

Self-Interest and the Design of Rules

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Abstract Rules regulating social behavior raise challenging questions about cultural evolution in part because they frequently confer group-level benefits. Current multi-level selection theories contend that between-group processes interact with within-group processes to produce norms and institutions, but within-group processes have remained underspecified, leading to a recent emphasis on cultural group selection as the primary driver of cultural design. Here we present the self-interested enforcement (SIE) hypothesis, which proposes that the design of rules importantly reflects the relative enforcement capacities of competing parties. We show that, in addition to explaining patterns in cultural change and stability, SIE can account for the emergence of much group-functional culture. We outline how this process can stifle or accelerate cultural group selection, depending on various social conditions. Self-interested enforcement has important bearings on the emergence, stability, and change of rules.

Keywords Cultural evolution · Social evolution · Norms · Institutions · Self-interested enforcement

Rules are ubiquitous, influential, and numerous in human social life. Among the Kapauku Papuans, Pospisil (1958a) documented 120 rules pertaining to murder, assault, food taboos, the appropriate context for lying, deference toward authority, inheritance, incest taboos, and property rights. Pospisil's list represented Kapauku "law" only, excluding such central institutions as the customs surrounding birth or adoption, or the many informal norms enabling the coordination of social life. In a study of Malagasy taboos, Ruud (1960) identified more than 600 prohibitions and prescriptions, including 48 concerning the consumption and treatment of plants, 94

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relating to animals, 57 that apply during pregnancy and birth, 25 specifically surrounding the construction of tombs, and 39 that regulate interactions with figures of authority. The Code of Hammurabi, among the oldest-known law codes, consisted of 282 rules, setting standards in contexts as diverse as economic contracts, slave-master relations, family life, and punishment for aggression (Yankwich 1930). According to the National Conference of State Legislatures (2013), 40,000 new laws took effect in the United States in 2014. The pervasiveness of rules among humans cannot be overstated.

Rules influence social life in two ways (North 1990, 1991). First, they enable coordination by informing individuals how their group-mates will likely behave (Cronk and Leech 2013; Lewis 1986; Schelling 1960). We focus in this paper, however, on the second important effect of rules—that of the enforcement of rules altering the payoffs of behavioral strategies. Of particular significance are *group-functional* rules, the subset of rules that regulate behavior in ways that create group-level benefits. Most striking among group-functional rules are those whose enforcement either incentivizes otherwise costly behaviors, such as cooperation, or disincentivizes behaviors that benefit a party at the expense of other group members (Axelrod 1986; Ullman-Margalit 1977). Evolutionary thinkers increasingly recognize that these rules have crucial roles in stabilizing the unique levels of human cooperation, both among non-kin in small-scale bands and among anonymous individuals in contemporary large-scale states (Chudek and Henrich 2011; Powers et al. 2016; Richerson and Boyd 1998). Common examples of such rules include property rights, sharing norms, prohibitions on murder or adultery, supernaturally sanctioned religious rules, and institutions promoting participation in warfare (Boehm 2008a; Glowacki and Wrangham 2013; Hill 2009; Hoebel 1954; Johnson 2005, 2015; Zefferman and Mathew 2015).

Why do rules exhibit the design features that they do, such as controlling particular behaviors or creating group-level benefits? Evolutionary anthropologists and cultural evolutionists, in addressing this question, aim to recognize the various processes that favor the spread or maintenance of some rules over others. Although they acknowledge that within-group and between-group processes interact to sculpt the norms and institutions of human societies (Henrich 2015), within-group processes have remained underelaborated, leading to an emphasis on between-group processes, most notably cultural group selection (CGS) (Singh et al. 2016). Cultural group selection hypotheses contend that rules favoring group-level benefits spread because they increase success in between-group competition (Boyd and Richerson 1985, 2010; Henrich 2004, 2015). Researchers have employed the logic of CGS to study a range of sociocultural phenomena, including the spread of prosocial religion (Norenzayan et al. 2016), the rise of complex society (Turchin 2010; Turchin and Gavrillets 2009), monogamy (Henrich et al. 2012), and human warfare (Zefferman and Mathew 2015).

Cultural group selection clearly occurs: practices and institutions diffuse across groups as societies subdue each other or observant rule-makers adopt them from their successful neighbors (Diamond 2005; see the Pama-Nyungan expansion for an example among Australian hunter-gatherers: Evans and McConvell 1997). The global pervasiveness of nation-states where tribes, bands, and chiefdoms once stood suggests that at least some cultural practices spread because of their effects on group-level properties (Flannery and Marcus 2012; Fukuyama 2011). But in emphasizing between-group selection, researchers have underappreciated the scope and extent of within-group processes based in self-interest, limited reason, and power. In fact, CGS is

sometimes considered to be the primary or even only explanation for the development of group-functional norms and institutions (Boyd and Richerson 2002; Chudek and Henrich 2011). Richerson et al. (2016:16), for example, could not recognize how “any of the alternatives to [cultural group selection] can easily account for the institutionalized cooperation that characterizes human societies.”

Here we respond to Richerson et al.’s challenge by elaborating on how within-group processes—specified here as self-interested enforcement—can account for various aspects of rule design, including the creation of group-level benefits. The self-interested enforcement hypothesis (SIE) proposes that the design of rules reflects the relative capacity of cooperating or competing parties to enforce their preferences and the degree to which the interests of those parties overlap. Rules that promote cooperation, control conflict, and encourage success in intergroup warfare can thus emerge from the interactions of self-interested agents.

In the first section of the paper we review the definition of rules and their enforcement. We then present the self-interested enforcement hypothesis, evaluate predictions, and describe how it can account for the existence of group-functional rules. We conclude by outlining five ways in which SIE interacts with CGS, including instances where SIE stifles CGS, drives CGS, and generates variation that then spreads by CGS.

What Are Rules?

We define *rules* as “guidelines of behavior that are enforced and commonly known by members of a relevant community or society.” This definition integrates Knight’s (1992) “guidelines for behavior” (which we use interchangeably with “expectations of behavior” and “standards of behavior”) and Ostrom’s (1990) emphasis on common knowledge. *Common knowledge* means that every member knows the rules, and knows that others know the rules, and knows that others know that the member knows the rules, and so on (Aumann 1976; Thomas et al. 2014). Our definition of rules encompasses laws, customs, conventions, taboos, codes of behavior, and prescriptive norms,¹ but it excludes those rules of thumb that individuals use in structuring their own behavior and that are not shared by the members of relevant groups. Sets of interacting rules comprise “institutions” (Knight 1992; Ostrom 1990).

