyC* vignette free responses.

#### **4.4.2 *Gozona and usos y costumbres norms may tap interdependence psychology***

Researchers have theorized that humans have an evolved “interdependence psychology” that fosters cooperation between people whose fitnesses are intertwined (Aktipis et al. 2018; Fiske 1992; Roberts 2005; Tomasello et al. 2012; Henrich and Muthukrishna 2021). Fitness interdependence can emerge in many ways, including sharing genes, sharing offspring, and living in a group that pools risks and benefits (Cronk, Steklis, et al. 2019). Some have argued that interdependence psychology arose via gene-culture coevolution. According to this hypothesis, the cultural evolution of norms and institutions that pool risks, costs, and benefits within a group created selection pressures for the capacity to recognize and cooperate with those on whom one’s fitness depends (Henrich, 2020; Henrich & Muthukrishna, 2021; see S1.3.3 for details). Institutions that create (1) relationships based on mutual aid, sharing, or exchange or (2) corporate groups with shared rights and obligations are hypothesized to foster interdependence (Cronk, Steklis, et al. 2019; Henrich 2020).

Ethnographic evidence suggests a role for interdependence psychology in both *gozona* and *UyC*. *Gozona* constructs a web of reciprocal relationships, making it a good candidate for building interdependence within a community. Speaking to this, in her discussion of *gozona* and other reciprocal institutions in the Zapotec community of Talea de Castro, Nader (1964) argued that these institutions build complex networks of “cross-linkages” between community-members.

Similarly, Zapotec scholar Luna's (2010) description of the Zapotec worldview evokes something akin to a psychology of interdependence, highlighting the importance of cooperation, reciprocity, and solidarity (which he later links to *gozona*, p. 90-91):

*“Being born in small human settlements allows us to experience the need for collective survival. In other words, being born in small communities linked to the land made cooperation, reciprocity, [and] solidarity naturally occurring elements of human relationships, and with this, “the we” flourished in the mind, because in truth we depended on others, we could live thanks to others.”* (p. 33, translated from Spanish)

While we do not have social network data on *gozona*, anecdotal evidence indicates that *gozona* networks are dense. Several informants relayed how many people had offered *gozona* when they hosted a *convivio*. At the low end, one informant reported that 26 people did *gozona* when he and his wife voluntarily hosted a *convivio* to celebrate a saint's feast. At the high end, another informant relayed that 90 people did *gozona* when she and her husband hosted an obligatory *convivio* as part of his *cargo*. According to the 2010 census, 26 people constitute about 8% of adults in Yateé or representation from 15% of households, while 90 people constitute about 25% of adults or just over 50% of households. Given that there are many *convivios* each year, these numbers indicate that the people of Yateé are enmeshed in a dense network of *gozona* relationships.

