In-group bias in human cooperation: insights from the *contrade* of Siena, Italy



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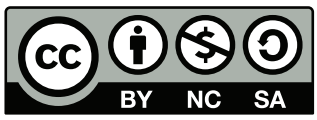
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Abstract

Cooperation in humans shows an in-group bias, with individuals more likely to benefit members of their own in-group than members of other out-groups. This thesis explores the effects of inter-group competition, group relationship, and shared identity on in-group bias, by conducting field experiments among communities in a historic Italian city, namely the *contrade* of Siena.

In Chapter 1, I review the literature on the evolution of cooperation and in-group bias. I then describe how field experiments that employ economic games can help elucidate in-group bias in the real world, before outlining how I conducted field experiments with the *contrade*. I describe the *contrade* in greater detail in Chapter 2, using research from my fieldwork among these communities to demonstrate the importance of group relationship in the Sienese context.

In experiment 1 (Chapter 3), I compare in-group and out-group cooperation during a period characterised by low competition vs. high competition. There is no evidence for an effect of competition. However, there is a significant effect of group relationship, with more cooperation among neutral out-groups compared to rival out-groups. In experiment 2 (Chapter 4), I analyse third-party punishment decisions and participants' interpretations of the experiment, to assess whether cooperation within and between *contrade* is supported by social norms. There is limited support for third-party punishment sustaining norms governing either in-group or out-group behaviour. In experiment 3 (Chapter 5), I explore the effect of shared identity on in-group bias, by seeing if a "common enemy" encourages out-group cooperation. The common enemy neither increases the perceptions of shared identity nor decreases in-group bias.

I conclude with a meta-analysis in Chapter 6, which reveals an overall strong in-group bias among the *contrade*. The bias is influenced by the relationship between the groups, but is unaffected by the level of competition and attempts to induce a shared identity. This thesis shows that symbolic group identities in the real world have a significant impact on social behaviour.

Contribution to collaborative efforts

I follow the integrated thesis format. Chapters 2 to 5 of this thesis are under consideration for publication as peer-reviewed journal articles.

These chapters are currently being prepared for submission in collaboration with my supervisor, who has supported their development in an advisory capacity. I am responsible for the majority contribution to the work, in terms of intellectual development, practical implementation, and writing up.

Note that these chapters are written in the first-person plural, to reflect the collaborative input from my supervisor.

Note on names, anonymization, translations, and photographs

The names of all informants have been changed in ethnographic descriptions of scenes, in order to protect their identity.

For all experimental research, I use an anonymization scheme for the names of the *contrade*, in order to protect their identity and to preserve the anonymity of participants. All 17 *contrade* were randomly assigned an alphanumeric code, composed of `C` plus a number from `01` to `17`. The codes are consistent throughout the thesis. In cases where *contrada* identities could be easily inferred, I use the *contrada* name.

Where I have included any translated quote or statement made by research participants, I have added the verbatim text as a footnote. I have also included, where possible, the personal identification code of the participant in instances where e.g. written statements were provided as part of a questionnaire.

I use original Italian terms, italicised for clarity. I limit terms to those unique to the Sienese context, and provide literal translations where appropriate, following Italian rules for pluralisation, such that singular *contrada* (ending with "-a") becomes plural *contrade* (ending with "-e"), and singular *palio* (ending with "-o") becomes plural *palii* (ending with "-i").

All photographs were taken by me between March 2016 and June 2019. Where individuals can be identified in photographs I have received their permission to include the image in the thesis. The photographs are licensed under a Creative Commons "Attribution-NonCommercial-ShareAlike 4.0 International" license.

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Glossary

Contains Italian terms that appear more than once in the thesis, with plural forms and literal translations.

Contrada One of 17 territorial communities that divide the historic city centre of Siena in Italy (pl. *contrade*)

Contradaiolo/a A member of a *contrada* (pl. *contradaioli/e*)

Giro A day-long procession of Siena as part of annual *contrada* celebrations (pl. *giri*; lit. "tour")

Palio One of two horse races held every year on 2 July and 16 August in the central square of Siena (pl. *palii*)

Protettore A dues-paying member of a *contrada* (pl. *protettori*; lit. "protector")

Acronyms

DG Dictator game
GPS Global positioning system
PGG Public goods game
TPPG Third party punishment game
WEIRD Western, educated, industrialized, rich, and democratic

The degree of love for one's contrada *can only be exceeded by the degree of hate for the rival* contrada.

— Dundes and Falassi (1984: 49)

1 Introduction

1.1 Retrospect

I had been living in the Italian city of Siena for about a week — in a small flat located on the ground floor of an eighteenth century villa — when Duccio offers to give me a tour of the floor above my apartment. Duccio, who is approximately 70 years old, is my new landlord, and the first floor is his family home, although neither he nor the rest of his family live there anymore. Most of them reside in the surrounding countryside.

Upstairs, Duccio proudly explains that he is a member of a *contrada*, one of the 17 communities that occupy the neighbourhoods of the historic city centre of Siena. Specifically, he is a member of the *contrada* called *Lupa* (literally "She-wolf"). Duccio stresses that his family has always been *della Lupa* (lit. "of the She-wolf"), and various items on display throughout the room we find ourselves in attest to this. A flag of the *contrada*, coloured white and black with orange trimming and featuring a wolf suckling two children, rests in a corner. A photograph of his mother on her wedding day, her husband to her left and a man representing the *contrada* in white and black regalia to her right, sits on a table. A letter from the leadership of the *contrada*, thanking Duccio's grandfather for his involvement in the *contrada* during the first quarter of the twentieth century, hangs on a wall.

Surrounded by these items, Duccio recounts the story of how his younger sister, Caterina, was born. His pregnant mother was in the front room overlooking the main road, he says pointing towards the window, when she went into labour. Grinning, Duccio explains that the house spans the territories of two *contrade*. The front of the house, including the room overlooking the main road, is actually in the territory of the other *contrada*, called *Istrice* (lit. "Porcupine"). *Lupa* and *Istrice* are rivals, which means the relationship between them is strained, characterised by recurrent mocking and goading, avoidance during annual rituals, and the occasional fight between members. Therefore, Duccio's mother immediately demanded to be brought to the other side of the house, in order to give birth in *Lupa* territory. In doing so, she guaranteed Caterina's membership of *Lupa*, as Sienese tradition

largely dictated that people became members of the *contrada* in which they were physically born. Today, membership is more often determined by family ties, or through sustained interest and involvement in the *contrada*.

In Siena, the most important event to *contrada* members is the *palio*, a bareback horse race that takes place twice a year in the central square, on 2 July and 16 August. I moved to Siena after *Lupa* had won both the July and the August *palii*. *Lupa* had not triumphed for 27 years before the summer of 2017; victory was therefore particularly momentous, and cathartic. I had visited Siena for the August *palio* — a fortnight before formally moving in to Duccio's apartment — and I had seen the jubilant celebrations, including *Lupa* members parading their victorious jockey before the altar of the cathedral overlooking the city. The revelry continued for weeks, and even in mid-September I was being kept awake by singing, music, and fireworks in the streets surrounding my apartment.

Late one evening a couple of weeks after first hearing the story of Caterina's birth (the anecdote will be repeated often), I descend a steep road leading to the heart of the *Lupa* neighbourhood. The *contrada* is hosting a celebratory event to mark their victories, a large party open to everyone in the city. The *Lupa* territory is draped with flags unfurled from nearly every window, and an assortment of white, black, and orange decorations hangs from every possible appendage. There are stalls selling local food, and there is an abundance of Tuscan wine. Duccio is in the middle of the main square in the *Lupa* neighbourhood, chatting, singing, and dancing. Instead of disturbing him, I turn to Caterina, who holds up with glee two intricately sculpted chocolates she has just purchased from one of the stalls located by a medieval fountain.

One chocolate is in the shape of a coat; winning the *palio* twice in a row is called *cappotto* (lit. "coat"). The other chocolate is a hedgehog weeping while sitting on a toilet. *Lupa* members mockingly refer to *Istrice* as *riccio* (lit. "hedgehog"), as a hedgehog is a smaller, more ordinary animal than a porcupine. The latrinal element relates to the native view that success in the *palio* means members of the rival *contrada* must purge themselves. The sweetness of victory is a combination of "us" winning and "them" losing.

Looking back at those first few weeks in Siena I realise they hint at the deep significance of the *contrada* to its members. The story of Caterina's birth and the scenes of celebration also allude to the salience of group boundaries: Duccio's mother considered her child's *contrada* membership first and foremost, and *Lupa* revelled in *Istrice*'s loss as much as their own victory.

In this thesis, I seek to understand the role of groups in human prosocial behaviour. Specifically, I attempt to understand why and how humans show an in-group bias in cooperation. By cooperation I mean behaviour in which an individual provides benefits to another individual, while by in-group bias I mean the propensity for individuals to help members of their own group (the in-group) rather than members of other groups (out-groups).

I conducted research with the *contrade* of Siena, the majority of which involved experimentation using behavioural economic games, supplemented by extended fieldwork. The data were collected in a specific context, with social, cultural, and

historical peculiarities. However, the experiments were designed to test evolutionary theories of in-group bias, and as such, the results speak to the broader literature on this topic. Thus, the thesis aims to explain in-group bias, a phenomenon of interest across the biological and the social sciences, using insights from the *contrade* of Siena.

1.2 Prospect

In this section I provide a brief outline of the thesis (Section 1.2.1), followed by a discussion of the theoretical and methodological approaches to understanding in-group bias in cooperation (Sections 1.2.2 to 1.2.6). First, I discuss the literature on cooperation and in-group bias in Section 1.2.2. Then, I outline several theories that explain in-group bias in cooperation in Section 1.2.3. I describe the methodology of field experiments in Section 1.2.5. Finally, I present the fieldsite in Section 1.2.6.

1.2.1 Thesis aims, definitions, and structure

In this thesis, I investigate in-group bias, and its constituent components of in-group and out-group cooperation. Cooperation is behaviour in which an individual benefits another individual, or recipient (West et al. 2007b; see Section 1.2.2 below). A group is a collection of individuals who perceive themselves to be members of the same social category, and therefore share a social identity (following Everett et al. 2015a; definitions vary, see Böhm et al. 2018; Robinson and Barker 2017). In-group cooperation involves benefits to a recipient who belongs to the same group (in-group); out-group cooperation entails benefits to a recipient who is a member of a different group (out-group). In-group bias in cooperation is the result of the benefits of in-group cooperation being greater than those of out-group cooperation.

Particular attention is given to the effects of inter-group competition, group relationship, and shared identity on in-group and out-group cooperation. I describe these concepts in greater detail in Sections 1.2.3 and 1.2.4, but I note broad definitions of these interrelated terms. Inter-group competition is competition between groups, over either a limited material resource or a set of values. In the thesis I refer to the level of competition, that is, the intensity of competition, which can be either high or low dependent on situational factors. Group relationship is a group-level characteristic that describes the interactions between a pair of groups, which can be relatively positive or negative. Shared identity relates to the concept of a group given above; a shared identity is when individuals perceive themselves to be members of the same group.

I investigate in-group bias by analysing behavioural data collected among the *contrade* of Siena, Italy. The methodology for collecting behavioural data — field experiments — is presented in Section 1.2.5, and I outline the features of the *contrade* system which make it appropriate for investigating the three factors mentioned above in Section 1.2.6.

In Chapter 2, I detail the contemporary *contrada* system. Aside from providing a primer on the *contrade*, supplemented by original survey data, I discuss a couple of studies that reveal the importance of group relationship on attitudes and ritualised

behaviour in the Sienese context, the former through a psychological item and the latter via GPS data collected during an annual ritual.

In Chapters 3, 4, and 5, I present the results of three field experiments with the *contrade*, henceforth experiment 1 (Chapter 3), experiment 2 (Chapter 4), and experiment 3 (Chapter 5). In Chapter 3, I compare cooperative decisions during a period characterised by low competition vs. high competition, and with varying group relationships. Thus, I assess the effect of level of inter-group competition and group relationship on in-group and out-group cooperation.

In Chapter 4, I explore whether the cooperative behaviour seen in Chapter 3 is sustained by social norms. I adopt a standard experimental paradigm for capturing norms, which measures participants' willingness to punish others for a failure to abide by the norm. In doing so, I consider whether social norms vary with group relationship and in response to the possibility of harmful behaviour.

In Chapter 5, the final study, I assess the hypothesis that competition with a third party perceived as a "common enemy" could reduce the in-group bias in cooperation seen in Chapters 3 and 4. The reduction in in-group bias is expected to occur because *contrada* members share a Sienese identity, and might "come together" in the presence of an external competitor.

The general conclusion, Chapter 6, includes a meta-analysis of the results from experiments 1–3 (Chapters 3, 4, and 5). In addition to highlighting limitations and future directions of study, both personal and for other scholars, I provide insights into how in-group bias in cooperation is affected by inter-group competition, group relationship, and shared identity.

Note that the thesis follows an integrated thesis format, with Chapters 2 to 5 written as stand-alone articles. Thus each chapter reviews relevant background and research related to the specific study, and presents a self-contained discussion of the findings. A general discussion of all studies is considered in the concluding chapter (Chapter 6).

1.2.2 Cooperation and in-group bias in humans

Cooperation, defined as a behaviour in which an individual benefits another individual (West et al. 2007b), is one theme with several processes and various perspectives (Hammerstein 2003: 1). Over the past 50 years, anthropologists (e.g., Henrich and Henrich 2007), biologists (e.g., Hamilton 1963; Nowak 2006; Smith 1982), economists (e.g., Olson 1965; Ostrom 1990), psychologists (e.g., Dawes 1980), and sociologists (e.g., Kollock 1998), among others, have investigated the theme of cooperation in humans as in other species. In doing so, a body of research has provided answers to the question, why do we behave in ways that benefit others?

Cooperation in humans shows an in-group bias, with individuals more likely to help members of their own in-group than members of other out-groups (Rand and Nowak 2013: 415). In-group bias is also of interest to scholars across disciplines (e.g., Bowles 2009; LeVine and Campbell 1972; Sherif et al. 1988/1961; Sumner 1959/1906; Tajfel et al. 1971). Through theoretical reviews (e.g., Brewer 1999; Hewstone et al. 2002; Rusch 2014; Tajfel et al. 1971), cross-cultural studies (e.g.,

Dorrough and Glöckner 2016; Romano et al. 2017), and meta-analytic approaches (e.g., Balliet et al. 2014; Lane 2016), research has shown that this in-group bias in cooperation is a general human phenomenon, albeit one that varies in response to a host of contextual, cultural, and developmental cues (e.g., Cashdan 2001; Fehr et al. 2008; Robinson and Barker 2017). I take an evolutionary perspective on cooperation, and by extension in-group bias, in order to address how the general phenomenon of in-group bias in cooperation evolved in humans.

I begin this section by reviewing the key processes underlying the evolution of cooperation more generally (Section 1.2.2.1). I then describe how these processes combine with the emergence of group boundaries and thus the origin of in-group bias (Section 1.2.2.2).

1.2.2.1 Cooperation in evolutionary perspective

Cooperation, as mentioned above, involves a cooperator extending benefits to another individual or recipient (West et al. 2007a, 2007b). Other definitions of cooperation include a cost to the cooperator (Nowak 2006; Rand and Nowak 2013). In an evolutionary framework, benefit and cost are measured in terms of fitness, i.e., lifetime reproductive success. Cooperation means a cooperator incurs a fitness cost. Herein lies an evolutionary problem, as natural selection should oppose cooperation.

In order for cooperation to evolve, there must be a mechanism that ensures cooperators interact (Rand and Nowak 2013). In this interaction, benefits are extended to others who, in turn, provide benefits to the cooperator. Kin selection, reciprocity, and group selection are three mechanisms that have been identified (following the classification in Molina et al. 2017). I do not provide an exhaustive review of the mechanisms, but outline the key concepts for each one. See Nowak (2006), Rand and Nowak (2013), and West et al. (2007a, 2007b) for extensive discussions, and see Apicella and Silk (2019) for a recent update that appends partner choice as a mechanism.

Kin selection is "the process through which traits are favoured because of their beneficial effects on the fitness of relatives" (West et al. 2007b: Box 1). Kin selection relies on the concept of inclusive fitness and the application of Hamilton's rule (Hamilton 1964). Essentially, cooperation can be favoured by selection if there is a benefit to the self via inclusive fitness.

Reciprocity sees cooperation as mutually beneficial behaviour and is often divided into direct and indirect reciprocity. Direct reciprocity involves repeated encounters that favour cooperation because the cooperator receives benefits extended by the recipient cooperating in the future (Axelrod 1984; Trivers 1971). It is thus a formal description of the phrase, "I'll scratch your back, you scratch mine".

Indirect reciprocity occurs in contexts where the actions of individuals are observed by third parties (Nowak and Sigmund 2005). Here, cooperation is favoured because it earns a positive reputation for the cooperator, who may then receive future benefits from the third party (Leimar and Hammerstein 2001). The human capacity for language means an observation can spread (Sommerfeld et al. 2007). The threat of a negative reputation can also encourage cooperation (Rankin and Eggimann 2009; Sigmund 2012).

The third mechanism is group selection. The basic underlying logic is that if there is competition between groups, as there is between individuals, groups composed of cooperators out-compete groups of non-cooperators (Traulsen and Nowak 2006; Wilson and Wilson 2007). The selection pressure at the individual or the group level changes the relative frequency of cooperators within and between groups. Under increased between-group competition, cooperation will be strongly favoured (Bowles 2009). Selection at the group level can thus increase cooperation.

There is significant debate over which mechanism best explains the evolution of human cooperation (see Burnham and Johnson 2005; Chibnik 2005; Delton and Krasnow 2014; Hagen and Hammerstein 2006; Henrich et al. 2012; Lamba and Mace 2012; Zefferman 2014). The debate focuses on two observations. First, cooperation occurs at large scales among unrelated individuals. Second, under experimental settings, humans cooperate in one-shot and anonymous conditions (Camerer 2003). Kin selection is unlikely to be sufficient to explain the first observation (e.g., Boyd and Richerson 2009).

The second observation is argued to be the result of a psychology that evolved under repeated interactions, i.e., a reciprocity-based mechanism (Burnham and Johnson 2005; Delton and Krasnow 2014; Hagen and Hammerstein 2006). Others argue that the second observation is the result of group selection (Bowles 2008), although this often evokes selection on cultural traits (Boyd and Richerson 2009). However, group selection is controversial (Lehmann et al. 2007; Leigh 2010; West et al. 2011). It is likely that a combination of mechanisms explains human cooperation (e.g., Tomasello et al. 2012).

1.2.2.2 The emergence of groups and in-group bias

Underpinning the three mechanisms of kin selection, reciprocity, and group selection is positive assortment (Fletcher and Doebeli 2008). The benefits of cooperation are only accrued when cooperators interact with other cooperators. One method to ensure assortment is to interact with others who signal cooperative intent through shared tags or markers (Cohen 2012). In other words, if someone shares the same marker, then they are likely to be as cooperative as you are.

Cultural markers can symbolise group boundaries and thus facilitate positive assortment. The list of possible cultural markers is extensive, as it includes any one of, or a combination of, distinctive languages, rituals, cuisines, dress styles, tattoos, etc. (Barth 1998/1969). Many cultural markers have been empirically investigated for strength and reliability in ensuring assortment. Strong markers include language (Nettle and Dunbar 1997), accent (Cohen and Haun 2013), and norms (McElreath et al. 2003). In order for markers to be effective they must be hard to fake or costly to acquire. A notable example is accent, which develops during childhood, making it difficult for an e.g., Irish accent to be impersonated by a non-native (Henrich and Henrich 2007: 176). Tattoos and other body modification practices are permanent markers gained through painful procedures often endured during important rituals, making them costly signals of group membership (e.g., Watson-Jones and Legare 2016). One function of cultural markers may be to facilitate interactions among individuals who share social norms (McElreath et al. 2003).

The combination of multiple markers among contemporary groups makes it appear that a complex set of cues is required to signal membership. However, evidence from models and experiments show that single, simple markers cause cooperation to be sustained by groups composed of individuals with that marker. Hammond and Axelrod (2006) show via an agent-based model that a predisposition to favour members of the same group can become a dominant strategy, even when the groups are based on a single tag, such as one of four colours. Furthermore, they show that in-group bias continues to be sustained even when cooperation is extremely costly, and in particular when groups are surrounded by other groups. Thus, the mere presence of a group boundary, indicated by a single marker, is sufficient for in-group bias in cooperation to emerge (similar models include Fu et al. 2012; Riolo et al. 2001).

Experimental work with participants complements such evolutionary modelling to demonstrate that group formation and in-group bias emerge simultaneously. The main experimental paradigm used in the study of in-group bias is the minimal group (Diehl 1990; Tajfel et al. 1971). The minimal group paradigm involves dividing participants into two groups on the basis of an arbitrary categorisation criterion, such as a preference for Klee over Kandinsky paintings or the colour red over blue. Participants are then asked to anonymously divide money among themselves. A consistent finding is that minimal groups, which are artificial and have no interaction history nor future, are enough to elicit in-group bias (Balliet et al. 2014; Diehl 1990; Lane 2016).

Further work has shown that endogenous group formation (i.e., the groups are not externally induced by experiments) emerges simultaneously with in-group bias. In an laboratory experiment, participants chose whether to be represented by a triangle or a circle and then played an economic game, repeated over 80 sessions (Efferson et al. 2008). After each session, participants were free to interact with other participants who had either selected triangles or circles. After all sessions were completed, groups had emerged that shared the shape marker and adopted the same (cooperative) behaviour — behaviour that was biased toward members of the same group. In a more realistic setting, Goette et al. (2006) found that bias emerged after two weeks in military groups that had not previously existed and to which new soldiers were randomly assigned. Thus, regardless of the precise marker that distinguishes groups, cooperation tends to become biased towards the in-group.

1.2.3 Theories for the evolution of in-group bias

A distinction can be drawn between theories attempting to account for the evolution of cooperation and those accounting for cooperation in terms of proximate mechanisms (Scott-Phillips et al. 2011). The same holds for in-group bias in cooperation. Theories that account for the evolution of in-group bias tend to feature a mechanism for cooperation, such as group selection or reciprocity, as described in Section 1.2.2. In contrast, theories that account for in-group bias in terms of proximate explanations focus on mechanisms that underpin behaviour, which can be cognitive, psychological, physiological, and/or hormonal. For example,

group-bounded feelings of empathy can trigger in-group bias and hormones such as oxytocin might modulate behaviour (De Dreu et al. 2020).[1]

Numerous theories have been put forward to explain in-group bias in cooperation among humans. I will review the following five theories: 1) parochial altruism, 2) cultural group selection, 3) bounded generalised reciprocity, 4) social identity theory, and 5) coalitional psychology. The first three can be classified as theories that account for the evolution of in-group bias; the latter two consider proximate mechanisms. For elaboration of other candidate theories see reviews in Böhm et al. (2018), Hewstone et al. (2002), and Hruschka and Henrich (2013).

Two theories cite group selection as a primary mechanism, parochial altruism (Bowles 2008; Choi and Bowles 2007; reviewed in Rusch 2014) and cultural group selection (initially synthesised in Boyd and Richerson 1988: 238–240; for comprehensive reviews, see Chudek and Henrich 2011; Henrich 2004; Richerson et al. 2016; Smith 2020). Both these theories advance a human history characterised by frequent and intense inter-group competition. One theory — bounded generalised reciprocity— is explicitly based on reciprocity as a mechanism for cooperation (Yamagishi et al. 1999; Yamagishi and Kiyonari 2000). Bounded generalised reciprocity does not rely on inter-group competition and by extension group selection (Yamagishi and Mifune 2016).

Social identity theory and coalitional psychology look at proximate reasons for in-group bias. Social identity theory focuses on the individual's categorisation of others as members of either the same or a different group (Tajfel and Turner 1979; Turner 1975), with in-group bias caused by a personal propensity to consider the welfare of the in-group compared to the out-group (Balliet et al. 2014; Chen and Li 2009; Everett et al. 2015a). A coalitional psychology is a set of evolved, cognitive structures that are specialised to recognise and track individuals that could form good cooperative partners (Kurzban et al. 2001; Pietraszewski 2013).

The review begins with parochial altruism (Section 1.2.3.1), followed by cultural group selection (Section 1.2.3.2), bounded generalised reciprocity (Section 1.2.3.3), social identity theory (Section 1.2.3.4), and ends with coalitional psychology (Section 1.2.3.5). For each theory, I describe its logic, present supporting evidence, and relate it to a mechanism for cooperation and/or proximate mechanism.

1.2.3.1 Parochial altruism

The theory of parochial altruism states that in-group bias is a product of inter-group competition (Bowles 2008; Choi and Bowles 2007; Rusch 2014). Under frequent inter-group competition, cooperation is favoured when directed at in-group members, because cooperation increases the likelihood success in between-group contests (Bowles 2008). In other words, the cost of cooperation is smaller than the cost of group elimination.

Specifically, the theory of parochial altruism states that humans show two

1. To prevent confusion, I always include "proximate" when discussing proximate mechanisms. I use "mechanism" alone when discussing mechanisms for assortment, which allow for cooperation to evolve.

behaviours; individually costly cooperative behaviour towards in-group members and hostile behaviour directed towards out-group members (Choi and Bowles 2007). Several models demonstrate that a predisposition to be cooperative towards group members and hostile towards out-groups co-evolved under conditions of intense inter-group competition and even moderate migration and gene flow (Bowles 2009; Choi and Bowles 2007; García and van den Bergh 2011; Konrad and Morath 2012).

The presence of conflict in ancestral human environments is used to support the parochial altruism account (e.g., Bowles 2009; Gat 2008; Glowacki et al. 2017; Keeley 1997; but see e.g., Fry and Söderberg 2013; for debates on the historic prevalence of conflict see Ember 1978; Fuentes 2004; Layton 2014; Lee 2018; Otterbein 1999). Furthermore, this theory is supported by a large volume of empirical research, using either artificial or real groups across a range of experimental designs. Multiple experiments reveal an increase in within-group cooperation under inter-group competition, relative to no competition (e.g., Bornstein et al. 1990; Burton-Chellew et al. 2010; Puurtinen et al. 2015; Puurtinen and Mappes 2009; Rabbie 1982; Reimers and Diekhof 2015). A similar response occurs under "pseudo-competition", i.e., when inter-group competition does not affect earnings, suggesting humans respond to even simple cues of competition (e.g., Böhm and Rockenbach 2013; Burton-Chellew and West 2012; Tan and Bolle 2007). Comparable research conducted in conflict-affected areas across the world shows a general increase in prosocial behaviour directed at in-group members during or following war (as summarised in Bauer et al. 2016). Some experiments also show that under inter-group competition, an increase in in-group cooperation is accompanied by a decrease in out-group cooperation and/or an increase in out-group-directed behaviour classified as harmful (e.g., Abbink et al. 2012; Beekman et al. 2017; Cacault et al. 2015). Overall, the above experimental results appear to support parochial altruism, because competition increases in-group bias and/or increases out-group hostility.

However, two consistent findings call into question the role of inter-group competition, and by extension, the explanatory power of parochial altruism. First, inter-group competition itself may not be the cause of increased in-group cooperation (e.g., Jordan et al. 2017). For example, increased in-group cooperation may result instead from the expectation of reciprocity from in-group members, regardless of whether inter-group competition is present (Koopmans and Rebers 2009; Rebers and Koopmans 2012). Thus, in-group cooperation might be explained by reciprocity, without recourse to inter-group competition (Yamagishi and Mifune 2016), as described in Section 1.2.3.3 below. Competition may have been a selection pressure on the emergence of in-group bias in human evolution, but it does not follow that competition is a proximate driver.

Second, an increase in in-group cooperation is not always accompanied by hostile out-group behaviour. Experiments find that individuals prefer to avoid either harming out-group members or entering into conflict with out-groups (e.g., Halevy et al. 2008; Weisel and Böhm 2015). Individuals who show greater in-group cooperation also show greater out-group cooperation (Corr et al. 2015; Thielmann and Böhm 2016; Yamagishi and Mifune 2009). In some contexts, out-group cooperation occurs (e.g., Leibbrandt and Sääksvuori 2012; Pan and Houser

2013). In-group bias may not be characterised by hostile out-group behaviour, contrary to the theory of parochial altruism.

1.2.3.2 Cultural group selection

Many researchers implicitly discuss in-group bias in cooperation being the result of cultural group selection. The theory of cultural group selection is a co-evolutionary account of human behaviour that focuses on the interaction of genes and culture during human evolution (Boyd and Richerson 2009). Broadly, cultural group selection states that selection on cultural traits at the group level — in particular social norms, but also informal conventions and institutions — results in large-scale human cooperation (Richerson et al. 2016). I focus on three aspects of cultural group selection most relevant to in-group bias in cooperation (Boyd and Richerson 1988: 238–240); social norms, inter-group competition, and punishment in the origin and maintenance of cooperation. For a summary of norm maintenance and in-group bias, see Delton and Krasnow (2017: Section 1.1), and for more general reviews of the theory, see Chudek and Henrich (2011), Ensminger and Henrich (2014), Henrich and Henrich (2007), and Richerson et al. (2016).

Social norms Cultural traits include social norms. Social norms are learned behavioural standards shared and enforced by a community (Henrich and Henrich 2007). They are found in most, if not all, human groups. The Hadza in northern Tanzania prescribe the distribution of hunted game, and the Jewish community proscribes the consumption of pork. Failure to adhere to normative rules can result in punishment, often by un-involved third parties. For example, sanctions — which include gossip, ostracism, and homicide — are commonly directed at individuals who fail to abide by the rules in small-scale societies (Boehm 1999). Punishment is often costly to both the recipient *and* the actor. By way of an extreme example, capital punishment may result in a revenge killing (Boehm 2011).

Crucially, norms are possible thanks to an evolved norm-psychology: a suite of cognitive mechanisms, motivations and dispositions for interacting with norms (Chudek and Henrich 2011). Internalised norms are associated with emotions — such as anger, guilt, and shame — that are expressed when either the individual transgresses the norm (often shame), or observes others do so (often anger; Henrich and Henrich 2007: 65). Reaction to violations committed by others can include punishment, as discussed below.

Inter-group competition In order for cultural group selection to operate, there must be limited behavioural variation within the group, significant variation in cultural traits between groups, and inter-group competition. Limited variation exists within the group because of conformist transmission (whereby individuals copy the most common behaviour in the population; Henrich and Boyd 1998) and by individuals learning to avoid punishment through the adoption of behavioural practices that follow the norms (Chudek and Henrich 2011: Box 2). Conversely, there is significant variation in population-level behaviours between groups, which reflects variation in group norms (e.g., Henrich et al. 2005; c.f. Lamba and Mace 2011).

Inter-group competition will then favour groups with social norms that increase group success, i.e., more cooperative norms. Inter-group competition can take many forms. The most direct form of competition is warfare (Zefferman and Mathew 2015); the pressure for norms that promote in-group solidarity and the ability to defend against others is significant when group elimination or assimilation are possible. Other forms of competition include demographic production, imitation, or migration (Chudek and Henrich 2011). Imitation of more successful groups is also seen as a form of non-violent competition (Henrich 2017: 172–175).

Cultural group selection implies that groups with more cooperative norms spread at rates greater than groups with less cooperative ones (Boyd and Richerson 2009). By way of example, proponents of cultural group selection cite the case of the Nuer expanding at the expense of the neighbouring Dinka during the nineteenth century in Sudan (Kelly 1985). Differences in norms meant the Nuer were able to form larger, more cooperative groups. The Nuer out-competed the Dinka, occupying their territories, and assimilating tens of thousands of Dinka into their communities. This shows how inter-group competition acting on persistent cross-cultural variation can result in the replacement of groups. Over time, successful social norms rapidly proliferate, and neighbouring groups become extinct (Soltis et al. 1995).

Punishment Norms sustain in-group cooperation through a predisposition to cooperate with other in-group members and to punish those who violate the norms of cooperation (Gintis et al. 2003). Punishment is individually costly, a behaviour known as "altruistic" or "costly" punishment, or "strong reciprocity" (Gintis et al. 2003). Individuals punish even when the costs incurred are not likely to be recouped, i.e., in one-shot interactions, which is found across a wide range of experimental work (e.g., Bernhard et al. 2006; Fehr and Fischbacher 2004; Marlowe et al. 2008). Ethnographic accounts of punishment, such as gossip, ostracism, and homicide, are used as examples of real-world punishment (Boehm 1999), although some contest this interpretation by querying whether individually costly punishment is common in small scale-societies (e.g., Baumard 2010; Guala 2012). As societies increase in size, punishment is "out-sourced" to elected leaders and formal institutions with vested authority, through the development of moralising religions, laws, police forces, and judicial processes (Henrich et al. 2010a; Ostrom 1990).

Punishment has been shown to be affected by group membership and inter-group competition. Experiments show that cooperation directed towards the in-group is accompanied by a preference to punish deviant behaviour among both real-world groups (e.g., Bernhard et al. 2006; Goette et al. 2006; Marlowe et al. 2008) and artificial groups (e.g., Delton and Krasnow 2017; Fehr and Fischbacher 2004; Jordan et al. 2014). Punishment is prevalent in situations of inter-group competition, where punishment deters individuals from non-cooperation; failure to cooperate may result in group failure in inter-group contests. Evidence comes from raiding parties among the pastoralist Turkana of East Africa, where a failure to participate in raiding parties results in punishment (Mathew and Boyd 2011), and from Israel, where a lack of cooperation is more readily punished during wartime compared to peacetime (Gneezy and Fessler 2011). Punishment is thus a key aspect of cultural group

selection, alongside internalised norms and inter-group competition.

1.2.3.3 Bounded generalised reciprocity

Humans condition cooperation on whether they expect direct or indirect benefits (e.g. Dal Bó 2005; Delton et al. 2011; Milinski et al. 2002). In other words, the mechanisms of direct and indirect reciprocity can favour cooperation (Section 1.2.2.1). As interactions are more likely among in-group members than out-group members, in-group bias may arise because of the greater expectation of future interaction and maintenance of reputation within the group. This forms the basis of the theory of bounded generalised reciprocity (Yamagishi et al. 1999).

Bounded generalised reciprocity assumes that human groups provide a container for a "generalised exchange network" of cooperation (Yamagishi and Kiyonari 2000). Specifically, bounded generalised reciprocity states that individuals have a general, i.e., non-personal, belief that in-group members will cooperate, are motivated to establish a positive reputation within the group, and respond to cues of group membership, which activates a heuristic to cooperate with in-group members (Yamagishi et al. 1999).

In other words, groups are based on a system of predominantly indirect reciprocity. Individuals cooperate in order to gain and maintain a positive reputation within the group, so that they receive future benefits from other members (Mifune et al. 2010). A negative reputation would result in exclusion from potential cooperative interactions. Cues of shared group membership increase trust, reputational concerns, and cooperation (e.g. Mifune et al. 2010; Yamagishi and Mifune 2008, 2016). Conversely, cues of different group membership have little effect on cooperative behaviour, as there is little potential for reciprocity and reputation formation (e.g. Yamagishi and Mifune 2009).

A range of experimental studies support the theory of bounded generalised reciprocity (reviewed in Balliet et al. 2014; Yamagishi and Mifune 2016). For example, Karp et al. (1993) showed cooperation is conditional on interdependent payoffs among individuals. When earnings were influenced by the decisions of other participants, i.e., were interdependent, there was cooperation. When earnings were fixed, cues of reciprocity and reputation building were removed, and cooperation declined. Cooperation also decreases when the group membership is hidden from the recipient — which again removes the possibility for both reciprocity and the formation of a positive reputation (e.g. Mifune et al. 2010; Ockenfels and Werner 2014; Yamagishi et al. 1999). A recent meta-analysis of 212 studies spanning four decades of empirical research found that in-group cooperation was mostly a product of indirect reciprocity, with interdependence resulting in greater in-group bias, again supporting bounded generalised reciprocity (Balliet et al. 2014).

In sum, bounded generalised reciprocity is an evolutionary perspective on in-group bias that differs from parochial altruism and cultural group selection as it does not rely on inter-group competition. In-group bias arises even in situations of no conflict (e.g. Yamagishi and Mifune 2009). This means inter-group competition may not be required to explain bias (De Dreu and Balliet 2016). Thus, bounded generalised reciprocity does not necessitate group selection, and is an alternative

account of the evolution of in-group bias to the other two theories.

1.2.3.4 Social identity theory

Social identity theory states that a suite of emotions and behaviours that favour the in-group are caused by three components: categorisation, identification, and comparison (Chen and Li 2009; Everett et al. 2015a).[2] Categorisation is the labelling of individuals as those from either the same group, "us", or from a different group, "them". Identification is the association of an individual with a specific group, i.e. a social identity derived from a sense of belonging to a collective. Comparison is the process by which an individual compares their group with another group.

Comparison with another group can cause in-group bias when the individuals engage in actions designed to change the standing of their group relative to the other group. This strategy is known as social competition, and is one way individuals can differentiate between groups and promote a positive social identity and "positive distinctiveness" between the groups. Different strategies are available, dependent on the specific groups (see summary in Böhm et al. 2018). Related to this comparison process is the metacontrast principle (Turner et al. 1987), which states that in-group bias requires the presence of an out-group in order to trigger inter-group comparisons. In the absence of an out-group, differentiation between the in-group and the out-group is not possible.

In general, social identity theory refers to the psychology motivating the suite of attitudinal, cognitive, and behavioural outcomes where the in-group is favoured over the out-group (Hewstone et al. 2002). Cooperation has also been investigated as an outcome of social identity (e.g., Chakravarty et al. 2019; Chen and Li 2009; Simpson 2006). The prominent view is that social identity increases in-group bias in cooperation as individuals care more for the welfare of in-group members than for that of outsiders, with the individual perceiving their own and their group's welfare as interchangeable (Chen and Li 2009). An extension points to the effect of identity causing individuals to both maximise in-group outcomes and minimise in-group differences (Simpson 2006).

Any mechanism discussed in Section 1.2.2.1 could explain cooperation under social identity theory. Brewer and Caporael (2006) suggests a role of group selection, but also suggests in-group cooperation is a byproduct of inter-group differentiation which would not require direct, inter-group conflict. Recent analyses suggest that most of the results driven by social identity theory are better explained by bounded generalised reciprocity (Balliet et al. 2014). This is because a salient out-group is not necessary to give rise to in-group bias, and often interdependence and reputation management are considered by participants in minimal group paradigm experiments (Balliet et al. 2014; Yamagishi and Mifune 2016).

2. Social identity theory was initially developed by social psychologists during the 1970s (Tajfel and Turner 1979; Turner 1975). Following Balliet et al. (2014), I describe social identity theory as the combination of two related perspectives, social identity theory and self-categorisation theory (Turner et al. 1987). Recent perspectives, such as identity fusion (Swann Jr and Buhrmester 2015) provide additional explanatory power, especially for extreme forms of in-group cooperation such as self-sacrifice.

1.2.3.5 Coalitional psychology

Researchers in evolutionary psychology view in-group bias, and related group phenomena such as minimal groups, as the manifestation of an evolved coalitional psychology (Pietraszewski 2013, 2020). A coalitional psychology is a common set of cognitive structures that are specialised to recognise and track individuals that could form good cooperative partners, i.e. allies (Kurzban et al. 2001). Such features of the mind are purported to have evolved in ancestral human environments (Tooby et al. 2006).

The function of a coalitional psychology is threefold (Pietraszewski 2013). First, it has to infer both actual and potential alliance relationships between people. It may do so on the basis of coalitional cues, including visual markers, that predict cooperative behaviour. Note that cues are dynamic, and are updated if the cue no longer reliably predicts behaviour. Second, it has to generate expectations of how such individuals are likely to act and react. Once coalitional cues have been detected, individuals need to make inferences about the behaviour of the ally. Third, it has to initiate and engage in these alliance relationships. In other words, individuals should signal their interest in forming a cooperative relationship. With respect to economic games, this may involve allocating resources to the identified target (e.g., Pietraszewski et al. 2014).