Most social scientists recognize two ways by which conformity is enforced—self-enforcement and external enforcement. Self-enforcement applies to those rules that act to create shared expectations among individuals and facilitate coordination: for example, a rule that declares whether people drive on the left or ride side of the road, or greet each other by shaking left or right hands. The difference in payoffs between coordinating and miscoordinating makes conforming with the rule the more profitable option (Greif and Kingston 2011; Sugden 1989). Although coordination rules enforced by self-enforcement can promote cooperation, they do not regulate conflicts of interest

¹ Researchers (e.g., Brauer and Chaurand 2010; Ellickson 1991) have noted that *norm* has two usages: (1) a behavior that is normal (descriptive) and (2) a behavior that people perform to avoid punishment (prescriptive). Here, and throughout the rest of this paper, we mean the latter, though note that such norms appear to sometimes develop from regularities in behavior (Opp 1982).

among individuals or between an individual and the group. We therefore do not consider them further.

External enforcement is necessary when the payoff structure favors behaviors that deviate from a desired rule, such as selfishness that carries group-level costs (Masclot et al. 2003; Ostrom 1990). Admittedly, some rules (or norms) appear to become internalized—that is, “a norm’s maintenance [becomes] independent of external outcomes” (Aronfreed 1968:18). However, this internal motivation often seems to follow enforcement, particularly when social feedback and reputation rather than monetary payoffs incentivize compliance (Deci 1971; Deci et al. 1999; Hoffman et al. 2015). For this reason, we will assume that, with the exception of self-enforcing rules that facilitate coordination, rules require external enforcement to maintain compliance.

The Self-Interested Enforcement Hypothesis

The self-interested enforcement (SIE) hypothesis proposes that the design of rules, including the extent of asymmetric or group-level benefits, importantly reflects the relative enforcement capacities of competing parties.

Assumptions

The SIE hypothesis makes four assumptions. We assume that a focal individual (1) can assess how the behavior of her group-mates affects her own self-interest; (2) will tend to prefer that others behave in ways that benefit her; and (3) will use enforcement mechanisms to try to incentivize behaviors that benefit her. We also assume that (4) individuals will vary in their capacity to enforce compliance with behaviors that benefit them. By these assumptions individuals vary in their ability to enforce their preferences. This variation contributes importantly to the design of rules.

Assumptions 1 and 2, which maintain that a focal individual prefers that others’ behavior benefits her, follow from conventional principles of behavioral ecology: individuals act in their own interests subject to specific cognitive, social, and ecological constraints. By “their own interests,” we mean general welfare-based preferences, encompassing social and material resources such as social relationships, power, prestige, food, and sex (Buss 1995; Cronk 1991; Fuentes 2009). We include changes in welfare resulting from punishment and reward—individuals behave according to norms when the enforcement mechanisms incentivize compliance.

The enforcement mechanisms referred to in assumption 3 include punishment, direct reciprocity and reputation, and the manipulation of an individual’s perceived costs and benefits, such as through deception. Such mechanisms are widespread and well-known (Axelrod and Hamilton 1981; Barclay and Willer 2007; Bénabou and Tirole 2004; Boehm 1993; Fehr and Gächter 2000; Gneezy 2005; Trivers 1971).

Assumption 4 is supported by ubiquitous variation in social power and influence. Power is “an individual’s relative capacity to modify others’ states by providing or withholding resources or administering punishments” (Keltner et al. 2003), corresponding with the ability to enforce a standard of behavior on another. Institutionalized inequality often reflects ecological conditions, including the defensibility of resources and the transmissibility of wealth (Mattison et al. 2016), but notable inequities in

power, such as between genders and ages, exist even in acephalous societies (Flanagan 1989; Smith et al. 2010). Asymmetries in influence or information also allow one party to enforce rules on another through the manipulation of perceived payoffs, or deception. Examples of parties using deception to enforce rules include lies told by parents to control their children (Heyman et al. 2009, 2013) and institutions in many small-scale societies that involve men dressing up as monsters to maintain order and collect redistributive benefits (Sack 1972; Walker 1877; Webster 1968).

These assumptions may seem self-evident. But they contrast with the assumptions commonly invoked by cultural evolutionary theorists in two important ways. First, alternative models do not assume that an actor enforces a behavior because they want a target individual to behave in ways that benefit the actor. Instead, motivations to incentivize a particular behavior are unrelated to how the behavior affects the enforcer, such as enforcing after observing group-mates doing so (e.g., Henrich and Boyd 2001) or punishing so as to avoid second-order punishment (Boyd and Richerson 1992; Henrich and Boyd 2001; Panchanathan and Boyd 2004). Second, these models tend to assume that enforcement is equally costly for group-mates, thus ignoring within-group heterogeneity in enforcement capacity (Boyd and Richerson 1992; Boyd et al. 2003; see Guala 2012). As a consequence, these models can sustain any behavior as normative, leaving equilibrium selection (usually cultural group selection) to sculpt rule design. Consequently, according to these accounts, “the content of norms is not constrained by the enforcement mechanism” (Boyd n.d.).

We, in contrast, assume that parties possess a limited capacity to identify standards of behavior in their self-interest and recognize that parties vary in their capacity to enforce. We thus conclude that enforcement mechanisms importantly shape the content of norms and institutions.

Social bargaining theory of political economy and neo-institutional economics employs a similar logic, with the design of rules reflecting variation in enforcement capacity (Ensminger and Knight 1997; Knight 1992). Likewise, researchers have observed that heterogeneity in the costs and benefits of enforcement can drive the maintenance of public goods and the emergence of collective action in animal and human societies (Frank 1996; Gavrillets 2015; Glowacki and von Rueden 2015; Olson 1965; Singh and Boomsma 2015; von Rueden et al. 2015), especially with regard to common pool resources (Baland and Platteau 1999; Ruttan and Borgerhoff Mulder 1999).