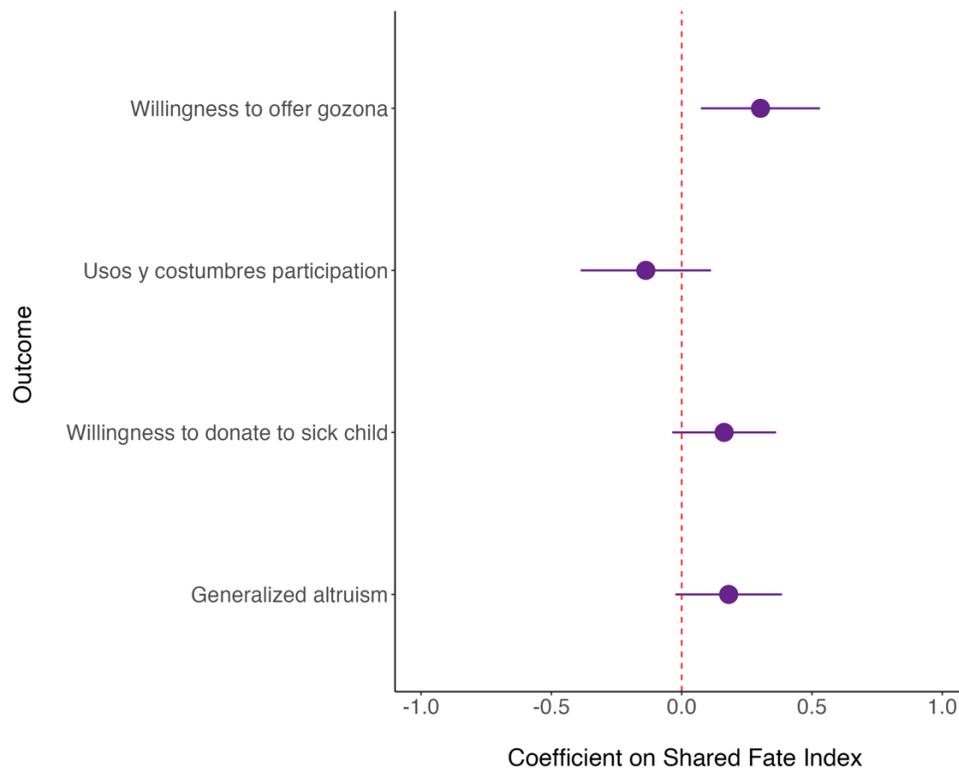
Moreover, *gozona* is relevant to fitness. *Gozona* is reserved for contexts where the goal cannot be accomplished alone or by a nuclear family: feeding the community, building a house, and doing labor-intensive agricultural work. Building a house and doing subsistence agriculture tasks have clear fitness impacts— one cannot live a healthy life without shelter and food. We argue that celebration *gozona* also impacts fitness by alleviating economic strain on *cargo*-holders (see S4.8 for an ethnographic example).

*UyC* also likely build interdependence within the community. First, through the collective effort of male citizens, *UyC* facilitate the provisioning of fitness-relevant public goods such as clean drinking water, well-maintained streets and footpaths on steep terrain (Figure S9), and the communal mill for daily grinding of corn (the staple food). Second, under *UyC*, Yateé functions as a corporate group that collectively owns resources such as land and water. Collective resources are administered by three *cargo*-holders who form the Commissariat of Communal Lands (Table 1 notes). These resources are fitness-relevant. Although subsistence agriculture has waned in recent decades, 86% of our sample of 42 households reported cultivating at least one crop in the past year. In addition, residents rely on communally owned forests for gathering firewood, the primary cooking fuel. The communally owned resources also include sand and gravel extracted from the river, which are used in and sold to fund public works projects (Figures S10, S11). Highlighting the importance of communal resources, many indigenous Oaxacan towns have long histories of violent inter-community conflict over land (Dennis 1987; Yannakakis 2008; López-Bárceñas 2004) (S4.9). Yateé’s most recent violent intergroup conflict dates to the mid-1990s, although simmering tensions persist with the closest neighboring community.

#### **4.4.3 Quantitative evidence suggests a role for interdependence in gozona**

Vignette and survey data suggest that interdependence is implicated in *gozona*. First, women who feel more interdependent with the community hold stronger normative beliefs about *gozona*. A one standard deviation increase in Shared Fate Index, a psychological measure of perceived fitness interdependence (Ayers et al., 2023), is associated with a 0.54[−0.08, 1.16] standard deviation increase in *Gozona* Judgement Index. Second, in the full sample of participants who completed the survey (men and women,  $N = 48$ ), Figure 4 shows that a one standard deviation increase in Shared Fate Index is associated with a 0.30[0.07, 0.53] standard deviation increase in

likelihood of offering *gozona* to a newly widowed woman. This suggests that people who feel more interdependent with the community are more inclined to participate in *gozona*. Shared Fate Index is also positively associated with likelihood of donating money to the family of a sick child, not a traditional context for *gozona* ( $\beta = 0.16[-0.04, 0.36]$ ) and general willingness to help ( $\beta = 0.18[-0.02, 0.39]$ ), although these coefficients are smaller and the 95% confidence intervals include 0 (Figure 4). All in all, these results suggest that interdependence psychology is intertwined with *gozona*, and may explain broader prosocial inclinations.