Coalitional psychology is congruent with both social identity theory and bounded generalised reciprocity, as the psychology that values in-group members (social identity theory) is yoked to expectations of future payoffs (bounded generalised reciprocity) (Pietraszewski 2013). Threat and inter-group competition are important mediators of in-group bias; coalitions are required to combat aggregations of out-group members (Pietraszewski 2016; Tooby and Cosmides 2010). However, accounts of coalitional psychology tend not to invoke group selection (Tooby and Cosmides 2010; Tooby et al. 2006). Instead, this account can be viewed as one underpinned by (in)direct reciprocity (see Section 1.2.2.1). The second function of a coalitional psychology — to generate expectations of how individuals will behave — indicates that cooperation is conditional on future interactions. Under the purported ecological environment of ancestral humans, the probability of re-encountering others was sufficiently high that a predisposition to cooperate evolved in order to foster long-term beneficial relationships (Delton and Krasnow 2014; Krasnow et al. 2013). In these environments, humans might have also developed a free-rider detection module in order to avoid costly interactions (Tooby et al. 2006).

1.2.4 Ultimate and proximate factors mediating in-group bias

The theories described in Section 1.2.3 above explain the evolution of in-group bias in cooperation among humans. The basic logic of each theory describes the emergence of in-group bias, which is broadly assumed to be the only outcome. However, variation in the strength of in-group bias has been long been recognised (e.g., Brewer 1999; Cashdan 2001; LeVine and Campbell 1972). Contextual features might increase in-group bias (Böhm et al. 2018; Hruschka and Henrich 2013).

Furthermore, it is not always the case that in-group bias is the outcome of group interactions (Dovidio and Banfield 2015; Pisor and Surbeck 2019; Robinson and Barker 2017). For example, if there is increased out-group cooperation (relative to in-group cooperation), the result is less in-group bias.

Here I discuss two ultimate factors contributing to variation in in-group bias. These are competition, conceptualised as threat (Section 1.2.4.1), and resource asymmetries (Section 1.2.4.2), following the categorisation in Robinson and Barker (2017). I then focus on proximate effects, relevant to this thesis and to the theories in Section 1.2.3, that mediate in-group bias, namely group identity, inter-group relationship, and social norms.

The term ultimate is used here to refer to particular behavioural strategies that are adaptively responsive to variable conditions, such that the behaviour results in greater inclusive fitness. As described in Section 1.2.3, the term proximate is concerned with mechanisms that underpin behaviour, e.g., a psychological mechanism. See Scott-Phillips et al. (2011) for details on the ultimate-proximate distinction. A useful schema is in De Dreu et al. (2020: Box 1).

1.2.4.1 Threat, competition, and the effect of group identity

One ultimate driver of in-group and out-group cooperation is threat (Robinson and Barker 2017). Threat encompasses inter-group competition, as well as predation and adverse environmental conditions. Threat can be "realistic" or "symbolic" (Böhm et al. 2018). The former concerns a material resource, whereas the latter concerns non-material goods, e.g. moral values. Although the psychological consequences of these forms of threat vary slightly, both result in greater in-group bias — and as they are often interlinked, both forms are typically moderately correlated (Böhm et al. 2018). Important to the discussion here is that one form of threat, competition, can occur at different scales: between individuals within a group, or between groups (West et al. 2006). As such, the scale of competition can range from more "local" to more "global", and can involve as few as two groups, or several groups.

When one group poses a threat to another, such as during warfare, raids, or social competition, individuals often respond by increasing in-group cooperation and reducing out-group cooperation, as predicted by parochial altruism, cultural group selection, and social identity theory (Sections 1.2.3.1, 1.2.3.2, and 1.2.3.4). Accordingly, increased in-group bias benefits the individual as their group is more likely to be successful in contests.

The threat posed by particular out-groups varies, based in part on their interaction history. The level of threat can be approximated by the relationship between groups, which can vary significantly, on a spectrum from negative to positive. For example, political parties often have a rival party (negative relationship), while also forming alliances (positive relationship) based on partly overlapping ideologies. Furthermore, some out-groups are relatively neutral, either because of a lack of enmity, or because the group is unknown. Recent experimental research has shown greater cooperation among out-groups classified as neutral or positive, compared to antagonistic or hostile out-groups (e.g., Diekhof et al. 2014; Doğan et al. 2018; Pisor and Gurven 2018; Silva and Mace 2014). The relationship with a particular

group can change dynamically in response to situational factors such as the level of competition or threat, whether real or perceived (Böhm et al. 2018). For example, in Georgia, residents in regions exposed to ethnic outsiders show higher levels of perceived threat and aggressive behaviour towards out-groups compared to regions exposed to fewer ethnic outsiders (Schaub 2017). Where there is a threat from an out-group, all theories for in-group bias predict an increase in in-group cooperation and/or a decrease in out-group cooperation.

Not only might the degree of out-group cooperation change with increased threat, but the form of out-group cooperation might change in response. A recent proposal is to distinguish between weak and strong parochial altruism (Böhm 2016; Böhm et al. 2018), two qualitatively different behaviours caused by contrasting attitudes. Weak parochial altruism, which arises from a lack of positive attitude towards the out-group, is defined by behaviour directed at the out-group that is neither beneficial nor harmful (Böhm et al. 2018). Strong parochial altruism, which arises from negative attitude towards the out-group, results in harmful behaviour directed at the out-group (Böhm et al. 2018). The difference between weak and strong parochial altruism may be apparent in situations where the relationship between groups differs, with strong parochial altruism more likely among groups that are either currently in competition or generally antagonistic towards each other.

The response to threat is not always increased in-group bias (Robinson and Barker 2017). Threats can promote out-group cooperation when two groups have "some degree of shared interest or interdependence" (Robinson and Barker 2017: 2). The threat involves competition that takes place on a more global scale among larger associations. Increasing out-group cooperation benefits individuals through the reduction of costs imposed by the threat.

Groups can respond to external threats in two ways (Robinson and Barker 2017). Groups might respond to external threats by fusing, which involves the temporary conceptual expansion of the in-group to encompass individuals from both groups. In essence, what was previously out-group cooperation is now in-group cooperation. Alternatively, groups might respond to threats with increased out-group cooperation while maintaining distinct identities. In such cases, the two groups do not behave as additive aggregations of their individual members.

Whether groups fuse or retain group boundaries is mediated by several factors, such as the level of interdependence and group identity effects. Weaker group identity effects can lead to fusion. Groups can combine more easily where there is no strong distinction between in-group and out-group. Stronger group identity effects make group membership more salient, but out-group cooperation can still arise where group identity is multi-dimensional (Smaldino 2019a), i.e. individuals can be members of more than one group.

Group membership is rarely limited to a single group; humans regularly belong to multiple in-groups, a capacity that likely has early origins (Moffett 2013). For example, an Irish atheist man may categorise himself as a member of the groups defined by nationality, religion, and gender. When outwardly expressed, these identities allow for successful cooperation among members of different groups.

Often, group identities are hierarchical, also referred to as nested (Gaertner

et al. 1993). This means that smaller "subordinate" groups are subsumed by larger "superordinate" groups. Nations, for example, are divided into smaller aggregations defined by e.g. regional area. Group identities can also be orthogonal to each other, with little overlap, such as affiliations based on professional and recreational activities.

It is possible for antagonistic subordinate out-groups to share a superordinate identity. For example, Democratic Party and Republican Party supporters are politically opposed but share an American national identity. In other words, out-groups can share a common in-group identity (Gaertner et al. 1993). There is empirical support for the dynamic recategorisation of out-groups into in-groups through a common superordinate identity. Priming a superordinate identity has been shown to encourage cooperation (e.g., Gaertner et al. 1993; Kramer and Brewer 1984). For example, Clinton supporters cooperated with Obama supporters, previously seen as the out-group, following Clinton's concession in the 2008 US presidential race (Rand et al. 2009b). In this case, the in-group was expanded beyond "Clinton supporter" to encompass all Democrats. Such superordinate identities can even extend to global communities (e.g. Buchan et al. 2011, 2017).

In sum, the effect of threat on in-group and out-group cooperation is complicated by contextual factors. Threat at a local level between two particular groups tends to lead to increased in-group bias. Conversely, threat at a more global level, where multiple groups are involved, might lead to increased out-group cooperation. In both cases, group identity effects mediate in-group and out-group cooperation. With threat at a local level, the degree and form of cooperation is influenced by the recognition of particular out-groups and their associated threat. With threat at a more global level, out-group cooperation can be facilitated by a shift to a broader "superordinate" group identity common among specific groups.

1.2.4.2 The effect of resource asymmetries on inter-group interactions and norms

Another ultimate driver is the acquisition of resource-related benefits (Robinson and Barker 2017). Often, different groups have access to particular resources that vary, both temporally and spatially (Pisor and Surbeck 2019). When groups can acquire different amounts and/or types of resources, exchange is possible, leading to increased out-group cooperation. This is exemplified by inter-group trade, which has been present throughout human history.

Exploitation, at both the individual and group level, remains possible under these inter-group interactions (Robinson and Barker 2017). How can exchange be ensured, and individuals from one group not gain an advantage by taking a resource but not giving one? Two pertinent mechanisms reduce exploitation. One is repeated interactions between individuals from different groups (Robinson and Barker 2017), leading to long term inter-group relationships. Another is the development of "cultural institutions", or norms, promoting cooperation (Pisor and Surbeck 2019).

With repeated interactions, individuals can learn, directly or indirectly, about the reliability of others, whether at the group level or at the individual level (Pisor and Gurven 2016, 2018). Individuals can then choose interaction partners, who

might be any from a specific, reputable out-group, or specific individuals within an out-group. Likewise, unreliable partners can be avoided. In essence, reciprocity maintains (out-group) cooperation (see similar discussion in Section 1.2.3.3).

The logic of repeated interactions between groups has led to the proposal of unbounded indirect reciprocity (Romano et al. 2017) as an extension to bounded generalised reciprocity (Section 1.2.3.3). In unbounded indirect reciprocity, reputation management is not limited to the in-group, so the (indirect) benefits of cooperation can transcend group boundaries. Indirect benefits here are those garnered by future cooperation from unknown others, based on a positive reputation (Section 1.2.2.1). Recent experimental evidence from the field shows that group- and individual-level reputation can led to cooperation between out-group members (Pisor and Gurven 2016, 2018). For example, among three populations of Bolivian horticulturalists, allocation of money to out-group strangers was greater if the out-group showed more market integration, and if specific individuals were perceived to be trustworthy (Pisor and Gurven 2018).

Another proximate mechanism that ensures the benefits of out-group cooperation are maintained is norms and similar cultural codes (Pisor and Surbeck 2019). Norms act as "external commitment devices that enhance the reliability of extra-community partners and re-purpose these relationships to additional ends" (Pisor and Surbeck 2019: 218). Rituals, as a cultural practice, can reinforce relationships, by establishing interdependencies among groups and expectations of reciprocity — Pisor and Surbeck (2019) provides an example of the *hxaro* exchange among the San, which establishes reciprocal exchange over long periods of time (see Wiessner 2002). Rituals can also engender feelings of social closeness between groups. Thus, norms can maintain out-group cooperation (Bunce and McElreath 2017).

Cultural group selection tends to focus on norms that promote cooperation within groups (Section 1.2.3.2), but it is possible that norms promote cooperation between cultural groups, especially where there is a degree of overlap between them (Handley and Mathew 2020). For inter-group cooperation to be stable, especially under conditions where such out-group cooperation is infrequent and thus susceptible to exploitation, or where the group relationship is particularly valuable, it might be that humans punish violators for defecting on out-group members (Fearon and Laitin 1996). Whether this is a feature of the norm psychology discussed under the rubric of cultural group selection is a possibility that could be explored in greater detail.

The potential to establish between-group norms and distribute benefits might influence the default form of out-group cooperation. Again, the classification of weak vs. strong parochial altruism above is a useful concept for predicting the level of out-group cooperation based on group relationship (Böhm et al. 2018). Where there is currently a neutral relationship, the possibility of future trade might favour behaviour that does not harm, to prevent the formation of an intractable antagonistic relationship. Then, mutually beneficial out-group cooperation in the form of trade establishes a positive relationship, which favours continued cooperation, potentially in domains other than trade. Of course, there are reciprocal connections between out-group cooperation and inter-group relations (Dovidio and Banfield 2015), such that it should be considered a dynamic process. The level of out-group cooperation

and the relationship between groups likely fluctuates over time, with factors such as threat potentially leading to a breakdown in relations and reduced out-group cooperation (Section 1.2.4.1). Interdependence structures between groups can tip the balance from peace to violence (De Dreu et al. 2020).

In sum, the stochastic or deliberative emergence of groups able to gain different resources has resulted in the possibility of sharing these gains. Under increased inter-group contact and trade, the reputations and expectations of particular out-groups and/or out-group members can serve to maintain out-group cooperation. These can be supplemented by norms that promote cooperation between particular out-groups.

1.2.4.3 Theoretical contextualisation of research questions

I have discussed the ways in which in-group and out-group cooperation might change in relation to ultimate reasons such as the level of threat (Section 1.2.4.1) and resource asymmetries (Section 1.2.4.2). Furthermore, I have shown that the degree and form of cooperation in group contexts is mediated by the effects of group identity, group relationship, expectations of reciprocity, and social norms. I return to the aims of this thesis to map out the research questions in greater detail.

The first research question is: *Does increased competition result in greater in-group bias?* I expect there to be an increase in in-group bias (due to increased in-group cooperation and decreased out-group cooperation) during periods of intense competition vs. periods of less intense competition. This is informed by literature that emphasises competition as a selection pressure in the emergence of in-group bias (Sections 1.2.3.1 and 1.2.3.2), as well as a potential proximate driver (Section 1.2.4.1). Competition here is between two groups at the same scale. Experiment 1 (Chapter 3) deals with this question.

The second research question is: *What role does group relationship have on cooperation?* Group relationship mediates the form of out-group cooperation, so under the rubric of weak vs. strong parochial altruism, we might expect behaviour towards neutral out-groups to be neither beneficial nor harmful, and the behaviour towards antagonistic out-groups to be harmful (Section 1.2.3.1). This classification is addressed by experiment 1 (Chapter 3) and experiment 2 (Chapter 4). In experiment 2 (Chapter 4) I also assess whether different norms for in-group and out-group cooperation are sustained by third-party punishment, focusing on whether out-group cooperation is permissible contingent on the relationship between groups (Sections 1.2.3.2 and 1.2.4.2).

The third research question is: *Does competition with a third party reduce in-group bias?* In other words, can a common enemy induce out-group cooperation? Where there is threat, in the form of competition with a third party, groups might unite, mediated by group identity effects whereby individuals from subordinate out-groups share a superordinate in-group identity (Sections 1.2.3.4 and 1.2.4.1). I attempt to answer this question with experiment 3 (Chapter 5).

1.2.5 Measuring in-group bias in cooperation with economic games

Our understanding of cooperation reviewed in Chapter 1 has been informed by behavioural economic games, henceforth economic games, which quantitatively measure cooperation and other aspects of prosocial behaviour. Economic games have roots in economics and psychology (historical overviews are provided in Camerer 2003; Hertwig and Ortmann 2001; Pruitt and Kimmel 1977) and are a staple experimental tool across the social sciences, including evolutionary anthropology (Pisor et al. 2019).

Essentially, economic games involve people making real choices about how to distribute resources, such as money. A general result is that participants regularly distribute resources to others, i.e., they cooperate. To gauge in-group bias in cooperation, participants are aksed to distribute resources between themselves and others who are members of the same in-group vs. others who are members of a different out-group; the relative difference is a measure of bias. Table 1.1 collates a set of standard economic games from the arsenal available to social scientists, thanks to research over the past 50 years. Some of these have been adapted for use in this thesis.

Often economic games are conducted in laboratory settings, which trades external validity, i.e., how well results generalise to other contexts, in exchange for control over variables of interest, such as whether decisions are private or public. However, the standardised and abstracted procedure of economic games means they can be conducted in real-world settings among a variety of populations — known as field experiments (Harrison and List 2004) — which allows for comparison across different environmental, social, and cultural contexts (e.g., Henrich et al. 2005; Purzycki et al. 2016). Social scientists have increasingly adopted field experiments (see recent reviews in Baldassarri and Abascal 2017; Gneezy and Imas 2017; Pisor et al. 2019).

Field experiments employing economic games are now common in evolutionary anthropology, applied both within groups (e.g., Apicella et al. 2012; Cronk 2007; Gerkey 2013; Gervais 2017; Gil-White 2004; Gurven and Winking 2008; Lamba and Mace 2011; Lesorogol 2007; Lesorogol 2005; McNamara and Henrich 2017; Paciotti and Hadley 2003; Thomas et al. 2018; Tracer 2003; Wiessner 2009) and between groups (e.g., Gil-White 2004; Lang et al. 2019; Pisor and Gurven 2018; Ruffle and Sosis 2006). Motivated by other evolutionary anthropologists who have uncovered prosocial behaviour "on the ground" through field experimentation, I adopted similar methods to understand in-group bias in cooperation. Of course, economic games are not the only tool available to researchers interested in cooperation and/or in-group bias (see Böhm et al. 2018).

In the following sections, I aim to introduce economic games as a methodological tool for studying cooperation (Section 1.2.5.1). I then discuss how field experiments enrich our understanding of in-group bias in cooperation (Section 1.2.5.2), while highlighting some strengths (Section 1.2.5.3) and weaknesses (Section 1.2.5.4) of this approach. I conclude with a justification for using field experiments (Section 1.2.5.5).

Table 1.1: A selection of economic games commonly used in the study of cooperation[1]

game (abbreviation)	reference[2]	description
dictator (DG)	Kahneman et al. (1986)	one participant (the dictator) unilaterally decides how to divide an amount of money with a second participant (the recipient); the dictator can allocate any amount, and the recipient must accept this amount
public goods (PGG)	Hardin (1968)	n participants (typically, $n = 4$) in a group each decide how much money to contribute to a common pot; the total contributed amount is multiplied by a factor x ($1/n < x < 1$) and then redistributed equally to all participants
third-party punishment (TPPG)	Fehr and Fischbacher (2004)	one participant (first party) decides how to divide an amount of money with a second participant (second party); a third participant (third party) observes this decision, and can punish the first party; punishment involves both the first and third party losing money (typically, a ratio of 3:1); the second party receives the initial division
trust (TG)	Berg et al. (1995)	one participant (the investor) decides how much money to send to another participant (the trustee); the proportion sent will be multiplied, and the multiplied amount given to the trustee; the trustee then must send back a proportion to the investor
ultimatum (UG)	Güth et al. (1982)	one participant (the proposer) decides how to divide an amount of money with a second participant (the responder); the responder can either accept or reject the proposed split; acceptance means both participants receive the allocated money, while rejection means both participant receive nothing

[1] I have selected games that are either used in this thesis (DG, PGG, TPPG) or mentioned in the literature review (TG, UG). All games can measure in-group bias by comparing decisions made when participants are from the same in-group vs. different out-groups. Table adapted from Everett et al. (2015a).

[2] First documented use of the game.

1.2.5.1 What do economic games measure?

Prosocial behaviour in economic games may arise due to individual preferences or beliefs (Camerer 2003; Everett et al. 2015a). Preferences refer to a person's tendency towards certain behaviours and outcomes in a given context based on the expected rewards of those outcomes. People have both self-regarding preferences and other-regarding preferences. The latter means that an actor considers how a decision benefits its recipients, as part of the actor's reward function. "Consideration" need not be deliberative, as individuals may have an intuitive disposition or internalised motivations to benefit others (Rand et al. 2014).

Beliefs refer to the expectations that people have about uncertain outcomes in an economic game (Camerer 2003). While preferences refer to the motivations of the actor, beliefs focus on the other player and the context of the game. If, for example, people expect to receive future benefits from the other player, then they strategically cooperate (Blanco et al. 2014; Fischbacher and Gachter 2010). Where there is no advantage to be gained from acting prosocially, individuals will not cooperate.

It is difficult to parse the effects of preferences and beliefs, as both likely influence behaviour in the real world (Everett et al. 2015a). However, economic games vary in how indicative they are of preferences vs. beliefs. The dictator game (Table 1.1), where a player unilaterally transfers money to another, is indicative of preferences. In the public goods game (Table 1.1), where multiple players contribute to a pool which is shared by all, beliefs play a role because individuals will contribute based on how much they expect others to.

Notwithstanding the various strengths of economic games, they are not without criticism. Detractors question whether the results are an artefact of the constraints and artificiality imposed by the game. As such, does an individual who behaves prosocially in an economic game behave the same in real life? I parse this question into two criticisms, one more general and one specific to how economic games are conducted.

The first criticism focuses on the interpretation of economic games, particularly those conducted in one-shot and anonymous settings (Hagen and Hammerstein 2006). Human interaction is rarely one-shot and anonymous, and was unlikely to have been so throughout most of human history (Tomasello et al. 2012). If humans did not evolve to interact with others through the anonymous, one-shot encounters of most economic games, there is little reason to expect that players would be adapted to successfully maximise monetary utility under such conditions (Delton and Krasnow 2014; Trivers 2004). One-shot cooperation in anonymous settings may be a by-product of a psychology designed to establish long, beneficial relationships (Burnham and Johnson 2005; Delton et al. 2011). This criticism both questions whether one-shot games capture anything evolutionarily relevant, and also supports accounts of cooperation based on reciprocity vs. group selection. The criticism also speaks to the need to develop games that are more realistic by including genuine interaction partners (e.g., Gervais 2017) or contextually relevant frames (e.g., Cronk 2007). There is also an issue with comprehensibility. Answering standard control questions correctly, contrary to the assumptions in previous studies, does not guarantee understanding (Burton-Chellew et al. 2016). This raises the same question,

namely which aspects of human sociality are these games actually measuring?

The other criticism is that economic games are unnatural and unrepresentative of human behaviour because most experiments are conducted in the artificial setting of the laboratory and rely on student populations. As such, findings from laboratory experiments may not be externally valid — results do not generalise to other situations in the real world — nor ecologically valid — games do not map onto naturalistic settings (Gervais 2017; Levitt and List 2007a, 2007b; Pisor et al. 2019). The lack of either type of validity arises from participants playing the game with a windfall under the scrutiny of the experimenters, and with other participants that differ from the groups of people with whom they interact in real life (Levitt and List 2007b). Furthermore, most experiments in the laboratory are conducted with samples composed of university students concentrated within Western, educated, industrialised, rich, and democratic societies (WEIRD; Henrich et al. 2010a). WEIRD students represent a particular set of cognitive skills and tend to come from similar cultural backgrounds. In order to make generalisations about human behaviour — often the goal of evolutionary research — a less homogeneous and more representative sample of human behaviour is required (Gurven 2018; Rad et al. 2018).

1.2.5.2 Exporting economic games to the field

One manner in which researchers can alleviate concern surrounding the generalisability of their results is to conduct field experiments — economic games conducted outside the laboratory with participants from non-student populations (Harrison and List 2004). Field experiments exist on a continuum of "fieldness" with some experiments being closer to laboratory experiments and others approximating observational research (Gerber and Green 2012). As such, the precise definition of a field experiment varies. For example, Gneezy and Imas (2017: 3) define a field experiment as one that is "conducted in naturalistic environments and typically use[s] a non-student population that is not aware that their decisions are being studied". The definition provided by Baldassarri and Abascal (2017: 43) is "a data collection strategy that employs manipulation and random assignment to investigate preferences and behaviours in naturally occurring contexts". Here, a field experiment refers to an economic game played with non-student participants in situ. The literature also calls this type of field experiment a "lab-in-the-field" (e.g., Schaub 2017), "naturalistic" (e.g., Silva and Mace 2015), or "artefactual field" (e.g., Harrison and List 2004) experiment.

Over the past 20 years, field experiments have been increasingly employed across social science disciplines to understand both the universal patterns of human cooperation and the factors that influence variation in prosocial behaviour, such as market integration, religion, demography, and ecology (Ensminger and Henrich 2014; Henrich et al. 2004; Lamba and Mace 2011; Purzycki et al. 2016). The pioneering research by Henrich et al. (2004) is an early example of systematic field experimentation at an ambitious scale (details of this project and subsequent studies by anthropologists and economists can be found in Ensminger and Henrich 2014).

Since then, field experiments have been conducted at large scales within societies

(e.g., across villages in Northern India; Lamba and Mace 2011) with adjustments to the experimental design and procedure to ensure contextually relevant behaviour is captured (e.g., the Hadza play games with honey sticks; Apicella et al. 2012; Saami reindeer herders play games with petrol; Thomas et al. 2015). Economic games have undergone significant elaboration in order to tap into different aspects of prosociality (Pisor et al. 2019). For example, recipient identity-conditioned heuristics (RICH) games involve participants playing standard economic games with photos of other individuals in the participant's social network in order to assess the confluence of inter-individual relationship and cooperation (e.g., Gervais 2017).

1.2.5.3 Strengths of field experiments

Field experiments alleviate the issue of laboratory experiments being unrepresentative of human cooperation, because they are often conducted with non-student populations, often in non-WEIRD societies, as demonstrated by the above studies by Ensminger and Henrich (2014) and Henrich et al. (2004). However, field studies in WEIRD societies are also appropriate: evolutionary theory is applicable to understanding cooperation in all human systems. Cooperation in wealthy, urban environments in Western countries can be studied, as among middle- and upper-class Chaldeans in the United States (Henrich and Henrich 2007). The benefit of field experiments is therefore samples that are not predominately student (Gurven 2018).

Field experiments can assess the impact of variables of interest on prosocial behaviour by making use of the natural variation that exists between and within settings and societies. Knowledge of variation often comes from an ethnographic understanding of the societies in question (e.g., Lesorogol 2005). To quantify the impact of market integration on cooperation, Henrich et al. (2010a) compared 15 societies that varied in their level of market integration, ranging from hunter-gatherers in Papua New Guinea (the Au) with little market integration, to fully integrated wage workers in Missouri, United States. To measure the impact of exposure to out-groups on cooperation, Schaub (2017) compared decisions in villages in Georgia with a high percentage of inter-ethnic mixing to those with little inter-ethnic exposure. Variables of interest vary naturally in field experiments, in contrast to laboratory experiments where variables are exogenous, i.e., artificially manipulated by the experimenter. As such, laboratory results may be artefacts of the game and may not generalise to the field (Guala 2012).

It has been noted for some time that the widespread finding of in-group bias in cooperation is due to both the laboratory settings and the use of artificially induced minimal groups. In-group bias therefore might be a weak effect that gets swamped by other biases in the context of more realistic situations, as pointed out by Gil-White (2004: 174):

> "The putative importance of the in-group favouritism finding in minimal groups depends on its being informative about the real world, where people play for real stakes and within real social categories (...). But if the real world swamps what can be obtained only in the exotic

> environment of the lab, then this literature is hardly useful for explaining real discrimination and intergroup conflict."

Looking to the literature, the majority of studies are conducted in the laboratory: in the review of the experimental literature on parochial altruism by Rusch (2014), only 20 out of 96 (20.8%) reviewed experimental papers were conducted in the field. Research in the laboratory tends to adopt minimal groups, and these likely do not reflect real-world situations: ""minimal groups" will miss important aspects of real groups and [...] they will be misleading when translating results from such laboratory experiments to the field" (Goette et al. 2012: 102). More recently, Pisor et al. (2019) and Pisor and Surbeck (2019) point to limitations of existing research methods that fail to capture interactions between natural groups, which results in creating a picture of humans as perennially parochial. The recommendation is that "field researchers working with living humans ask about relationships that span community boundaries when collecting qualitative and quantitative data" (Pisor and Surbeck 2019: 218).

The different degrees of contact within and between communities plays a vital part in the differential treatment of in- and out-group recipients, such that participants attune to certain characteristics of recipients. For example, Thomae et al. (2012) found that, across two different villages in Cameroon, in-group bias was affected by the village and sex of the recipient, and not the ethnic group membership alone, with the effects of village and sex driven by the degree of inter-group contact, as opposed to ethic group membership per se.

In sum, field experiments, conducted in genuine settings and using natural groups, alleviate the possibility that in-group bias does not generalise outside the laboratory to the real world, and provide insights into the situational and contextual factors that accentuate or dampen in-group bias.

1.2.5.4 Weakness of field experiments

Of course, field experiments are not a comprehensive cure for issues of generalisability and artificiality. The issue of external validity does not disappear with field experiments; a single field experiment is not any more externally valid than a single laboratory experiment (Baldassarri and Abascal 2017). A field experiment is naturally highly contextual, as the setting and population arise from historical processes or cultural parameters which cannot be controlled by the experimenter. For example, Henrich et al. (2005) found that extremely cooperative behaviour was not accepted in Papua New Guinea (in contrast to 14 other societies). Here, "hyper-fair" offers were often rejected. This mirrors the local custom of gift exchange. If gifts are accepted, the recipient is bound to future exchanges (Bolyanatz 2014; Tracer 2003; Tracer et al. 2014).

Field experiments are said to capture contextually relevant behaviour, but this will vary with the type of game and the framing of the game (Chibnik 2005; Cronk and Wasielewski 2008). In some cases, it may be that a standard game conducted in the field reflects a local practice or institution. For example, the pastoral Orma of Southern Kenya spontaneously recognised a public goods game as

similar to *harambee*, a local community-driven fund-raising initiative (Ensminger 2004). While this shows a potential advantage of field experiments — a game may be representative of real-world behaviour — this will very much depend on the choice of game and how the game is presented. Among the same Orma, the ultimatum game had no cultural relation, and thus associations may be incidental. Thus, when choosing a game for a field experiment, it is important to understand the study population to ensure contextually relevant behaviours are elicited.

Presentation and framing are also very important. Lesorogol (2007) compared decisions made by the Samburu, pastoralists of Northern Kenya, in a contextualised dictator game (framed so that monetary divisions represented amount of meat shared) vs. an uncontextualised dictator game (with standard monetary divisions). Results differed, with greater divisions in the uncontextualised game. Similarly, Wiessner (2009) found that decisions in abstract experiments did not match behaviours seen in the real world. Such criticisms have been levied at experiments in general, where the one-shot, anonymous interactions of games are unlikely, particularly in small-scale communities (e.g., Burnham and Johnson 2005; Hagen and Hammerstein 2006). Thus issues of artificiality, induced by the game, and by extension generalisability, arise in field experiments.

Finally, there are significant practical considerations that constrain field experimentation. Establishing a field site requires a significant investment of time. An extended period of fieldwork before conducting experiments is often necessary to build contacts in the field — either to gain permission from local leaders or to hire research assistants — and gain the trust of local communities (Henrich et al. 2004). Protocols — which have been predominantely refined for studies involving WEIRD students — may not be sensitive to cultural differences in skills, motivations, and expected modes of social interaction when exported to other contexts (Hruschka et al. 2018b). Experimental designs therefore need to be sensitive to local considerations (requiring intimate knowledge of the field site) and may require multiple testing (e.g., Gil-White 2004; Hruschka et al. 2018b), which needs to be weighed against exhausting the participant pool in small-scale communities. Conducting a field experiment is therefore a more laborious and uncertain process then running a laboratory experiment.

It remains an open question whether, or to what extent, field experiments better capture real-world behaviour. Comparing laboratory and field experiments adopting the same games has found similarities (Camerer 2011; Falk and Heckman 2009) and differences in prosocial behaviour (Levitt and List 2007b; Voors et al. 2012). Studies comparing laboratory or field experiments with real-world behaviours show conflicting evidence (evidence for an association, e.g., Benz and Meier 2008; Cárdenas et al. 2013; Fehr and Leibbrandt 2011; evidence for a lack of association, e.g., Galizzi and Navarro-Martínez 2018; Gurven and Winking 2008; Hill and Gurven 2004; Wiessner 2009; for a comprehensive review see Galizzi and Navarro-Martínez 2018). It should be noted that these are complementary approaches, with dialogue between them: experiments in laboratory settings generate results which inform the design and interpretation of field experiments, and vice versa.

The advantage of real-world populations means field experiments will continue to

be conducted. A recent collection of papers, as part of the 2017 Sackler Colloquium entitled "Pressing Questions in the Study of Psychological and Behavioral Diversity" (Hruschka et al. 2018a), calls on studies of human nature to "devote a greater share of resources to studying a range of diverse, nondominant populations and cultures" and "allocate commensurate effort to assessing generalizability across populations and contexts" (11367). Field experiments, designed with collaborating communities in mind, will assist this endeavour.

1.2.5.5 My approach to field experiments

In this thesis, I use field experiments because of the advantages of non-student populations and more realistic groups and settings. I believe that in order to assess the effects of, e.g., inter-group competition and group relationship (Section 1.2.4), genuine competition and natural groups should be used. The possibility remains that, due to a reliance on laboratory experiments to date, in-group bias in cooperation is a result found mostly among minimal groups, or at least a weak effect that gets washed away by other biases in the context of more realistic situations (Gil-White 2004; Pisor and Gurven 2018). Furthermore, field experiments allow for the investigation of relevant situational factors and local context that enrich our understanding of the strength of in-group bias, the form of in-group and out-group cooperation, and the proximate factors that sustain it.

The research context and design capitalise on some of the strengths of field experiments: I was able to recruit among communities that vary in demographic characteristics, and use the natural variation in the relevant factors described above. As field experiments provide insights into individual real-world behaviour, each decision is an explicit measurement of (in-group bias in) cooperation. The context is one well-suited for investigating in-group bias, as outlined below (Section 1.2.6). I captured contextual behaviour based on my understanding of the fieldsite. I rely on relevant features of the context to explain any null results.

However, I note that the research relied on standard experimental designs, with minor modifications. As such, I traded some ecological validity in order to make results comparable to laboratory studies.

1.2.6 Playing economic games with the *contrade*

The aim of this thesis is to understand how in-group bias in cooperation is affected by inter-group competition, group relationship, and shared identity in a real-world setting. As such, three field experiments were conducted among the *contrade* of Siena, Italy. The *contrade* are 17 territorial communities that divide the city of Siena. They compete in an annual horse race called *palio*.

A brief outline of Siena, the *contrade*, and the *palio* is provided here (Section 1.2.6.1); a full description of the *contrada* system, incorporating insights from my fieldwork, is provided in the next chapter (Chapter 2). I then describe general features of the Sienese context that make it appropriate for investigating the influence of the above factors on prosocial behaviour (Section 1.2.6.2). I then



Figure 1.1: Location of Siena in Italy. The shaded areas correspond to the region of Tuscany (light grey) and the province of Siena (dark grey). Rome, the capital of Italy, and Florence, the capital of Tuscany, are also indicated.

describe how I established the field site and some guiding principles behind the economic games (Section 1.2.6.3).

1.2.6.1 Overview of the study site

Siena, Italy, is a city of approximately 55,000 inhabitants (Comune di Siena 2017). Siena is the administrative capital of the province of Siena. The province of Siena is part of the larger region of Tuscany, whose capital is Florence (Figure B1). The city is divided into the historic city centre, delineated by a fortified wall, and the surrounding conurbation. The resident population in the historic city centre is approximately 10,000 inhabitants (Comune di Siena 2017).

Siena was a powerful republic from the twelfth to the fifteenth century (Bowsky 1981; Hook 1979). During this period, Siena was an economic and artistic centre, as characterised by the presence of the world's oldest bank in continuous operation (*Monte dei Paschi di Siena*, founded in 1472) and the well-known Sienese school of painting (Hook 1979). In 1555, the city succumbed to invasion by the Medici of Florence, and regained autonomy with the Unification of Italy in 1861 (Hook 1979). Today, Siena is a relatively wealthy city and is a major tourist destination: its status as a "medieval city" means the historic city centre is recognised as a UNESCO World Heritage Site (UNESCO WHC, n.d.).

The historic city centre of Siena is divided into 17 small-scale communities that occupy a specific territory, each called a *contrada*. The *contrade* have been described as "neighbourhoods" (e.g. Dundes and Falassi 1984), "districts" (e.g. Pomponio Logan 1978), and "wards" (e.g. Park 1992; Silverman 1979). The *contrade* have been in existence since the medieval period (Savelli 2008).

Contrada membership is typically conferred at birth (see Figure 1.2). The *contrade* form a strong identity among their members, due to continual involvement in the life of the *contrada*, with activities and rituals held throughout the year (Dundes and Falassi 1984; Parsons 2004; see Figures 1.3 and 1.4). The sense of belonging to and loyalty towards the *contrada*, coupled with the territorial boundaries, history, and social life of each *contrada*, have created communities that are commonly referred to, and perceived by the Sienese, as unique cities or even nations: "the city [...] is composed of 17 cities and 17 'popoli', peoples" (Park 1992: 80). The strength and naturalness of the bonds between members means that the *contrada* is regularly likened to a family by *contrada* members (see Section 1.2.6.2).

The most important event in the *contrada* calender is the *palio* festival (Dundes and Falassi 1984).[3] The *palio* horse race is one of a pair of bare-back horse races held every July and August in Siena's central square. The *palio* has also been in existence since the medieval period (Silverman 1979). Ten *contrade* compete in each horse race, each nominating a jockey to represent them, with victory resulting in euphoria among winning *contrada* members. More details of the *contrade* and the *palio* are provided in Chapter 2.

Note that competitive festivals among urban divisions are common throughout the Italian peninsula, particularly Central Italy (e.g., Silverman 1985, 1989). Indeed, there are other noted horse races, such as the *palio* of Asti, of Ferrara, and of Legnano, the latter two also involving territorial communities called *contrade*. One aspect of the *palio* of Siena that separates it from these and other festivals is that it is not a recent revival or creation. For example, the *palio* of Legnano was first run in 1953. Furthermore, the *contrade* of Siena have been in continuous existence for centuries, imbuing them with historical significance. They have been and remain part of the social fabric of the city, unlike many communities involved in other festivals.

1.2.6.2 Suitable features of the study site

Aspects of the *contrada* system make it interesting to use to investigate in-group bias in cooperation, including the strength of group identities, the lack of assortment, the presence of regular social assistance, and the form of inter-group competition. Furthermore, the context provides variation in the three main variables of interest to this thesis: level of competition, group relationship, and level of identity. I outline these features, and because I was motivated to conduct studies before fieldwork, rely on previous ethnographies to describe them.[4] The features were

3. Three related elements are referred to as *palio*: the four-day festival, the horse race that concludes the festival, and the banner that is given to the victorious *contrada*. Throughout this thesis, *palio* means horse race, unless otherwise stated.

4. Scholars have studied the *palio* and the *contrade* for over a century (e.g. Heywood 1899). Since the 1970s, several anthropological interpretations of the *palio–contrada* complex have been produced, notably *La Terra in Piazza* by Dundes and Falassi (1984), which remains the standard ethnographic account of *contrada* life. Other anthropological accounts consider the history of the *contrade* (Park 1992; Silverman 1979), or interpret the *palio* using native views (Pomponio Logan 1978), often focusing on symbolism (Crociani-Windland 2005; Handelman 1998; Parsons 2004). More recent work focuses on changes within the *contrade* (e.g., Boos 2017), or on the manifestation of group relationship in the *palio* (Operti et al. 2020; Sgourev and Operti 2019). There is also avid



Figure 1.2: The birth of a new *contrada* member is announced by placing a flag outside the *contrada* clubhouse, with a ribbon attached. A pink ribbon announces a girl, a blue one a boy. Photograph taken by Adam R. Kenny.

corroborated by my fieldwork (Chapter 2).

General features of the *contrade* The *contrade* have strong group identities. Numerous scholars compare the *contrade* to city-states or nations — "the *patria* is no longer the city but the Contrada" (Heywood 1904: 231) — implying a strong attachment and loyalty to the *contrada* akin to patriotism. As mentioned above (Section 1.2.6.1), kinship terms are often used to describe the *contrada*, such as "second family" (Pomponio Logan 1978: 49) or "extended family" (Park 1992: 82). These identities are reinforced by an array of symbolic markers that delineate each *contrada*, notably their own colour and totemic symbol, but also associations with specific songs and locations within their territory (Dundes and Falassi 1984).