Predictions of Self-Interested Enforcement

Predictions When Parties Vary in Their Enforcement Capacity

Asymmetries in enforcement capacity abound in human societies, including in households (such as between parents and children), bands of foragers (elders and youth or men and women), chiefdoms (the chief and the population), and large-scale industrial societies. We thus expect the predicted patterns reviewed in this section to generalize across subsistence strategies and levels of social complexity.

Prediction 1: Rules Should Emerge When Powerful Individuals Enforce Their Preferences

Rules should emerge when individuals use their expertise, formidability, or value as social partners to enforce their own preferences. If the enforcement is by a single individual, they can incentivize compliance with their preferred rules using sanctions, deception, and so on. Group-mates come to learn of and comply with these rules when the powerful individual explicitly declares them or when the group-mates infer the rules from patterns in enforcement. Rules can also develop formally when a party of powerful individuals collectively creates and enforces some standard.

Examples of powerful individuals intentionally creating and enforcing standards of behavior occur across all scales of human groups. Within households, parents commonly decide on rules for how their children should behave, comprising regulations on the treatment of personal property, respecting others' time and space, and contributing to household chores (Goodnow 1988; Gralinski and Kopp 1993). To ensure compliance with these standards, parents turn to enforcement techniques such as rewards, physical punishment, moral exhortation, and lying (Baumrind 1971; Goodnow 1988; Graziano and Namaste 1990; Heyman et al. 2009; Heyman et al. 2013). The rules formulated and enforced by despots, chiefs, and other rulers also exemplify how individuals with asymmetric enforcement capacity can deliberately introduce rules. For example, in their ethnography of the Cheyenne legal system, Llewellyn and Hoebel (1941) described an incident during which tensions arose after one man borrowed another individual's horse without permission. The chiefs resolved the conflict and then established a rule: "Now we shall make a new rule. There shall be no more borrowing of horses without asking . . . [If] the taker tries to keep them, we will give him a whipping" (1941:128). This example is notable because it illustrates how people in a small-scale society have a practical understanding of how their rules promote cooperation and control conflict.² Other examples of rule-making include legal and social reform by the British Raj (Carroll 1983; Giunchi 2010), Shaka Zulu's creation of a year of mourning (Gluckman 1960:165), the numerous rules introduced by Tswana chieftains (Schapera 1970), the changing of incest law by a Kapauku headman (Pospisil 1958b), and the abolition of the taboo system by the ruling class of Hawaii (Davenport 1968; Webb 1965). Religious leaders and prophets also commonly use their power and influence to establish new rules; see for example legislative pronouncements issued by the Catholic pope (Morrissey 1990), the institution of polygamy by Joseph Smith (Brodie 1982), and the creation of religious rules and customs by the Sikh prophet-teacher Guru Gobind Singh (Singh 2012:78–86). Lastly, members of one society can enforce rules on the members of other societies, such as colonial states pacifying resident small-scale societies (Kuethe 1970; Radford 1977).

² Boehm (2008b) presented instances in small-scale societies in which individuals understood that the purported supernatural enforcement of cooperative rules can promote desirable outcomes. For example, citing Gusinde (1961), he wrote, "An Ona informant said that even though real supernatural forces existed, there were also false beliefs which were useful because they contributed to the social order" (Boehm 2008b:144).

Prediction 2: Rules Should Benefit the Powerful

Rules should benefit the perceived self-interest of parties best able to enforce their preferences, or the powerful. Ethnographers and social scientists commonly recognize that rules asymmetrically benefit the powerful. In his exhaustive study of Malagasy prohibitions, Ruud (1960:15–26) recognized thirty-nine authoritative rules in the household, most of which regulated interactions between a father and his children or wife (though in the case of a father's death, the advantage usually transferred to the oldest son). Rules included prohibitions on eating before one's father, on mentioning his name, on shaving one's beard without paying one's father, on walking in front of him, on tapping him on the shoulder, and on conducting a case against him, regardless of "whether he is right or wrong" (1960:25). Prohibitions were enforced supernaturally (e.g., "the transgressor will die young" [1960:15] if he eats before his father) and with force (e.g., expulsion). Additionally, food taboos exemplify a fitness-relevant rule that advantages powerful individuals across cultural and geographic settings. Ethnographers have documented taboos benefiting men and/or elders among the Sirionó and Sanumá of northern South America (Priest 1966; Taylor 1981), the Aranda of Australia (Spencer and Gillen 1927), the Hadza of Tanzania (see the *epeme* institution specifically: Marlowe 2010:57–59), and the Etoro of Papua New Guinea (Kelly 1980). In fact, in writing about the food taboos of the Aranda, Spencer and Gillen even noted, "The idea throughout is evidently that which obtained so largely in savage tribes; of reserving the best things for the use of the elders, and more especially the elder men" (1927:492). Finally, Leach's (1964) study of sociocultural variation among the Kachin of highland Burma illustrates how the design of rules reflects asymmetries in enforcement capacity. Leach found that in some village networks (known by the term *gumlao*), lineages and villages considered themselves equal in status, and villages had autonomy in their decision-making. In other networks (termed *gumsa*), lineages were ranked relative to each other, while a single chief controlled all settlements. The rules followed. For example, in *gumlao* (egalitarian) networks, (1) villagers did not owe headmen tributes, (2) the compensation for legal offenses did not vary with individuals' rank, and (3) each village made its own sacrifice independently (Leach 1964:204–5). In contrast, in *gumsa* (ranked) networks, (1) villagers unrelated to the chief had to donate an upper hind limb each time they slayed a four-footed animal, (2) legal offenses against highly ranked individuals called for more expensive compensation, and (3) only the chief could perform major sacrifices.

Prediction 3: Rule Design Should Vary with the Asymmetry in Enforcement Capacity

The asymmetry of the benefits should vary with a number of factors, the most basic being the degree to which the power-holding locus can enforce their own preferences. This, in turn, reflects their relative ability to control resources, their manipulation over group-mates' perceived costs and benefits (and others' trust in them), the extent to which others depend on them, and their ability to coordinate.