**Figure 4. Shared Fate Index is associated with willingness to offer *gozona*, but not participation in *usos y costumbres* activities.** Plots show coefficients on Shared Fate Index and 95% confidence intervals from LMER models with random intercepts for participant. Models predicting willingness to offer *gozona*, willingness to donate, and generalized altruism include controls for education, age, and material security (2 observations of outcome per participant from several months apart). The model predicting *usos y costumbres* participation among men stacks self-reported frequency of attendance at Communal Assembly, self-reported frequency of attendance *tequio*, and willingness to attend an emergency *tequio* (three observations total per participant). This model includes controls for education, wage labor, and age above 65. All variables are standardized.

However, quantitative analyses provide no evidence that interdependence is implicated in *UyC*. The coefficients linking the Share Fate Index to both the severity of judgements about *UyC* violations and participation are small, negative, and poorly estimated. Given the ethnographic context, the lack of association between perceived interdependence and *UyC* is surprising. However, the formalization and severity of exogenous punishment may deplete people's intrinsic motivation arising from a sense of interdependence (Bowles 2008).

## 5. Conclusions

In this paper, we integrated ethnographic and quantitative data to explore how two institutions sustain cooperation within a Zapotec village. We found clear evidence that both *gozona* and *usos y costumbres* are governed by social norms that drive context-specific cooperation. In contrast, these norms were not associated with generalized prosociality. This finding is inconsistent with the view that human cooperation results purely from genetically evolved cognitive capacities such as kin altruism or direct reciprocity. Moreover, results revealed that these institutions exploit distinct but overlapping sets of mechanisms to stabilize cooperation. Both institutions harness indirect reciprocity (reputation). Meanwhile, direct reciprocity plays an important role in *gozona*, while punishment is integral to *usos y costumbres*. Although ethnographic evidence strongly suggests that both *gozona* and *usos y costumbres* build interdependence, quantitative analyses present a murkier picture, yielding evidence of a role in *gozona* alone. Overall, this study provides support for cultural evolutionary theory, which suggests that as cooperative institutions culturally evolve, they stitch together different cooperation-sustaining mechanisms. We also shed light on the rich diversity of culturally evolved institutions—

even within a single, small-scale society, different institutions exploit different mechanisms to stabilize cooperation.

Social structure in Yateé is not static— the future will look different than the present, which already looks different from the past. Several forces are eroding *gozona* and *usos y costumbres*. Market integration, and associated increases in wealth and wage labor, are undermining *gozona*. Housebuilding *gozona* has already disappeared, replaced by several paid construction workers— a pattern that has also been observed in other Sierra Norte towns (Beltran Morales 1982). Informants report that harvest *gozona* is likewise declining. One probable reason is that subsistence agriculture is slowly being replaced by wage labor, whether locally or as a migrant. While most households still cultivate, few entirely rely on subsistence agriculture. Informants often spoke of the need for harvest *gozona* in the past because there was no money to pay workers. Meanwhile today, some people decline to do harvest *gozona* because they would prefer to be paid as day-laborers.

Similarly, market integration and migration are slowly undermining *usos y costumbres*. The *cargo* system, wherein men provide years of free labor to the community, is antithetical to full participation in a market economy. So far, Yateé's men appear to be balancing the opposing demands of achieving economic prosperity while serving the community. Relatively few men do wage labor while living in Yateé, but the vast majority migrate to work elsewhere at some point. In a sample of 29 men, only 28% reported currently doing any wage labor, but 86% had a history of outmigration. Informants spoke of carefully planning their *cargo* careers— trying to fulfill several posts in rapid succession during youth, leaving to earn money for several years, then returning to finish the ladder. Although migrants are regularly named to *cargos*, some refuse to return, and many informants lamented the challenges of filling *cargo* positions with an ever-

dwindling pool of men. Whether Yateé’s *cargo* system someday crumbles or adapts to the new socioeconomic landscape, there is little doubt that it will change.

Broadly, these dynamics suggest an interesting tradeoff. While market integration may expand the sphere of cooperation, fostering greater impersonal prosociality (Henrich et al. 2010; 2001; Rustagi 2023), it may come at a cost to smaller-scale cooperation within the community, as local, culturally evolved institutions that sustain cooperation slowly erode.

## 7. Acknowledgements

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