There is no apparent assortment by specific demographic characteristics or

local interest in the *palio–contrada* complex, with many *contrada* members producing historical accounts of life in Siena (e.g. Cecchini and Neri 1958; Filiani and Zaffaroni 2002)



Figure 1.3: *Contrada* members during an annual ritual, in which members parade around the city centre. Men dress in the colours and symbols of the *contrada*. Photograph taken by Adam R. Kenny.

personal preferences. Members of each *contrada* vary with respect to demographic indicators, such as age and sex. Each *contrada* is also composed of individuals of different socioeconomic status and political preference (Dundes and Falassi 1984). The fact that *contrade* encompass different social classes was central to their conception, unlike in other cities where comparable neighbourhoods sprung up (Silverman 1979). As *contrade* are similar in their heterogeneity, these characteristics are unlikely to explain differences between *contrade* in in-group bias in cooperation. The *contrade* are unlike communities that form based on the ideological preferences of their members, such as political parties. The *contrade* all share the same collection of features — each have colours, symbols, etc.— and all *contrade* engage in the same type of activities and the same rituals, just on different days and in honour of different saints.

The *contrade* provide a suitable setting for investigating cooperation, including in-group bias in cooperation, as group boundaries determine prosocial behaviour: "trust and cooperation are developed among *contrade* members united by a common goal



Figure 1.4: Costumed representatives during the *giro* procession. A flag-waver from *Civetta* waves the *contrada* flag (left) and a drummer from *Leocorno* passes in front of the cathedral (right) during the processions analysed in Chapter 2. Photographs taken by Adam R. Kenny.

and identity. Mistrust and aggression are spared from the group by being projected onto its rival *contrade*" (Crociani-Windland 2005: 221). *Contrada* members commit considerable time, money, and effort into the organisation of *contrada* activities that benefit the community and its members. Notably, there are groups responsible for the welfare of younger members, such as the *gruppo piccoli* (lit. "group for little ones", i.e., for children) and *gruppo giovani* (lit. "group for youths", i.e., for adolescents). Commentators note the *contrade* have considerable social capital (Drechsler 2006). Traditions, or normative behaviour, promote fairness — "social interaction among *contradaioli* [lit. "*contrada* members"] is guided by egalitarian forms" (Silverman 1989: 428) — such that the *contrade* can be considered a "community in which there is a high degree of social conformity" (Park 1992: 89).

The *contrade* compete in a pair of horse races every summer in July and August, each called *palio*. The *palio* is referred to as "symbolic" or "ritual warfare" (Pomponio Logan 1978: 60–61). Of course, the *palio* is not actual warfare — there is no lethal violence common to most conceptions of war (see Glowacki et al. 2017). Yet, to *contrada* members, the *palio* is imbued with significance: "the native view of the Palio rejects any definition of it as sport; for the Sienese the Palio is intensely serious, at the center of "real life" and not something apart from it, more akin to war than to play" (Silverman 1989: 232). The source of conflict is not over resources, material or economic. Victory does not result in remuneration, in fact, it

imposes financial costs, mostly on the winning *contrada*, as it has to pay *contrade*, jockeys, and others in deals made before the race (Dundes and Falassi 1984). Nor is the conflict over values, of right or wrong. Rather, the source of inter-group conflict is prestige, with the form of competition largely symbolic: "There is only one winner, one *contrada* that is the strongest and best and demands the most respect" (Pomponio Logan 1978: 57).

Variation in the effects of interest In Siena, there is variation in the intensity of competition between *contrade*, due to each *palio*. The *palio* is intensely competitive, with increased tension between *contrade* often resulting in members engaging in collective physical aggression (Operti et al. 2020). This is in contrast to the rest of the year, particularly the winter, when the level of competition is relatively low. For example, in discussing scuffles and fights that occur in the build-up to the *palio* horse race, Handelman (1998: 123) notes "all such aggressive behaviour [fighting] usually is avoided, apart from the [*palio*] festival". In sum, there is a natural fluctuation in the level and the intensity of competition between *contrade* throughout the year.

The *contrade* share different relationships with each other (Filiani and Zaffaroni 2002). Some *contrade* are reciprocal rivals, whose relationship is antagonistic. Other *contrade* may be allies, a positive relationship. The majority of relationships can be described as neutral, as there is neither rivalry nor alliance. The *palio* is the arena where group relationship is most prominent, as rivals attempt to prevent each other from winning, and allies can be relied upon to curry favours (Sgourev and Operti 2019). However, the influence of group relationship "goes beyond the *palio* itself" (Silverman 1979: 416), with the social identity of an individual's *contrada* providing a "perceptual lens through which to interpret and interact with others, both within and outside of his or her own *contrada*" (Pomponio Logan 1978). In other words, the relationship between *contrade* structures daily life in Siena to a degree, with attitudes and (ritualised) behaviour affected by group relationship, as detailed in Chapter 2. While *contrade* vary in terms of group relationship, in all other respects, including history, nationality, ethnicity, and religion, they are homogeneous. Therefore the effect of out-group relationship, e.g. rival vs. neutral, can be compared without confounding factors.

The *contrade* are located within, and share an intricate history with, the city of Siena. Furthermore, most (but not all) *contrada* members are from Siena. Thus there is a common Sienese identity shared by members, which is superordinate to *contrada* identity. Parsons (1997: 194) uses the phrase *unità nella diversità* (lit. "unity in diversity") to describe the interplay of these distinct levels: "the heart of Sienese identity lies, above all, in a paradoxical 'unità nella diversità' — a passionate revelling in rivalry and faction which, nevertheless, in and of itself, affirms a greater shared identity and sense of distinctiveness as Sienese." Therefore, natal *contrada* members have at least two identities that form nested, hierarchical groups, both of which are broadly determined by relatedness and place: *contrada* identity and Sienese identity.

Together, these features make the *contrade* — symbolically divided groups in a Western, urban environment — an intriguing and appropriate system for

investigating in-group bias in cooperation. *Contrade* are natural groups with strong group identities, but with little difference between them in factors likely to affect cooperation. However, three features of the system vary naturally — inter-group competition, group relationship, and group identity — so that their effects on in-group and out-group cooperation can be studied. For this reason, I undertook fieldwork in Siena, and conducted three experiments with the *contrade* (Chapters 3 to 5).

1.2.6.3 Background information for the fieldwork-based research

In this section I provide background information that applies generally to the fieldwork-based research presented in Chapter 2, and the three field experiments presented separately in Chapters 3 to 5.

Table 1.2: Timeline and supporting information for fieldwork-based research with the *contrade*, 2017–2019

year	period	research elements[1]	*contrade*[2]	approval[3]
2017	February	experiment 1, survey	C08, C11, C16, C05, C06	A
	June–August	experiment 1, survey	C11, C16, C05, C06	A
		experiment 2, survey	C08, C11, C06	B
		attitudes item	*Torre*	A
2018	March	attitudes item	*Civetta*, *Leocorno*	A
	June–August	attitudes item, GPS study	*Civetta Leocorno*	A
		experiment 2, survey	C08, C11, C06	B
		experiment 3	C16, C05	C
2019	June	experiment 1 follow-up	C16	A

[1] Elements shown on the same line were part of the same questionnaire.

[2] *Contrada* names are anonymized, except for the *contrade* participating in the attitudes item and the GPS study; see Section 1.2.6.3 for details. The *contrade* in experiments 1 and 2 and the survey are not consistent between periods; see Chapters 2 to 4.

[3] Reference number for approval by SAME REC. A: SAME_C1A_16_051, B: SAME_C1A_16_052, C: SAME_C1A_16_053.

Table 1.2 provides an overall timeline for the project, together with supporting information, pertaining to data collection. With the exception of a brief stint in May–June 2019, the data collection occurred between August 2016 and August 2018. I was based in Siena for approximately 14 months during this period. Throughout my time in Siena I frequently participated in *contrada* activities and events, at the invitation of *contrada* members. For example, I attended communal meals, assisted with event preparations, and observed annual ceremonies and rituals. During these activities I often engaged in formal and informal interviews and discussion, and observed interactions in a variety of contexts linked to *contrada* life. The insights I gained during these activities strongly inform my interpretation of the research findings. As I am fluent in Italian there were few barriers to effective written and oral communication, and I did not require an interpreter during fieldwork.

Overall, the project focused on in-group bias in human cooperation across three field experiments involving a behavioural economic game to investigate prosocial behaviour among *contrada* members. The three field experiments — labelled experiment 1, experiment 2, experiment 3 — investigate the three features of interest to this thesis, to with the effect of intensity of competition, group relationship, and level of group identity on in-group and out-group cooperation. These features vary in the Sienese context are described above (Section 1.2.6.2).

Furthermore, I obtained information on various aspects of *contrada* life through a survey of *contrada* members. Finally, I assessed the significance of the pattern of relationships among the *contrade* through a psychological item measuring the attitudes of members towards different *contrade*, and by tracking the annual *giro* procession. Taken together, the latter three elements provide a quantitatively informed description of key features of the contemporary *contrada* system. Therefore, they are presented jointly in Chapter 2, and separately from the results of the field experiments.

As an additional demonstration of how group relationship affects behaviour, I also conducted archival research on antagonism during the *palio*. This is summarised in an appendix (Chapter A).

The project was reviewed and approved by the School of Anthropology and Museum Ethnography Research Ethics Committee (SAME REC) at the University of Oxford, across three separate applications (Table 1.2), between July and August 2016. Furthermore, beginning in March 2016, my supervisor and I liaised with the two organizations that represent the *palio* and the *contrade* in external matters, the Consortium (Ita. *Consorzio per la Tutela del Palio di Siena*) and the Magistrate (Ita. *Magistrato delle Contrade di Siena*). In December 2016, following approval from the Magistrate to conduct the research in collaboration with the *contrade*, I approached each *contrada* separately, by delivering a letter addressed to its head. Six responded, resulting in separate meetings with members of the *contrada* leadership between December 2016 and January 2017. Of the six, five agreed to take part in the project, nominating a contact to collaborate on logistics of the studies. The collaborator was a member of the leadership of the *contrada*.

Research participants were members aged 18 years or older of one of these five *contrade* (Table 1.2). Participation was voluntary. The recruitment process for each element is detailed in the relevant chapter. Informed consent was obtained from all participants. Throughout data collection, I endeavoured to minimize disruption to the *contrade*, and to the individuals involved. To this end, I recruited participants from the same *contrada* across the smallest possible number of sessions, and I combined elements if feasible to do so (Table 1.2). For example, the survey questions were administered across three periods, as part of the questionnaire for one of two experimental studies (Table 1.2). Consequently, the survey design reflects, in part, methodological and practical considerations linked to the set-up of the corresponding experiment (e.g. the sample size, the timing of data collection, and which *contrade* were involved in each period).

I note here some details about the methods for the three experiments; full details of the methods for each experiment are in each chapter (Sections 3.2, 4.2,



Figure 1.5: An example of the set-up for the experimental studies. This particular set-up was for experiment 3 (Chapter 5). A research assistant is seated. The image is in black-and-white to prevent *contrada* identity being revealed. Photograph taken by Adam R. Kenny.

and 5.2). Data collection mostly occurred at pre-specified events held in each *contrada*, specifically communal meals organised by the *contrada* and open to all its members. Following discussion with the collaborators, we choose events that were anticipated to be well attended, held in celebration of a particular occasion. These included smaller informal meals held in the *contrade* on a regular basis, as well as larger formal meals that took place during the *palio* festival. I did not note the number of attendees at these events, nor do the *contrade* keep systematic attendance records. However, figures provided by a contact from `C16` (pers. comm., 26 January 2020) for meals held during the summers 2014–2019, indicate that these events attract approximately 50–500 attendees. Recruitment at these well-attended events, as opposed to other events involving fewer members, meant that the sample would come from a larger population of members, and be more reflective of the composition of the *contrada*. While participants were asked to orally confirm their *contrada* affiliation, I excluded from analysese individuals who provided responses that indicated they were not members.

Participants completed the questionnaire privately and individually in a dedicated space within the *contrada*, usually the clubhouse. Multiple participants were allowed to complete the questionnaire at the same time, but they were asked to do so without conferring with one another during and after the process. This was assisted by a privacy board. An example of the experimental set-up can be seen in Figure 1.5, which shows a secluded area within a property of the participating *contrada*, with anonymity ensured by the use of a privacy board.

I was present during data collection, but I faced away from participants while they

made decisions in the experiment, as did research assistants when they were present (see below). Participants were informed, both verbally and through information provided as part of the questionnaire, that their decisions would be anonymous. Names, addresses, or other detailed identifying characteristics were not collected.

Where necessary, I made use of research assistants for the field experiments (Figure 1.5). These were four male postgraduate students, fluent in Italian. All were recruited from the the Department of Political Economy and Statistics at the University of Siena (Ita. *Dipartimento Economia politica e statistica, Università di Siena*). The research assistants were trained in the protocol and followed written instructions, but they were blind to the hypotheses.

I developed a coding scheme to refer to the *contrade* in reporting the work, so as to protect their identity and to preserve the anonymity of participants. Specifically, I randomly assigned each *contrada* an alphanumeric code, composed of the letter `C` followed by a number from `01` to `17`. To maximise comparability, the scheme applies to all elements of the project, and extends to subsequent work with the *contrade*. Across the project, the five *contrade* involved in the fieldwork-based research are `C08`, `C11`, `C16`, `C05`, and `C06`, including *Civetta*, *Leocorno*, and *Torre* (Table 1.2). I use *contrada* names, rather than the alphanumeric codes, if the identity of the *contrade* could be inferred from relevant information, such as the pattern of alliances and rivalries in the attitudes item (Section 2.3.3), or the trajectories of the *giro* procession in the GPS study (Section 2.3.4). Using the alphanumeric codes in reporting these elements would invalidate the coding scheme as a whole.

Such, Reader, is the Palio. And in reviewing its curious mixture of religious rites and purely secular enthusiasms, it is well, not only to remember its origin, but also to bear in mind that, in the words of a modern writer, 'Italy is above all lands the home of human nature'.

— Heywood (1899: 248–249)

2

Inter-group dynamics among the contemporary *contrade* of Siena, Italy

2.1 Introduction

Every summer, thousands of visitors descend on the city of Siena, Italy, to attend the *palio*, a bareback horse race held in the central square. The horses are urged to victory by members of the *contrade*, the communities that make up the city and participate in the event. The race over, and extravagant celebrations underway in the winning *contrada*, visitors may leave Siena with the impression that the *palio* is simply an exciting game for *contrada* members. Yet the *contrada* carries great emotional and symbolic significance beyond the *palio*, structuring social interactions in the city throughout the year.[1]

The *palio* and the *contrade* have received considerable attention across a range of disciplines, including anthropology, history, and sociology (e.g., Boos 2020; Cecchini and Neri 1958; Crociani-Windland 2011; Drechsler 2006; Dundes and Falassi 1984; Handelman 1998; Heywood 1899; Operti et al. 2020; Park 1992; Parsons 2004; Pomponio Logan 1978; Silverman 1979; Solinas 1987; Warner 2004). Overall, this literature has tended to focus on the *palio* rather than on the *contrade* themselves, and it is largely qualitative. For example, Park (1992) includes an insightful discussion of the shifting criteria for *contrada* membership over the twentieth century. However, this account is not supported by estimates of the actual size of the *contrade*, because relevant information is not made available systematically.

The first aim of this article is to provide a primer on the contemporary *contrada* system, drawing on published materials and on recent field-based observations. The primer is supplemented by information we collated on estimates of membership size,

1. We use original Italian terms, italicised for clarity. We limit terms to those unique to the Sienese context, and provide literal translations where appropriate, following Italian rules for pluralisation, such that singular *contrada* (ending with "-a") becomes plural *contrade* (ending with "-e"), and singular *palio* (ending with "-o") becomes plural *palii* (ending with "-i").

and the results of a survey we conducted with multiple *contrade*. The second aim of this article is to provide a systematic description of the relationships between *contrade*, relying on two studies completed during a period of extended fieldwork. One study involved a questionnaire that measured the attitude of *contrada* members towards the *contrade*, the other used GPS devices to track a ritual procession.

The article is divided into three sections. The first is a description of Siena, the *palio*, and the *contrade* (Section 2.2). The second presents the methods, results, and discussion of four elements of our research relating to the *contrade* (Section 2.3). Finally, we discuss broader implications of our research, highlighting the importance of the *contrada* phenomenon and the impact of group relationship on perceptions and behaviour (Section 2.4).

2.2 Siena, the *palio*, and the *contrade*

The primer on the *contrade* is informed by previous accounts, notably Dundes and Falassi (1984). Observations in the literature were corroborated by fieldwork, most of which was conducted by A.R.K. while he was based in Siena for approximately 14 months between August 2016 and August 2018 (Section B3). In this section we refer to interviews held and observations made during this period. We provide some information on Siena and outline the basics of the *palio* phenomenon (Section 2.2.1) before focusing on the *contrade* (Section 2.2.2).

2.2.1 Background to Siena and to the *palio*

Located in the region of Tuscany in central Italy, Siena is a city with a population of approximately 55,000 inhabitants (Comune di Siena 2017). The historic city centre is divided into three areas called *terzi* (lit. "thirds"): *Camollia*, *Città*, and *San Martino*. *Terzi* used to represent important military divisions in the medieval period, but they are currently of limited functional significance (Dundes and Falassi 1984: 29–31). The three *terzi* comprise 17 territories, the *contrade* (Figure 2.1). Two main areas within the city centre are not part of any *contrada* territory: the cathedral (*Duomo*) and the central square (*Piazza del Campo*, including the space occupied by the town hall).

Colloquially, the term *contrada* is used to describe both the territory and the social community composed of *contrada* members. Technically, the *contrada* territory is called *rione* (lit. "neighbourhood"). In this article we use the term *contrada* to refer specifically to the community, and we designate the cathedral and central square as non-*contrada* territories.

The central square is the location of the *palio*, a horse race held every year on 2 July and on 16 August. Each race is the culmination of a four-day festival, also termed *palio*, in honour of the Virgin Mary. In addition to the two "ordinary" *palii*, some years include an "extraordinary" one, to mark a significant event (e.g., the millennium in the year 2000). Detailed information about the festival and the race is in Dundes and Falassi (1984: Chs. 3–6).

The race involves three clockwise laps of the square, lasting approximately 75–90 seconds in total. The victorious *contrada* secures a silk banner, also called *palio*, depicting the Virgin Mary or the significant event (for ordinary and extraordinary *palii*, respectively) (Dundes and Falassi 1984: 19). The *palio* festival is an event heavily imbued with ritual and symbolic significance, and the highlight of the *contrada* calendar (Dundes and Falassi 1984: Ch. 9; Handelman 1998; Parsons 1997; Pomponio Logan 1978; Silverman 1989; Solinas 1987). Emotions are heightened in the days before, and the moments during and after, the *palio*. For example, fights (Ita. *cazzotti*, lit. "punches") regularly occur around the period of the *palio*, when competition intensifies (Drechsler 2006; Operti et al. 2020). The current *palio* format developed in the eighteenth and nineteenth centuries (Dundes and Falassi 1984: 23), but competitive events linked to distinct local groups are documented as early as the twelfth century (Hook 1979: 223). In this article we use the term *palio* to refer specifically to the horse race.

In the days preceding each *palio*, earth brought in from the countryside is laid in the square to form a track, and infrastructure (e.g. viewing stands) is built. Only ten of the 17 *contrade* take part in each event, due to the limited space on the track. The ten *contrade* include the seven which did not participate in the corresponding race the previous year, plus three from the remaining ten drawn at random just over a month before the *palio*.

Horses are provided by local breeders. The *contrade* are randomly assigned a horse through a draw, conducted publicly in the square, four days before the race (Dundes and Falassi 1984: Ch. 3). Jockeys, who are typically professional riders and not *contrada* members, are subsequently hired to ride and represent the *contrada*. A *contrada* assigned a horse perceived to be of higher quality has an incentive to hire a more skilled jockey, who commands higher fees.

Secretive deals (Ita. *partiti*) are often made between *contrade* in the days preceding the *palio*, and/or directly by the jockeys at the starting line, in order to influence the outcome of the race (Dundes and Falassi 1984: Ch. 4). Deals are not publicly recorded, so details are unknown. Generally, they involve the promise of money in exchange for favours during the race. For example, a common tactic is for a jockey to position his horse to block another horse at the starting line. The outcome of the race is likely influenced by these deals, and by variation in skill both among the horses and among the jockeys, as well as by several other factors, including luck. The *palio* is a source of pride and joy for members of the winning *contrada*, and of grief and distress for members of the losing *contrade*.

2.2.2 The contemporary *contrada* system

2.2.2.1 Historical sketch

The *contrade* have a long history, with antecedents in the medieval period (Silverman 1979). Beginning in the twelfth century, territorial divisions in Siena were loosely associated with parishes, subsequently serving as units for military recruitment (Cecchini and Neri 1958: 10–13). Entities broadly comparable to present-day *contrade* emerged over the period from the end of the fifteenth century until their

formalisation in the eighteenth century (Savelli 2008: Chs. 2–4). Specifically, fatal clashes in the early eighteenth century led to the establishment of a commission with the aim to delineate formal boundaries, culminating in the issue of a decree in 1729. The boundaries remain nearly unchanged to this day (Silverman 1979). See Section B1.1 for details of the boundaries.

Unlike their boundaries, the *contrade* themselves have not remained static. They regularly update their organisational structure and membership criteria (Park 1992), and have sought to expresses their collective identity on the internet (by creating websites, Boos 2017, 2020), in part a response to increased tourist and media interest (Warner 2004). The long, continuous history of the *contrade* contributes to their significance to their members today (e.g., Park 1992; Pomponio Logan 1978).

2.2.2.2 Basic elements and structure

Each *contrada* has an official title (Table 2.1; full titles are in Table B1). Colloquially, the title is shortened, e.g., *contrada della Torre* (lit. "*contrada* of the Tower") becomes *Torre*. *Contrada* symbols feature an animal, real or imaginary, and a distinctive set of colours. In most cases the animal appears in the title (Table 2.1).

Governance follows a written statute, with a governing structure (Ita. *seggio*, lit. "seat") elected biannually (Dundes and Falassi 1984: 43–44). The leadership has responsibility for the running of the *contrada*, including management of its assets (e.g., residential property). A subset of the leadership is in charge of involvement in the *palio*. A church, a clubhouse, and a museum linked to the *contrada* are located within its territory (Figure 2.1).

2.2.2.3 *Contrada* membership

Historically, being born in *contrada* territory was the key criterion for membership. Exceptions to the birth criterion applied to the nobility, with children acquiring membership on account of a long-standing relationship between their family and the *contrada*, and to non-native residents of the territory involved in *contrada* activity over a period of several years (Park 1992).

In current practice, membership criteria can be grouped into three broad categories: birth, kinship, and choice.[2] Following a decline in the practice of home delivery, the birth criterion has extended to encompass residence of the child's parents in *contrada* territory. The other two criteria apply to individuals not born in *contrada* territory, whether resident in the territory or not. These criteria

2. This categorization is based on our reading of existing literature (e.g. Dundes and Falassi 1984: 45–47; Falassi 1983: 26; Park 1992; Pomponio Logan 1978: 129; Parsons 2004), corroborated by examination of the statutes of several *contrade* (e.g. Contrada della Lupa 2018; Contrada della Torre 2014; Nobile Contrada dell'Aquila 2016), and by direct observation and discussion with informants. An analogous scheme is in Parsons (2004: 129). Alternative schemes are in Falassi 1983: 26; Pomponio Logan 1978. Minor differences between these schemes likely reflect variation in current practice across *contrade*, and in interpretation by *contrada* members. Such variation likely stems from the relatively rapid change in membership criteria from the "traditional" practice that occurred over the past century. A discussion of underlying social and demographic factors is in Park (1992).

grew in importance following social and demographic changes that occurred in the twentieth century (Park 1992). One such change is the establishment of suburbs from the 1920s onwards, with consequent displacement of *contrada* members from the town centre; another is a marked increase in population, due in part to the influx of immigrants from the Sienese countryside and beyond (see discussion in). The kinship criterion is based on family ties (e.g. typically, but not exclusively, the children of *contrada* members). The choice criterion is based on sustained involvement in *contrada* activity and acceptance by the community.

The three criteria apply broadly across *contrade*, but the statute of each *contrada* may spell out specific additional requirements (e.g. loyalty towards the *contrada*, in the case of membership by choice) and outline relevant procedures. The attainment of membership is marked by a secular baptism (Ita. *battesimo contradaiolo*, lit. "*contrada* baptism"; see discussion in Parsons 2004: 121–123).

In current practice, membership is effectively linked to the status of *protettore* (lit. "protector"), which involves payment of an annual fee (Ita. *protettorato*). The fee varies by age and by role (e.g. lowest for young children and for the elderly, highest for those with official positions within the *contrada*). In particular, *protettore* status confers members certain rights relating to governance of the *contrada*, such as participation in the general assembly, the ability to vote in elections, and eligibility for official positions (typically subject to age and other restrictions, e.g. tenure as a member for a minimum number of years). Members who are not current on payments forfeit such rights.

Additional discussion of the relationship between residence in Siena, *contrada* membership, and *protettore* status — historically and in current practice — is in Section 2.3.1 and Section B2.

2.2.2.4 Aspects of *contrada* life

The *contrada* is a source of symbolic and emotional attachment for members across their lifetime (Park 1992; Pomponio Logan 1978). A member's birth is marked by the display of an unfurled flag with a blue or pink ribbon in the *contrada* territory. At death, a furled flag with a black ribbon is placed outside the *contrada* church, and a service is held to commemorate the deceased; the grave may be decorated with *contrada* symbols. During fieldwork, members often described the *contrada* using kinship terms, such as *famiglia allargata* (lit. "extended family"). For example, a *Civetta* member interviewed in May 2017 stated: "It's very obvious to me that the *contrada* is something natural like the family".[3] The familial symbolism is, to a degree, based on actual links between members, even yet-to-be realised ones, as connoted by a *Leocorno* member in July 2018: "In the flag [of the *contrada*] I see an orange thread which passes from my grandparents and which will extend to my children".[4]

Emotional attachment is fostered by participation in *contrada* activities from

3. Ita. *Per me è molto naturale che la* contrada *sia una cosa naturale come la famiglia.*

4. The *Leocorno* flag features the colour orange (Table 2.1); Ita. *Nella bandiera vedo un filo arancione che passa dai miei nonni e andrà ai miei figli.*

a young age, reinforced by exposure to relevant symbols, songs, and expressions. The *Civetta* member from the above interview spoke of their niece, whose first word was a clipping of *Civetta*: "Her mother opened the window and [the niece] saw the *Civetta* emblem above the church and went *'Etta*!"[5] The *contrada* is also a system of institutional and social support, for example by providing financial aid to members in need (Dundes and Falassi 1984: 35).

Unsurprisingly, then, membership biases interactions towards members of the same *contrada*, and strong intra- and inter-generational ties emerge both through family connections and through the involvement in activities year-round. For example, friendships, bounded by age and sex, are often within *contrada*; as demonstrated in Section 2.3.2 and Section B4. Marriage is also influenced by membership, but there is no prescribed endogamy. A lack of endogamy is supported by analysis of surname distributions (Vienna et al. 1998) and genetic markers (Fuciarelli et al. 1997), both of which indicate relationships across *contrada* boundaries.

Demographic changes as above mean that people increasingly interact outside the *contrada*. Of course, members interact with individuals affiliated with different *contrade*, or individuals with no *contrada* affiliation (e.g., at school, in the workplace).

5. Ita. *La sua mamma l'ha aperto la finestra e lei ha visto lo stemma della* Civetta *sopra la chiesa e ha fatto* 'Etta*!*

Table 2.1: Characteristics of the 17 *contrade* of Siena[1]

terzo	no.[2]	*contrada*	name (symbol)[3]	colours[4]	festival[5]	ally[6]	rival[7]
Camollia	1	*Bruco*	Caterpillar	green, yellow	July 2	*Istrice*, *Nicchio*, *Torre*	-
	2	*Drago*	Dragon	red, green	Apr 29	*Aquila*	-
	3	*Giraffa*	Giraffe	red, white	July 2	*Civetta*, *Istrice*, *Pantera*	-
	4	*Istrice*	Porcupine	red, black, blue, white	Aug 24	*Bruco*, *Giraffa*, *Chiocciola*, *Civetta*	*Lupa*
	5	*Lupa*	She-Wolf	white, black	Aug 16	-	*Istrice*
	6	*Oca*	Goose	white, green	Apr 29	-	*Torre*
Città	7	*Aquila*	Eagle	yellow	Sep 8	*Civetta*, *Drago*	*Pantera*
	8	*Chiocciola*	Snail	red, yellow	June 29	*Istrice*, *Pantera*, *Selva*	*Tartuca*
	9	*Onda*	Wave (dolphin)	white, pale blue	July 2	*Nicchio*, *Tartuca*, *Valdimontone*	*Torre*
	10	*Pantera*	Panther	red, blue	Aug 29	*Giraffa*, *Leocorno*, *Chiocciola*, *Civetta*	*Aquila*
	11	*Selva*	Forest (rhinoceros)	green, orange	Aug 15	*Chiocciola*, *Tartuca*	-
	12	*Tartuca*	Tortoise	blue, yellow	June 13	*Leocorno*, *Selva*, *Nicchio*, *Onda*	*Chiocciola*
San Martino	13	*Civetta*	Owl	red, black	June 13	*Aquila*, *Giraffa*, *Istrice*, *Pantera*	*Leocorno*
	14	*Leocorno*	Unicorn	white, orange	June 24	*Pantera*, *Tartuca*	*Civetta*
	15	*Nicchio*	Shell	blue	Aug 7	*Bruco*, *Onda*, *Tartuca*	*Valdimontone*
	16	*Torre*	Tower (elephant)	burgundy red	July 25	*Bruco*	*Oca*
	17	*Valdimontone*	Ram	red, yellow	Apr 26	*Onda*	*Nicchio*

[1] Information from Dundes and Falassi (1984: 32, 36, 47).
[2] Number corresponds to territory in Figure 2.1.
[3] Symbol only shown if different from the translated name of the *contrada*.
[4] Does not include decorative colours.
[5] Date of patronal festival.
[6] All alliances are reciprocal. Order of allies as per the *contrada* column.
[7] All rivalries are reciprocal except that between *Onda* and *Torre*.

2.2.2.5 Relationships between *contrade*

A key factor shaping interactions between the *contrade* and their members is the relationship type (Filiani and Zaffaroni 2002: 3–7). The default type, which we term "neutral", involves no formal relationship. The other two types, alliance and rivarly, are formally recognized — that is, the relationship is stipulated in the official statute of each *contrada*, with alliances sanctioned by a treaty (Filiani and Zaffaroni 2002: 3). All such relationships are reciprocal, with one exception (*Onda* stipulates *Torre* as a rival, but not *vice versa*; Table 2.1). Rival pairs may feature a common ally (e.g., *Aquila* and *Pantera* are rivals, and each is an ally of *Civetta*; Table 2.1).

All *contrade* feature at least one formal relationship: 15 of the 17 *contrade* have at least one ally (the range is between one and four allies; Table 2.1) and 13 have a rival (no *contrade* have multiple rivals; Table 2.1). Thus, two *contrade* have no allies, and four have no rivals.

Alliances and rivalries can exist for centuries. For example, the rivalries between *Oca* and *Torre* and *Chiocciola* and *Tartuca* emerged in the seventeenth century (Filiani and Zaffaroni 2002: 5). All current alliances and rivalries have been around for at least 50 years. The most recent example being the rivalry between *Civetta* and *Leocorno* which was formalised in 1960 (Filiani and Zaffaroni 2002: 51).

There is a perception that alliances do not last as long as rivalries (e.g. Dundes and Falassi 1984: 49; Filiani and Zaffaroni 2002: 6). An analysis reveals that the average length of an alliance was 141.2 years compared to 125.8 years for a rivalry over the period 1743 to 2011 (Sgourev and Operti 2019). However, the same analysis finds that alliances are more easily formed and ended, with 46 alliances formed and 33 ended, compared to 11 rivalries formed and six ended. Thus, alliances and rivalries are not static, and relationship status is subject to change. A recent example is *Bruco* and *Giraffa*, who ceased their rivalry in 1996 (Filiani and Zaffaroni 2003: 141).

Except for *Oca* and *Torre*, rival pairs share a boundary, suggesting that territorial disputes are an important factor in establishing and maintaining rivalry (Filiani and Zaffaroni 2002: 5–6) (Table 2.1 and Figure 2.1). Rival *contrade* denigrate each other in expressions and songs memorised from a young age (Dundes and Falassi 1984: 39–43, 51–53). Alliances can be made with any *contrada*, and usually entail a number of commitments throughout the year, such as honouring an ally during certain rituals and sharing feasts (Falassi (1983: 29); see Section 2.3.4).

The relationship type is most visible during the *palio*, and the proceedings of a race can influence the status of a relationship. It is almost a given that rival *contrade* will attempt to prevent each other from winning the *palio* (Dundes and Falassi 1984: 78). In circumstances where a rival stands a good chance of victory, a *contrada* might dedicate the race to thwarting the rival rather than aiming to win themselves. This is possible through deals (Section 2.2.1), in particular with allied *contrade*, who can be relied upon to make advantageous agreements (Operti et al. 2020). The *palio* often results in physical aggression between rival *contrada* members (Drechsler 2006). Aggression — measured as altercations during or after the race — is more common between members of, and jockeys representing, rival pairs than between allied *contrade* (Operti et al. 2020). By extension, among neutral *contrade* there is little expectation for positive exchanges, such as the advantageous deals between

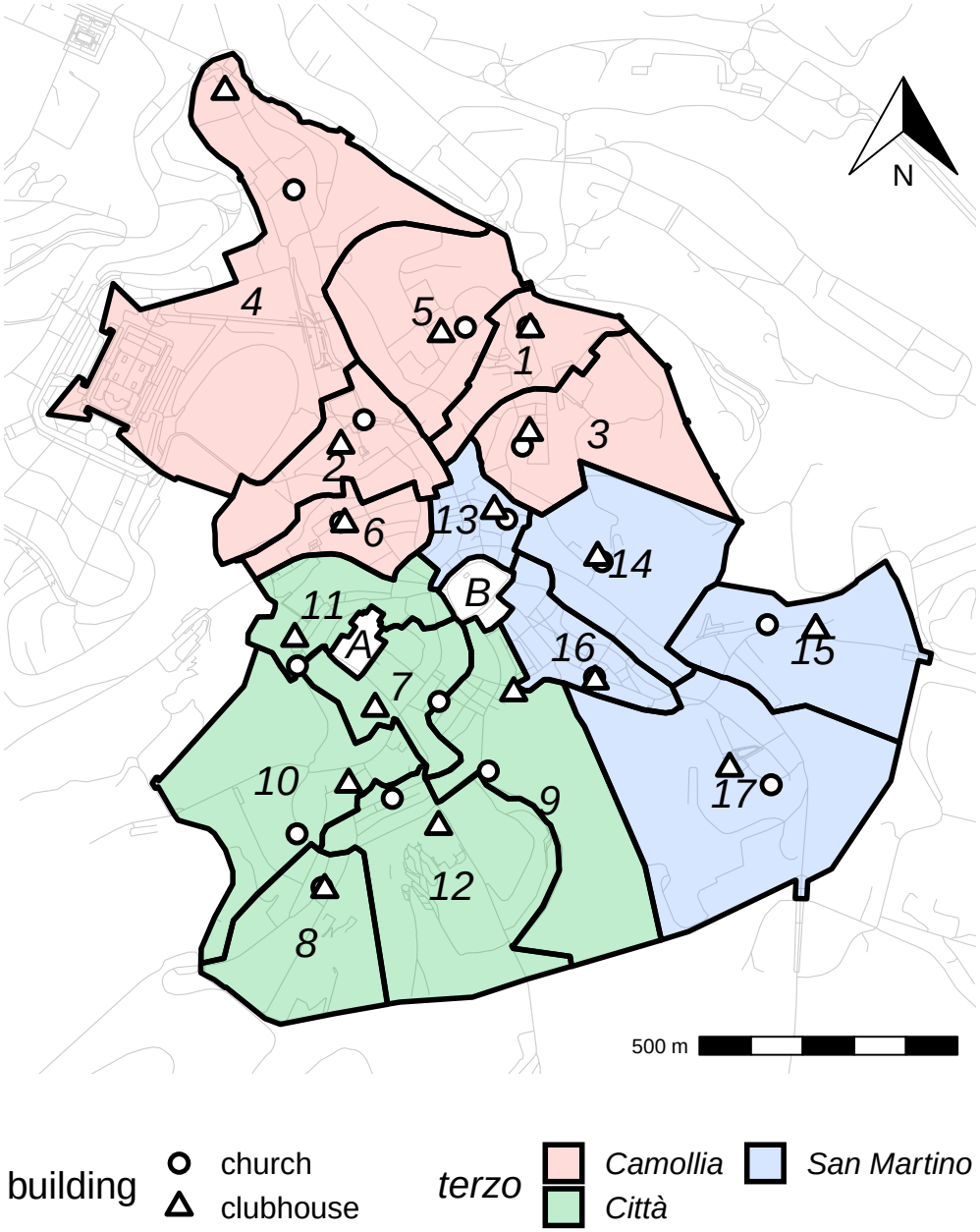


Figure 2.1: The territorial boundaries of the 17 *contrade* of Siena. Numbers correspond to those in Table 2.1. The two non-*contrada* territories are (A) the cathedral and its square and (B) the central square, including the town hall and adjacent tower. Boundaries drawn by us, based on several versions of the boundaries; see Section B1.1. Base map data from OpenStreetMap (www.openstreetmap.org/copyright).

allies, and fewer negative behaviours (e.g., fights) than between rivals (Chapter A).

2.2.2.6 The patronal festival and the procession

After the *palio*, the most important *contrada* event is the annual patronal festival (Ita. *festa titolare*, lit. "titular festival"). Each *contrada* observes a separate patronal festival, which celebrates the patron saint of the *contrada* (e.g. Dundes and Falassi 1984: 47, 136–137; Falassi 1983: 28–29). Celebrations last at least a week, but the main events normally occur on the weekend nearest the date devoted to the saint (dates range from April 26 until September 8, Table 2.1). Many of the activities and ceremonies held during the patronal festival are religious (Parsons 2004: 110–111), in particular the Catholic service held in honour of the saint in the *contrada* church and cemetery visits to pay respect to deceased members. Other events are not religious, such as the secular baptism of new members, the initiation ceremony for adolescents able to vote, and several communal meals.

The culmination of the patronal festival is the day-long procession around the city centre, a ritual called the *giro* (lit. "tour"). We use the term procession, rather than parade, due to the religious nature of the patronal festival and the visitation of religious sites during the procession. On the whole, the procession is far from solemn: members walk through the city bearing colourful flags and symbols of the *contrada* and make noise with repetitive drumming and collective singing. There is also plenty of eating and drinking.

The procession departs from the *contrada* church in the early morning and returns to the church in the late evening, with a two hour pause for lunch. The procession is structured with respect to the role and order of participants. Males lead the procession, dressed in costumes based on medieval attire. Each *contrada* has around 100 costumed representatives, most of which are either a flag-waver (Ita. *alfiere*) or a drummer (Ita. *tamburino*).[6] The costumed representatives are followed by *contrada* leaders first, then women, children, and older men, all of whom are not costumed. Members not in costume wear a scarf emblazoned with the *contrada* symbol (Ita. *fazzoletto*).

During the procession, the *contrada* enters the territory of other "host" *contrade*. Each host *contrada* "receives" the procession, meaning that members of the host *contrada* greet and then accompany the procession through its territory, and provide refreshments. In the host *contrada* territory, two activities take place. First, the procession enters the church and collectively sings a brief hymn devoted to the Virgin Mary. Second, flag-wavers and drummers perform a choreographed flag-toss (Ita. *sbandierata*). The flag-toss involves a series of synchronised flag movements to a rhythmic drum roll that concludes with flags simultaneously thrown between pairs of flag-wavers. Members of the host *contrada* perform the flag-toss alongside the visiting *contrada*. Other flag-tosses occur in locations that are not part of *contrada* territory and at other religious locations, dependent on the *contrada*, e.g.

6. There are two other costumed representatives. A single duke (Ita. *paggio maggiore*) bears armour and a large, ornate flag. Several pages (Ita. *paggi*) — young male or female members — distribute a poem in honour of the *contrada*.

patronal sites with a connection to the celebrated saint. The flag-toss performed in the central square is the penultimate act, after which the procession returns to the *contrada* for a final service and flag-toss.