Comparative studies of social structure and rules support the prediction that asymmetries in enforcement capacity correspond with greater asymmetries in rule design. Goldman (1955), for example, compared cultural variation, distributions of power, and belief systems across nineteen Polynesian societies, which he classified on a

spectrum ranging from “traditional,” such as the Maori (small-scale with limited power asymmetries), to “open,” such as the Marquesans (intermediate), to “stratified,” such as the Tongans or Tahitians (complex and asymmetric). The ability for rulers to enforce their preferences intensified along the spectrum. For instance, the chiefs of traditional societies rarely used physical force, those of open societies seemed to employ it mainly against non-group-members, while among stratified societies, rulers commonly used “severe and capricious punishment against [their] own people” (1955:689). The priesthood and religion similarly transformed into political tools along the societal spectrum. In line with this prediction, the design of rules reflected the increasing asymmetries in enforcement capacity. Unlike in traditional and open societies, the rules of stratified societies redistributed resources, especially food, more toward chiefs and the gentry, commoners lost their property rights, human sacrifice became instituted, and rulers and other elites came to monopolize ritual. Betzig (1982, 1986) conducted a similar cross-cultural study comparing despotism, extreme polygyny, and other institutions. She found that the extent of hierarchy in a society predicted both the degree to which powerful individuals’ interests were favored over others in conflicts and the form of rules in a given society (see especially Betzig 1986:39–61).

Prediction 4: Rule Design Should Vary with the Scope of Shared Interests between the Enforcers and the Rest of the Group

We predict that the asymmetry of benefits should co-vary with the scope of shared interests between the power-holding locus and the rest of the group. Powerful individuals may be closely related to other group-mates or share a preference for high levels of cooperation and low levels of conflict. In these scenarios, we expect powerful individuals to create and enforce rules that are largely overlapping with the interests of individuals in their group. Alternatively, a power-holding locus may be unrelated to group-mates or fail to share long-term interests, considering group-mates merely as vehicles from which to exploit resources. In this case, we predict that rules will benefit the powerful at the expense of other group-mates.

Instances where foreign rulers with short time horizons replace local rulers with longer time horizons illustrate how the scope of shared interests can dictate the asymmetry in benefits (Olson 1993). For example, the *mit’a* labor tax system transformed from Incan to Spanish colonial rule. Under Incan rule, citizens were obliged to provide the government with labor service on a cyclic basis (Rowe 1946). This labor often had asymmetric ends—it supported the religious caste and created surpluses for the king—but *mit’a* labor also contributed to many public goods and services, including urbanization projects and a well-functioning postal service (Rowe 1946). Under Spanish colonial rule, the *mit’a* service expanded into an onerous labor scheme. The colonial rulers demanded that, as a part of their service, communities send one-seventh of their adult male population to work in the silver and mercury mines (Rowe 1967). These revenues were delivered to the Spanish crown, creating a burdensome demand on the population until the system was finally abolished with depletion of the silver mines and Peruvian independence in the early 1800s (Dell 2010). Although powerful individuals in both societies used the institution to benefit themselves, the colonial rulers’ interests overlapped less with those of the populace, as their objectives appeared to be primarily extractive and short-term.

Predictions When Parties Have Similar Enforcement Capacity

The predictions of the self-interested enforcement hypothesis are more nuanced when the individuals in a group are roughly equivalent in their ability to enforce their preferences. In these instances, we predict that the individuals will recognize standards of behavior in their common interest and enforce compliance with those standards using coordinated or collective punishment and public opinion.³

As with groups exhibiting asymmetries in enforcement capacity, groups with flatter hierarchies span subsistence types and exist across levels of social complexity, ranging from the play groups of small children (Nobes 1999) to bands of pirates (Leeson 2007) and cliques of adult men in acephalous foraging societies (Boehm 1993) to the balance of power among political groups in contemporary state societies (Fukuyama 2011). Notably, similarly powerful individuals can form a party that then dominates or is dominated by other parties, so that coercive rule-making exists alongside the consensual rule-making described below (e.g., Cohn 1959).

Prediction 5: Rules Should Emerge When Similarly Powerful Individuals Recognize Standards of Behavior in Their Common Interest and Enforce Them

We predict that among similarly powerful individuals, rules can emerge through explicit and intentional orchestration, with individuals jointly agreeing on guidelines for behavior. Such rules can result from actors publicly deciding, such as by a meeting or formal discussion, that they would collectively benefit if all group members acted according to certain standards of behavior. A simple example of a rule of this sort would be for individuals to cooperate in a stylized prisoner's dilemma: all parties benefit more if everyone cooperates than if everyone defects. In line with this prediction, some researchers contend that individuals who communicate before playing economic games create normative standards of behavior (rules) (Bicchieri 2002), accounting for the observed increases in cooperation when experimenters allow communication (Ostrom et al. 1992).

Instances of individuals consensually orchestrating rules are common in accounts of self-governing communities. Ostrom (1990) reviewed the ways in which communities created (or failed to create) systems of rules to protect common-pool resources such as fisheries or forests from depletion. Fisherman in Alanya, Turkey, for example, developed an institution to control overharvesting and conflict over a ten-year period, with rules demanding regular switching and random assignment (Ostrom 1990:19). The system included built-in means of motivating individuals to monitor and enforce, though ultimately, “violations. .. [were] dealt with by the fishing community at large, in the coffee house. Violators may come under social pressure and, on occasion, threats of violence” (Berkes 1986:74). Rules that emerged across camps during the California Gold Rush represent another instance of self-interested individuals coordinating to

³ Theoretical and empirical evidence suggests that contributions to public goods (such as collective punishment) can be maintained by signaling benefits (Gintis et al. 2001; McAdams 1997). In particular, when group-members use an actor's participation in collective punishment as an indication that the actor will cooperate in the future, and preferentially partner with these punishers, an actor can be incentivized to punish (e.g., Jordan et al. 2016). Note that this predicts that less-cohesive groups will be less capable of enforcing cooperative norms because the partner choice mechanisms that incentivize punishment will be less effective.

formally create and enforce rules. Despite the absence of a functioning criminal justice system, miners residing at promising digs instituted majority-approved rules to protect property rights and safety (McDowell 2004). In the case of a violation, injured parties sought redress through the support of the community, who used collective punishment to enforce the standards. Lastly, the adult men of Ambae (Aoba) Island in Vanuatu designed a new legal order following the retreat of colonial social control (Rodman 1985). The men devised the rules with two basic questions in mind: “What are the most likely causes of conflict in everyday life in [the village of] Na Sara? What penalties should be imposed for particular offenses?” (Rodman 1985:613). The resulting rule system included laws concerning “the most common offenses and sources of disputes in everyday life: theft, drunkenness, verbal threats to life or property, assault, animals that destroy property, premarital sexual relations, adultery, gossip, and swearing” (1985:614).

Indigenous peace treaties provide another example in small-scale societies of the formal emergence of rules among similarly powered parties. In these cases, representatives (usually elders) of warring groups meet to decide on rules regulating how members of the two groups should behave toward each other, as well as how violations of those standards should be compensated, so as to reduce intergroup conflict (Glowacki and Gönc 2013; Sullivan 2008). Although the elders use their power and social influence to enforce these agreements within their groups, the rules represent contracts between similarly powered groups and the elders within them.⁴

Prediction 6: In More Cohesive Groups, Rules Should Redirect Individual-Level Benefits toward Group-Level Benefits

We predict that the design of rules among similarly powerful individuals will vary with the social structure of the group because the potency of enforcement mechanisms (partner choice and collective punishment) appears to depend on shared interests among group members and their relative interdependence. We define the combination of these variables—shared interests and interdependence (comprising expected time horizon and frequency of cooperative interactions)—as “cohesiveness” (see “social capital” [Pretty 2003] and “community” [Singleton and Taylor 1992] for similar concepts). The efficacy of partner choice mechanisms will increase with group cohesiveness because it is under these conditions that the costs of losing a relationship are highest (Ellickson 1991). The effectiveness of collective punishment should also covary with these factors because individuals more easily coordinate and overcome the collective action problem under cohesive conditions (Bandura 2000; Kahan 2003; Lubell and Scholz 2001; Sturmer and Simon 2004). We thus predict that rules in more-cohesive groups will redirect individual-level benefits toward group-level benefits more so than rules in less-cohesive groups.

Ostrom (1990) noted how rules protecting common-pool resources were most effective under conditions of distant time horizons and frequent interactions (see also

⁴ Peace treaties represent one of several potential pathways by which societies use enforced rules to curb or otherwise prevent ruinous cycles of blood revenge (Boehm 2011); see, for example, how states and colonial powers exercise force to stifle feuding (Pinker 2011), as well as how small-scale societies delegate executions to close kin to control revenge (Boehm 2012).

Gutiérrez et al. 2011; Mearns 1996). Meanwhile, Schwartz's (1954) comparison of two Israeli cooperative settlements, a *kvutza* and a *moshav*, shows how the degree of social cohesiveness determines the ease of enforcement among similarly powerful individuals. Although the two settlements were similar in population size, subsistence, land area, and political orientation, the *kvutza* was a collective community "whose members engage[d] in continuous face-to-face interaction" whereas the *moshav* was organized as a cooperative of nuclear families, each of which typically ate and worked in a separate household. Consequently, public opinion was an effective tool of social control in the *kvutza*. In contrast, Schwartz argued that members of the *moshav* needed to institute a judicial committee (i.e., redistributing enforcement power to a subgroup) in order to maintain a similar degree of social order.

The weakening in sharing norms accompanying economic transitions similarly illustrates how reductions in interdependence correspond with weaker enforcement and changes in the design of rules. Anthropologists and other social scientists have long noted that shifts from non-storage to storage economies are complemented by a loss of communal property rights on energy-rich food items and a corresponding recognition of private property rights (Cashdan 1980; Testart 1982). In non-storage economies, individuals appear to use sharing as a way to invest in reciprocal relationships or social reputation (Gurven 2004; Gurven et al. 2000; Winterhalder 1986), thus insuring against times of need (Cashdan 1985; Faichamps and Lund 2003; Wiessner 1977). Once individuals live in storage economies, however, they can insure against difficult times by investing in their own stores instead of in social relationships (Ligon et al. 2000). This signifies a reduction in interdependence and weakening of the efficacy of partner choice mechanisms, partly contributing to the dissolution of communal property rights.⁵

Predictions of Cultural Change

Prediction 7: Rules Should Change Following a Shift in Power

We predict that a shift in the relative abilities of parties to enforce their preferences should lead to a change in rules. For example, if some subgroup suddenly became better able to enforce their preferences, we expect the rules to accordingly advantage these individuals more so. An example of one such change is the decline in norms of respect toward elders in East Asia, which is associated with a diminishing authority of older individuals (Sung 2000). Similarly, Abbink (1997, 2009) connected the acquisition of guns and wealth by younger men to the degradation of traditional institutions among the Suri of East Africa. It appears that older age-grades and ritual leaders previously enforced rules of social order but that their loss of power destabilized social guidelines. An analogous process occurred among the Enga of Papua New Guinea: the institutions and regulations controlling warfare deteriorated after youths obtained

⁵ A recent study by Gurven et al. (2015) appears to violate this prediction, finding that greater market integration among the Tsimane does not correlate with weaker sharing norms. But the authors recognized that in this group, market involvement does not screen households from regular risk, and in some cases, market-integrated families experience new dangers, such as spousal sickness. In other words, market integration is not necessarily related to a decrease in interdependence, likely accounting for the persistence in sharing norms.

shotguns and M16 s in the 1990s (Wiessner 2011). However, the Enga differ from the Suri in that their leaders appear to be reestablishing order using such mechanisms as socialization, the church, and coordinated response units that allow for tighter control (Wiessner and Pupu 2012).

Prediction 8: Rules Should Change When Enforcers Learn of More Profitable Options

Models of cultural group selection (e.g., Boyd and Richerson 2002) predict that groups should adopt the rules of their neighbors when doing so promises higher group-level benefits. However, political scientists note that groups frequently remain at suboptimal peaks, even when leaders are aware of more optimal alternatives (Acemoglu and Robinson 2012). The SIE hypothesis accounts for this inconsistency. It specifies that enforcers should adopt rules when they learn of options that are more profitable for their self-interest. In some instances, the interests of enforcers will overlap with the group (such as when they are related to group members or power is highly distributed), though in many cases, their interests will diverge and they may prefer extractive or domineering rules.

An example of a coercive institution that may have spread by this sort of imitation is the development of the Jim Crow system in the post-Reconstruction South. Many rules enforcing racial segregation were first instituted by single states; then neighboring legislatures adopted similar laws. Woodward (1974) argued that states “elaborated the original scheme and added devices of their own contriving. . . there was a great deal of borrowing and interchange of ideas throughout the South” (1974:83). Eventually these laws became common across the southern United States, illustrating how coercive institutions can spread when power-holding enforcers adopt self-serving rules of neighboring groups.