The relationship between *contrade* also influences the procession (Dundes and Falassi 1984: 49, 136). Allies provide sit-down meals, and are more likely to receive the procession with larger delegations compared with neutral *contrade*. On the other hand, rival *contrade* are not visited at all. We return to these points in Section 2.3.4, our quantitative analysis of two processions.

2.3 Investigation of the *contrade*

The rest of the article details our research related to the *contrade*, which involved data collated from published sources or data collected during fieldwork completed between August 2016 and August 2018. Five *contrade* agreed to take part in the fieldwork studies. Research participants were members aged 18 years or older of one of these five *contrade*. Informed consent was obtained from all participants. The five *contrade* were `C05`, `C06`, `C08`, `C11`, and `C16`, which includes *Civetta*, *Leocorno*, and *Torre*. The alphanumeric code is used to protect *contrada* identities and to preserve the anonymity of participants. We use *contrada* names, rather than the alphanumeric codes, if the identity of the *contrade* could be inferred from relevant information. See Section B3 for more background information that applies generally to the fieldwork-based research. Data were analysed in in `R` v. 3.4.4 (R Core Team 2020); see `R` information for full list of packages.

First, we provide quantitative information on *contrada* membership which is absent from most previous ethnographies. Namely, we provide an estimate of *contrada* size using publicly available records (Section 2.3.1) and describe the composition of the *contrade* using a survey we conducted with a convenience sample from five *contrade* (Section 2.3.2). Then we demonstrate the significance of group relationship in the Sienese context. We present the results of a psychological item measuring members' attitude towards the *contrade* (Section 2.3.3) and the analysis of GPS data from two *contrade* collected during their annual *giro* procession (Section 2.3.4). For each research element, we outline the data or the methods, summarize the results, and provide a brief discussion.

2.3.1 Estimation of *contrada* membership size

2.3.1.1 Data

We obtained estimates of the size of *contrada* membership from two independent sources, as detailed in Section B2.1. We use these two sets of figures as they are the only publicly available records we are aware of. Membership size is rarely divulged by the *contrade*.

The first set of figures comprises data gathered by the municipality of Siena in 1981, relating to the number of Sienese who declared themselves to be *contrada* members. We obtained these figures from Falassi (1983: 13, 79), following the

interpretation in Ascheri (2001: 23).

The second set of figures relates to the number of *protettori* (lit. "protectors"; Section 2.2.2.3) in 2012–2013. We obtained these figures from a series of interviews with the head (Ita. *priore*) of each *contrada* published in a local online newspaper (Siena Free 2012). With one exception (*Tartuca*), the interviews include the exact number of *protettori*, an approximate figure, or a range. The interviews for *Chiocciola*, *Drago*, *Nicchio*, and *Torre* provide additional information on the breakdown by gender and/or by age.

The first set of figures are less representative than the second as they are older. As the figures relate to different samples, a direct comparison cannot be made, although they indicate an approximate change in membership size over the past 30 years.

2.3.1.2 Results

In 1981 a total of 21,818 Sienese declared themselves to be *contrada* members (Falassi 1983: 13, 79). The 1981 figures by *contrada* are in Table B2. The number of members ranges from 287 (*Civetta*) to 3,871 (*Istrice*). The median value is 1,009 (*Tartuca*).

The 2012–2013 figures by *contrada* are in Table B3. Across the 16 *contrade* for which information is available (i.e. excluding *Tartuca*), the total number of *protettori* has a lower bound of 32,244 and an upper bound of 33,694. The number of *protettori* ranges from approximately 750–800 (*Selva*) to 3,000–4,000 (*Istrice*) and approximately 3,500 (*Nicchio*, *Torre*). The median values are approximately 1,700–1,800 (*Lupa*) and approximately 1,800–2,000 (*Onda*).

Details on the breakdown by gender and/or by age in 2012–2013 are in Section B2.2. Briefly, 46.7% of *protettori* in *Drago* were women; across three *contrade*, between 14.4% (*Chiocciola*) and 27.7% (*Drago*) of *protettori* were aged up to 16 (Table B4).

2.3.1.3 Discussion

We obtained estimates of the size of *contrada* membership from two independent sources, one relating to 1981, the other to 2012–2013. Interpretation of the two sets of figures is complicated by a number of issues. Broadly, these stem from the fact that residence in Siena, *contrada* membership, and *protettore* status do not overlap completely in current practice. We therefore emphasize that the two sets of figures cannot be compared directly, and that they are to be taken as an approximate indication of relative membership size (see discussion in Section 2.2.2.3 and Section B2.3).

These issues notwithstanding, the information presented here shows that membership size varies across *contrade* from a few hundred to several thousand individuals. However, it is important to note that both sets of figures likely overestimate the number of people who are active participants in *contrada* life, for example through regular attendance of *contrada* events (see discussion in Park 1992: Section B2.3). Overall, the data are in line with the common perception of an increase in the number of members and/or *protettori* over recent decades (e.g. Boos 2020; Park 1992; Silverman 1979). Most strikingly, perhaps, they underscore the extent of

the phenomenon: the contemporary *contrada* system involves on the order of over 30,000 individuals — men and women, old and young — who identify as *contrada* members and/or contribute to the *contrade* financially.

2.3.2 Cross-*contrada* survey

2.3.2.1 Methods

We conducted a survey of *contrada* members, administered as part of a questionnaire that included one of two experiments, as detailed in Sections B4.1 and B4.2.

Data collection for the survey involved five *contrade* — `C05`, `C06`, `C08`, `C11`, and `C16` — across three periods between February 2017 and August 2018 (Section B3). Recruitment occurred at pre-specified events held in each *contrada*, and specifically communal meals organised by the *contrada* and open to all its members. Participants completed the survey privately and individually, by hand, in a dedicated space within the clubhouse of their respective *contrada*.

One section of the survey questions asked for demographic characteristics, i.e. year of birth, gender, employment status, personal income, and level of education. The other section asked about the participant's relationship to the *contrada* and Siena, which we label "*contrada* questions". The 10 *contrada* questions asked for: location of birth, residency, years lived outside of Siena, reason for membership, *protettore* status, current and past roles in the *contrada*, participation in the social and the organisational life of the *contrada*, affiliation of closest friends, and feeling of superiority. Most questions involved multiple-choice responses.

With the data aggregated across periods and *contrade*, we summarised the number and percentage of responses to each question. We provided additional analyses and figures where we either calculated a new variable or re-categorised responses. Note the number of responses varies for each question, as some participants were excluded for not providing a response. Percentages presented below are based on the number of participants who provided a response to the specific question. We report the key findings in the results below; see Section B4.3 for a more detailed breakdown of the results.

2.3.2.2 Results

We recruited 526 participants (Table B5). Following the exclusion of 14 participants, 12 of which had completed the survey in a previous period, we analysed 512 participants (Table B6).

Participants had a mean age of 42.3 years (SD = 15.5 years, range 18–84 years), and 36.6% were female. Most participants were employed (71.1%), and most had completed secondary education (89.4%). Table B7 shows the distribution of employment status, personal income, and level of education.

The majority of participants were born in the historic city centre or municipality of Siena (79.1%; Table B8). The majority were resident in the municipality (74.6%), with 17.1% resident in the territory of their own *contrada*. We calculated the percentage of lifetime in Siena, based on the age of each participant and the number

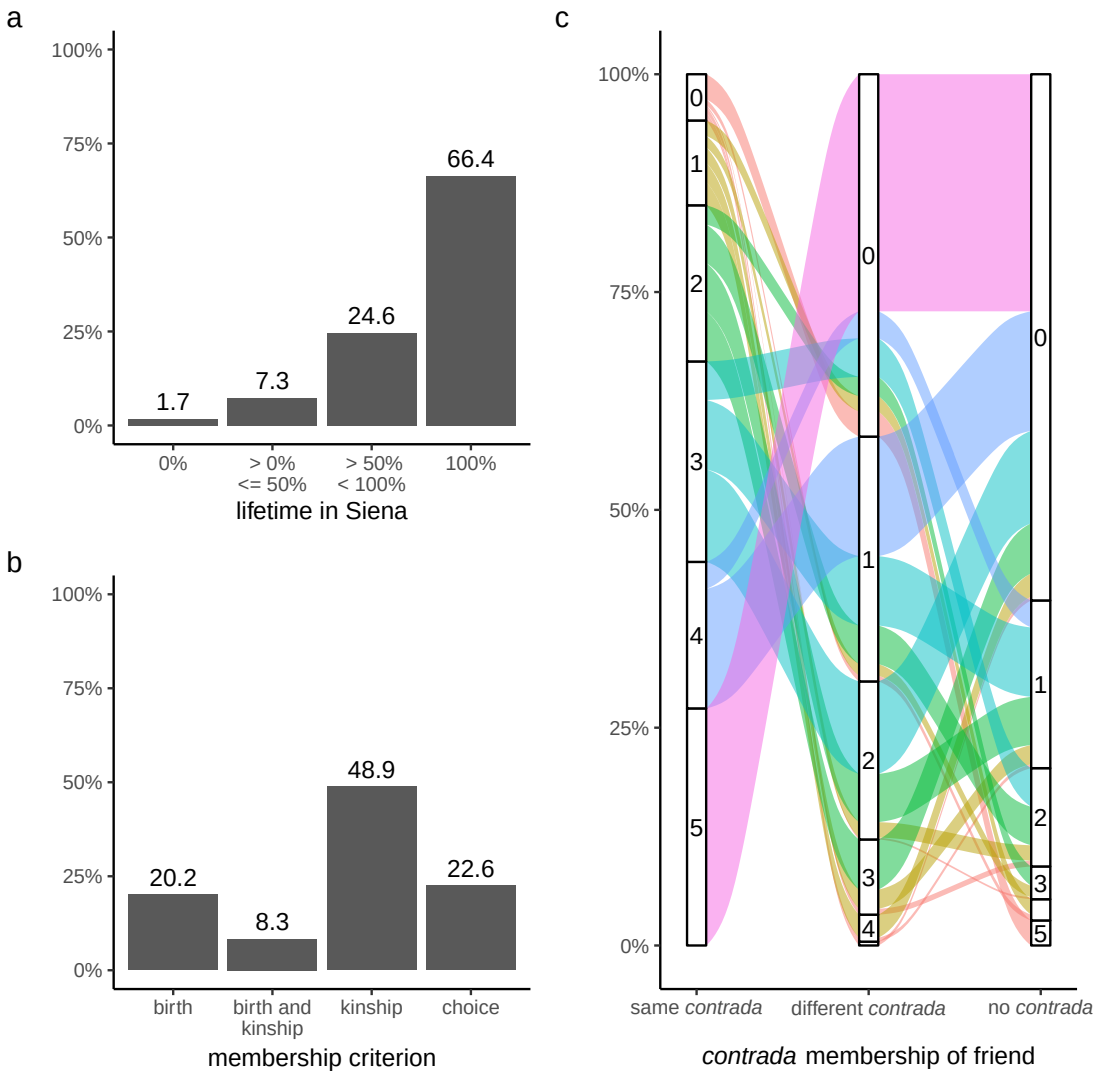


Figure 2.2: Selection of survey results; see Section B4.3 for details. a) Percentage of participants' lifetime spent in Siena ($n = 464$). b) Reasons for being a *contrada* member ($n = 505$). c) *Contrada* membership of each participant's five closest friends ($n = 452$). The coloured flow represents a particular combination of friends e.g. the pink flow shows that 27.2% indicated five friends of the same *contrada*, zero of a different *contrada*, and zero of no *contrada*. Labels with a total of responses $< 2.5\%$ removed for legibility.

of years and months they had lived outside the province of Siena. Most participants had a value of 100%, i.e. had spent all of their life in the province (Figure 2.2a), and the mean percentage of lifetime in Siena was 89.4% (SD = 23.7%).

We categorised the reasons given for *contrada* membership following our classification scheme in Section 2.2.2.3 — birth, kinship, and choice — adding a birth and kinship criterion as 42 participants indicated both (Table B8). Figure 2.2b shows that the most common membership criterion was kinship, whether those who responded with both birth and kinship were included (57.2%) or excluded (48.9%). The majority had been a *protettore* the preceding two years (98.2%; Table B8).

Most participants had a current and/or past role in the *contrada* (67.9%; Table B8). Figure B7 shows how frequently participants were involved in the social and organisational life of the *contrada* during the winter, i.e. February 2017, and during the summer, i.e. June–August 2017 and June–August 2018 (Table B5). The percentage that participated in social activities at least once a week was 44.9% during the winter vs. 53.7% during the summer. The percentage that participated in organisational activities at least once a week was 37.1% during the winter vs. 37.5% during the summer.

We analysed the affiliation of friends with a sample of 452 participants, corresponding to a total of 2,260 friends. Of these, 1,437 (63.6%) were members of the same *contrada*, 474 (21.0%) were members of a different *contrada*, and 349 (15.4%) were not a member of any *contrada*. Figure 2.2c shows that friendships are often within the *contrada*. Specifically, 27.2% indicated all five friends were from the same *contrada*, and 67.0% had a majority, i.e. 3 or more friends, from the same *contrada*. Most indicated that all five friends were members of a *contrada*, whether the same or a different one (60.4%).

Finally, the most common response to the question "In general, my *contrada* is better than the majority of other *contrade*" was "strongly agree" (42.2%; Table B8).

2.3.2.3 Discussion

As part of the fieldwork described in Section B3 we conducted a large-scale survey of *contrada* members from five *contrade*. We emphasize that we have a convenience sample, both with respect to the *contrade* involved and the participants who completed the survey, and thus generalisations are limited. Without access to the actual composition of *contrada* members, it is difficult to assess how much our sample deviates from the general population. Despite this, the data collected provides an indication of the composition of the *contrade* and especially those that regularly participate in the life of the *contrade*. This is insightful given that no large-scale survey of *contrada* members has been conducted to date.

The sample suggests that the *contrade* are populated by members from a range of ages and that there is some variation in socio-economic backgrounds (Dundes and Falassi 1984: 35). The data are unable to demonstrate the existence of inter-generational ties, but we observed interactions across age cohorts during our fieldwork. The sample is skewed towards males. *Contrada* membership is not, to our knowledge, biased in favour of a particular gender. The only reliable and comparable data are from the *Drago* interview (Voltolini 2012d), which states that 614 out

of 1,314 *protettori* (46.7%) were female in 2012–2013 (Section 2.3.1.2). However, the skewed sample reflects our observation that most events are attended by men, and that currently, it is male members who occupy the most prestigious leadership roles and represent the *contrada* during important rituals, i.e. the procession is led by male costumed representatives (Section 2.2.2.6).

The survey indicates that most individuals who frequent the *contrada* were born and/or currently live in Siena, with membership mostly conferred by birth and/or kinship. Therefore, the *contrada* remains largely a "domain which is exclusively Sienese" (Park 1992: 92), but not entirely. Reflecting demographic and social changes in the twentieth century (Park 1992), the data suggest most members do not live in the territory of their own *contrada*. A notable proportion of the membership, around one-fifth to one-quarter of our sample, were born outside Siena and/or a member by choice. The common perception of an increase in the number of members, discussed in Section 2.3.1.3, is likely driven by those who have become members in ways that were not possible before significant socio-demographic shifts in the twentieth century.

Results from the participation item suggests that the *contrada* is a community active throughout the year, with members frequently socialising both during the winter and the summer. Furthermore, the survey indicates assortativity in friendships. Approximately two-thirds of members in our sample have a majority of their closest friends from the *contrada*, with around a quarter nominating all their closest friends as from the same *contrada*. However, membership does not exclude social ties with individuals from outside the *contrada*. Three-quarters of members in our sample indicated at least one close friend from a different *contrada* or no *contrada*. Frequent participation and interaction among members may explain why most members felt their own *contrada* superior. Generally then, the survey reflects previous ethnographic research: "[e]ach individual seeks to perpetuate *contrada* power and unity by his or her membership, friendships, and involvement in *contrada* life throughout the year" (Pomponio Logan 1978: 57).

2.3.3 Evaluation of attitude towards the *contrade*

2.3.3.1 Methods

We measured and analysed the attitudes of *contrada* members toward the 17 *contrade*, as detailed in Sections B5.1 and B5.2.

Data collection involved three *contrade* — *Torre*, *Civetta*, and *Leocorno* — across three periods between July 2017 and June 2018. Participants completed a paper-based questionnaire, which asked them to state their general attitude towards the 17 *contrade*, against a scale from 1 (very negative) to 7 (very positive).

With the data aggregated across periods and *contrade*, we used a Wilcoxon signed-rank test to determine whether the mean attitude of participants towards own *contrada* differed from their mean attitude towards all other *contrade*. Next, we tested for a main effect of *contrada* classification (with levels own *contrada*, alliance, neutral relationship, and rivalry) via a mixed-model ANOVA with type III sum of squares. To compare the difference in attitude based on *contrada* classification, we conducted pair-wise comparisons with a Tukey correction. Significance was assessed

at $p < .05$. Finally, we focused on the data for *Torre* to explore, qualitatively, the effect of the asymmetry in its relationship to *Onda* (Section 2.2.2.5).

2.3.3.2 Results

We recruited and analysed 42 participants. Participants had a mean age of 35.1 years ($SD = 14.9$ years, range 18–82 years) and 2 (4.8%) were female.

Overall, the mean attitude was higher for own *contrada* ($M = 6.8$, $SD = 0.7$) than for other *contrade* ($M = 3.8$, $SD = 1.5$; Wilcoxon signed-rank test, $V = 856.0$, $p < .001$). Focusing on relationship type, the mean attitude was highest for alliances ($M = 4.6$, $SD = 1.4$), followed by neutral relationships ($M = 3.9$, $SD = 1.4$), followed by rivalries ($M = 1.6$, $SD = 0.9$). The distribution of attitude is in Figure B9. There was a significant effect of *contrada* classification on attitude (mixed-model ANOVA, $F(3, 652.9) = 143.0$, $p < .001$), with significant differences between all contrasts (Table B9).

Focusing on *Torre* participants, their mean attitude was 1.4 ($SD = 0.8$) towards *Onda*, 4.1 ($SD = 1.5$) towards the other 13 *contrade* with which *Torre* has a neutral relationship (Table 2.1), and 1.7 ($SD = 1.0$) towards *Torre*'s rival (*Oca*).

2.3.3.3 Discussion

We assessed the attitude of *contrada* members towards the 17 *contrade*, based on *contrada* status (as own vs. other) and relationship type (as alliance vs. neutral relationship vs. rivalry). Results are to be considered preliminary, as participants were recruited opportunistically from a subset of the *contrade*, in different contexts over the course of a year, resulting in a small convenience sample that is strongly biased towards men.

Our findings show that the attitude of *contrada* members towards the *contrade* tends to vary systematically with *contrada* status and by relationship type, and in the expected direction — most positive for own, followed by alliances, neutral, rivalry. At the same time, there is variation in attitude across individuals, which may reflect personal experience, exposure, etc. to the different *contrade* — including one's own. Furthermore, there is evidence of departure between attitude and classification, particularly in the case of *Torre* towards *Onda* (see discussion in Section B5.4), possibly linked to the fact that relationship status between *contrade* is subject to change over time (Section 2.2.2.5).

The results are in line with existing ethnographic accounts (see discussion in Section B5.4). For example, "the degree of love for one's contrada can only be exceeded by the degree of hate for the rival contrada" (Dundes and Falassi 1984: 49) maps onto the finding that that responses for own *contrada* and for rivalry tend to cluster at the two ends of the scale — positive and negative, respectively. Furthermore, a large body of research from social psychology shows in-groups are evaluated more positively than out-groups (Brewer 1999; Riek et al. 2006). Attitude has also been shown to change as a function of inter-group relationship, e.g. attitude towards rival out-groups is lower than attitude towards more neutral out-groups among both supporters of opposing football teams and members of different political

parties (Weisel and Böhm 2015). Thus, the attitudes of *contrada* members in this study are congruent with attitudes among other groups across a variety of contexts.

2.3.4 The *giro* ritual reflects group relationship

2.3.4.1 Methods

We analysed the 2018 processions of two *contrade*, based on A.R.K.'s observations and a study involving GPS devices, as detailed in Section B6.1. See Section 2.2.2.6 for details of the procession.

The two *contrade* were *Civetta* and *Leocorno*, who are reciprocal rivals situated in adjacent territories (labelled 13 and 14 in Figure 2.1). We analysed the routes of 18 costumed representatives, 12 from *Civetta* and six from *Leocorno*, during their procession on Sunday 17 and Sunday 24 June 2018, respectively. Participants were all males between 21.0 and 46.0 years of age. Each participant was given an activated portable GPS device (model: Canmore GT-730FL-S) before the start of the procession, which was placed within a pocket or pleat of the costume. Devices were retrieved at the end of the procession.

The analysis of the GPS data focused on variation in each procession based on the classification of each area in the city centre of Siena into one of five territory types: own territory, allied territory, neutral territory, rival territory, and non-*contrada* territory. We investigated the effect of territory type using a linear mixed-effects model. Significance was assessed at $p < .05$ via a mixed-model ANOVA with type III sum of squares. To compare the time spent based on territory type, we conducted post-hoc comparisons with a Tukey correction for multiple comparisons. Finally, we used the GPS data to demonstrate whether participants visited *contrada* churches.

2.3.4.2 Results

Figure 2.3 shows the route of the procession for *Civetta*, and Figure B13 for *Leocorno*. The *Civetta* procession lasted around 10.0 hours, covering a distance of approximately 12.1 km. Similarly, the *Leocorno* procession lasted around 9.3 hours, covering a distance of approximately 11.5 km.

The pattern of time spent in *contrada* territory by relationship type was qualitatively similar for both *Civetta* and *Leocorno* (Tables B11, B12, and B14). Taking the mean of both *contrade* (Table B14), the processions spent on average 57.3 minutes in their own territory. Focusing on the relationship type, the mean was highest in allied territories ($M = 59.5$ minutes), followed by neutral territories ($M = 24.8$ minutes), followed by rival territory ($M = 10.4$ minutes). The processions also spent on average 14.7 minutes in each of the two non-*contrada* territories. The model revealed a significant effect of territory type on time spent $F(4, 325.7) = 357.1$, $p < .001$), with significant differences between all contrasts, except between own and allied territories and rival and non-*contrada* territories (Table B13).

Finally, the cluster analysis found at least 10 out of the 12 participants from *Civetta*, and at least 2 out of the 6 participants from *Leocorno*, visited all *contrada*

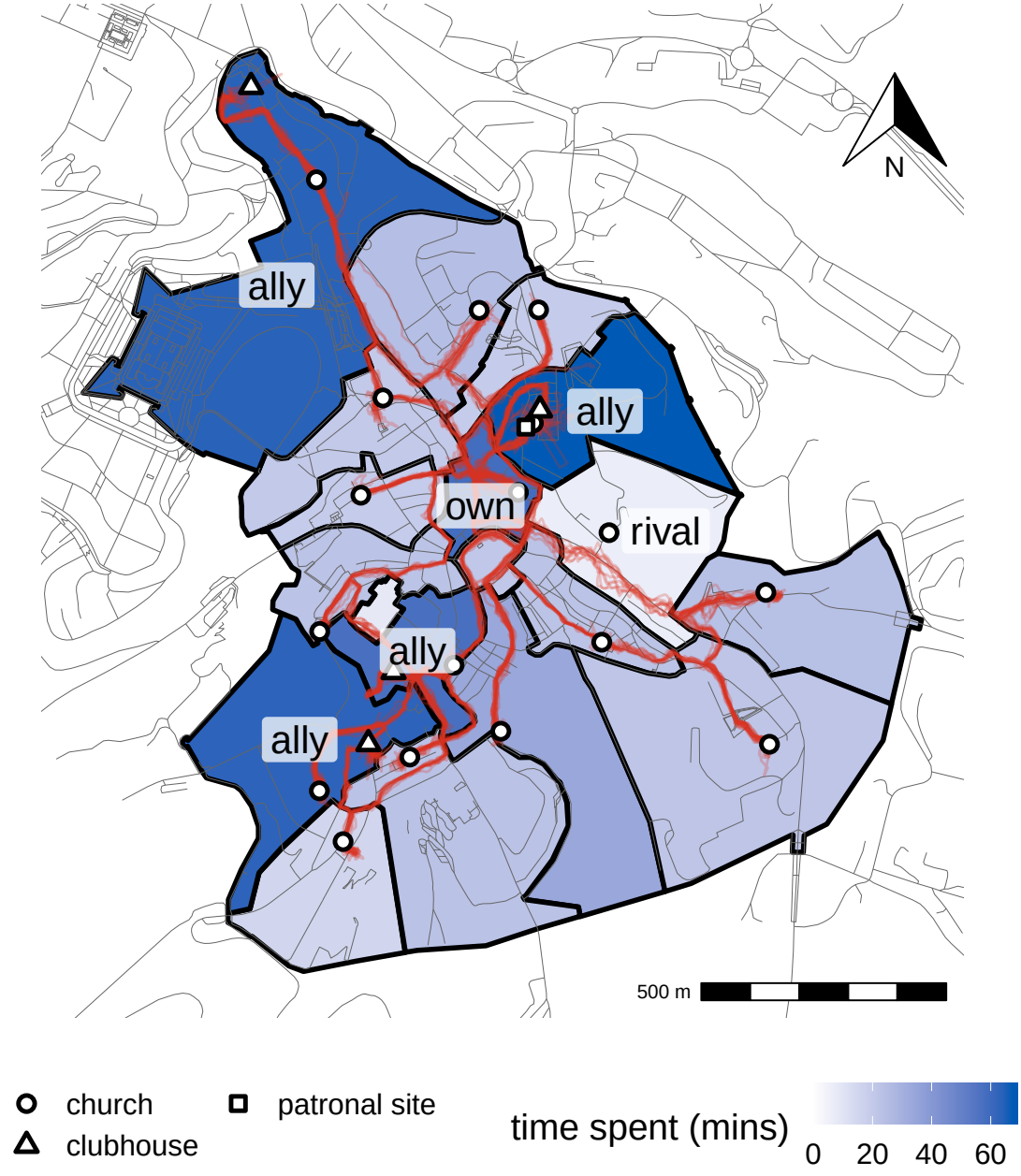


Figure 2.3: The GPS routes of the *Civetta* procession. The routes of the 12 participants are in red. The location of all *contrade* churches, allied *contrade* clubhouses, and the patronal site are indicated. The territories of the 17 *contrade* and the two non-*contrade* are shaded with the time spent in each territory (in minutes). The allied and the rival *contrade* are labelled, while the neutral *contrade* and non-*contrada* territories are not. See Figure B13 for the *Leocorno* version. Base map data from OpenStreetMap (www.openstreetmap.org/copyright).

Table 2.2: Time spent in each territory for *Civetta* and *Leocorno* [1]

	Civetta		*Leocorno*		
territory type	*M*	*SD*	*M*	*SD*	overall
own	58.8	2.0	55.8	12.8	57.3
allied	62.9	8.4	56.1	14.2	59.5
neutral	22.7	4.7	26.8	11.4	24.8
rival	6.7	0.5	14.2	2.2	10.4
non-*contrada*	15.0	6.7	14.4	8.5	14.7

[1] Order in table is by territory type; time is in minutes.

churches except the rival *contrada*'s church, which was not visited by any of the participants (Tables B11 and B12).

2.3.4.3 Discussion

We analysed the 2018 processions of two *contrade* — *Civetta* and *Leocorno*– using data from GPS devices distributed to members participating in the annual ritual as costumed representatives. We used location data to estimate the duration in each territory, which is more reliable than a purely descriptive analysis, although estimates should still be considered approximate, mostly due to inaccuracies with the GPS data, few participants recruited from *Leocorno*, and the use of territorial boundaries whose interpretation can differ (Section B1.1).

Minimal time is spent in rival *contrada* territory because the procession neither visits the rival's church, nor does the host *contrada* provide a reception. More time is spent in allied *contrada* territory — compared to neutral *contrade* — because each ally prepares a large sit-down meal where members from both *contrade* are present and speeches are exchanged. Commensality explains the time spent in allied territory . In sum, our analysis of the *giro* procession using data from GPS devices shows that ritualised behaviour is affected by the relationship between groups.

The movement during the procession respects local symbolic patrimony. On a typical day, *contrada* relationship has less influence on the routes members take when walking around the city centre. However, conversations during our fieldwork suggest that movement is constrained, particularly with respect to a rival. Members avoid walking through, and living in, a rival territory, citing a sense of discomfort. A *Civetta* member interviewed in June 2019 indicated that avoidance of rival areas can start from a young age: "but even when you're a child, you don't go to play in [the rival *contrada*] [. . .] I've always been afraid to go beyond [church at the boundary between the *contrade*], down there in that dump. We used to stop there, as far as I can remember, we never went any further [. . .] we would stay there."[7]

7. From experiment 1 follow-up (Table B5); Ita. *"ma anche da bambini, non ci si va a giocare [nella* contrada *], nel senso. C'è, io sempre avuto remora andare oltre [name of church], la giù in quella postaccio. C'e, noi ci si fermava lì, che ricordi, non siamo mai andati oltre. Che io mi*

2.4 Discussion

Taking the *contrada* size estimates and the cross-*contrada* survey of members together, the start of the twenty-first century has seen a numeric expansion of the *contrade*, likely driven by the number of members who are themselves not Sienese. Furthermore, members no longer inhabit the territory of their own or other *contrade*. These two trends have been documented in previous ethnographies, notably Park (1992) which describes the general displacement of members outside the city centre. Notwithstanding these changes, the contemporary *contrada* remains an active community that is primarily based on family ties, and one which structures interactions between individuals, as evidenced by friendships that are predominately within the *contrada*.

Taking the results from the attitudes item and the GPS study together, we see that group relationship is a relevant facto in the *contrada* context. Group relationship influences attitudes, such that members generally hold a slightly positive attitude towards allies, and a neutral attitude towards the *contrade* with which they share no relationship. Conversely, rivals are perceived negatively. Group relationship also affects behaviour in the ritualised context of the giro, such that more time is spent with allies than neutral *contrade*, with no time spent with the rival out-group.

Our analysis of the attitudes item and the *giro* procession provide preliminary evidence that inter-group relationship plays a significant role in structuring the evaluation of, and patterns of interaction between, *contrada* members. We are unable to systematically assess whether other factors that vary between *contrade*, namely population size, territory size, and prestige, have an effect on *contrada* identification and behaviour. Instead, we refer to our ethnographic understanding of the Sienese context. Anecdotally, more populous *contrade* are perceived, by members of relatively smaller *contrade*, as having difficulties in strengthening social ties and organising collective efforts. Differences in territory size reflect attempts to equalise population size when boundaries where drawn in the eighteenth century, taking into account population density (Silverman 1979); as such, territory size is unlikely to order contemporary *contrade*. Prestige, from historical or recent victory at the *palio* horse race, is only of concern to members if the successful *contrada* is a rival — again, reiterating the primacy of inter-group relationship.

It is possible that the psychological feature (attitude) and behaviour (time spent in *contrada*) are linked. In spending more time in allied *contrade*, members can form positive associations with the ally and encourage social ties across group boundaries. Conversely, the lack of contact with out-groups means fewer positive associations and fewer opportunities for contact; these may in turn entrench negative attitudes. Based on the data of these two studies we are unable to conclude that this is happening — these studies are not conclusive due to small sample size and the ritualised context of the *giro* procession. Broadly, this pattern aligns with the observation by Pomponio Logan (1978: 62) that "each individual's conceptions of self and of others are patterned by *contrada* membership and participation, and this conception patterns Sienese social interaction." Future research could disentangle

ricordi, ci si stava lì."

the relationship between individual attitudes and behaviour throughout the year.

2.5 Conclusion

We have provided an extensive update of the contemporary *contrade* of Siena, through four items of original research. Our estimation of *contrada* size and cross-*contrada* survey shows that the *contrade* are a phenomenon of importance to around 30,000 people, with a section of these dedicating a significant amount of time, energy, and money throughout the year engaging with the *contrada* and other members, many of whom are family or friends. Our focus on inter-group dynamics among the *contrade* demonstrated the impact of group relationship on attitudes and (ritualised) behaviour in this system. We believe group relationship should be treated with the same consideration in other societies and contexts. The *contrade* of Siena present an intriguing system in a Western, urban environment — their development over a period spanning several centuries has resulted in communities that today generate strong social identities, where group boundaries are particularly salient.

Those last days of June before the first Palio, that middle week of August before the second, are days of growing excitement and tension in Siena.

— Huxley (1925: 92)

3

Competition and inter-group relationship in human cooperation: a case study in a historic Italian city

3.1 Introduction

Human groups are ubiquitous. Many are demarcated by ideological boundaries, such as religion, but even purely symbolic markers are sufficient to bias behaviour towards members of the same "in-group" as opposed to members of a different "out-group" (Böhm et al. 2020). In particular, cooperative behaviour — in which individuals extend benefits to others (Apicella and Silk 2019) — is known to be biased: across a wide range of experimental and cultural settings, cooperation is greater between in-group members than out-group members (e.g., Balliet et al. 2014; Dorrough and Glöckner 2016; Lane 2016; Lang et al. 2019; Romano et al. 2017).

The propensity to cooperate with (unrelated) in-group members may have evolved due to greater reciprocity within groups (Yamagishi et al. 1999; Yamagishi and Mifune 2016). Additionally, biased cooperation may be the result of a history marked by intense inter-group competition, where groups of cooperators were more likely to out-compete those of non-cooperators (Bowles 2008, 2009). The differential survival of competing groups may have led to greater levels of cooperation among in-group members, alongside punitively low levels of cooperation among out-group members (Choi and Bowles 2007). The combination of these two divergent behaviours, altruism towards in-group members and hostility towards out-group members, is known as parochial altruism (Bowles 2008; Rusch 2014). Mathematical modelling has shown the two behaviours can arise simultaneously under inter-group competition (Choi and Bowles 2007; De Dreu et al. 2020; García and van den Bergh 2011; Lehmann and Feldman 2008), although they can also arise without competition (e.g., Fu et al. 2012).

Experimental evidence for inter-group competition leading to parochial altruism

in humans comes from laboratory studies in which artificial groups play games in conditions of high inter-group competition compared to low or no competition. Under competition, cooperation with in-group members increases (e.g., Bornstein 2003; Burton-Chellew et al. 2010; Puurtinen et al. 2015; Puurtinen and Mappes 2009), which is often accompanied by a decrease in cooperation with out-group members (e.g., Abbink et al. 2012; Beekman et al. 2017). Field experiments — those conducted with real groups in natural settings — also find that in-group cooperation is greater than out-group cooperation (e.g., Baldassarri and Grossman 2013; Bernhard et al. 2006; Habyarimana et al. 2007; Ruffle and Sosis 2006), especially among groups with greater exposure to inter-group competition and out-group threat (e.g., Alexander and Christia 2011; Bauer et al. 2014; Gilligan et al. 2014; Schaub 2017; Silva and Mace 2014; Voors et al. 2012; Whitt and Wilson 2007). Furthermore, competition in the form of conflict is known to have long-term effects on cooperation, such that individuals exposed to conflict in the past show greater in-group cooperation even in the absence of current competition (Bauer et al. 2016).

However, few field experiments are longitudinal and compare cooperation in periods of reduced vs. heightened competition. To our knowledge, only two such studies have been conducted (Gneezy and Fessler 2011; Silva and Mace 2015). The results are mixed, with either no increase in in-group-directed cooperative behaviour (based on first-order behaviour, Gneezy and Fessler 2011: supplementary materials) or a decrease in both in-group and out-group cooperation (Silva and Mace 2015). We conducted a field experiment in which we compared cooperation in periods of heightened vs. reduced competition among real social groups to assess whether the level of competition exacerbates the difference between in-group and out-group cooperation. Furthermore, the relationship between groups varies in our setting, allowing for an assessment of out-group relationship on cooperation.

While cooperation among out-group members tends to be lower than among in-group members, the precise relationship between out-groups influences cooperation. Groups that share a history of antagonism or rivalry are less likely to cooperate than more neutral groups, in both laboratory (e.g., Diekhof et al. 2014; Weisel and Böhm 2015) and field settings (e.g., Doğan et al. 2018; Silva and Mace 2014). Out-group cooperation may be favoured where there are positive expectations of reciprocal behaviour (Yamagishi and Mifune 2016), beneficial opportunities in terms of access to resources (Pisor and Gurven 2016, 2018), or institutions that promote prosociality (Alexander and Christia 2011). As such, hostility towards out-group members — one of the behaviours described in parochial altruism — may not be universal across cultures and contexts (Cashdan 2001; Hruschka and Henrich 2013). Out-group cooperation is a more common human phenomenon than theories currently accommodate (Pisor and Surbeck 2019; Robinson and Barker 2017).

Where out-group hostility persists, it remains an open question as to whether the lack of cooperation is better defined as help avoidance (i.e. not conferring a benefit) or active harm (i.e. imposing a cost) (Böhm 2016). Most experiments are unable to distinguish between the two because of the frame used in the experimental game. In a standard game, such as the dictator game (DG), participants begin with an endowment of monetary value (Everett et al. 2015a; Kahneman et al. 1986). Each

participant decides an amount of the endowment to transfer to another individual, retaining the rest. Larger transfers indicate greater cooperation, and smaller transfers indicate lower cooperation. The least cooperative decision is to transfer none of the endowment. However, in order to actively harm, participants need to be able to impose a further cost on the other individual, which is not possible with the standard DG. A simple modification is to include the ability to take (Bardsley 2008; List 2007). If giving nothing is favoured over taking, then the behaviour is better described as help avoidance, whereas taking indicates active harm. Experiments that utilise frames that include the ability to take, or related experimental designs, typically support the hypothesis of out-group hostility as help avoidance (e.g., De Dreu et al. 2015; Everett et al. 2015b; Halevy et al. 2008; Weisel and Böhm 2015), although some studies find more active harm (e.g., Cacault et al. 2015).

Cooperation, especially when elicited through non-strategic games such as the DG, captures an individual preference to provide a benefit (Camerer 2003). People are concerned about the welfare of others, and have other-regarding social preferences (Fehr and Schmidt 1999). In situations where group membership is salient, individuals have a preference for greater cooperation with in-groups compared to out-groups (Everett et al. 2015a). However, parochial altruism may also be modulated by expectations, also known as beliefs, about how in-group and out-group members might behave (Camerer 2003; Everett et al. 2015a; Guala et al. 2013). Expectations are formed either through internalised social norms proscribing individual behaviour, or based on direct experience and the associated likelihood of reciprocity. Norms exist across societies that encourage in-group cooperation and/or promote out-group derogation (e.g., Bernhard et al. 2006; Gneezy and Fessler 2011; Goette et al. 2006; Mathew and Boyd 2011). Among in-group members, frequent interaction promotes reciprocal exchanges (Yamagishi et al. 1999). Among out-group members, infrequent interaction means individuals can expect little reciprocity. The formation of expectations is likely to be affected by both norms and reciprocity, as the historical context between out-groups will both regulate interaction frequency and encourage the development of different norms for in-group and out-groups. Together, preferences and beliefs influence cooperative decisions, and cooperation and expectation should therefore co-vary with competition and group membership.

The present study is a field experiment designed to compare cooperative behaviour under low vs. high competition and across different group relationships. We employed a modified DG with the option to take in order to describe out-group hostility as help avoidance or harm giving. Behaviour involved personal decisions made by participants, i.e. cooperation, as well as their expectations about the choices of others. Therefore, we compare cooperation and expectations, to assess whether and how they vary with competition and group relationship. We expect i) in-group (out-group) cooperation to increase (decrease) under high competition, and for cooperation among out-groups that share greater rivalry to be ii) lower and iii) characterised as active harm. We also expect iv) cooperation and expectations to match, i.e., expectations to be similar to cooperation across competition and group relationship.