Group-Functional Rules

We have so far introduced the self-interested enforcement hypothesis and outlined various predictions for the emergence and design of rules. In this section, we use these insights to summarize how the self-interested enforcement hypothesis predicts that group-functional rules should frequently emerge in human societies without the necessary contribution of cultural group selection. Some authors have highlighted the difficulty of assessing (or even defining) whether a biological or cultural trait is group-functional (e.g., Pinker 2012). For that reason, we restrict our discussion to a subset of rules that researchers consistently embrace as being in the interest of the group—those that foster cooperation and reduce conflict (Queller and Strassmann 2009; Richerson et al. 2016; Traulsen and Nowak 2006; West et al. 2007).

Of those rules promoting cooperation, the most interesting from an evolutionary perspective are those prescribing cooperative behavior in social interactions where actors prefer to defect in the absence of external enforcement (i.e., social dilemmas). These include property rights, prohibitions on adultery, sharing norms, and rules prohibiting murder or bullying—a suite of rules that seems to emerge in some form or another across human societies (Boehm 1993, 2008a; Gurven 2004; Hill 2009; Hoebel 1954). The SIE hypothesis describes the ways by which these rules emerge. In

groups with heterogeneity in enforcement capacity, powerful individuals should create rules with group-level benefits (promoting cooperation and controlling conflict) when their own interests overlap with those of their group. This can occur when they are related to the other group members, when their social advantage depends on the stability and success of their group, and when the compliance of their group-mates ensures that they continue collecting material benefits. An example of powerful individuals creating and enforcing rules with group-level benefits comes from Amana, an American commune society that was criticized by some nineteenth-century contemporaries as being “an aristocracy of elders” (Erasmus 1977:142). The spiritual leaders of Amana used supernatural sanctions and indoctrination to institute rules, including demands of communal sharing and prohibitions on pretension or selfish thinking (Erasmus 1977). These rules parallel those of the Kurnai, a foraging group of Australia. Kurnai elders demanded that young boys “listen to, and obey the old men” and “live peaceably with their friends” (Howitt 1885:316). As with the supernaturally sanctioned rules of Amana, these rules advantaged the older individuals while promoting cooperation.

The emergence of certain traditions following the Industrial Revolution illustrates how leaders continue to create institutions that are both self-serving and group-functional in contemporary state societies (Hobsbawm and Ranger 1983). In analyzing the recent history of Western nations, Hobsbawm (1983) argued that many traditions and institutions establish group cohesion, legitimize authority, and inculcate a populace with values. His historical study revealed that these practices were often invented or instituted “with political purposes in mind” (1983:263). During the French Third Republic, for example, the political leadership introduced secular primary education “to turn not only peasants into Frenchmen but all Frenchmen into good Republicans” (1983:271), while establishing public holidays to commemorate the power and history of the state.

We also showed that rules with group-level benefits can emerge through intentional orchestration in societies in which individuals are similar in their enforcement capacity. We pointed out that reputation and coordinated punishment can incentivize compliance with rules in these groups. We also argued that the degree of social cohesiveness (encompassing homogeneity of interests, frequency of positive interaction, and future time horizon) will determine the efficacy of enforcement mechanisms and thus the degree to which a collective of individuals can divert individual benefits toward shared group benefits.

Self-Interested Enforcement and Cultural Group Selection

We have outlined the SIE hypothesis, reviewed its predictions, and discussed how it can account for group-functional rules. In this section, we elaborate on its interactions with cultural group selection. We first review how the SIE hypothesis addresses several limitations of CGS. We then delineate under which contexts the respective hypotheses help explain the design and development of rules. Finally, we consider the various ways by which self-interested enforcement might oppose, facilitate, and otherwise interact with cultural group selection. Highlighting the interactions between these processes is crucial for properly synthesizing how within-group processes and between-group selection interrelate to produce cultural design.

Cultural group selection (CGS) encompasses various processes of cultural design (Boyd and Richerson 1985, 2002, 2009) united by a shared logic: *if* (1) the culture of a group affects some metric of the group's success (e.g., demographic expansion, wealth), (2) the success of a group determines the spread of its culture, and (3) group cultures are maintained over time, *then* groups with culture of higher group-level benefits will tend to spread at the expense of those with less group-functional effects, favoring the spread of group-functional culture (Henrich 2004; Richerson et al. 2016; see also Campbell 1965; Hayek 1967).

Note that evolutionary scientists and cultural evolutionists have described other processes to explain cultural design (Acerbi and Mesoudi 2015; Mesoudi et al. 2006), such as cultural attractors (Claidiere et al. 2014; Sperber 1996; Sperber and Hirschfeld 2004). Although these complementary processes are important for sculpting culture, we focus here on cultural group selection because it is the most relevant for explaining the forms of rule systems generally and cooperative institutions in particular (see Baumard and Boyer 2013; Boyer and Petersen 2012 for important exceptions).

Limitations of CGS

Cultural group selection models recognize that norms are enforced (e.g., Boyd and Richerson 1992, 2002) but tend to assume that (1) enforcement is equally costly for group-mates, thus ignoring how power differentials allow some parties to punish at lower costs (Boyd et al. 2003; Boyd and Richerson 1992; see Guala 2012), and (2) the decision to enforce a norm is unrelated to how that norm's maintenance will benefit the enforcer (Boyd and Richerson 1992; Henrich and Boyd 2001; Panchanathan and Boyd 2004). These assumptions lead to hypothesized social processes that can sustain any behavior as normative (Boyd and Richerson 1992; Chudek and Henrich 2011; Chudek et al. 2013; Henrich 2015; Richerson and Boyd 2008).

We suggest that the assumptions of CGS leads to two important limitations that SIE addresses. First, contemporary models do not consider how rules emerge, including the crucial point of actors intentionally creating or changing rules. Chudek et al. (2013) recognized the possibility of rules being sculpted by "rational, forward-looking individuals." But they dismissed the importance of this process, in part because "groups and individuals are usually quite bad at foreseeing the outcome of complex, probabilistic processes" (Chudek et al. 2013:439). In contrast, we argued earlier that social scientists often find that individuals are capable of designing rules and understanding their impacts.

Our second criticism of CGS models is that they have difficulty relating the design of rules to the social structure of a group, failing to more broadly consider how within-group variation in interests and power constrains the form of norms and institutions. For example, Leeson's (2007) study of institutions of order among various maritime enterprises showed how variables such as the ability for a leader to use force accounted for differences in rules. Specifically, on merchant ships, single individuals owned the vessels and hired captains who could freely use force that was authorized by law. These conditions led to autocratic rules that favored the interests of captains. Among pirates, on the other hand, ownership was shared and there were no laws that condoned force by a single individual. These factors in turn led to more democratic institutions and sharing systems on pirate vessels. Cultural group selection, as currently formulated, has difficulty explaining these patterns and the empirical examples reviewed earlier.

Our contention is not that cultural group selection fails to explain facets of cultural design. It represents a convincing mechanism by which certain cultural practices and institutions spread through populations. Instead, we wish to emphasize that it has limited explanatory power and that within-group processes rooted in self-interest and limited reason contribute to the form of rules.

SIE and CGS (Usually) Describe Different Processes

Figure 1 specifies the differences we envision between SIE and CGS. We consider rules existing within social structures, where “social structure” encompasses the distribution of power, overlapping interests among parties, and cohesiveness. SIE describes how rules emerge from the interactions of self-interested actors, as well as how social structure constrains the design of rules. CGS, in contrast, describes how rules diffuse through populations, as well as how between-group competition drives the spread of some social structures at the expense of others. Note that we have here treated social structure as exogenous, although we acknowledge that the rules a society adopts can subsequently shift the distribution of power.

Interactions between SIE and CGS

1. Success-Biased Imitation

There are some social conditions under which self-interested enforcement and cultural group selection make the same predictions about cultural change. In particular, self-interested enforcement predicts that when the interests of the powerful overlap considerably with those of the group or when power is sufficiently distributed, individuals should adopt the group-beneficial rules and institutions of neighboring societies (Fig. 1, panel II). This resembles what previous researchers have termed success-biased cultural group selection (Boyd and Richerson 2002; Henrich 2015; see also Dolowitz and Marsh 1996; Shipan and Volden 2012).

2. SIE Generates Variation for CGS

In many instances, rules emerge through self-interested enforcement before subsequently spreading by CGS (Fig. 1, panels I and II). For example, the reforms introduced by Shang Yang, a Chinese statesman in the state of Qin, were implemented to curb the command of the slave-owning aristocracy and consolidate the power of the rising landlord class that Yang advised (K’uan 1977). But the institutional changes also mobilized the state’s resources on an unprecedented scale, allowing the Qin to dominate their neighbors (Hui 2005). Historians implicate Shang Yang’s reforms in the Qin state’s dramatic military success and the establishment of the first unified Chinese empire (Hui 2005; K’uan 1977).

3. SIE Can Drive CGS

Many factors contribute to societal failure, but scholars frequently identify SIE-driven changes as important contributors. Tainter (1988:67–73) reviewed theories recognizing

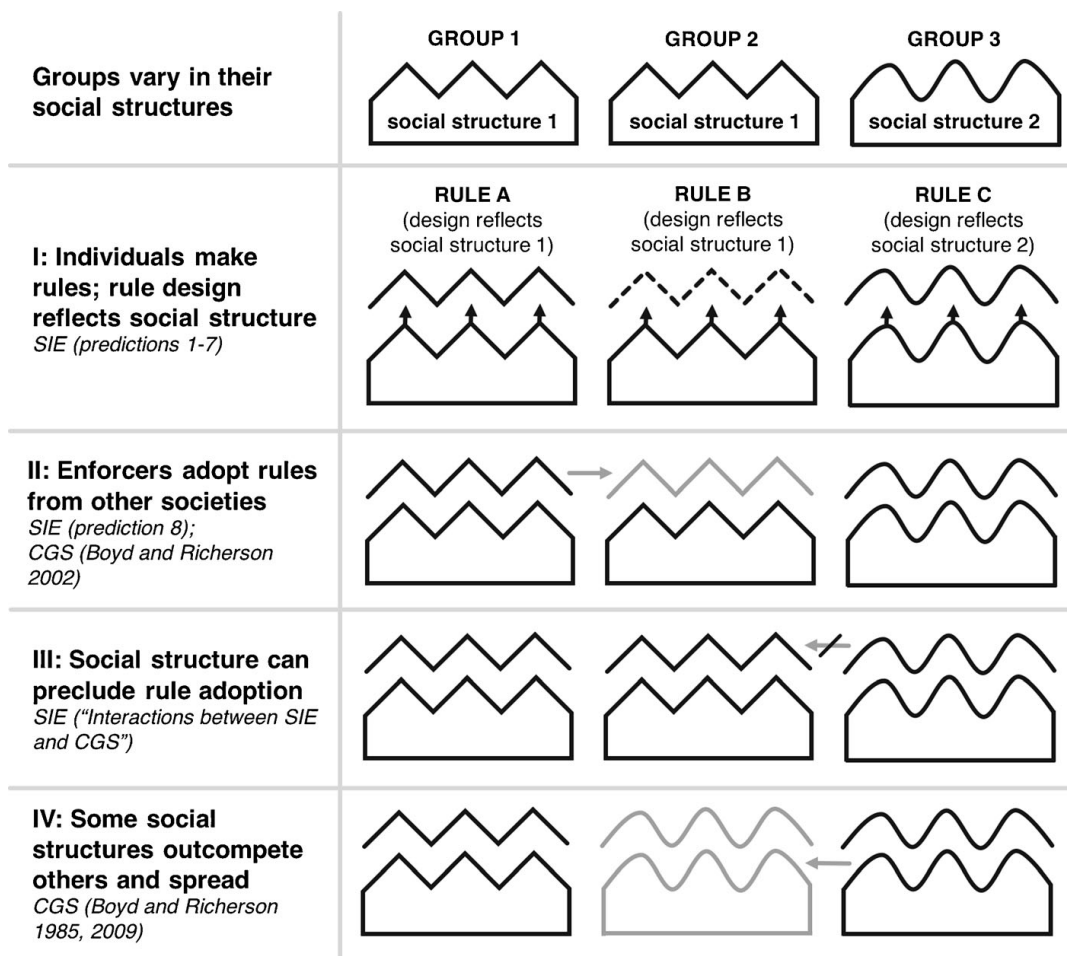


Fig. 1 An illustration of how self-interested enforcement (SIE) and cultural group selection (CGS) compare in sculpting rules. Closed forms represent groups. Closed forms with different shapes represent groups with different social structures: groups 1 and 2 have the same social structure while group 3 is different. Floating lines represent rules. Lines with different shapes represent rules in different social structures: rules A and B are stable in social structure 1, whereas rule C is stable in social structure 2. Rule B is dashed and rule A is not to show that, whereas both rules are stable in the same social structure, they are different rules. Black arrows signify individuals making rules. Gray arrows signify the spread of rules and/or social structures; gray lines and closed forms denote rules and social structures that have spread

“elite mismanagement” and “greed and self-aggrandizement” as central drivers in the collapse of Mesopotamia, the Roman empire, and the Byzantine empire, among other societies.