The study was conducted with members of the *contrade*, 17 "neighbourhoods"

that divide the city of Siena, Italy (Chapter 2), as discussed in Section 3.2 below. Two features of the *contrada* system are germane to testing the effects of competition and group membership. First, there is natural variation in the level of competition between *contrade*. Inter-group competition, in terms of its symptoms like tension and aggression, intensifies during the summer months before the two horse races in which the *contrade* compete, each known as *palio* (Dundes and Falassi 1984). Competition is cyclical, so we were able to predict appropriate periods in which to conduct the study, and exogenous, which means we capture cooperative behaviour in response to real-world competition as opposed to artificially induced competition. The second feature is the variation in group relationship among the *contrade* — there are allied, neutral, and rival out-groups (Filiani and Zaffaroni 2002) — yet they are broadly homogeneous with respect to other factors known to affect cooperation, e.g., ethnicity, religion, and power. Our field experiment is apposite for comparing cooperation under low vs. high competition and across different group relationships.

3.2 Methods

3.2.1 Collaborating communities

Siena is a city of around 55,000 inhabitants in central Italy. It is divided into 17 neighbourhoods called the *contrade* (singular: *contrada*). The *contrade* have existed since the medieval period, and today membership ranges from 750 to 4,000 people (Chapter 2). *Contrada* identity is strong among members due to a combination of factors, such as membership from birth and participation in rituals and social events throughout the year (Boos 2020; Dundes and Falassi 1984; Parsons 2004).

The *contrade* are involved in two competitive horse races each year, held on 2 July and 16 August, each called *palio* (plural: *palii*). Only ten of the 17 contrade participate in each *palio* horse race, as the race track is not wide enough to accommodate more horses. During the period immediately preceding each *palio*, competition between the *contrade* intensifies, particularly between those participating in the race, often resulting in antagonism and physical aggression (Operti et al. 2020). In contrast, there is reduced inter-group competition during the remainder of the year. We conducted the study during a period of low competition, approximately six months before each *palio*, and during a period of high competition, up to around two weeks preceding each *palio*.

We also make use of the variation in group relationship between *contrade* (Chapter 2; Filiani and Zaffaroni 2002). *Contrade* can be rival out-groups (negative relationship), neutral out-groups (neutral relationship), or ally out-groups (positive relationship). Not all *contrade* have rivals Section 2.2.2.5), so we distinguish between two *contrada* types, *contrade* with a rival (of which there are 13) and *contrade* without a rival (of which there are four).

3.2.2 Participants

We collected data with five *contrade*; see Section C1.1. The names of the *contrade* are anonymized. Four were *contrade* with a rival (`C05`, `C06`, `C08`, and `C16`) and one was a *contrada* without a rival (`C11`). We recruited 367 participants aged 18 or older (we aimed to recruit at least 180 participants; sample size justification is in Section C1.1.1).

Informed consent was obtained from participants before the study. Ethical approval was obtained from the School of Anthropology and Museum Ethnography Ethics Committee at the University of Oxford (Ref No.: SAME_C1A_16_051).

3.2.3 Experimental design

We employed a modified DG. Participants received an endowment (€2.50) five times greater than a recipient (€0.50). The distribution was unequal so that participants could either i) *give* an amount of their endowment to the recipient (up to €2, in divisions of €0.20), or ii) *take* an amount from the recipient's endowment (up to €0.50, in divisions of €0.10). The stake size was selected following consultation with the *contrade* involved; one *contrada* allowed only a small stake size, which we decided to keep consistent across all of them.

As in the standard DG, the recipient was passive meaning only the participant's decision affected payoffs. Decisions were indicated on paper, meaning both participant and recipient were not present at the same time although recipients did receive payoffs. The only information relating to the recipient was their *contrada* membership, which was spelled out and represented by the *contrada*'s flag. Note that if a participant gives €1.00 to the recipient, each have €1.50.

Each participant played a total of six DGs. These involved two dependent variables, cooperation and expectation, which we refer to as decision types. Cooperation was the amount transferred by the participant in the DG. Expectation was the amount the participant expected to be transferred in the DG if the roles were reversed, i.e., if the participant was the recipient and vice versa.

The independent variables were competition and group membership (Figure 3.1). Each participant played six DGs in either low or high competition (between-subject). The six DGs involved the two decision types described above and three group membership levels (one in-group and two out-groups), both within-subject. The order of the six DGs was randomised between participants.

The competition variable had two levels, low and high. Low competition involved DGs played over a two-week period in February 2017; in high competition, DGs were played in the two weeks preceding either the July 2017 or the August 2017 *palio*. We collected data before either one of the two *palii* to ensure *contrade* were participating in the horse race; see Section C1.2 for more details. A two-week period was required in order to collect sufficient data across all *contrade*. There were between five and six months between low competition and high competition.

The group membership variable had three levels, one in-group and two out-groups. The in-group involved a recipient from the same *contrada*. The out-groups involved a recipient from an out-group. For the *contrade* with a rival, the out-groups were

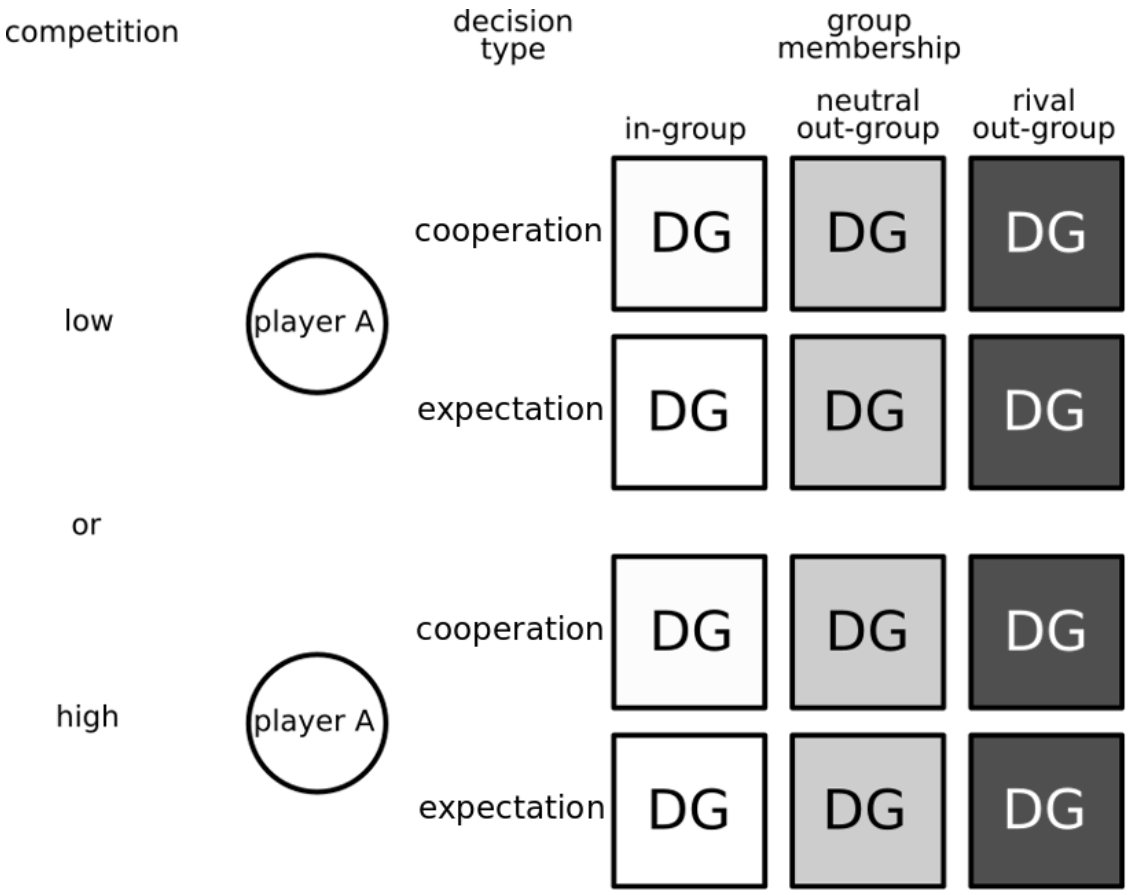


Figure 3.1: Experimental design of the DG. Each participant played six DGs, in either low or high competition (between-subject). The six DGs involved three group membership levels (one in-group and two out-groups) and two decision types (cooperation and expectation), both within-subject. Note the rival out-group was only for the *contrade* with a rival; it was replaced by an anonymous out-group for the *contrada* without a rival. The order of the six DGs was randomised between participants.

either a neutral or an ally *contrada* plus a rival *contrada*. For the *contrada* without a rival, the out-groups were a neutral *contrada* and, instead of a rival *contrada*, an anonymous out-group, using the description "an anonymous individual from Siena".

For one of the *contrade* with a rival, an ally *contrada* was used instead of a neutral *contrada*. Justification for this plus additional details about all relationships between the participating *contrade* are in Section C1.2 and Table C3. However, we classified the ally *contrada* as a neutral out-group in the analysis described in Section 3.2.5. There is little difference in the results when analysing the two relationship types separately (Section C2.2).

3.2.4 General procedure

The key procedural features were as follows. Participants were recruited at events held within each *contrada*; events were decided beforehand with each collaborator, and were expected to be well attended by members. Participants completed a

pen-and-paper questionnaire in Italian that comprised an information sheet plus consent form, followed by three parts. The first part asked participants to indicate demographic information. The second part featured instructions for the experimental games followed by the six DGs. The third part asked participants to answer questions about their association with the *contrade* and Siena, as part of a survey of the *contrade* conducted across multiple studies (Chapter 2). The responses to the survey were only included in exploratory analyses.

Questionnaires were completed in a dedicated space within the respective *contrada*, which was private to ensure anonymity. At the end of the event, participants received earnings based on decisions in one of the three cooperation DGs, selected at random. More details of the procedure are in Section C1.3, and the original Italian questionnaire and English translation are in Section D2.2.7.

3.2.5 Analysis

We split the statistical analysis into four sections. The first two sections related to cooperation (Sections 3.3.1 and 3.3.2), and the third section focused on expectation (Section 3.3.3). In the fourth section, we analysed cooperation and expectation together (Section 3.3.4). We also conducted an exploratory analysis (Section 3.3.5).

Within each section, analysis of the three *contrade* with a rival and the single *contrada* without a rival were conducted separately and presented consecutively. No quantitative comparison was made between the *contrade* with a rival and the *contrada* without a rival, due to the difference in out-group relationship (rival out-group for the *contrade* with a rival vs. anonymous out-group for the *contrada* without a rival) and an unbalanced sample (254 participants from the *contrade* with a rival vs. 82 from the *contrada* without a rival). All analyses were conducted in `R` v. 4.0.2 (R Core Team 2020); see Section 6.6 for full list of packages.

First, we performed a linear mixed-effects analysis, using the package `lme4` (Bates et al. 2015), in order to assess the effect of competition and group membership on cooperation. Fixed effects were two variables (competition, group membership) and all possible interactions. Random effects included the intercepts of each participant and *contrada*, and random slopes for each fixed effect but not their interactions (Barr et al. 2013). Model specifications are in Section C3. Visual inspection of residual plots did not reveal any obvious deviations from normality or homoscedasticity. The p values were obtained by parametric bootstrapping over 1,000 simulations (Luke 2017), using the package `afex`. As we are interested in the effect of competition within group membership, we conducted post-hoc comparisons with Tukey corrections, using the package `emmeans`, regardless of whether the interaction effect was significant (Ruxton and Beauchamp 2008). For each group membership level, we compared cooperation under low and high competition.

Second, to investigate whether out-group cooperation was better described as help avoidance or active harm, decisions were classified into one of three behavioural types: “give”, “avoid”, and “harm”. Give included decisions in which any amount was given to the recipient, avoid involved neither giving nor taking, i.e., leaving the initial endowments as is, and harm included decisions in which any amount was taken from

the recipient. We then calculated the effect of competition and group membership on the likelihood of each decision by estimating the odds ratios using a categorical linear mixed-effects model, with the behavioural type coded as 1 and the other two behavioural types coded as 0. Each model regressed behavioural type on the same fixed effects as above, namely three variables (competition, group membership, and expectation) and their interaction. Random effects for the intercepts of each participant and *contrada* were included. The models were conducted using the package `nnet` and the odds ratios were estimated using the package `questionr`.

Third, in order to assess the effect of competition and group membership on expectation, we performed another linear mixed-effects analysis, similar to the one performed for cooperation. Fixed effects were competition, group membership, and their interaction. Random effects included the intercepts of each participant and *contrada*, and random slopes for each fixed effect but not their interaction.

Fourth, we compared (average) cooperation and expectation. We conducted a linear mixed-effects analysis with DG decision (whether cooperation or expectation) as the dependent variable, with competition, group membership and decision type (cooperation and expectation) as independent variables. We conducted post-hoc comparisons with Tukey corrections, where for each level of group membership and competition, we compared cooperation and expectation.

Finally, an exploratory analysis assessed the effect of various individual characteristics on cooperation (Section 3.3.5). We performed a similar linear mixed-effects analysis to the one for cooperation, but with an additional four characteristics included as fixed effects. Two were standard demographic variables, age and gender, and two were measures of personal association with the *contrada*, based on survey responses, which we label "*contrada* involvement" and "Sienese member". These latter two measures were derived from a principal component analysis. Participants who frequently engaged in the life of the *contrada*, e.g. attended social events, scored highly in *contrada* involvement, and participants born in Siena and members through birth or kinship scored highly in Sienese member. See Section C4 for full details of the principal component analysis.

3.2.6 Follow-up study

About 24 months after completing the experiments, we conducted a follow-up study in the form of a focus group interview with a short questionnaire. The study involved 10 members of `C16` recruited by the collaborator. First, we asked participants to express their general interpretation of the DG results. We then proposed and discussed four specific factors that we thought explained the results, derived following data analysis and based on our understanding of the Sienese context. These were competition, social learning, frequent participation, and tradition (explained in greater detail in the results and discussion; Sections 3.3.6 and 3.4.1). We asked participants to indicate how much they agreed that each factor was relevant on a five-point scale from "strongly agree" to "strongly disagree". Full details of the methods and results are in Section C5.

3.3 Results

We excluded 31 (8.4%) of the 367 participants. Of these, 22 participants were from `C08`, excluded due to interference from the collaborator during data collection, while 7 participants failed to respond to a single DG; see Section C1.1.2 for full exclusion details. Therefore, we analysed 336 participants from the three other *contrade* with a rival ($n = 254$) and the one *contrada* without a rival ($n = 82$). Approximately half of the participants analysed made decisions during high competition ($n = 162$, 48.2%).

Participants included in analysis ranged in age from 18 to 84 years (M = 43.9 years, SD = 15.4 years) and were predominately (64.3%) male. The distribution of demographic characteristics by *contrada* are in Table C1 and by competition are in Table C2.

3.3.1 The effect of competition and group membership on cooperation

3.3.1.1 *Contrade* with a rival

We first examined the effect of the independent variables on cooperation in the *contrade* with a rival (Figure 3.2). Analyses revealed no significant effect of competition on cooperation, but they revealed a significant effect of group membership (Table 3.1). Across both low and high competition, cooperation was higher among in-group members (M = €0.95, SD = €0.56) than it was among neutral out-group members (M = €0.37, SD = €0.61) and rival out-group members (M = €0.04, SD = €0.66). There was no significant interaction of competition and group membership. Post-hoc comparisons revealed no significant effect of competition conditional on group membership for the in-group, neutral out-group, and rival out-group (Table C6).

3.3.1.2 *Contrada* without a rival

The effects of the independent variables on cooperation in the *contrada* without a rival are qualitatively similar to the effects in the *contrade* with a rival (Figure 3.2). Again, analyses revealed no significant effect of competition on cooperation, whereas they revealed a significant effect of group membership (Table 3.1). Across both low and high competition, cooperation was higher among in-group members (M = €0.90, SD = €0.57) than it was among neutral out-group members (M = €0.54, SD = €0.57) and anonymous out-group members (M = €0.54, SD = €0.62). Again, there was no significant interaction of competition and group membership. Post-hoc comparisons revealed no significant effect of competition conditional on group membership for the in-group, the neutral out-group, and the anonymous out-group (Table C6).

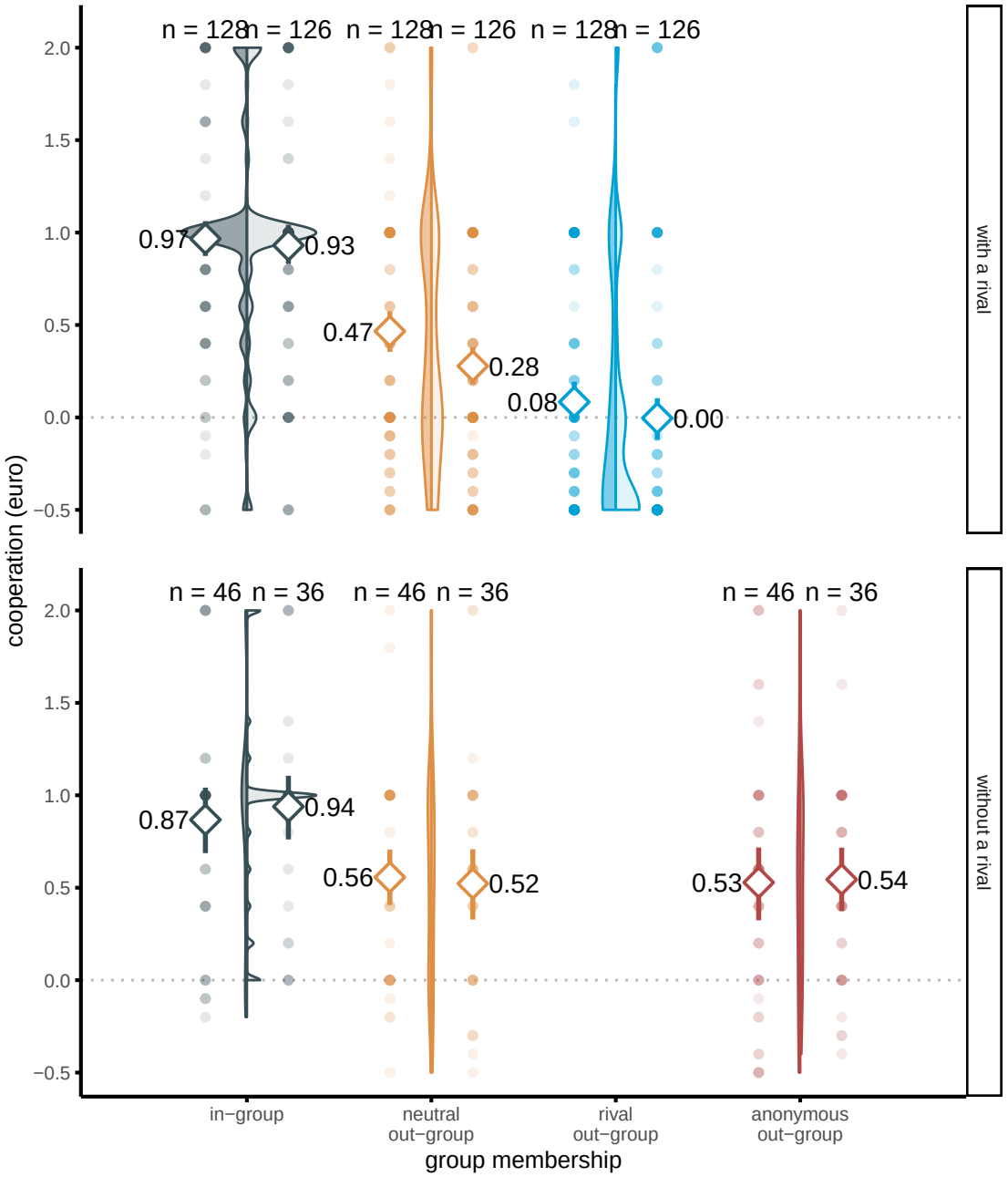


Figure 3.2: Cooperation dependent on competition and group membership for the *contrade* with a rival (N = 254) and the *contrada* without a rival (N = 82). Points are the raw data, diamond and label indicate the mean and vertical bars represent the 95% confidence intervals. Half violin shows the smoothed density. The n indicates the sample size.

Table 3.1: The effects of competition and group membership on cooperation[1]

		with a rival		without a rival	
variable	df	χ^2	p	χ^2	p
group membership	2	15.41	.005 **	26.37	.001 ***
competition	1	1.50	.224	0.05	.810
competition X group membership	2	1.18	.542	0.17	.912

[1] The full model with the variable in question was compared against a model without the variable in question. p-values were obtained by parametric bootstrapping over 1,000 repetitions: * $p < .05$, ** $p < .01$, *** $p < .001$

3.3.2 Out-group hostility as help avoidance or harm giving

3.3.2.1 *Contrade* with a rival

As described in Section 3.2.5, decisions were classified into three behavioural types: "give", "avoid", and "harm". Figure 3.3 shows the percentages of each decision by competition and group membership for the *contrade* with a rival. "Give" was the most common behavioural type among in-group members (90.6% of decisions across low and high competition). The majority among neutral out-groups was also "give" (53.9%), though a smaller percentage than among in-group members. "Harm" was the most common behavioural type among rival out-group members (54.7%).

A multilevel model of each decision against the other two revealed the likelihood of "give", "avoid", and "harm" based on competition, group membership, and expectation (Table C17). Participants were 8.8 times less likely to give, 9.1 times more likely to avoid, and 5.7 times more likely to harm a neutral out-group member compared to an in-group member. A similar pattern is observed with rival out-groups, where individuals were 22.8 times less likely to give, 5.5 times more likely to avoid, and 21.6 times more likely to harm a rival out-group member compared to an in-group member. Competition, and the interaction of competition with group membership, had no significant effect on the likelihood of giving, avoiding, and harming (Table C17).

3.3.2.2 *Contrada* without a rival

The pattern of "give", "avoid", and "harm" was similar for the *contrada* without a rival (Figure 3.3 and Table C18). "Give" was the most common behavioural type among in-group members (85.4% of cooperation across low and high competition). The majority of decisions were to "give" for both the neutral out-group (67.1%) and the anonymous out-group (70.7%). Participants were 3.7 times more likey to harm an anonymous out-group member compared to an in-group member; otherwise there was no difference in the likelihood of giving, avoiding, and harming among neutral and anonymous out-groups (Table C18).

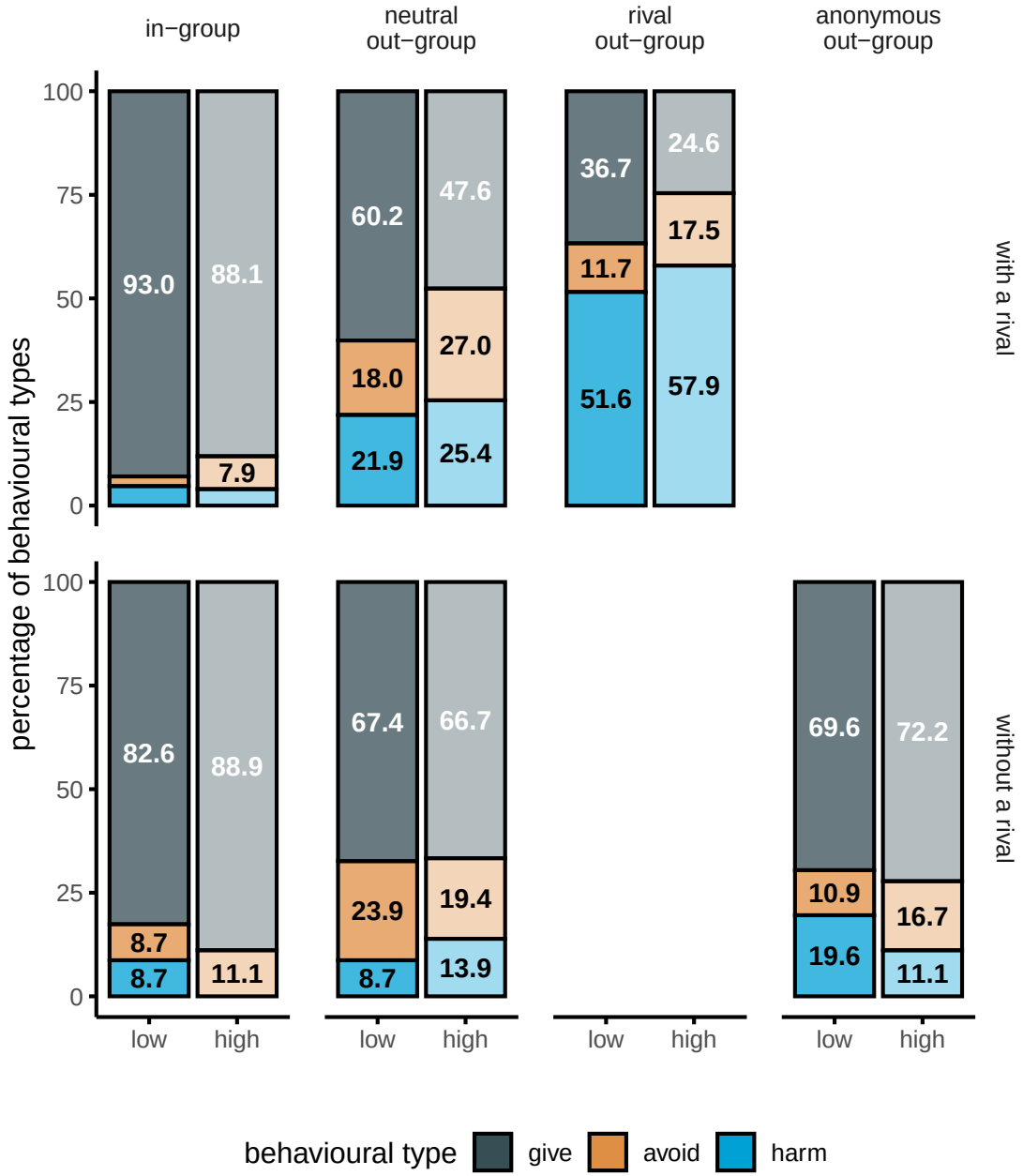


Figure 3.3: Percentage of behavioural types by group membership and competition, for the *contrade* with a rival (N = 254) and the *contrada* without a rival (N = 82). Percentages not included for the in-group in the *contrade* with a rival are as follows. Low competition: avoid = 2.3%; harm = 4.7%. High competition: harm = 4.0%. Percentages may not total 100 due to rounding.

Table 3.2: Odds ratios and 95% confidence intervals estimated from a categorical linear mixed model regression with the *contrade* with a rival [1]

	give		avoid		harm	
variable	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
high competition	0.56 (0.24–1.33)	.189	3.59 (0.96–13.38)	.057	0.84 (0.25–2.83)	.778
neutral outgroup	0.11 (0.05–0.25)	< .001 ***	9.13 (2.67–31.26)	< .001 ***	5.69 (2.27–14.29)	< .001 ***
rival outgroup	0.04 (0.02–0.09)	< .001 ***	5.53 (1.56–19.61)	.008 **	21.64 (8.89–52.69)	< .001 ***
expectation	0.33 (0.15–0.74)	.007 **	5.12 (1.43–18.27)	.012 *	1.72 (0.61–4.89)	.307
high competition X neutral out-group	1.08 (0.40–2.92)	.885	0.47 (0.11–1.99)	.305	1.45 (0.38–5.55)	.590
high competition X rival out-group	1.01 (0.36–2.79)	.992	0.44 (0.10–1.97)	.286	1.54 (0.42–5.71)	.518
high competition X expectation	1.51 (0.52–4.37)	.445	0.35 (0.08–1.61)	.179	1.21 (0.27–5.53)	.805
neutral out-group X expectation	2.12 (0.82–5.48)	.121	0.23 (0.06–0.95)	.042 *	0.82 (0.25–2.69)	.744
rival out-group X expectation	2.06 (0.78–5.41)	.143	0.26 (0.06–1.11)	.069	0.72 (0.23–2.29)	.583
high competition X neutral out-group X expectation	0.64 (0.18–2.31)	.500	2.41 (0.43–13.60)	.320	0.92 (0.17–5.09)	.925
high competition X rival out-group X expectation	1.40 (0.38–5.17)	.616	1.38 (0.22–8.53)	.731	0.62 (0.12–3.30)	.576
(intercept)	13.22 (6.72–26.04)	< .001 ***	0.02 (0.01–0.08)	< .001 ***	0.05 (0.02–0.11)	< .001 ***

[1] For each regression, the behavioural type (give, avoid, or harm) was coded as 1 and the other two as 0. Fixed effects of interest are out-group (vs. in-group), expectation (vs. cooperation), and competition (vs. low). Random effects included individuals and *contrada*. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 3.3: The effects of competition and group membership on expectations[1]

		with a rival		without a rival	
variable	df	χ^2	p	χ^2	p
group membership	2	168.27	.001 **	14.06	.003 **
competition	1	0.05	.841	0.21	.658
competition X group membership	2	2.96	.256	4.57	.085

[1] The full model with the variable in question was compared against a model without the variable in question. p-values were obtained by parametric bootstrapping over 1,000 repetitions: * $p < .05$, ** $p < .01$, *** $p < .001$

3.3.3 The effect of competition and group membership on expectation

3.3.3.1 *Contrade* with a rival

We investigated expectation separately from cooperation, and find that the general pattern of expectation follows that of cooperation (Figure 3.4). Analyses revealed no significant effect of competition on expectation, whereas they revealed a significant effect of group membership (Table 3.3). Across low and high competition, expectation was higher for in-group members (M = €0.77, SD = €0.57) than it was for neutral out-group members (M = €0.25, SD = €0.58) and rival out-group members (M = €0.04, SD = €0.77). There was no significant interaction of competition and group membership. Post-hoc comparisons revealed no significant effect of competition conditional on group membership for either the in-group, neutral out-group, or rival out-group (Table C10).

3.3.3.2 *Contrada* without a rival

Again, the general pattern of expectation among the *contrada* without a rival is similar to the *contrade* with a rival (Figure 3.4). Analyses revealed no significant effect of competition on expectation, but they revealed a significant effect of group membership (Table D6). Across low and high competition, expectation was higher for in-group members (M = €0.70, SD = €0.58) than it was for neutral out-group members (M = €0.43, SD = €0.62) and anonymous out-group members (M = €0.45, SD = €0.65). There was no significant interaction of competition and group membership. Post-hoc comparisons revealed no significant effect of competition conditional on group membership for the in-group and the anonymous out-group, but a significant effect for the neutral out-group (Table C12). Expectation for the neutral out-group was M = €0.29 (SE ± €0.14) greater in low competition than in high competition.

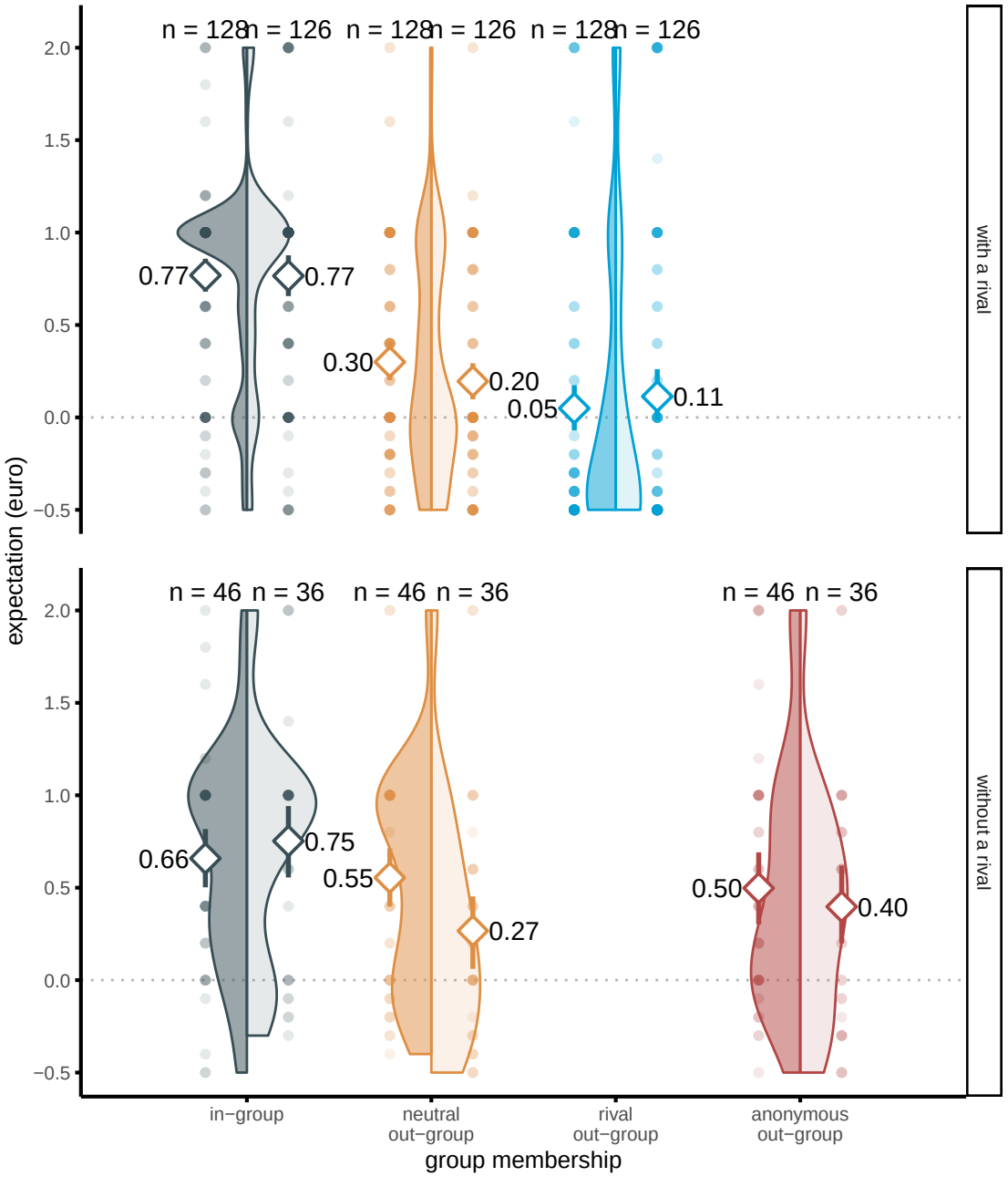


Figure 3.4: The participant expectations dependent on competition and group membership for the *contrade* with a rival (N = 254) and the *contrada* without a rival (N = 82). Points are the raw data, diamond and label indicate the mean and vertical bars represent the 95% confidence intervals. Half violin shows the smoothed density. The n indicates the sample size.

3.3.4 Cooperation vs. expectation

As mentioned in Section 3.2.5, we compared cooperation and expectation, to assess any differences between them by competition and group membership. Among *contrade* with a rival, post-hoc comparisons showed a significant difference between cooperation and expectation in both low and high competition for the in-group (low: t(1279) = 2.91, = .004; high: t(1279) = 2.41, = .016), with cooperation greater than expectation by €0.20 ± 0.07 (standard error) and €0.17 ± 0.07 (standard error) during low and high competition, respectively. There was also a significant difference during low competition for the neutral out-group (t(1279) = 0.17, = .014), with cooperation greater than expectation by €0.17 ± 0.07 (standard error). Post-hoc comparisons for the *contrada* without a rival revealed no significant difference between cooperation and expectation across all comparisons by competition and group membership. Table C14 shows all pairwise contrasts for both the *contrade* with a rival and the *contrada* without a rival.

3.3.5 Exploratory analysis of individual characteristics on cooperation

As described in Section 3.2.5, we conducted an exploratory analysis of four individual characteristics — age, gender, *contrada* involvement, and Sienese member— on cooperation in the *contrade* with a rival. Figure C3 shows how little cooperation varied with the individual characteristics, regardless of the recipient's group membership. For example, for every 1 unit increase in *contrada* involvement, cooperation with an in-group member increased by €0.03 ± 0.05 (standard error). Analyses revealed no significant effect of age, gender, *contrada* involvement, and Sienese member on cooperation, whether as a main or interaction effect (Table C19). Additional models were robust to these results. For further details, see Section C4.

3.3.6 Follow-up study

As described in Section 3.2.6, we asked for general interpretations of the experimental results. Some selected quotes (translated by A.R.K.) are presented here, which we interpret in greater detail in the discussion (Section 3.4); complete translations and original comments are in Section C5. The concept of family was invoked by several members to describe the *contrada*, and by extension, to explain in-group cooperation. For example, a young man stated:

> "The base concept is that of family, so what do you do? There's sharing within the family. [...] It comes spontaneously."

Focusing on the equal division of money between in-group members, a middle-aged man detailed (direct) reciprocity:

> "[M]aybe someone will hopefully do the same with you. Therefore, it's also a bit like setting an example of how you should behave, in the social

> sphere. Those who have been left behind are helped, with the hope, unconscious perhaps, that you might be helped, so I also see it as a kind of social investment, of the sort: I'll give you a hand, but if one day I need it, you'll give one back to me."

When asked to elaborate on whether this applied to behaviour within the *contrada* or between *contrade*, he continued:

> "Within the *contrada*, help doesn't have a colour [...] maybe I don't like that person, but one needs to try to help them anyway."

Turning to the finding of lower out-group cooperation compared to in-group cooperation, a couple of participants used terms like "city-state" to describe the 17 *contrade*, as exemplified by a middle-aged woman:

> "The glue is the good of the *contrada*, of your country, of your nation, of your state, since it [the *contrada*] is a state. Therefore even [individual] differences [...] are surpassed by the ultimate objective: [...] to do good in your *contrada*."

Finally, when asked to explain why there was no difference between low and high competition, an older man stated:

> "There's no great variation between when you play the game because it's a sense of belonging [to the *contrada*] that manifests itself throughout the year, not only in the 'climax' period of the festival [...] Participation [in the *contrada*] sees us together regardless of the race, fundamentally."

In the follow-up study, we also showed participants a stylized version of Figure 3.2, and asked participants if the results, in particular the finding that in-group cooperation is greater than out-group cooperation, could be explained by four factors that we thought explained the results. These were competition (annual competition in the form of the *palio* favours in-group cooperation), social learning (learning to identify with one's own *contrada* from a young age creates a strong group identity), freqeunt participation (year-round participation in the life of *contrada* reinforces group identity) and traditions (traditions and rituals reinforce identity). All ten participants indicated either "strongly agree" or "agree" to each factor, expect for one "neither agree nor disagree" response for social learning.

3.4 Discussion

Within an evolutionary framework, it has been proposed that the level of inter-group competition has a polarising effect on cooperation (increased in-group cooperation and decreased out-group cooperation), and that interactions with out-group members are characterised by hostility (Bowles 2009; Rusch 2014). In order to assess the effects of the level of competition and inter-group relationship on cooperation in

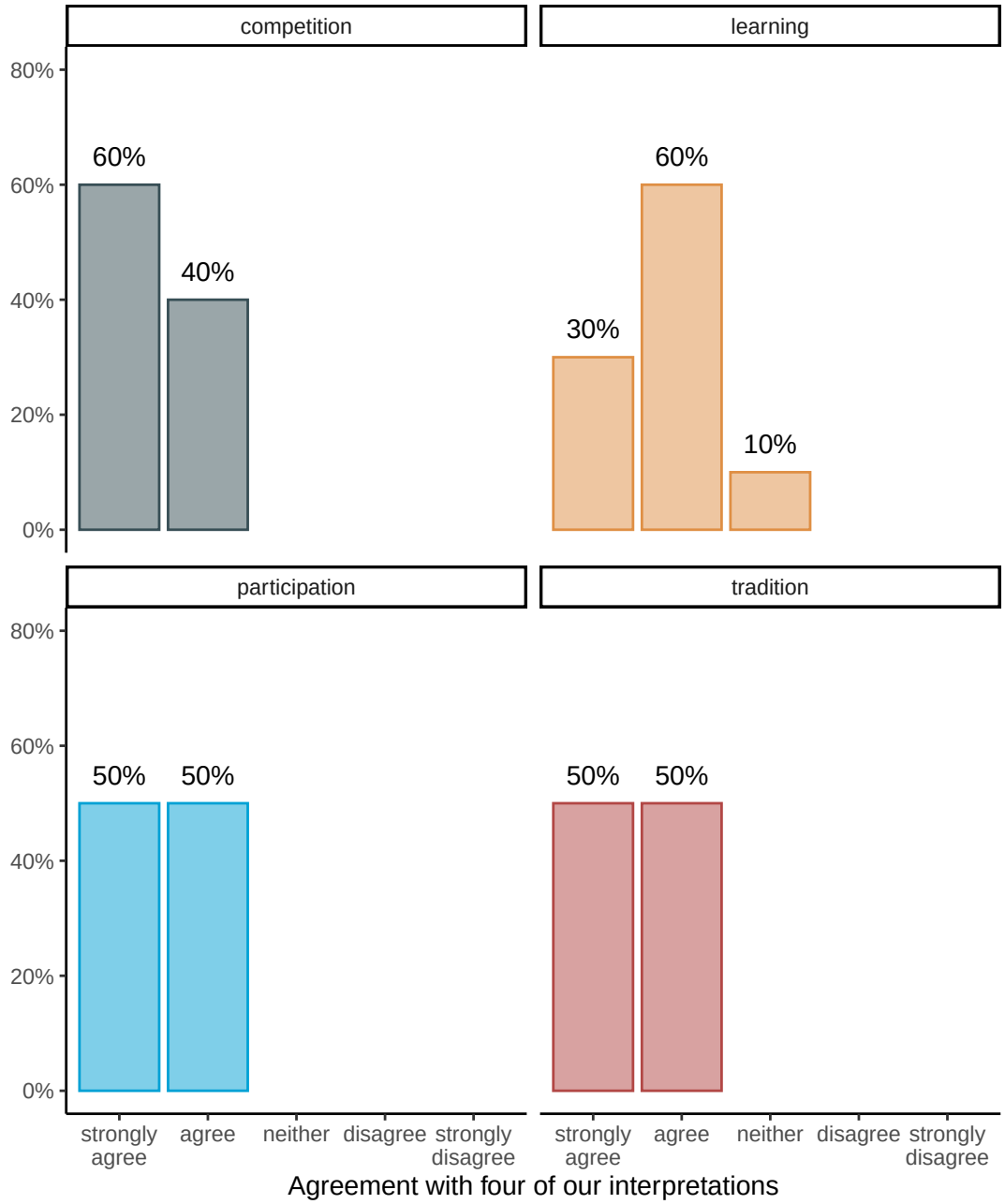


Figure 3.5: In a post-game study involving ten participants from `C16`, participants were asked to indicate whether the results of the dictator were explained by four of our interpretations — competition, (social) learning, participation in *contrada* life, and traditions; see Section C5 for more details.

the real world we conducted a field experiment with the *contrade* of Siena. The experimental design afforded the distinction between help avoidance and active harm, to see whether out-group cooperation is always hostile.

Contrada members showed a general propensity to favour in-group members over out-group members. However, we found limited evidence for an effect of the level of competition (low vs. high) on cooperation. We found an effect of group relationship, with cooperative behaviour between neutral out-groups and hostile behaviour predominantly between rival out-groups. We discuss these findings in the context of the literature on the evolution of human cooperation and against the ethnographic background for the Sienese system (Section 3.4.1), then outline study limitations and possible extensions (Section 3.4.2).

3.4.1 Substantive findings

We find that increased competition neither increases average in-group cooperation nor decreases average out-group cooperation, in contrast to theoretical predictions (Bowles 2009; Rusch 2014) and related research conducted in laboratories using artificial groups (e.g. Abbink et al. 2012; Beekman et al. 2017; Bornstein 2003; Burton-Chellew et al. 2010; Puurtinen et al. 2015; Puurtinen and Mappes 2009). Instead, we find that cooperative behaviour is similar across periods characterised by high and low competition. This result is similar to one of two longitudinal field experiments. Gneezy and Fessler (2011) found that in-group cooperation among Israeli citizens during the 2006 Israel-Hezbollah war was the same as before and after the war (based on first-mover decisions, described in the corresponding supplementary material). In contrast, Silva and Mace (2015) found that both in-group and out-group cooperation among Catholic and Protestant neighbourhoods in Northern Ireland decreased during riots in 2013 compared to both before and after the riots. The results from our study with the *contrade*, alongside the two other longitudinal field experiments, suggest that the current level of competition does not always affect cooperation among natural groups.

That out-group cooperation did not change is surprising, particularly with respect to neutral out-groups. During the *palio*, neutral out-groups represent more of a threat relative to the rest of the year when they are rarely considered. Although average cooperation with neutral out-group decreased during high competition, it was not statistically significant. Again, it seems that the level of competition or threat does not affect cooperation in the context studied here.

What alternative explanations might there be? It could be that reciprocity explains cooperation (Yamagishi et al. 1999), as in-group members were expected to cooperate, and out-group members were expected not to cooperate. Pointedly, direct reciprocity was described by one of the older men in the post-game study to explain the equal division of money among in-group members. However, we found that cooperation and expectation were only similar among out-group members, whereas participants behaved more prosocially than they expected in-group others to behave, which has been found in previous experiments (e.g., Koopmans and Rebers 2009). It is likely that in this context, in-group members were more

familiar to each other than out-group members. Participants are aware of the variation in behaviour within the in-group, which includes both cooperators and non-cooperators. Conversely, out-group members are homogenised (for a review see Rubin and Badea 2012), with all out-group members expected to be similarly non-cooperative. Of course, other non-excluding explanations exist, such as fairness norms for egalitarian behaviour (common in market-integrated societies,e.g. Henrich et al. 2005), and strong reciprocity, whereby participants reward others (specifically, in-group members) at a cost to themselves (Fehr and Gächter 2002).

An understanding of the null finding of no effect of competition requires an appreciation of the Sienese context. The annual *palio* is a centuries-old tradition, and represents a moment of intense and direct competition between *contrade* (Dundes and Falassi 1984). Over time, periodic competition means adult members develop strong "in-group love" for their own *contrada*, and "out-group hate" for their rival *contrada*. Divergent emotions and behaviours, even in the absence of the *palio*, are reinforced by social learning (most members form positive associations with their own *contrada*, and negative associations with other *contrade*, from interactions with family members, peers, and elders within the *contrada*), active participation in the life of the *contrada* throughout the year, and traditions that maintain group boundaries. Results from the follow-up study suggest that these interpretations are supported by *contrada* members. Finally, ethnographic evidence for the constant exposure to the *palio* and associated inter-group dynamics is the Sienese proverb "the *palio* is run all year long" (Ita. *il Palio si corre tutto l'anno*, Dundes and Falassi 1984: 142). The comment made by the older man during the focus group resonates with this point: the "sense of belonging manifests itself throughout the year".

The null finding, that the current level of competition did not affect cooperation, does not mean competition has little influence on cooperative behaviour. Rather, this is consistent with research on the long-term effects of competition and conflict (e.g., Bauer et al. 2016, 2014; Voors et al. 2012). Inter-group competition in the real world has a cumulative effect on in-group and out-group cooperation, an effect that extends beyond the period in which intense competition occurs. In the Sienese context, in-group bias in cooperative behaviour arises because competition has occurred over considerable time-scales, i.e., a few centuries. The null finding might generalise to other settings, such that degree of bias is the same before, during, and after either match days among rival sports fan or raids among warring small-scale societies. We would expect in-group to remain unaffected by competition the longer it has been a feature of inter-group relations.

We found that the relationship between *contrade* has an important effect on cooperative behaviour, in line with other field research involving groups whose relations vary (Baldassarri and Grossman 2013; Doğan et al. 2018; Pisor and Gurven 2016, 2018; Silva and Mace 2014): cooperation is greater among neutral out-groups compared to rival out-groups. The relationship between out-groups is especially important in determining whether participants cooperate, avoid giving help, or actively harm out-group members. Across the *contrade* with a rival and the *contrada* without a rival, as well as during high competition, most decisions with neutral out-groups were cooperative. Conversely, most decisions with rival

out-groups were actively harmful. This means that out-group hostility among neutral out-groups cannot be classified as such, and out-group hostility among rival out-groups can be classified as active harm. Behaviour that harms out-group members — termed "strong" parochial altruism (Böhm 2016) — may only be found with out-groups with which there is a history of antagonism. Parochial altruism thus needs to clarify what environmental and social factors cause out-group hostility; from this study a negative or antagonistic group relationship is a clear candidate.

It is important to note that cooperation with rival *contrade* did occur, with a third of rival out-group decisions classified as cooperative. This means average cooperation among rival out-groups, as measured by the amount transferred, was approximately €0, which is neither hostile nor cooperative. As discussed above, cooperation is also common among neutral out-groups. In an urban and market-based setting where groups are not endogamous, out-group relationships remain important in providing opportunities for cooperative partners, particularly in social and economic contexts outside of the *contrada*. The opportunities afforded by inter-group cooperation have long been a focus of social psychology (Brewer and Miller 1996; Gaertner and Dovidio 2001; Sherif 1966). This study further demonstrates that evolutionary models and theorising should incorporate positive between-group interactions (e.g., Masuda 2012; Pisor and Surbeck 2019; Robinson and Barker 2017).

Finally, our exploratory analysis suggested that neither demographic characteristics (i.e. age and gender) nor individual measures of *contrada* involvement affected in-group and out-group cooperation. The possibility remains, however, that more precise measurements of involvement may affect cooperation. Whether more recent or more established members show greater bias is a question that merits further consideration in research of intergroup contexts.

3.4.2 Study limitations and future directions

This field experiment has several advantages, such as the use of genuine groups and exogenous competition, but there are also limitations to the context and experimental design. Competition in the Sienese context often results in antagonism and physical aggression (Drechsler 2006; Dundes and Falassi 1984), but the *palio* is not an inherently violent conflict. As such, it is possible that the effect of inter-group competition is different in other real-world situations where the form of competition is better described as warfare (e.g., between Israel and Hezbollah; Gneezy and Fessler 2011) or is the result of recent riots (e.g., between Catholics and Protestants; Silva and Mace 2015). There is also a difference in how group membership and competition were elicited in the experiment. Group membership was explicitly indicated through the design of the game, whereas competition was an implicit feature of the environment. Laboratory experiments may find a stronger effect of competition as it is a manipulated variable. The relative strength of manipulated vs. environmental variables should be explored in future studies comparing laboratory and field experiments (e.g., Levitt and List 2007a).

Our recruitment strategy might have influenced two results. First, that expectation among in-group members is lower than actual in-group cooperation might be

due to recruitment being on a voluntary basis. In other words, our sample might be composed of generous individuals. Second, when looking at the overall sample, there was a slightly higher percentage of participants who were born in Siena and who are members through birth or kinship in the low competition period compared to high competition. These members will have been associated with the *contrada* from a young age and might be more biased than those who became members later in life, meaning the results in low and high competition appear to be similar. While the exploratory analysis alleviates the second concern, in general an alternative recruitment strategy, such as randomly sampling from a list of *contrada* members, could have allayed these concerns. We note that this was the first experimental study with the *contrade*, and a randomised approach was not an option available to us due to the burden it would have placed on the communities.

Stake size and the operationalisation of taking as harmful are further limitations of this study. The small stake size may have limited participant decisions, creating both ceiling and floor effects (although increasing stake size has a liminal effect on DG decisions; Engel 2011; Larney et al. 2019). However, many participants took a marginal amount of money (€0.50) from an out-group member, suggesting a strong preference for taking even if the relative loss for the other individual would have been minimal.

We have labelled decisions involving taking as harmful, because resources which might have been allocated to the out-group were not given. However, in taking, the participant does not incur a cost but earns relatively more money for themselves (and by extension, the group). Thus, taking both maximises returns to the in-group and maximises the difference between the in-group and the out-group. Future experiments could use an experimental paradigm that captures spite, where a personal cost is incurred in order to mete a larger cost to others (Böhm et al. 2018; West et al. 2007b).

We note as well that individual characteristics — such as the personal amount of inter-group contact (Brown and Hewstone 2005) — could be included in future studies. A more explicit inclusion of out-groups that share a positive relationship (in this case, allied *contrade*) could also be investigated further, both in the Sienese context and more generally.

Finally, we recognise that the follow-up study should be interpreted with caution, as the sample was small and various demand characteristics of the setting might have inclined participants to confirm our explanations.

3.4.3 Conclusion

Human prosociality is influenced by inter-group competition, although understanding the precise effect of this factor requires investigation in natural settings. We conducted a field experiment with the *contrade* of Siena, Italy. We found that the level of competition did not affect cooperation in a manner predicted by psychological and evolutionary theories of in-group bias (Böhm et al. 2020). Instead, we suggest that competition leads to in-group bias when it is present over relatively long time-scales — over several centuries in the case of the Sienese *contrade*. The study

also highlights the variety of relationships that exist between human groups, and it encourages studies of cooperation to focus more on details of inter-group relations.

And, even today, fighting and violence over contrada *matters is tolerated during the Palio festival by a society which accepts no other expression of public lawlessness.*

— (Hook 1979: 230)

4

Third-party punishment among historic Italian communities

4.1 Introduction

A social norm can be defined as a behavioural standard shared and enforced by a particular group (Chudek and Henrich 2011). Humans are hypothesised to have evolved a norm psychology that enables individuals to acquire norms from the local environment, act upon them, and enforce them upon others (Chudek and Henrich 2011). There are several ways in which normative behaviour can be enforced, but one behaviour of special significance is punishment, particularly third-party punishment (Fehr and Fischbacher 2004). Third-party punishment involves a bystander observing an interaction that violates a norm and meting a sanction on the perpetrator of the violation. Third-party punishment is often framed as "costly" or "altruistic" as the punisher incurs a cost (Fehr and Gächter 2002). According to some accounts, this costly mechanism sustains cooperative practices in the long-run, by encouraging cooperative behaviour in others (e.g. Fehr et al. 2002). The level of cooperation expected by norms varies substantially across cultures (Henrich et al. 2006; Herrmann et al. 2008; Marlowe et al. 2008). Scholars debate the role of third-party punishment in sustaining norms that, in turn, sustain cooperation (Guala 2012; Raihani and Bshary 2019), and the influence of altruistic punishment in real-life (see Baumard 2010; Pedersen et al. 2019; Wiessner 2005).

Social norms are a group-based phenomenon: they are determined by a specific community. Numerous studies suggest third-party punishment is affected by the relative group identities of the perpetrator, the victim, and the punisher (e.g. Bernhard et al. 2006; Delton and Krasnow 2017; Goette et al. 2006; Jordan et al. 2014; McAuliffe et al. 2015; Rabellino et al. 2016; Schiller et al. 2014; Shinada et al. 2004; Yudkin et al. 2016). However, different views have been put forward with regards to the manifestation of punishment when perpetrator and punisher are from the same group. This study focuses on this issue, contrasting two theories — group

norm maintenance theory vs. deterrence theory — following the characterisation in Delton and Krasnow (2017: in particular Figure 1).

According to group norm maintenance theory, third-party punishment punishes violations of group norms. Specifically, third-party punishment functions to maintain i) fairness norms that encourage in-group members to share resources fairly, and ii) parochialism norms that promote derogation of out-group members. When all three parties are from the same group, group norm maintenance theory predicts punishment in instances where the first party does not cooperate, in line with the fairness norm. It also predicts that in-group members should be punished more as they cooperate more with out-group members, in-line with the parochialism norm.

Alternative views argue that group norms are not the reason for third-party punishment, in part because being punished does not consistently have the intended effects of increasing cooperation from the target or increasing group payoffs (see overview in Raihani and Bshary 2019). Punishers gain both direct and indirect benefits from punishment, regardless of the effect it has on group norms (Bone et al. 2014; Krasnow et al. 2016). Third-party punishment also has reputational benefits (Barclay 2006), as a signal to others that the punisher is cooperative and trustworthy (Jordan et al. 2016a). Punishment might also be competitive: a punisher may seek to increase their own payoffs relative to the target (Raihani and Bshary 2015). These explanations for third-party punishment are not mutually exclusive, and all have empirical support. However, it is not clear how punishment of in-group members changes as a function of the group membership of the recipient, expect that reputation is generally a more likely motivator within groups, due to increased likelihood of social interactions and increased expectations that in-group members provide benefits to one another (Yamagishi et al. 1999).

Deterrence theory makes a specific prediction for punishment targeted at those who (fail to) cooperate with in-group vs. out-group members (Delton and Krasnow 2017). Here, third-party punishment flows from an evolved deterrence psychology that aims to deter poor treatment of oneself and valued others. An individual is motivated to punish an in-group member when they do not cooperate with an in-group member because in-group members are more valuable, and because the punisher can infer how much the perpetrator values the punisher, based on shared membership. Conversely, an individual should not punish an in-group member who treats an out-group member poorly because this behaviour does not reliably predict how the perpetrator would treat the punisher.

So when to punish an in-group member? When an in-group member does not cooperate, both group norm maintenance and deterrence theory predict more punishment when this lack of cooperation is directed at an in-group member vs. an out-group member. When an in-group member does cooperate, group norm maintenance predicts more punishment when cooperation is directed at an out-group member than at an in-group member (due to the parochialism norm), whereas deterrence predicts no punishment when cooperation is directed at both an in-group member and an out-group member (as there is no inference about behaviour).

An important element missing from these predictions is the role of out-group relationship in determining whether or not an individual punishes cooperative

behaviour directed at an out-group. For example, in Bernhard et al. (2006), there was no punishment at fair divisions of a resource among in-group members or among out-group members. In this field experiment, the two groups — the Ngewma and Wolimbka in the Western Highlands of Papua New Guinea — shared a peaceful relationship, having "never conducted tribal warfare with each other within the memorised history of the older members" (914). We expect results to differ given a more hostile inter-group relationship. If experiments incorporated different out-groups, the flexibility among people with regards to between-group cooperation and their associated norms could be captured. In situations where out-groups share a neutral or positive relationship, punishment of in-group members for a failure to cooperate with an out-group member might be admissible (Fearon and Laitin 1996). This could be driven by cultural institutions, treaties, or trade deals that encourage cooperation across distinct group boundaries — in essence social norms between groups (Pisor and Surbeck 2019). Personal interaction histories could also result in greater out-group cooperation (Pisor and Gurven 2018), which, in turn, might be viewed favourably by other in-group members.

The main aim of this study is to examine how group relationship affects the dynamics of third-party punishment in group contexts. To critically assess what we should expect from situations involving in-group and out-group victims, we present a survey of the literature (Section 4.1.1). We then outline the specific aims of this study (Section 4.1.2).

4.1.1 Review of the experimental literature

We surveyed the literature for experimental studies that employed a third-party punishment game (TPPG), the standard paradigm for assessing third-party punishment, with a group membership manipulation. In the TPPG, an actor (player A) decides whether or not to cooperate with a recipient (player B). A third-party (player C) then decides, based on player A's behaviour, whether they wish to pay a cost in order for the player A to incur an additional cost. Players A, B, and C can be in-group or out-group members relative to each other. To assess how punishment changes as a function of the recipient of cooperation, player A and player C can be in-group members (ABC treatment), and player B can be either an in-group or an out-group member (AC treatment). Nine studies met these criteria (Baumgartner et al. 2012, 2014; Bernhard et al. 2006; Daughters et al. 2017; Delton and Krasnow 2017; Goette et al. 2006, 2012; Morese et al. 2016; Rabellino et al. 2016; see Section D1 for details of the literature review).

Figure 4.1 is a graphical representation of the results. As cooperation increased, punishment decreased for treatments ABC and AC in six of the seven studies where this relationship could be analysed (the exception was no change in the AC treatment, Delton and Krasnow 2017). However, in five of the nine studies, the slopes in treatments ABC and AC differed. The slope in the ABC treatment was steeper, as there was more punishment of non-cooperation in the ABC treatment than the AC treatment. Overall, punishment of non-cooperation was greater in the ABC treatment than the AC treatment for six of the nine studies, with

punishment similar in the remaining three studies. Punishment of cooperation was similar between the ABC treatment and the AC treatment for seven of the nine studies, with less punishment in the ABC treatment than the AC treatment in the remaining two studies.

In summary, the experimental literature consistently finds more punishment of an in-group member who does not cooperate with another in-group member vs. one who does not cooperate with an out-group member, in line with both group norm maintenance theory and deterrence theory. The experimental literature also suggests more punishment of an in-group member who cooperates with an out-group member vs. one who cooperates with an in-group member. This latter finding is congruent with group norm maintenance theory, not deterrence theory, and raises the prospect of norms for behaviour towards out-group members. However, it is not possible to state, based on the above literature review, whether there is significantly more punishment of out-group cooperation than in-group cooperation. This is in part due to limitations of this qualitative review of a small number of studies, such as its completion after the study was conducted, which relied on A.R.K.'s coding and interpretations of the results.

4.1.2 The current study

The novelty of this study is twofold. First, we varied the relationship between out-groups, including one out-group with which there are no formal relationships and another out-group characterised by hostile interactions. Most TPPG studies employ a single out-group (a notable exception is Schiller et al. 2014). Second, following Halliday (2011), we modified the TPPG so that resources could be taken from the recipient. This option allows for the distinction between two types of non-cooperative behaviour: help avoidance and active harm (Weisel and Böhm 2015).

In this setting, help avoidance is the preference to neither give nor take. Active harm is the preference to take. While most out-group cooperation is better characterised as help avoidance, an increase in the degree of rivalry increases active harm (e.g. Chapter 3; Weisel and Böhm 2015). Halliday (2011) found greater punishment when player A takes compared to when player A does not take, indicative of a norm to prevent non-cooperative behaviour that is deliberately harmful. We include the option to take in order to assess whether harmful non-cooperation affects punishment among in-groups, and whether harmful non-cooperation when directed at out-group members can be sustained by punishment.

Our study is a lab-in-the-field experiment. Criticism of costly third-party punishment has focused on the fact that such punishment is not commonly observed in either natural settings (e.g. Baumard 2010; Pedersen et al. 2019; Wiessner 2005) or experimental conditions outside of the laboratory (e.g. Balafoutas and Nikiforakis 2012; Balafoutas et al. 2014). Thus, the compelling evidence for costly punishment in the laboratory may not be externally valid (Guala 2012; Raihani et al. 2012): instead, third-party punishment may be the result of an experimental design that does not capture behaviour in the real world. Not only does our lab-in-the-field study address this issue by virtue of being conducted with members of genuine

communities, but we qualitatively assessed whether the TPPG paradigm captures contextually relevant behaviour. To do so, we asked participants to provide a written interpretation of the game. This allowed us to qualify the relevance of the TPPG in sustaining norms, instead of assuming that participants bring external norms into the game that are reflected in their decisions (e.g. Henrich et al. 2005).

The TPPG was played by members of the *contrade* of Siena (Chapter 2). The *contrade* are 17 "neighbourhoods" that make up the Italian city of Siena (singular: *contrada*). Two features of the *contrade* make them suitable for investigating third-party punishment in the real world. First, the *contrade* are relatively small-scale communities distinguished by traditions (i.e., norms) that promote significant volunteering that benefits in-group members (Dundes and Falassi 1975: Ch. 7; Parsons 2004: Ch. 5), while also being embedded in the general Italian cultural system known to punish altruistically (Lergetporer et al. 2014; Rabellino et al. 2016). Previous accounts support the presence of norms and sanctions, "social interaction among *contradaioli* [*contrada* members] is guided by egalitarian forms, and there are specific sanctions against behavior that might be divisive" (Silverman 1979: 428). Second, we showed that members of the *contrade* bias cooperation towards their in-group, but cooperation does occur more often among *contrade* that share a relationship classified as "neutral" compared to one classified as "rival" (Chapter 3).

Based on the literature review (Section 4.1.1) and the results of our previous study (Chapter 3), we made the following predictions for behaviour in the TPPG. With respect to cooperation, we expected greater cooperation among in-groups than out-groups and greater cooperation among neutral out-groups than rival out-groups. With respect to punishment, we expected to find a strong norm for cooperation among in-group *contrada* members, with no third-party punishment of cooperative behaviour and third-party punishment of non-cooperative behaviour whether classified as active harm or help avoidance. Conversely, we expected to find no norm for cooperation among out-group *contrada* members, with little third-party punishment across both non-cooperative and cooperative behaviour. However, we anticipated a difference between neutral and rival out-group *contrade*, such that among neutral out-group *contrada* members there was some punishment of non-cooperative behaviour, an indication of a weaker norm for cooperation. We have no a priori prediction about the magnitude of this difference. We also measured expectations of punishment, which we predicted will be similar to actual punishment.

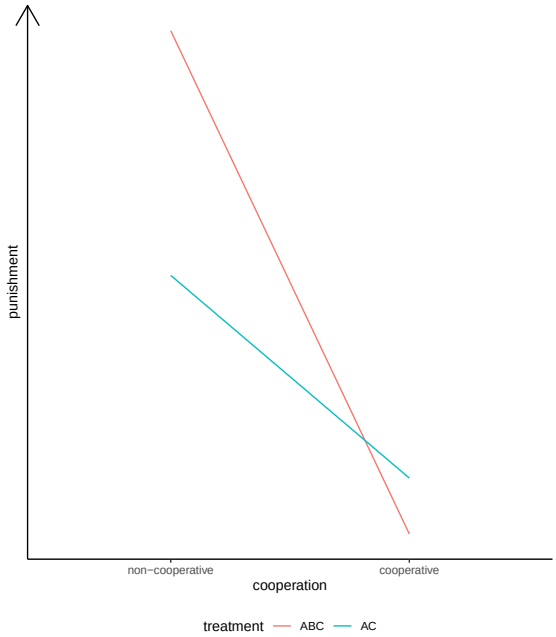


Figure 4.1: Graphical summary of a literature review of nine studies involving a third-party punishment game (TPPG) with group membership manipulation. See text for details of the TPPG and Section D1 for inclusion criteria. In the ABC treatment, the recipient was an in-group member; in the AC treatment the recipient was an out-group member.

4.2 Methods

4.2.1 Study population

Siena is a city in central Italy with a population of approximately 55,000. It is divided into 17 neighbourhoods called the *contrade*. The *contrade* have antecedents in the medieval period, and today count 750–4,000 members (Chapter 2). *Contrada* identity is strong among members due a combination of factors, such as membership from birth and participation in events and rituals throughout the year (Dundes and Falassi 1975: Ch. 7; Parsons 2004: Ch. 5).

Relevant to the current study is the fact that the *contrade* share different relationships (Chapter 2: Section 2.2.2.5). Most *contrade* are neutral with respect to each other, meaning there is no official relationship between them. However, many *contrade* have formally recognised rivals. Rivalry is intense. From a young age *contrada* members learn to dislike each other and tend not to interact (particularly during rituals, Chapter 2). There is also antagonism between rivals, especially during the *palio*, two horse races held in the summer months in which the *contrade* compete (Chapter A). Note that the TPPG was conducted in the period up to four weeks before the *palio*, meaning group identities are salient.

4.2.2 Participants

Participants were dues-paying members of three *contrade*, with participation restricted to those aged 18 or older. To preserve anonymity, and consistent with Chapter 3, the *contrade* are labelled `C08`, `C11`, and `C06`. We recruited 159 participants. Informed consent was obtained from participants before the study. Ethical approval was obtained from the School of Anthropology and Museum Ethnography Ethics Committee at the University of Oxford (Ref No.: SAME_C1A_16_052).

4.2.3 Experimental design

Each TPPG involved three participants. The three participants did not play simultaneously, as players and their decisions were randomly matched after their participation. Therefore, the participants did not see each other nor know with whom they were playing. The TPPG was part of a paper-based questionnaire (see Section 4.2.4 below).

Each participant only played the game in one of three player roles: player A, player B, or player C. Player A had an initial endowment of €12, player B an endowment of €2, and player C an endowment of €7. Figure 4.2 illustrates the game and the difference between the treatments described below.

The TPPG involved decisions in two stages, which was explained to all participants. The first stage involved player A and player B, and captured cooperative behaviour. Player A made an allocation decision: they redistributed their initial endowment between themself and player B. This meant that player A either gave an amount of their endowment to player B (up to €6, in €1 increments), or took an amount of player B's endowment (up to €2, in €1 increments). Player B was passive and did not make any decision that affected payoffs. Therefore, at the end of the first stage, the allocation that maximised player A's payoff was taking €2 from player B. Player A could give a maximum of €6 because any greater amount could have resulted in negative payoffs if player C decided to punish in the second stage.

The second stage involved player C and player A, and captured punishment behaviour. Player C decided whether or not to punish player A. No punishment involved player C retaining their initial endowment of €7, and player A retaining the distribution following stage 1. Punishment involved either player C paying €1 so that €3 was removed from player A (low punishment), or player C paying €2 so that €6 was removed from player A (high punishment). Player A made no further decision.

Therefore, at the end of the second stage, the distribution that maximised player C's payoff was no punishment. Punishment reduced player C's final payoff, as well as player A's final payoff. Note that each player had equal payoffs if player A gave €5 and player C did not punish: in this scenario all players would have €7.

The strategy method was used, which means player C provided punishment decisions for each possible player A allocation between $-$€2 and €6, without knowing player A's actual allocation. However, player C were aware that one of their decisions would be matched with one of player A's decisions later on, and that they both would be paid based on the matched decisions. The strategy

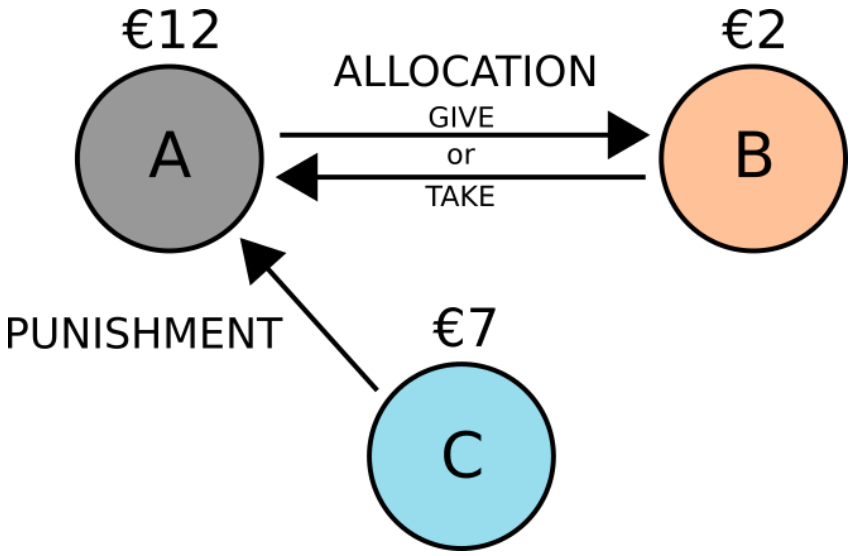


Figure 4.2: Experimental design of the TPPG. Player A makes an allocation, either giving to or taking from player B. Player B is either from the in-group (ABC treatment), the neutral out-group ($AC_{neutral}$ treatment), or the rival out-group (AC_{rival} treatment), relative to player A and player C. Player C chooses either no, low, or high punishment. In no punishment, player C pays €0 for player A to lose €0. In low punishment, player C pays €1 for player A to lose €3. In high punishment, player C pays €2 for player A to lose €6.

method is advantageous as it reveals the full spectrum of possible behaviours (with little influence on decisions compared to other methods, see Brandts and Charness 2011; Jordan et al. 2016b).

Aside from participants being randomly assigned to one of the three player roles (between-subject: player A, player B, and player C), they were also randomly assigned to one of three *group membership* treatments (between-subject), where the *contrada* membership of player B relative to players A and C changed. Players A and C were always from the same *contrada* (`C06`). In the ABC treatment, player B was from the same *contrada* as player A and player C. In the $AC_{neutral}$ treatment, player B was from a neutral *contrada* (`C11`) relative to players A and C. In the AC_{rival} treatment, player B was from the rival *contrada* (`C08`) relative to players A and C.

Player B indicated what they expected to be allocated by player A. All participants indicated what punishment decision they expected player C to make across four allocations: −€2, €0, €5, and €6. The experiment thus measured allocation and punishment, both the actual decision and the expectation (see Table 4.1).

Following decisions in the TPPG, participants provided their interpretation of the game, through an open-ended, written response to the questions, "What do you think of this study? What do you think was the aim of this study? Did it remind you of anything?"

Table 4.1: Measures in the TPPG

measure		indicated by player	value range (€)
allocation	actual	A	– 2 – 6
	expectation	B	
punishment	actual	C	0 – 2
	expectation[1]	A, B, C	

[1] Decisions were only made across four allocation decisions: −€2, €0, €5, and €6.

4.2.4 General procedure

Participants were recruited at well-attended *contrada* events, and upon recruitment completed a paper-based questionnaire in Italian. Questionnaires were completed in a dedicated space within the respective *contrada*, in groups comprising between one and six participants. These groups had a random mixture of player roles and group membership treatments. Data collection was completed across two periods, 13–30 June 2017 and 26–30 June 2018, and across 53 sessions in order to secure sufficient participants. See Section D2.2 for more details of the procedure.

Before making decisions in the TPPG, participants provided informed consent, constructed a unique identification code, read and listened to instructions for the TPPG, and answered comprehension questions. Comprehension was assessed through three hypothetical scenarios involving a different decision made by players A and C. For each scenario, participants had to indicate the payoffs of players A, B, and C via a multiple choice question. Either A.R.K. or a research assistant were present as participants completed the questionnaire, to present instructions orally, using a diagram similar to Figure 4.2. After the TPPG, participants indicated demographic information, responded to a survey about their association with the *contrade*, and provided their interpretation of the game. See Section D2.2 for the questionnaire.

After completing the questionnaire, participants received a participation bonus and earnings based on decisions in the TPPG. The participation bonus was handed out after completing the questionnaire, in the form of a €2.50 voucher for use within the clubhouse of the *contrada*. Earnings were determined by randomly matching player A and player C decisions, and all three players were paid. Earnings were provided after all participants in each period completed their TPPG. Delayed payment enabled matching the decisions between *contrade*, using the unique identification code to correctly allocate earnings to participants. Average earnings were €5.91 (SD = €3.11, range €0–€14).

4.2.5 Analysis

We analysed the TPPG into several steps. First, we analysed cooperation (i.e., allocations made by player A). Second, we analysed punishment (i.e., decisions made

by player C). Both analysed actual decisions and expectations (see Table 4.1). A summary of the written interpretations are presented in a separate section. Finally, we included an exploratory analysis of norms. All analyses were conducted in `R` v. 3.4.4 (R Core Team 2020); see `R` information for full list of packages.

4.2.5.1 Cooperation

To evaluate cooperation, we fit a linear model with group membership and punishment expectation (levels $-$€2, €0, €5, €6) as main effect, and allocation as outcome. The significance of the main effects was assessed using Kenward-Rogers approximations at $p = .05$ (all results were considered significant at this level). Post-hoc tests with pairwise contrasts using Tukey corrections compared the difference between group membership treatments. To compare actual allocation and allocation expectation, another linear model was constructed, with the interaction between group membership and player role (player A vs. player B) as main effect, and allocation as outcome.

To characterise out-group cooperation as help avoidance or active harm, allocations were classified into one of three behavioral types: "give" (positive allocations), "avoid" (€0 allocations), and "harm" (negative allocations). We then conducted a logistic regression of each behavioural type against the other two to calculate the likelihood of giving, avoiding, and harming based on group membership. Punishment expectations were included in the regression.

4.2.5.2 Punishment

Punishment was analysed with an ordered probit regression to test for a significant effect of allocation on punishment and a difference between group membership treatments. The outcome was punishment (ordered as no, low, or high), and the main effect was the interaction between allocation and group membership. A random effect of the intercept of each participant was included, as each participant made nine decisions across all possible allocations. The odds ratios were then calculated from the regression. We present one regression, selected through a multilmodal comparison using the Akaike information criterion (AIC), a process described in Section D3.1.

In order to compare the difference between actual and expected punishment, a linear mixed-effects (LME) model was constructed with punishment as outcome and the interaction between group membership and punishment expectations as main effect. As player C made both actual and expected punishment decisions, a random effect of the intercept of each participant was included. Again, the significance of the main effect was assessed using Kenward-Rogers approximations. Post-hoc tests were conducted, with pairwise contrasts using Tukey corrections.

Note that punishment expectations were analysed only from members of `C06`. We excluded participants from `C11` and `C08` because it was not clear whether they indicated the expected behaviour of someone from `C06` or someone from their own *contrada*.

We also explored individual punishment patterns. We calculated the slope between punishment and cooperation for each participant (derived from the slopes in a linear model regressing punishment over allocation for each participant). Negative slopes of any magnitude mean more punishment at lower cooperation; positive slopes of any magnitude mean more punishment at higher cooperation.

4.2.5.3 Interpretation

In order to assess participants' interpretation of the TPPG, written responses were coded by A.R.K. into one of seven categories. Two categories indicated that the game captured contextually relevant behaviour: "contrada attachment or prosociality" (response says the game captures an aspect of within or between *contrada* attachment or prosociality) and "palio related" (response says the game captures *palio*-related behaviour). All the categories are in Section D3.2. Note that these categories were created after reading through responses, i.e., were not determined a priori.

4.2.5.4 Exploratory analysis

To further explicate norms, the average lost payoff by group membership was estimated by calculating the payoffs lost for each player A allocation when matched with all possible player C decisions. The lost payoff was the amount (in €) discarded by a low or high punishment decision. If a low punishment decision was made, €4 were lost in total because player C paid €1 in order for player A to lose €3. A high punishment decision doubled this so that €8 were lost. We derived the average lost payoff across all participants by group membership.

We speculated that if strong norms were present, then player A should accurately predict the amount of punishment for each given allocation and thus select an allocation that results in no punishment. Thus, strong norms should result in an average lost payoff of approximately zero. Conversely, if participants had uncertain expectations about the level of punishment associated with a given allocation, which is likely where norms are either not strong or not present, then the average lost payoff is likely to be significant. To examine the strength of norms, we compared the value to zero using a one-sample t-test. Of course, values are unlikely to be zero, but we were not aware of any value above zero that would still indicate strong norms.

4.3 Results

4.3.1 Sample characteristics

We recruited 159 participants. Of these, 53 were player A (ABC: 17, $AC_{neutral}$: 19, AC_{rival}: 17), 51 were player B (ABC: 17, $AC_{neutral}$: 17, AC_{rival}: 17), and 55 were player C (ABC: 18, $AC_{neutral}$: 19, AC_{rival}: 18). This was consistent with the target sample size of 17 participants per treatment, following Bernhard et al. (2006).

However, we excluded 61 participants who failed to demonstrate comprehension of the game. Those who answered at least two out of three scenarios correctly demonstrated comprehension, as determined after recruitment. Therefore, we did

Table 4.2: Results of ANOVA with allocation as outcome and group membership and punishment expectations as fixed effect

effect	df	F	p
group membership	2	7.48	.045 *
punishment expectation (−€2)	1	0.82	.416
punishment expectation (€0)	1	1.51	.286
punishment expectation (€5)	1	6.31	.066
punishment expectation (€6)	1	0.06	.825
age	1	0.26	.636
gender	1	0.09	.778
membership reason	1	0.15	.716
group membership X punishment expectation (−€2)	2	4.28	.102
group membership X punishment expectation (€0)	2	1.44	.338
group membership X punishment expectation (€5)	2	1.44	.339
group membership X punishment expectation (€6)	1	0.18	.691
group membership X age	2	2.47	.200
group membership X gender	2	1.36	.354

* $p < .05$, ** $p < .01$, *** $p < .001$

not retain 17 participants per treatment. Due to the the limited sample, the statistical results should be treated as preliminary.

Following exclusion, 87 participants were analysed. Of these, 25 were player A (ABC: 8, $AC_{neutral}$: 7, AC_{rival}: 10); 40 were player B (ABC: 13, $AC_{neutral}$: 10, AC_{rival}: 17), and 22 were player C (ABC: 5, $AC_{neutral}$: 8, AC_{rival}: 9). Participants analysed were aged 18–74 years ($M = 37.4$years, $SD = 13.4$years), and 55 (34.6%) were male. The distribution of demographic characteristics is in Tables D2 and D3).