More recent reviews of political decay support the contention that selfish and extractive rule creation by the powerful can accelerate societal failure (Acemoglu and Robinson 2012; Fukuyama 2011:453–54). For example, two successive prime ministers of Sierra Leone intensified extractive tax schemes that both disincentivized economic productivity and contributed to the disintegration of schools, roads, and other public goods (Acemoglu and Robinson 2012). Fearing an uprising, one of the prime ministers also replaced the army with private paramilitary units loyal to him rather than to the state (Reno 2003). These changes fatally weakened the state; by 1991, when a rebel army crossed the border from Liberia, “the state of Sierra Leone had totally failed” (Acemoglu and Robinson 2012:376) and “had no capacity to oppose [the incoming rebels]” (2012:374). SIE by an asymmetrically powerful elite accelerated the society’s collapse.

4. *Barriers to CGS because of Elite Interests*

We described how self-interested enforcement can lead groups to adopt group-beneficial rules when the interests of enforcers coincide with those of the rest of the group. But this same logic predicts that group-functional culture should not spread under certain conditions (Fig. 1, panel III). When enforcement capacity is highly asymmetric and the enforcers' interests do not align with those of their group, we expect that powerful individuals will maintain or adopt maladaptive institutions. Acemoglu and Robinson (2012) observe this throughout the history of economic institutions. For example, they argued that Tsar Nicholas I of Russia and Franz Joseph I of Austro-Hungary blocked the introduction of group-functional industry, including factories and railroads, because of how the technologies might threaten the rulers' power. The leaders feared that these industries would concentrate peasants in urban areas, allowing them to more easily collectivize.

5. *Barriers to CGS because of Interests of Key Enforcers*

In some instances, powerful coalitions or leaders will prefer that a group-beneficial rule be adopted even if it will not benefit the interests of other key enforcers. Because these norms or institutions do not advantage other key parties' interests, they will not be maintained in that society, stifling cultural group selection (Fig. 1, panel III). Peter the Great's attempted changes to Russian social structure and governance provide an illustrative example of this kind of frustration. Riasanovsky (1963) noted that Peter the Great aimed to copy and adapt the successful institutions of other parts of Europe; these included "efforts to delimit clearly the authority of every agency, to separate powers and functions, to standardize procedure" (1963:258). But many of these attempts never materialized because they did not benefit the interests of the officials responsible for instituting and enforcing them: in "provincial Russia, everything depended as of old on the initiative, ability, and behavior of officials... Personal and largely arbitrary rule remained, in sum, the foundation of Russian administration" (1963:258).

Conclusion

Legal theorists, political scientists, and economists have long employed a logic similar to that in this paper in their analyses of social order and institutions (e.g., Acemoglu and Robinson 2012; Knight 1992; Marx and Engels 1978; Ostrom 1990). Yet the consequences of rules being standards of behavior enforced by self-interested agents have remained underdeveloped and neglected in studies of cultural evolution and the evolution of human sociality. For example, Henrich et al. (2012) recently argued that cultural group selection drove the diffusion of monogamy around the world (see also Alexander 1987). To support this claim, they provided evidence that monogamous societies exhibit reduced competition among males, corresponding with group-level benefits including lower levels of crime. But aside from acknowledging that powerful individuals should prefer to maintain polygamy and that today's "absolute wealth gaps [are] greater than any seen in history" (2012:657), the authors did not consider alternative explanations involving agents enforcing and adopting rules that promote

their interests. Explanations of this sort can include an increased ability for lower-status men to coordinate and demand their own preferences (as should occur with democratization), coercion by other states, increased bargaining power by women who prefer monogamy, or even manipulation by powerful individuals to maintain the size of their estates, as Betzig (1992) argued occurred with monogamy laws in Rome.

Aside from generating hypotheses of cultural design, the self-interested enforcement hypothesis emphasizes a particular set of skills and cognitive capacities as enabling the scale of human cooperation. Some researchers have highlighted the human capacity for cultural learning and imitation as contributing to our uniqueness (Boyd et al. 2011), and although these likely play an important role, we identify a complementary set of abilities as allowing humans to use and create rules. At the heart of these is the capacity for a group of individuals to identify and enforce a collectively beneficial standard of behavior (Singh et al. 2016). This capacity in turn seems to be facilitated by (1) linguistic communication and shared intentionality, which allow individuals to identify common goals (Tomasello et al. 2005, 2012), and (2) the ability to assess whether potential social partners contribute to those goals (and to choose them on this basis) (Tooby et al. 2006). Future research into the cognitive underpinnings of rules will evaluate the significance of these capacities and determine whether and how they developed during our recent evolutionary history.

A frequent debate within many social science disciplines pits functionalists against conflict-oriented theorists (see discussions in Abbott 1988; Edgerton 1992; Knight 1992; Tainter 1988). Functionalists emphasize how the constituent institutions and traditions of a society contribute to the stability and success of individual members or the society as a whole (Firth 1955; Holmwood 2005). Conflict-oriented theorists, on the other hand, focus on how institutions and traditions develop from strife, typically serving the interests of some powerful subgroup (Acemoglu et al. 2005; Knight 1992). Our objective is not to rehash this debate, but rather to contribute to the unification of these ostensibly opposing perspectives. By elaborating on how rules can develop from the interactions of self-interested but also cooperative actors, we propose that shared processes underlie the development of cooperative and exploitative rules.

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