4.3.2 Cooperation

There was a significant effect of group membership on allocation (Table 4.2). As shown in Figure 4.3, average allocations were greater for an in-group member (ABC; $M =$ €3.25, $SD =$ €2.25) than for a neutral out-group member ($AC_{neutral}$; $M =$ €0.86, $SD =$ €2.04) and a rival out-group member (AC_{rival}; $M =$ €−0.10, $SD =$ €2.60). Post-hoc comparisons revealed a significant difference only between in-group and rival out-group, with allocations among in-groups €3.35 greater than among rival out-groups ($p = .040$), but not between in-group and neutral out-group ($p = .137$) nor between neutral out-group and rival out-group ($p = .590$).

Figure 4.3 also shows average expectations of player A allocations, as indicated by player B. Allocation expectations by in-group members ($M =$ €2.00, $SD =$ €1.96) were similar to those by neutral out-group members ($M =$ €3.00, $SD =$ €2.75); both were greater than those by rival out-group members ($M =$ €−0.35, $SD =$ €1.97). The allocations and expectations were similar across group membership (Tables D6 and D7).

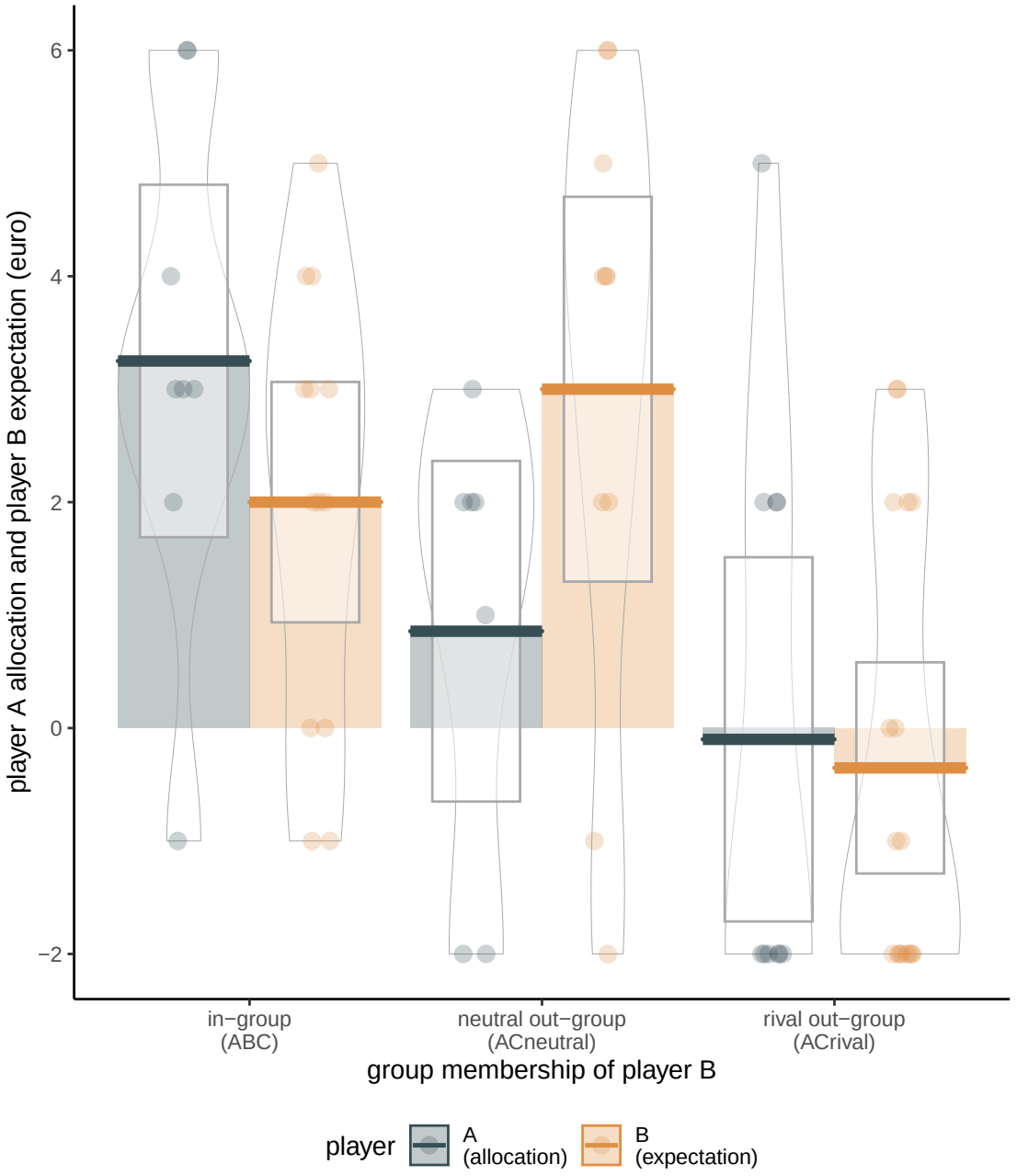


Figure 4.3: Mean player A allocation decisions and player B allocation expectations by the group membership of player B. Error bars are the standard error.

Finally, Figure 4.3 shows the distribution of allocations by group membership. The most frequent allocation to in-group members was €3, to neutral out-group members was €2, and to rival out-group members was −€2. As described in Section 4.2.5.1, these allocations were classified into three behavioural types: "give", "avoid", and "harm". "Give" was the most common behavioural type for the in-group (87.5%) and the neutral out-group (71.4%), while "harm" was the most common behavioural type for the rival out-group (60.0%; see Figure 4.3). There were no significant effect of group membership or of punishment expectations in

Table 4.3: Ordinal probit regression with punishment as outcome

	estimate	SE	z	p	
allocation	-0.84	0.20	-4.25	$< .001$	***
out-group (ref: in-group)	-1.08	0.47	-2.31	.021	*
punishment expectation ($-$€2)	-0.21	0.31	-0.66	.511	
punishment expectation (€0)	0.33	0.35	0.92	.357	
punishment expectation (€5)	0.38	0.35	1.08	.281	
punishment expectation (€6)	0.92	0.20	4.53	$< .001$	***
intercept (threshold 0–1)	0.55	0.47	1.17	.242	
intercept (threshold 1–2)	1.35	0.48	2.80	.005	**

* $p < .05$, ** $p < .01$, *** $p < .001$

logistic regressions of each behavioural type against the other two behavioural types (Table D8), meaning the decision to give, avoid, or harm was not influenced by the group membership of player B.

4.3.3 Punishment

Player C made punishment decisions for each possible player A allocation. The pattern of average punishment decisions was different across the three group membership treatments (Figure 4.4a). In the ABC treatment (i.e. with the in-group), punishment decreased as allocation increased. In the $AC_{neutral}$ treatment (i.e. with the neutral out-group), punishment followed no clear pattern. In the AC_{rival} treatment (i.e. with the rival out-group), average punishment remained approximately constant across all allocations.

To assess the effect of group membership, we compared ordered probit regression models that varied in how group membership was included as a parameter (the full procedure is in Section D3.1). The model that best fitted the data was one that compared punishment decisions in the ABC treatment vs. the two AC treatments combined, which suggests little difference in punishment between the neutral out-group and the rival out-group. The regression showed a significant difference between the ABC treatment and the two AC treatments combined (Table 4.3). Among the two AC treatments combined, the odds of punishment decreased by 66.2% ($p = .021$) compared to ABC, keeping all other variables constant. The interaction between allocation and group membership showed that every €1 increase in allocation among the two AC treatments combined increased the odds of punishment by 139.7% ($p < .001$), keeping all other variables constant. Thus, the decision to punish an in-group member was affected by the allocation to another in-group member, whereas there was little punishment of an in-group member regardless of whether they gave or took from an out-group member.

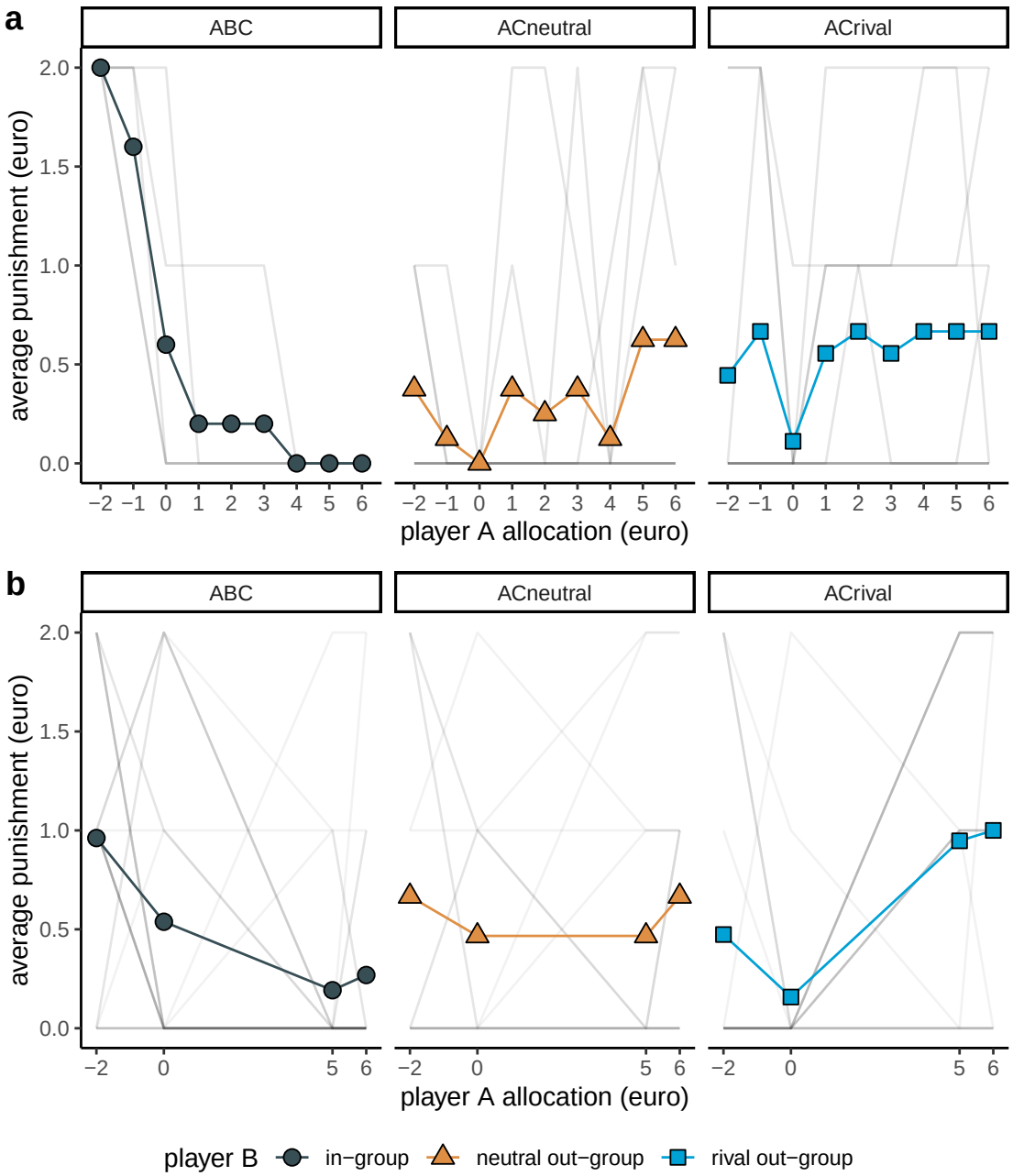


Figure 4.4: Actual and expected punishment decisions in the TPPG. a) Mean punishment decisions for all possible player A allocations across the three treatments. b) Mean expectations of punishment decisions across all `C06` participants. Error bars are the standard error.

Figure 4.4b shows the pattern of punishment expectations, which were only made across four allocations: $-$€2, €0, €5, and €6. In the ABC, $AC_{neutral}$, and AC_{rival} treatments the trends of the expected punishment were qualitatively similar to the actual punishment decisions, although in the ABC treatment the expected punishment at $-$€2 appears lower than the actual punishment, and in the $AC_{neutral}$ treatment the expected punishment at €0 appears greater than the actual

punishment. There was no significant effect of group membership on punishment (Table D9), and in pairwise contrasts the actual punishment and expectations at each of the four levels were similar among all group membership treatments (Table D10), except at take €2 for the in-group where the actual punishment was higher by €1.05 than the expected punishment (t = 3, $p = .003$).

Punishment patterns vary not just by group membership, but also at the individual level (Figure D1). With both AC treatments, individuals either increased punishment as allocation increased or *vice versa*, with 3 and 2 participants not making a single punishment decision in the $AC_{neutral}$ and the AC_{rival} treatment respectively. To show the general trend by individual, we used the slope (derived from the slopes in a linear model regressing punishment over allocation for each participant) to see the relationship between cooperation and punishment (Table D11): all of the slopes (5 out of 5 participants) were negative in the ABC treatment, whereas the most common slopes were zero in the $AC_{neutral}$ treatment (6 out of 8 participants, 75.0%, respectively) and zero in the AC_{rival} treatment (5 out of 9 participants, 55.6%).

4.3.4 Interpretations

Participants provided their interpretation of the TPPG in a written response. Of 159 participants, 104 (65.4%) provided a written response. As described in Section 4.2.5.3, we coded responses into categories. Two categories indicated that the game captured contextually relevant behaviour: a "contrada attachment or prosociality" response (38 of responses, 23.9% of all 159 participants) and a "palio related" response (4 of responses, 2.5% of all 159 participants). A total of 42 responses (26.4% of all 159 participants) indicated that the TPPG captured contextually relevant behaviour. This percentage is similar when we restricted the analysis to the 87 participants who demonstrated comprehension of the game, as a total of 23 responses (26.4%) indicated that the TPPG captured contextually relevant behaviour. See Table D5 for the totals and percentages for each category.

4.3.5 Exploratory analysis

As described in Section 4.2.5.4, for further evidence of norms we calculated the average lost payoff by group membership. If player A allocates an amount that is subsequently punished, then payoffs will be lost. The average lost payoff in the ABC treatment was not significantly different from zero (M = €1.20, SD = €2.14; t(7) = 1.59, $p = .156$), whereas the average lost payoff in both AC treatments was significantly different from zero: in the $AC_{neutral}$ treatment the average lost payoff was €1.29 (SD = €0.27; t(6) = 12.73, $p < .001$); and in the AC_{rival} treatment the averge lost payoff was €2.13 (SD = €0.46; t(9) = 14.70, $p < .001$).

4.4 Discussion

Social norms sustained by third-party punishment are central to co-evolutionary accounts of cooperation (Chudek and Henrich 2011). Experimental support for an association between cooperation and punishment typically makes use of the third-party punishment game (TPPG; e.g. Bernhard et al. 2006; Fehr and Fischbacher 2004; Henrich et al. 2006; Marlowe et al. 2008). Building on a substantial literature, our study used a TPPG to test for the relevance of third-party punishment in sustaining cooperation within and between communities. Our experimental design included two understudied features in TPPG studies: different out-group relationships and behaviour that was harmful. The impact of these two features on cooperation and punishment are discussed in Section 4.4.1, followed by a discussion of costly punishment sustaining cooperation in Section 4.4.2. We describe important limitations of the current study in Section 4.4.3.

4.4.1 Substantive findings

Generally, cooperation is greater among in-group *contrada* members than among out-group *contrada* members, congruent with the experimental literature on in-group bias in cooperation (Balliet et al. 2014; Lane 2016) and our previous research (Chapter 3). Some differences in out-group cooperation depend on the relationship between the groups, whether neutral or rival. The majority of participants cooperated with neutral out-group members by transferring a positive amount, while the majority of participants harmed rival out-group members by taking the rival's endowment. However, the resultant degree of out-group cooperation was similar, with the average around €0 for neutral and rival out-groups. Between the two out-group relationships, the degree of out-group cooperation was similar, but the form of cooperation was different, although this finding is limited by the small sample. The result among rival out-groups is consistent with our previous findings with the *contrade* (Chapter 3), but with a larger stake size. Situated within the broader literature on human cooperation, this shows that the relationship between groups is important in promoting inter-group cooperation (Pisor and Surbeck 2019; Robinson and Barker 2017), particularly where the relationship is positive or, at a minimum, less antagonistic (e.g., Doğan et al. 2018; Pisor and Gurven 2018).

The pattern of punishment is clear for behaviour directed at in-group members, with punishment decreasing as cooperation increases, as per previous studies (e.g. Bernhard et al. 2006: see Section 4.1.1). Maximum punishment was dispensed at non-cooperative allocations, and minimum punishment around egalitarian allocations. We did not find any clear punishment pattern for behaviour directed at neutral out-group members, while punishment was relatively consistent across behaviour directed at rival out-group members. In addition, the analysis of the individual slopes in our study shows that there is some heterogeneity in punishment decisions with out-group members.

Although there is no clear punishment pattern in the two out-group (AC) treatments, the fact that punishment is highest in both for cooperative behaviour indicates that such behaviour is supported by a parochialism norm (Choi and

Bowles 2007). Such a norm might dissuade individuals from extending benefits to out-group members (contra Fearon and Laitin 1996). Interestingly, in both AC treatments, there is little or no punishment for leaving the endowment as is, suggesting that neither harming nor benefiting the out-group is viewed favourably. Overall, as there is more punishment when an in-group member does cooperate with an out-group member vs. an in-group member; this result supports the group norm maintenance theory more than the deterrence theory (Section 4.1). The former predicts more punishment when behaviour benefits out-group members vs. in-group members, whereas the latter predicts no punishment when behaviour benefits out-group members (Delton and Krasnow 2017).

There was little indication that cooperation with neutral out-groups is sustained by a fairness norm; if there were such a norm, we expect the punishment pattern for the neutral out-group would follow that of the in-group, with greater punishment of non-cooperative vs. cooperative behaviour. If a norm had been found, it would have paralleled real-world scenarios that encourage inter-group cooperation, such as deals, treaties, or institutions, whether informal or formal (Pisor and Surbeck 2019; Robinson and Barker 2017). A more likely explanation in our study, and possibly elsewhere, is that individuals make cooperative decisions with out-groups based on personal opportunities, although we note none of the individual characteristics in our study had a significant effect. In the *contrada* context, it may be that an out-group is viewed favourably due to close social ties with that group. In other contexts, it may be that individuals contact and interact with out-groups "at their own risk" in an attempt to, for example, establish business partners (Pisor and Gurven 2016). Such cooperative interactions go unpunished as they are choices made by individuals, not proscribed by norms. Similarly, recent research has found little punishment of out-group directed cooperation when the relationship is based on exchange (Pan and Houser 2019).

4.4.2 Does third-party punishment sustain social norms?

We expected a strong norm for cooperation among in-group *contrada* members, with no punishment of cooperative behaviour and punishment of non-cooperative behaviour. The general trend is in line with our expectations, but one finding suggests that in-group cooperation may not be sustained by costly punishment. Only a quarter of all participants indicated that the TPPG captured contextually relevant behaviour. By extension, the majority found no association between the game and behaviour in the real world. This casts doubt on the assertion that participants bring heuristics from the real world into experiments (e.g. Henrich et al. 2005), unless solicited by contextualised games (e.g. Cronk 2007; Lesorogol 2007).

If the threat of costly punishment does not sustain cooperation in the *contrada* context, what other incentive or mechanism might? Analysis of participants' interpretations and our ethnographic understanding of the *contrade* provide three suggestions. One suggestion is reward. Two respondents indicated a preference to reward, rather than punish. For example, a 28 year-old female participant wrote "a way to reward [player] A is missing, the decision I would have made more frequently

in place of 'do not punish'."[1] In other experiments, reward has been shown to be at least as effective as, and occasionally more effective than, punishment in eliciting cooperation (e.g. Kiyonari and Barclay 2008; Rand et al. 2009a).

Considering how transgressions are punished in the *contrada* context further clarifies the proximate mechanisms at play. Generally, most sanctions within the *contrada* are mild, taking the form of gossip — the action of *contrada* members is a frequent topic of conversation, based on the informal discussions A.R.K. participated in. As members are aware that their behaviour is being monitored, it increases the likelihood of conforming to certain behavioural expectations. In the event of a transgression, members might be taken to one side by senior or respected individuals. Verbal confrontations are generally rare, and ostracism rarer still. An example of a confrontation during A.R.K.'s fieldwork involved Rosanna, a *contrada* member who had allowed a person from a rival *contrada* to visit the museum during the days of the July *palio* festival in 2018. Knowledge of the incident spread quickly, as a large number of members were socialising in the clubhouse at the time, and many were angry. Some immediately confronted Rosanna to assert that allowing a rival member onto *contrada* property during the *palio* festival was unacceptable. Rosanna was contrite, indicating they would not let something similar happen again. In sum, reputation, kept track by gossip, with occasional, stronger sanctions, deters *contrada* members from breaking social norms.

A final possibility for why costly third-party punishment is not common in the real world, again drawn from our ethnographic understanding of the *contrade*, is internalised motivations to conform to norms (Chudek and Henrich 2011). From a young age, *contrada* members participate in activities and rituals within the *contrada* that involve voluntarily benefiting other members (Dundes and Falassi 1975: Chs. 2 and 7). In adulthood, in-group cooperation becomes an intuitive response, which would mean punishment mechanisms are rarely required. We stress that these suggestions can still consider the presence of social norms, but they question the relevance of costly third-party punishment in the maintenance of cooperation (non-cooperation) among in-group (out-group) members, at least within the *contrada* system.

4.4.3 Study limitations and future considerations

There are limitations to this study relevant to the interpretation of the findings. One is the small sample size, with resultant low statistical power. Another limitation is that the study was conducted over two periods. During the first period, the in-group and neutral out-group participated in the *palio*, but the rival out-group did not. During the second period, the opposite occurred: the in-group and neutral out-group did not participate in the *palio*, but the rival out-group did. While Chapter 3 suggests there is little effect of competition on cooperation, participation may have a different effect on punishment because certain behaviours (favouring the in-group, not favouring the out-group) could be heightened by whether the

1. ID = MO906; Ita. *Manca il modo per premiare A, la crocetta che avrei messo frequentemente al posto di 'non punire'.*

out-group is participating in the *palio* or not. Testing for an effect of period is not possible, as the sample size is too small within each period.

The parameters of the game may have restricted cooperative decisions. By limiting the choice set to giving a maximum of €6, the participants may have believed to be behaving "fairly" by giving €3; the correct fair allocation is €5. Confusion arising from this feature of the game may explain differences with Chapter 3. Furthermore, the choice set did not distinguish between motivations to maximise personal gain vs. to harm the other. Future research could determine whether punishment changes as a function of these two distinct motivations.

Finally, we interpreted no written response as evidence that a participant did not find the game contextually relevant. As participants did not have to provide a response, they may simply have not been motivated to write, which is a relatively laborious task to complete at the end of the study. Future studies may either encourage responses through remuneration or provide multiple choice statements. We note as well that the assessment of participants' interpretations was based on categories determined after the study, so our inferences should be read with caution: future work that adopts a similar method may consider registering categories before the study.

4.5 Conclusion

That cooperative norms exist and are sustained by third-party punishment is widely discussed in the experimental literature on cooperation, and assumed to exist "in the field" with reference to a number of field experiments and other anthropological evidence. However, this study suggests that researchers should remain critical of the relevance of costly third-party punishment in maintaining norms. Furthermore, our design calls for consideration of inter-group relationship in future studies of third-party punishment.

The Sienese are fond of attributing any disadvantage, real or imaginary, under which they suffer to the hostile and unfriendly attitude of the Florentines.

— Villari (1902: 10)

5

Does a common enemy unite rivals? An experimental assessment of cooperation between natural groups in competition with a third-party

5.1 Introduction

In-group bias is pervasive in humans, manifest in our cognition, affections, and behaviours (Hewstone et al. 2002). For example, human prosocial behaviour displays in-group bias, with cooperation lower between members of out-groups vs. in-groups (Balliet et al. 2014; Lane 2016). Evolutionary explanations for an in-group bias in cooperation include higher relatedness, greater opportunities for direct and indirect reciprocity, and spatial selection among members of the same group (Rand and Nowak 2013). Some researchers suggest in-group bias stems from an evolutionary history characterised by inter-group competition (Bowles 2009; Rusch 2014) and cite (cultural) group selection as the reason for our bias (Chudek and Henrich 2011; Richerson et al. 2016), whereby cooperative groups out-compete ones that are less cooperative. Reducing in-group bias, while retaining out-group boundaries, is possible through the presence of between-group ties (e.g., Schaub 2017) and cultural features such as institutions (e.g., Alexander and Christia 2011). Are there social cues that could also reduce in-group bias?

The intuitive notion that a "common enemy unites" suggests that in-group bias may be reduced when two out-groups are faced with a third-party in competition with both of them. We call this the "common enemy effect". A variety of threats could be included under the rubric of a common enemy, including harsh environmental conditions. Here we focus on a common enemy represented by a social group, a third-party distinct to two out-groups, that poses some threat based on previous interactions and thus incites inter-group competition.

The idea is not novel: Aristotle observed that "a common danger unites even the bitterest enemies" (Jowett 1885: 154), and cases are recurrent throughout history. For example, in the nineteenth century, Tecumseh's Confederacy united some previously warring Native American tribes against the American settlers (Dellenbaugh 1901). Social scientists across disciplines have discussed the notion of a common enemy in a variety of contexts, such as friendships (e.g., Antal et al. 2006), warfare (e.g., Levy 1989), and cognition (e.g., Pietraszewski et al. 2014). Furthermore, a recent game theoretical model confirms the possibility of a common enemy effect, with simulated groups forming defensive units when attacked by another group (De Jaegher and Hoyer 2016). However, there is no empirical test of whether in-group bias is reduced when out-groups are in competition with a common enemy.

Here we aim to determine whether individuals adjust their behaviour when in competition with a common enemy, so that cooperation with out-group members increases and overall in-group bias decreases.

We measure cooperation with a public goods game (PGG), a standard tool in behavioural research (Camerer 2003). As with previous studies of in-group bias, we compare PGG contributions when individuals play with in-group and out-group members (one recent meta-analysis of in-group bias in cooperation counts 21 studies that use PGG paradigms, Balliet et al. 2014). In our study, individuals participate as in-group and out-group pairs. Our measure of in-group bias is the difference between in-group and out-group contributions: large differences indicate significant bias, whereas smaller differences indicate less bias.

We introduce cues of competition by presenting players with a target previously set by a third-party. By target, we mean a total contribution amount that is known to players before they make their personal contribution decision, similar to the target used in Jordan et al. (2017: Study 3). This is similar to "pseudocompetition" manipulation Burton-Chellew and West 2012; also see Böhm and Rockenbach 2013; Tan and Bolle 2007, in which players have information about the contributions made by another group before they make their own decision. However, unlike the pseudocompetition manipulation in Burton-Chellew and West (e.g. 2012), players are unable to compare their (individual and group) decisions with those of the target, the third-party, or their own group. Our manipulation constitutes a form of competition because a target set by a third-party elicits a comparison between social units, and it is pseudocompetition because knowledge of another group's contribution does not affect payoffs. We note that conformity could also play a role, a point we return to in the discussion.

In the key treatment, the target was set beforehand by a third-party that both groups identify as a common enemy. Our expectation is that contributions between out-group pairs will increase in this treatment, compared to a baseline treatment with no third-party and no target, for reasons described below. If contributions with the out-group increase relatively more than with the in-group, then bias has reduced.

In-group bias is expected to reduce through a mechanism of "recategorisation". Group identity is dynamic, with single individuals having multiple identities (Brewer 2001; Smaldino 2019b). Group identities are often nested, such that

one (subordinate) identity lies within a larger (superordinate) identity. When superordinate identities are salient, it is possible for individuals to recategorise themselves as members of the larger group (Brewer and Kramer 1986; Gaertner et al. 1993; Kramer and Brewer 1984), with postive effects on behaviour directed at former out-group members (e.g., Buchan et al. 2017; Dunham et al. 2018; Rand et al. 2009b). The introduction of a common enemy causes out-groups to perceive themselves as individuals who share a superordinate identity.

We control for two factors introduced in the key treatment, the third-party and the target. To determine whether it really is competition with a common enemy that leads to an increase in out-group cooperation, vs. competition per se, we include a control treatment with a target set by a neutral third-party. In other words, a third-party that neither group identifies as a common enemy. While a neutral third-party again introduces cues of competition, we expect that in-group bias will not be reduced in this case. We anticipate that only a third-party which could be perceived as a common enemy — whether because of a history of antagonism, incompatible goals, or threatening behaviour — is able to make salient a shared identity (Gaertner et al. 1993), and therefore favour out-group cooperation and reduce in-group bias. Thus, the identity of the third-party is a relevant factor in uniting out-groups. If in-group bias does indeed reduce with a neutral third-party, then cues of inter-group competition are more salient than the group identity of the external threat (e.g., Böhm and Rockenbach 2013; Tan and Bolle 2007).

It is possible that any effect we observe is driven by the presence of the target itself, rather than by competition (Jordan et al. 2017). The target presents a reference value which could elicit greater cooperation than individuals would in its absence (e.g., Fischbacher et al. 2001), or the target reflects a prescriptive norm favouring increased cooperation (e.g., Reuben and Riedl 2013). To address the possibility that the target elicits higher out-group cooperation (and reduces in-group bias), in a final treatment we include a target but no third-party. We predict that the target has no effect on either in-group or out-group cooperation, meaning in-group bias remains unchanged with a target. If in-group bias does reduce with a target, then targets are more salient than inter-group competition (Jordan et al. 2017).

We conducted this study in a naturalistic setting, by using genuine groups and playing the games in situ. The in-groups and out-groups of interest are the *contrade* of Siena, Italy. The *contrade* are 17 "neighbourhoods" that divide the city of Siena (Chapter 2). Individuals are affiliated with a specific *contrada*, many of which have rivals. We have already shown that cooperation is greater within each *contrada* than between the *contrade* (Chapters 3 and 4). The *contrade* also see themselves as part of a system unique to Siena (Park 1992; Parsons 2004; Pomponio Logan 1978), a city which has a longstanding rivalry with neighbouring Florence (Hook 1979). Florence represents a historic enemy, due to a period of conflict and economic disparity between the cities that lasted centuries, and today constitutes a symbolic rival. In Italy, parochial attachment to the natal village, town, or city vs. surrounding urban centres — a phenomenon known as "*campanilismo*" — strongly influences attitudes and behaviour towards surrounding urban centres. For more details of the *contrade* and history of the Siena-Florence rivalry, see Section 5.2.1.

We used members of the same *contrada* as in-group pairs, and members of the rival *contrada* as out-group pairs. The target in the common enemy treatment had previously been determined by individuals from Florence, which represents the common enemy. The neutral target was previously determined by players from Siena. Siena was chosen as it is not identifiable as a common enemy because most *contrada* members are themselves Sienese, yet represents a grouping which does not differ from Florence in terms of being a city with a similar ethnic and religious composition.

We expect recategorisation to occur among the *contrade*. The introduction of a common enemy will cause rival *contrada* members (subordinate identity) to perceive themselves as individuals who share a Sienese identity (superordinate identity). We include a post-game questionnaire to assess whether this psychological process underpins our posited common enemy effect. If the type of common enemy that we employ in this experiment, i.e. a largely symbolic one reflective of an historic rivalry, is able to reduce in-group bias, then our study will provide strong evidence of a common enemy effect — and one route through which in-group bias can be reduced.

5.2 Methods

5.2.1 Study population

Siena is a city in central Italy. The historic centre is geographically divided into 17 neighbourhoods called *contrade* (singular *contrada*). The current configuration of the *contrade* dates to 1729, although the *contrade* have antecedents in the medieval period (Dundes and Falassi 1975). *Contrade* vary in size from 750 to 4,000 members (Chapter 2). *Contrada* members participate in activities and rituals throughout the year, often within designated areas, such as their church, museum, and social space (essentially a clubhouse). The *contrade* compete in two horse races held in the summer months, each called *palio*.

Different types of relationship exist between *contrade*. Pairs of *contrade* maintain alliances, rivalries, and no relationship. Rivalry involves formal recognition on behalf of the *contrade* involved, and is in all cases but one reciprocal (Chapter 2). Members of rival *contrade* are less likely to interact with each other than with other *contrade* (Chapter 2), and there are often confrontations between rivals during the *palio* (Chapter A).

The *contrade* and the *palio* are perceived as unique to Siena, and as such there is intense pride for the city and the *contrada* system among members (Park 1992; Parsons 2004; Pomponio Logan 1978). United by shared history and collective identity, the *contrade* cultivate *Senesità* (lit. "Sieneseness"), referred to as "the personal understanding and expression of what it is to be Sienese", which means that "despite their intense individuality and rivalry, the *contrade* are also the source of unity within Sienese life as a whole" (Parsons 2002: 172).

In Siena, local attachment stems in part from a longstanding rivalry with Florence, a city 50 km north of Siena. Beginning in the thirteenth century, Siena and Florence were engaged in economic and territorial conflict, until Florence dominated Siena between the sixteenth and the nineteenth centuries (Hook 1979).

Contemporary attitudes in Siena stem from this inimical history, and expressions still in use allude to Florence as an enemy.

5.2.2 Participants

We recruited participants from two *contrade*, labelled as `C16` and `C05` for anonymity and consistency across studies (Chapters 3 and 4). We aimed for a sample size of 144 participants, determined a priori. The power analysis is in Section E1.1. Participants were dues-paying members of the *contrada*, called *protettori*, with participation restricted to those aged 18 or older. *Protettore* status and age were confirmed orally during recruitment. Exclusion criteria are in Section E1.2.

Informed consent was obtained from participants before the study. Ethical approval was obtained from the School of Anthropology and Museum Ethnography Research Ethics Committee at the University of Oxford (Ref No.: SAME_C1A_16_053).

5.2.3 Experimental design

Each participant played two PGGs, paired with another participant. Note that participants did not actually play the games in pairs, but answered questionnaires separately. Participants were randomly matched with each other after the study was complete. See Section 5.2.4 for more details.

In the in-group pair, the other participant was from the same *contrada*. In the out-group pair, the other participant was from a rival *contrada*. The two PGGs are thus within-subject. The order was counterbalanced, so that half of the participants played as the in-group pair first, and half played as the out-group pair first. Order was randomly allocated to participants.

At the beginning of each PGG, participants were allocated an endowment of 10 monetary units (1 unit = €1). They were asked to contribute any amount from the endowment to a group pot, in increments of one unit. The group pot was then multiplied by a factor of 1.2 and distributed equally between players in the pair. Thus, by contributing 1 unit to the group pot, a participant received a net benefit of -0.6 units, i.e., incurred a monetary cost. The endowment was reset between PGGs. Participants knew that payment was based on one of their decisions, and that of another participant, chosen at random. Therefore, each PGG was a one-shot interaction in which participants were incentivised to maximise earnings by not making a contribution.

Participants were randomly assigned to one of four between-subject treatments. In the standard control treatment, participants played with no target. The other treatments included a target. The target varied between treatments in how it was determined, but the value of the target itself remained constant. In the common-enemy and third-party control treatments, participants played with a target determined by a third-party, groups from Florence or groups from Siena, respectively. Specifically, they were informed that, in similar games, groups from Florence and Siena contributed about half of the endowment: "In a similar game conducted last year with groups from Florence/Siena, on average total contributions were about half of the points at their disposal" (Table E2). Finally, in the target control

Table 5.1: Differences in the experimental design of each between-subject treatment

treatment	design	
	target	third-party (identity)
standard control	no	no
common-enemy	yes	yes (Florence)
third-party control	yes	yes (Siena)
target control	yes	no

treatment, participants played with a target, but were not informed about how it was determined or whether it was set by a third-party. Again, participants were informed that the target was about half of the endowment: "In games of this type, on average total contributions are about half of the points at disposal" (Table E2).

A summary of the four treatments is in Table 5.1. Details of how the targets were experimentally determined are in Section E1.3, and the text used in the questionnaires is in Section E1.4.

After the two games, participants indicated their categorisation of the participant in the out-group PGG with a score from 1 to 9. Low categorisation scores mean the out-group player was perceived as having a subordinate identity (out-group *contrada*), high categorisation scores mean the out-group player was perceived as having a superordinate identity (Sienese). As a further manipulation check, we measured general attitudes towards each group post-game. Details of these two measures are in Section 5.2.5.

5.2.4 General procedure

Participants were recruited in person by A.R.K. with the assistance of a *contrada* collaborator. Within each *contrada*, recruitment occurred across three days. We recruited between 15 and 37 participants each day. The recruitment strategy considered logistical constraints imposed by the setting, while ensuring a representative sample of *contrada* members and minimising collusion/contagion within the *contrada*. Recruitment and data collection were completed in both *contrade* over a period of two weeks, from 27 June to 8 July 2018.

Immediately following recruitment, participants anonymously completed a paper-based questionnaire in a dedicated space within the *contrada* (Section E1.4). The questionnaires were completed in sessions that lasted approximately 15 minutes, and involved between 3 and 8 participants (mode = 5 participants). Treatments were randomly allocated to participants. Instructions were provided by research assistants blind to the hypothesis, but A.R.K. was present during data collection. The questionnaire comprised four sections: (i) provision of written consent and construction of a unique identification code; (ii) instructions for the PGGs and a comprehension task, (iii) decisions in the two PGGs, and (iv) questions for additional measures.

Following completion of the questionnaire, participants received a participation bonus and earnings based on decisions in one of the two rounds of the PGG, selected at random. The participation bonus was allocated immediately upon completion of the questionnaire, in the form of a €5 voucher for use within the clubhouse of the *contrada*. Earnings from the PGG were received at a later date, after all participants had completed the study. Delayed payment enabled matching of the decisions between *contrade*, using the unique identification code to correctly allocate earnings to participants. Average PGG earnings were €10.96 (SD = €2.30).

5.2.5 Measures

Contribution was the amount contributed in the PGGs (in units). We then calculated the *degree of bias* by taking the difference in contributions between in-group and out-group pairs per participant.

Categorisation was a single psychological measure, with participants asked "In the game with the [named out-group] *contrada*, how did you perceive the other participant?" (1 = more as a [named out-group] *contrada* member, 9 = more as a Sienese). The actual name of the *contrada* was used in the questionnaire.

Attitudes towards the two *contrade* and the two superordinate groups was measured via the question "What is your general attitude regarding people from the following groups: [named in-group] *contrada*; [named out-group] *contrada*; Siena; Florence?" (1 = very negative, 9 = very positive; the order of the groups was not randomised).

Covariates included the demographic characteristics age, gender, and Sienese (0/no = not born in Siena, 1/yes = born in Siena), alongside PGG order (0 = in-group PGG first, 1 = out-group PGG first), and comprehension (0/no = at least one out of the two comprehension questions incorrect, 1/yes = both comprehension questions correct).

5.2.6 Hypotheses

We tested the main hypothesis that the difference in contributions between in-group and out-group pairs will be larger in the three control treatments (standard control, third-party control, target control) than in the common-enemy treatment. It was decided, as part of the experimental design thus before data collection, to only provide a single hypothesis given constraints on recruitment and uncertainty around the effect size in the common-enemy treatment, which would have resulted in insufficient power for multiple contrasts (see power analysis in Section E1.1).

The experimental design assesses whether the introduction of a common enemy, as per the common-enemy treatment, causes rival *contrada* members (subordinate identity) to perceive themselves as individuals who share a Sienese identity (superordinate identity). In turn, this is expected to reduce in-group bias. In contrast, the other three treatments are not expected to affect the shared superordinate identity between rival *contrada* members, as there is no common enemy. As such, we expect little difference in in-group bias across these treatments. Thus, only one analysis provides a confirmatory test of the common enemy effect (see Section 5.2.7 below).

As it collapses across the common-enemy treatment and the two control (third-party control and target control) treatments, it suggests that the two control treatments are redundant. However, they are included as we assume that the degree of bias will only be reduced in the common-enemy treatment, and that there is no difference in the degree of bias between the other three treatments. Furthermore, the inclusion of the two control treatments allows for exploratory analysis of whether the purported decrease in the degree of bias is affected by either the third party or the target.

We also expected that the categorisation score would be greater in the common-enemy treatment than in the three control treatments.

As a manipulation check, we expected attitudes towards the in-group *contrada* to be more positive than attitudes towards the out-group *contrada*, and attitudes towards Siena to be more positive than attitudes towards Florence.

5.2.7 Analysis

All analyses were conducted in R v. 3.4.4 (R Core Team 2020); see R information for full list of packages.

We constructed linear-mixed effects (LME) models of *contribution*. In all models, the fixed effects were the between-subject treatment and the within-subject pair. The significance of the main effects was assessed using Kenward-Rogers approximations at $p = .05$. As our hypothesis relies on a comparison of the interaction between treatment and pair, we conducted post-hoc tests, with pairwise contrasts using Tukey corrections. This assessed whether there was a difference between in-group and out-group pairs for each treatment. The minimal model only included treatment, pair type, and their interaction as fixed effects. The maximal model added the following covariates as fixed effects: demographic characteristics, PGG order, and comprehension. All models included the intercepts of each participant and each *contrada* as random effects.

For *degree of bias*, we conducted a Welch's t-test on the mean difference between in-group and out-group pair contributions in the common-enemy and the other three treatments combined. This tested the main hypothesis (Section 5.2.3).

We compared the average *categorisation* scores between treatments via separate LME models. A minimal model included only treatment, and a maximal model included all covariates. Again, random effects included the intercepts of each participant and each *contrada*.

For *attitudes*, the average scores at the subgroup level (between the *contrade*) and at the superordinate level (between Siena and Florence) were compared via two paired t-tests. This was a manipulation check, to confirm that the treatments coincided with general attitudes towards the different groups.

5.3 Results

We begin by presenting details of the sample (Section 5.3.1). We then discuss the results of the attitudes (Section 5.3.2), followed by the analysis of decisions in the PGGs (Section 5.3.3) and the analysis of categorisation scores (Section 5.3.4).

Table 5.2: Comparison of covariates across the two *contrade*[1]

	overall[2]	C16	C05	p[3]
n	152	76	76	
demographics				
age	38.3 (14.3)	36.1 (13.0)	40.4 (15.2)	.064
gender = male	92 (60.5)	46 (60.5)	46 (60.5)	.999
Sienese = yes	131 (86.2)	62 (81.6)	69 (90.8)	.158
experience = yes	44 (28.9)	18 (23.7)	26 (34.2)	.211
public goods game				
comprehension = yes	67 (44.4)	32 (42.1)	35 (46.7)	.689
attitudes				
in-group *contrada*	8.4 (1.0)	8.5 (0.9)	8.4 (1.2)	.303
out-group *contrada*	3.9 (2.3)	3.6 (2.3)	4.3 (2.3)	.072
Siena	8.0 (1.5)	8.1 (1.3)	7.9 (1.6)	.317
Florence	4.6 (2.5)	4.6 (2.4)	4.5 (2.6)	.938

[1] Mean (SD) for age and attitudes, count (%) for all other measures.
[2] Includes all recruited participants.
[3] Derived from Mann-Whitney U tests comparing the two *contrade*.

We split categorisation into planned analysis (Section 5.3.4.1) and exploratory analysis (Section 5.3.4.2).

5.3.1 Sample characteristics

We recruited 152 participants, split equally across two *contrade*. Participants ranged in age from 18 to 75 years (M = 37.9, SD = 14.1) and were predominately (56.7%) male. A summary of the demographic information and other covariates is provided in Table 5.2, alongside tests that show no significant difference between the two *contrade* in these dimensions.

We excluded 4 participants who did not provide complete information (Section E1.2). We also excluded 14 participants who answered both comprehension questions incorrectly (see Section E2.1 for analyses considering comprehension). Therefore, we analysed 134 participants, 32 in the standard control treatment, 33 in the common-enemy treatment, 33 in the third-party control treatment, and 36 in the target control treatment. Again, there were no significant differences between the two *contrade* along relevant dimensions (Table E1).

5.3.2 Attitudes

Attitudes were measured on a scale from 1 (negative) to 9 (positive) to confirm that the treatments coincided with general attitudes towards the different groups. Table 5.2 shows that, as expected, attitudes towards the in-group *contrada* (M = 8.40, SD = 1.06) were more positive than towards the out-group *contrada*

(M = 3.96, SD = 2.31; paired Mann-Whitney U test: W = 7503.0, $p < .001$), and attitudes towards people from Siena were more positive (M = 7.93, SD = 1.51) than towards people from Florence (M = 4.57, SD = 2.5; paired Mann-Whitney U test: W = 7503.0, $p < .001$). For full set of contrasts see Table E5.

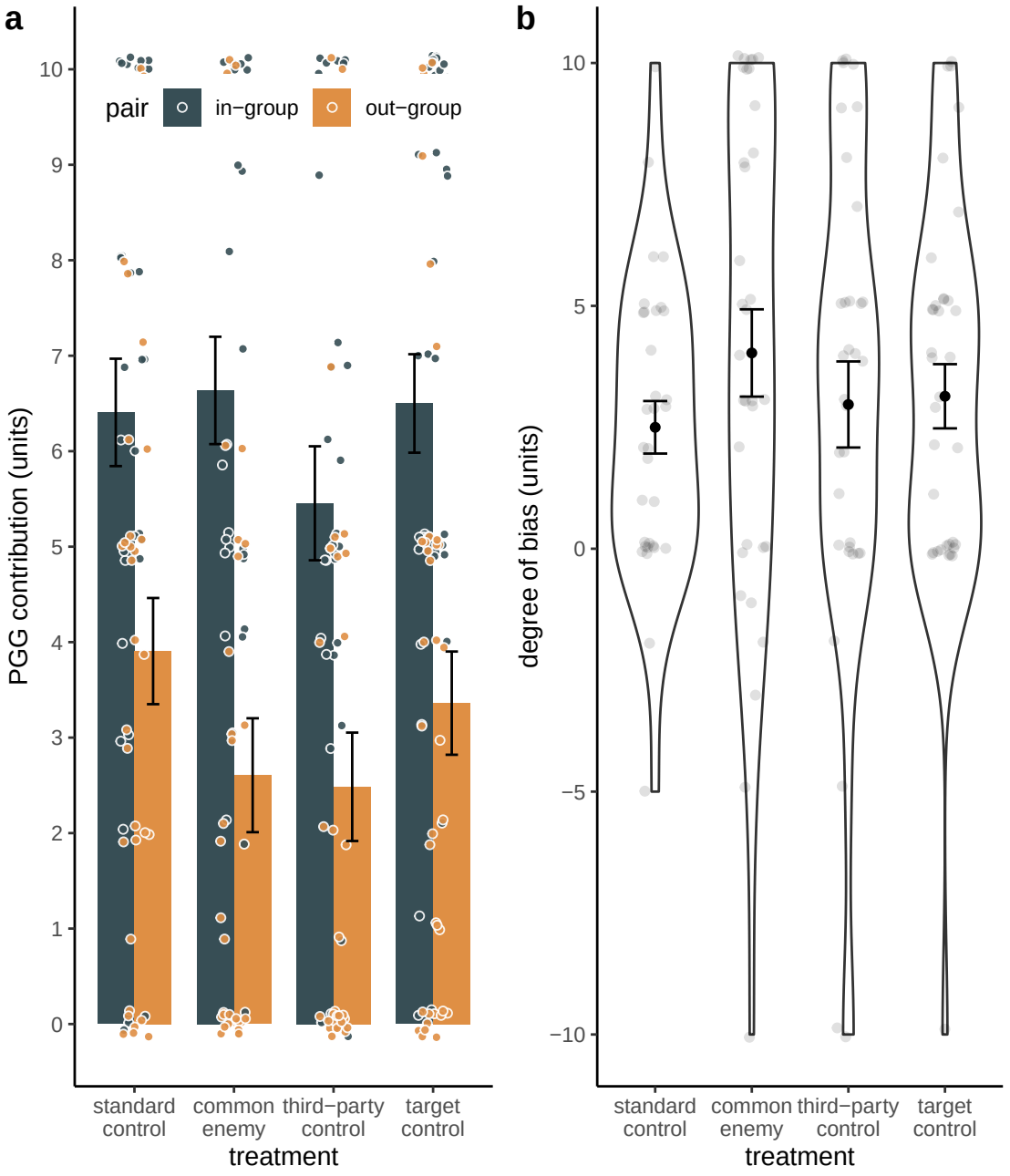


Figure 5.1: PGG contributions across the four treatments. a) Mean PGG contributions by treatment and pair type. b) Mean degree of bias (the difference in contribution between in-group and out-group pair per individual) by treatment. Jittered points are the raw data, error bars are the standard error, and beans in b) outline the smoothed density.

5.3.3 PGG decisions

As described in Section 5.2.3, participants played a PGG with an in-group member and an out-group member (pair type) in one of four treatments (Table 5.1). First, we compared PGG contributions (Figure 5.1a). There was a significant effect of pair type (Table 5.3), with contributions greater in in-group pairs (M = 6.25, SD = 3.23) than out-group pairs (M = 3.09, SD = 3.28). There was no significant effect of treatment and no significant effect of the interaction between treatment and pair type (Table 5.3). The results are similar when demographic characteristics, PGG order, and comprehension are included as covariates in a maximal model (Table 5.3).

We predicted that the difference in contributions between in-group and out-group pairs (i.e., the degree of bias) would be larger in the three control treatments than in the common-enemy treatment. The mean difference in the degree of bias was similar across treatments (Figure 5.1b). There was no evidence of a difference in the degree of bias between the common-enemy treatment (M = 4.62, SD = 3.88) and the other three treatments combined (M = 2.88, SD = 4.09; Welch's test: $t(1, 45.88) = 1.16$, $p = .250$). Taking contributions and degree of bias together, cooperation with both in-group members and out-group members did not appear to vary across treatments.

Table 5.3: The effect of treatment and pair type on PGG contributions

	minimal			maximal		
variable	df	F	p	df	F	p
treatment	(3, 139.06)	1.48	.224	(3, 133.08)	1.41	.242
pair type	(1, 116.05)	66.38	$< .001$ ***	(1, 116.19)	67.09	$< .001$ ***
treatment X pair type	(3, 137.73)	0.67	.574	(3, 137.49)	0.68	.565
age				(1, 132.02)	0.80	.372
gender				(1, 131.74)	2.71	.102
Sienese				(1, 110.03)	0.77	.382
order				(1, 121.96)	2.14	.146
comprehension				(1, 130.61)	2.72	.102

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 5.4: The effect of treatment on categorisation

	minimal			maximal		
variable	df	F	p	df	F	p
treatment	(3, 128.15)	1	.353	(3, 122.78)	1	.469
gender				(1, 124.02)	7	.010 *
Sienese				(1, 123.01)	7	.011 *
order				(1, 117.69)	0	.915
comprehension				(1, 123.90)	0	.561

* $p < .05$, ** $p < .01$, *** $p < .001$

5.3.4 Categorisation

As described in Section 5.2.3, participants indicated their categorisation of the participant in the out-group PGG with a score from 1 (out-group *contrada*) to 9 (Sienese). The average categorisation score was 4.51 (SD = 3.04), with 45.5% of participants indicating scores between 1 and 3 compared to 23.1% indicating scores between 7 and 9.

5.3.4.1 Planned analysis

As discussed in Section 5.2.6, categorisation was expected to co-vary with the degree of bias across the treatments, such that categorisation was higher in the common-enemy treatment than in the other three treatments. Instead, categorisation was similar across treatments (standard control: M = 5.06, SD = 2.84; common-enemy: M = 4.76, SD = 3.28; third-party control: M = 3.79, SD = 3.22; target control: M = 4.44, SD = 2.8). There was no significant effect of treatment (Table 5.4) and pairwise contrasts were not significant (Table E6).

An additional model, including demographic characteristics as covariates, showed a significant effect of gender and a significant effect of being Sienese (Table 5.4). Male participants were more likely to categorise the out-group player as an out-group member (male: M = 4.03, SD = 2.96; female: M = 5.14, SD = 3.06), and those born in Siena were more likely to perceive the out-group player as Sienese (Sienese: M = 4.79, SD = 3.04; non-Sienese: M = 2.90, SD = 2.59).

5.3.4.2 Exploratory analysis

We set out to test the effect of treatment on the degree of bias. However, we can also see test for the effect of categorisation on both PGG contributions and the degree of bias, using the categorisation score as a continuous explanatory variable. There was an effect of categorisation on contributions and its interaction with pair (Table E7). A post-hoc analysis of the trends showed that as categorisation increased, cooperation with the out-group increased more than with the in-group (slope of trend line = 0.37 and 0.20, respectively).

A separate model revealed an effect of categorisation on the degree of in-group

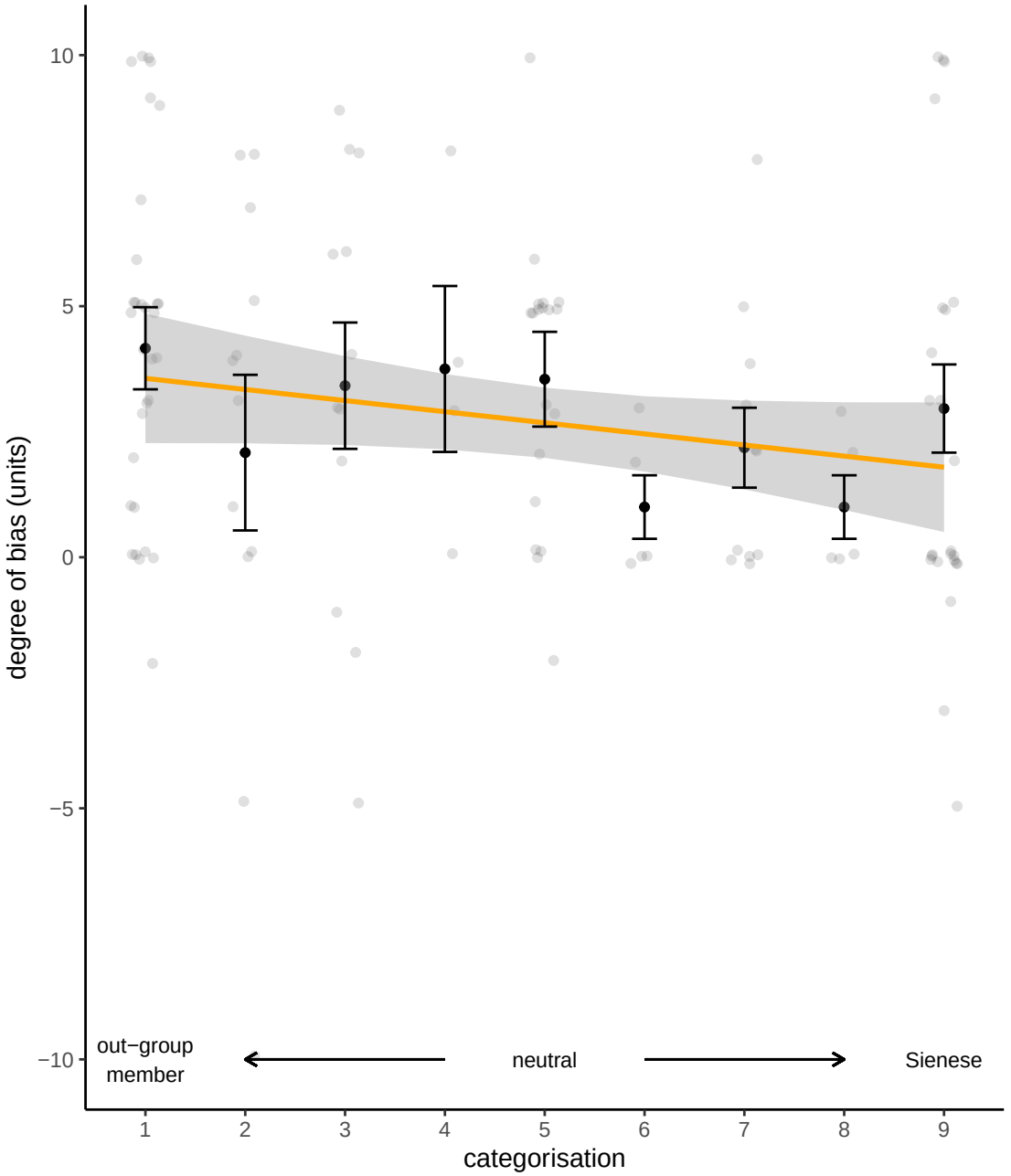


Figure 5.2: Mean degree of bias by categorisation. Jittered points are the raw data, and error bars are the standard error. Line is regression coefficient (GLM) with 95% confidence intervals.

bias ($F(1, 217.76) = 8$, $p = .005$). The degree of bias was greater among participants who perceived the out-group player as an out-group member than among participants who perceived the out-group player as Sienese (Figure 5.2).

Taking the planned and exploratory analysis together, categorisation did not vary across treatments. Instead, perception of the out-group varied by individual and those who perceived the out-group as having the superordinate identity showed a lower degree of bias, irrespective of the treatment they had been randomly assigned to.

5.4 Discussion

We set out to experimentally test a "common enemy effect": the ability of an external third-party to unite rivals. While intuitive, to our knowledge no previous study had employed a behavioural economic game in order to explicitly assess the common enemy effect. Our experimental design was informed by a large body of previous research, and we sought to enhance our study with the inclusion of appropriate control treatments and the employment of genuine group identities. The results are unable to confirm the hypothesis that competition with a common enemy unites rivals. We provide alternative explanations of the results as substantive findings in Section 5.4.1, followed by a discussion of study limitations and suggestions for future studies in Section 5.4.2.

5.4.1 Substantive findings

We expected bias — the difference between in-group and out-group cooperation — to be lower in the common enemy treatment compared to the baseline and the two additional control treatments. Instead, we found two patterns. First, bias was similar across all treatments, with in-group cooperation consistently greater than out-group cooperation. Second, perception of the rival during the game — measured by the categorisation scale — also remained constant across treatments. Therefore, the treatments did not affect average behaviour or perceptions of the out-group. Together, the results suggest that individual prosocial preferences are either resistant to the presence of superordinate competitors and/or the thresholds as presented in this study, or not affected by a pseudo-competition prime.

Exploratory analysis of superordinate categorisation suggests that individual perception of identity influences bias more than the treatments. The exploratory analysis regressed the degree of bias against categorisation, and suggests that those who perceived the other player as a member of the superordinate group (a person from Siena) showed less bias than those who perceived the other player as a member of the subordinate group (a member of the rival out-group). Across individuals there was heterogeneity in the level of identity with which out-group others were perceived, and this impacts their cooperative behaviour towards the out-group.

Previous research has shown that individual identification can dynamically shift between smaller, local levels (subordinate identity) and larger, even global levels (superordinate identity), either mediated by personal characteristics, e.g.,

concern for others (Buchan et al. 2017) or in response to major events, e.g., party conventions (Dunham et al. 2018; Rand et al. 2009b). Here it seems that subordinate or superordinate identities of others are perceived differently by individuals, and these perceptions are relatively stable. However, the effect of categorisation was small and requires direct testing.

In relation to psychological processes, *contrada* identity appears "additive" for some individuals, but "conjunctive" for most (Brewer 2001). When presented with two levels of identity, the additive process involves an extension of individual identity such that the subordinate group is seen as nested within the larger group. Conjunctive means that the identity is restricted, such that the subordinate group becomes more prominent. The results suggest that *contrada* members consider *contrada* identity first and foremost.

An appreciation of life in Siena may shed light on the results. Many *contrada* members spend the majority of their time socialising with individuals from their own *contrada* (Chapter 2). This creates strong bonds within the group, and among these individuals *contrada* membership will be more prominent than other identities. Conversely, other members, particularly those in leadership positions, often interact with other *contrade* when representing their community at various civic events. Inter-group contact, and the emphasise on a collective Sienese identity at these events (Parsons 2004: Ch. 6), means certain individuals conceive the *contrada* and Siena together. Furthermore, members vary in the extent to which they foster and value inter-group interactions, e.g. owing to kinship with out-group members. We expect individuals with more between-*contrada* ties to readily reduce bias compared to those with fewer ties, but we do not have relevant data to test this prediction here. In sum, *contrada* members vary in how they perceive out-group members, based on their individual conception of local identity, community, and history, and their social interactions within and between the *contrade*.

5.4.2 Study limitations and future considerations

The lack of a common enemy effect could be due to the fact our design employed pseudo-competition. Pseudo-competition has previously been shown to be sufficient to encourage cooperative decisions (e.g., Böhm and Rockenbach 2013; Burton-Chellew and West 2012; Jordan et al. 2017; Tan and Bolle 2007). It is essentially a prime, with the payoff structure of the game equivalent across treatments. The result from this study suggests that priming does not influence behaviour in all contexts, nor does priming influence the psychological processing of the game: individual perceptions of the other player were similar across treatments. An alternative design would be to modify the payoff structure between treatments, including thresholds above which group cooperative behaviour is rewarded with additional payoffs (e.g. individuals within groups that out-performed other groups earned extra money Burton-Chellew et al. 2010). Thresholds could encourage cooperation with out-group members either through the direct remuneration of cooperative behaviour, and/or the generation of a common goal (Sherif 1966).

A potential concern with our experimental design is conformity, whereby

participants copy the target. However, our design should not be conflated with standard conformity experiments employing PGGs (e.g. Bardsley and Sausgruber 2005; Carpenter 2004), as such experiments provide information about contributions made by participants' own group, not contributions made by another group as in our set-up. An example of an experimental manipulation that aimed to test for conformity, and that is similar to our target, is the group-means treatment in Burton-Chellew et al. 2017: see Figure 1. Here, the average behaviour, i.e. contributions, of other groups was known by participants before they made their decision. However, they find little evidence of conformity, and our design differs in a crucial aspect: the other group has a salient identity in our context, in the common enemy and third-party control treatment, which we predicted would elicit competition and alter individual group identity. Finally, the possibility that participants responses were conditional on the target are downplayed by average contributions being higher (around 65%) and lower (around 30%) than the target of "about half", among in-group and out-group pairs respectively.

An additional and considerable caveat is only half the participants demonstrated the correct understanding of the game. As such, the lack of comprehension attenuates the results, although we note that the pattern of results holds when analysing only those who demonstrated understanding, and that comprehension affected the decision between in-group and out-group type and not across treatments (Section E2.1). The lack of comprehension is a shortcoming we did not foresee — we thought research assistants verbally explaining the rules would be sufficient, even in less formal settings than a standard lab. Extensive piloting, such as in (Hruschka et al. 2018b), could have suggested either clearer, repeated instructions, or an alternative experimental design, even among communities drawn from a Western, Educated, Industrialised, Rich, and Democratic (WEIRD) society (Henrich et al. 2010b). Piloting was avoided as we wanted to reduce collusion. In hindsight, and based on the lack of an effect of day and session (Section E2.2), collusion should not have been a major concern. We think the research question and experimental design merits a high-powered conceptual replication in laboratory settings or on-line, ideally with natural groups, as minimal groups are less likely to have a common enemy as operationalised in this study.

Another possible issue is that the rivalry with Florence — largely historic and symbolic — does not present direct competition or sufficient threat to either the subordinate or superordinate group. In order for rivals to unite, competition with a common enemy might need to impose potentially severe costs, such as mortality or restrictions in resource access. The historical example of Tecumseh's Confederacy used in Section 5.1, where Native American tribes attempted to unite against settlers, is a scenario in which the lack of further unification resulted in genuine costs, i.e., death and a reduction of sovereignty. While the attitudes scale confirm that individuals from Florence are viewed negatively, it is not any more or less negative than for the out-group *contrada*, and most of the competition between the two cities is largely historic. Future studies in other contexts may present situations or events in which superordinate groups compete more directly, or where outcomes are zero-sum such as elections (Dunham et al. 2018).

It is possible that because the data were collected during the competitive summer months when the *palio* is run, subordinate identity was generally more salient. Indeed, more participants categorised the other player as a *contrada* member, as opposed to Sienese. Although, our previous research suggests that the time of year has no impact on cooperation among the *contrade* (Chapter 3), repeating this experiment during the less competitive winter months might result in less bias between *contrade* when faced with a common enemy.

5.5 Conclusion

"A common enemy unites" is an intuitive notion. To our knowledge, this study is the first to systematically test for a common enemy effect; the results suggest that there is no evidence that a common enemy unites rivals, at least in the context studied. Taken together, the results suggest instead that subordinate identity influences behaviour more so than superordinate identity. Furthermore, individual bias is relatively stable, at least in contexts where external influences have little behavioural consequence. Further systematic assessment, first via a conceptual replication, then with different experimental designs and cultural contexts, is required and we have identified areas for future experimentation. Knowing under what conditions rivals can unite is important, as many contemporary issues, such as climate change, require collaboration between political actors who would otherwise be inclined to not cooperate.

We and they, the good and the bad (. . .) everything is played in the palio*, that's why it means so much to win a piece of cloth, otherwise you would not explain, not even in pathological terms, why people get so much out of a symbolic victory.*

— Alessandro Falassi in the documentary *To Siena with Love* (1972)

6

Insights from the *contrade* on in-group bias

The 17 *contrade* of Siena, Italy provide a "natural laboratory" to test hypotheses about social behaviour within and between naturally-occurring human groups. I conducted three field experiments with the *contrade* to investigate an aspect of social behaviour, namely cooperation. The specific aim of this thesis was to explore the effects of inter-group competition, group relationship, and shared identity on in-group and out-group cooperation. The results suggest that, among these territorial communities, a long history of competition has resulted in strong in-group bias in cooperation, which is influenced by the relationship between the groups, but is generally unaffected by the current level of competition and attempts to induce a shared identity.

In this final chapter, I synthesise the results of my empirical research (Section 6.1.1), in part via a meta-analysis to gauge the overall magnitude of in-group bias across the field experiments (Section 6.1.2). After evaluating limitations of the current research (Section 6.2) and exploring future directions (Section 6.3), I situate the results within the broader literature on the evolution of human cooperation (Section 6.4). Finally, I provide insights into the in-group bias in cooperation found across this thesis based on my understanding of the *contrade* (Section 6.5).

6.1 Overview of results

6.1.1 Descriptive summary

In Chapter 2, I provided a primer on the *contrade* of Siena, and presented four elements of my fieldwork-based research with the *contrade*. First, I estimated the size of *contrada* membership to be on a scale on order of over 30,000 men, women, and children. Second, various aspects of *contrada* life were uncovered by a survey of 513 *contrada* members, pertinently that most people active in the *contrada* are members from birth, and most friends share *contrada* affiliation. I

then assessed the significance of the pattern of relationships among the *contrade* through a psychological item measuring the attitudes of members towards different *contrade*, and by tracking the annual *giro* procession. Taken together, I provided a quantitatively-informed description of key features of the contemporary *contrada* system. Of particular importance to understanding the rest of the thesis, I showed that the relationship between *contrade* affects attitudes and ritualised behaviour: attitude towards the in-group is greater than towards the out-groups, and more time spent is spent in the territory of allied *contrade* than neutral, and especially, rival *contrade*, during the procession.

In Chapter 3, I looked at the effects of competition and inter-group relationship on in-group and out-group cooperation. Three hundred and forty five participants played a modified dictator game (DG), in which they decided how much experimentally-endowed money they preferred to give to, or take from, another in-group member, a neutral out-group member, and a rival out-group member. Approximately half of the participants decided during a period characterised by low inter-group competition, around six months before the *palio* horse race. I then compared these decisions with those made by the other participants during a period characterised by high competition, i.e., in the days preceding the *palio*. Decisions were comparable across the two periods, indicating a limited effect of competition on in-group and out-group cooperation. However, the relationship between groups did affect cooperation. Most decisions among neutral out-group members were cooperative, while most decisions among rival out-group members involved taking money, i.e., were deliberately harmful.

In Chapter 4, I assessed whether the pattern of cooperation seen in Chapter 3 was sustained by social norms. To measure norms I adopted a standard paradigm, the third-party punishment game (TPPG). Norms are considered to be sustained by punishment meted by un-involved third parties. In the TPPG, 49 out of 147 participants played the same DG as in Chapter 3, with 48 other participants deciding how much to punish the original 49 participants for their decision, although around half of the participants were excluded due to a lack of comprehension. There was some evidence of norms for cooperation among in-group members, as punishment decreased as cooperation increased. I found some cooperation among neutral out-groups, and a lack of cooperation among rival out-group members, as in Chapter 3. However there was limited support for strong norms governing out-group behaviour, as evidenced by no clear punishment pattern for behaviour directed at neutral or rival out-group members. Based on a qualitative assessment of participants' written interpretations of the game, where the majority did not provide an interpretation that suggested the game reflected local life, I suggested third-party punishment was not a contextually relevant behaviour.

In Chapter 5, I explored the effect of shared identity on out-group cooperation. Specifically, I investigated the "common enemy" effect, the hypothesis that competition with a third-party perceived as a common enemy could unite rivals, and thus reduce the in-group bias revealed in Chapters 3 and 4. I had predicted that a common enemy (in this case, people from Florence) would unite rival *contrada* members by making salient a shared Sienese identity among members of different

contrade. In a public goods game (PGG) with 152 participants, I found limited support for a common enemy effect, as in-group bias was similar in a treatment involving the common enemy compared to three control treatments. In a post-game question, participants revealed varying perceptions of the nature of the out-group member. Some had played the game perceiving the out-group member to be from a rival *contrada*, whereas others perceived them as a generic, Sienese individual.

6.1.2 Meta-analysis of the results

A consistent finding across experiments 1–3 (Chapters 3, 4, and 5) is that cooperation was greater among in-group members than among out-group members. A meta-analysis of the results of the three economic games across 546 participants reveals the strength of this in-group bias.

To conduct the meta-analysis, I first calculated the effect size and confidence intervals in each study for two comparisons of bias: between the in-group and rival out-group, and between the in-group and neutral out-group. For experiment 1 (Chapter 3), I calculated an effect size for low and high competition separately, as these represent independent samples. For experiment 3 (Chapter 5), there was no in-group vs. neutral out-group comparison. I then estimated the overall effect size and confidence intervals for each comparison with a random effects model using the restricted maximum likelihood (REML) method (Kelley and Kelley 2012; Veroniki et al. 2016).

Figure 6.1 shows that in-group bias in cooperation was particularly acute among the *contrade*, with an average effect size of 0.84 (95% CI: 0.61–1.06) for rival out-groups and 0.68 (95% CI: 0.50–0.86) for neutral out-groups. An effect size of 0.2 represents a small effect, 0.5 represents a medium effect, and 0.8 represents a large effect, according to the rule of thumb outlined by Cohen (1988). Therefore, the effect size of in-group bias among rival *contrade* can be considered large and among neutral *contrada* medium to large. The *contrade* thus represent groups with strong group identities that translate to consistent and significant in-group bias in cooperation.

6.2 Limitations of the current research

I have addressed limitations specific to each study in the corresponding chapters (Sections 3.4.2, 4.4.3, and 5.4.2). Here, I discuss general limitations that were not addressed in detail within each chapter, namely, the generalisability of the results, the missed opportunity for assessing positive interactions, and the use of standard games. I also reconsider stake size and comprehensibility, given low stakes in experiment 1 (Chapter 3) and issues surrounding non-comprehension in experiment 2 (Chapter 4) and experiment 3 (Chapter 5).

The Sienese *contrada* system is relatively unique, and as such results may not be applicable to other settings. As a social system, it is analogous, but not identical, to other communities with frequent interaction, strong symbolism, and a long history: the *contrada* is not a neighbourhood as in most cities, a supporters club, or a religious community. *Contrada* members themselves referred to this issue, such

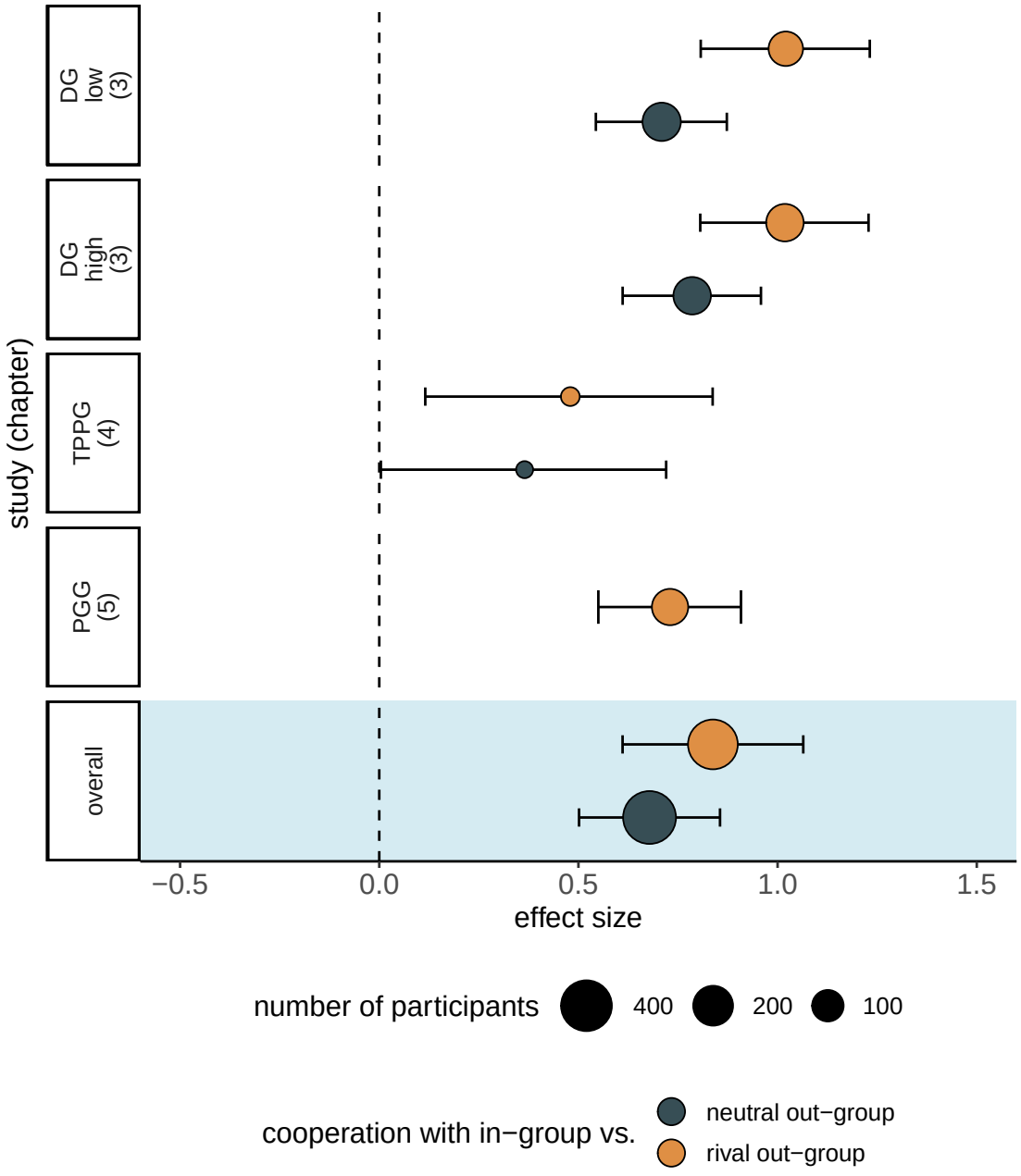


Figure 6.1: Forest plot of the effect sizes for each study and the overall effect size. Point size is weighted by the number of participants. DG refers to dictator game (divided into low and high competition), TPPG refers to third-party punishment game, and PGG refers to public goods game. Error bars are 95% confidence intervals.

as a 23 year-old male who wrote in his response to experiment 2 (Chapter 4): "I think, however, that it is difficult to apply the Sienese model to other cultures or social environments".[1] However, other informants, while recognising that "it is very difficult to find similar [societies] in a civil context", stated "we are not unique".[2] Thus, details of the results may not be applicable to other contexts, i.e., they may not be externally valid.

I emphasised the importance of considering inter-group relationship throughout the thesis (Section 1.2.4 and Chapter 2), and I used neutral out-groups as well as rival out-groups in two experiments (Chapters 3 and 4). I had initially aimed to systematically include allied *contrade* in the field experiments, to provide insights into cooperation based on explicitly positive inter-group relationships. An ally was included as an out-group for one *contrada* in experiment 1 (Chapter 3), but the allied *contrada* decided not to continue their involvement.[3] Thus, I was unable to include allied *contrade* in further studies as no alliance was present within the sample of five *contrade*. This limitation was an issue surrounding access and permission, and reveals the disjuncture between idealism in study design, and pragmatism in implementing field experiments.

Another weakness of field experiments employing standard games such as those in experiments 1–3 (Chapters 3, 4, and 5), is ecological validity — the mapping of decisions onto real-world behaviour. I took steps to ensure that the games reflected real-world behaviour: I spent significant time with the communities and conducted (post-game) interviews. But the former mostly corroborated expectations, such as competition is more intense during the summer than the winter, and the latter revealed that discrepancies might exist between the experimental design and the setting. Concerns might have been alleviated by asking participants to self-report behaviour that either promoted in-group member welfare or were harmful to out-groups, and compare these to decisions in the game. Concrete examples of behaviour that benefits others, and specifically the in-group, includes financial contributions to the *contrada* (beyond the *protettorato*), and time spent volunteering in *contrada* activities. I could have asked participants to state the number of fights they had been involved in, or the number of times they went around the city centre putting up posters goading their rival, over a given period.

Some respondents informally spoke to me after the studies saying that money is not a concern within the *contrada*. In their interpretation of the TPPG (experiment 2 (Chapter 4)), a 24 year-old male responded "I think it's wrong to talk about money between *contrade* and between *contrada* members, it would be more useful to answer questions of a moral or emotional nature".[4] This comment suggests that alternative

1. ID = AY511, Ita. *Penso pero, che sia difficile applicare il modello Senese in altre culture o ambienti sociali.*

2. Ita. *[È] una società, credo, anche se sono convinto, come ho detto primo, non siamo unici, pero molto difficile trovare, in un contesto specialmente civile.*

3. As described in Chapter 3, this ally was analysed as a neutral out-group because cooperation with it was the same as with the neutral *contrada* among the participants from the other three *contrade* in the sample.

4. ID = VI409, Ita. *Credo che sia sbagliato parlare di soldi tra contrade e tra contradaioli, domande di carattere morale o emotivo sarebbero più utili.*

strategies might have been used to measure real world dynamics. For example, I could have used vignettes. Maass et al. (1989) showed *contrada* members from the city of Ferrara cartoons of individuals, either in-group or out-group members, engaging in socially desirable or undesirable behaviours, such as stealing a *contrada* flag. They were then asked to describe the scene in their own words, and choose a description from four provided options. In both cases, participants selected abstract terms when describing positive in-group and negative out-group behaviour, but used concrete terms when describing negative in-group and positive out-group behaviour. Similar stimuli could have been used, and participants asked to rate their moral or emotional response.

Although this is an interesting possibility, I used money as it is a standard resource for capturing prosocial behaviour, particularly in studies involving WEIRD, fully market-integrated societies (Pisor et al. 2019). The participant's comment also potentially comes from two aspects of *contrada* life that are linked to money. First, the secretive nature of the deals made between *contrade* during the *palio* (see Chapter 2) results in a general avoidance of discussions related to money, at least at most social events (financial matters are discussed by the governance and during assemblies). Second, as *contrada* members instinctively give money to the *contrada*, through their annual dues, promises to pay in the event of a *palio* victory, and the regular payment of meals and snacks, some members might believe that money should always be given to the *contrada*. However, the results show that participants did consider the returns from the games, as participants rarely allocated more than 50% of the endowment to others, even within the *contrada*.

One possibility would be would have been to use food items — although this is more useful in contexts where they are a valuable commodity (e.g. Apicella et al. 2012; Lamba and Mace 2011) — or cover the costs of a *contrada* meal. Or, participants could have earned their endowments (e.g. via a quiz Cherry et al. 2002). This way game decisions would reflect real decisions individuals make, as any financial contribution to the *contrada* comes from members' own pockets.

A more pertinent issue surrounding money is the low stake sizes, particularly in experiment 1 (Chapter 3) where the stake was €3.00, although I was able to increase this to a stake size of €10.00 plus €5.00 show-up fee in experiment 3 (Chapter 5). The stake is often a day's wage in previous field experiments (e.g. Henrich et al. 2005), which means caution should be exercised when comparing the results with similar research conducted in the field, although online studies often use even lower stakes (e.g. Amir and Rand 2012). Furthermore, it is possible that the small stake sizes increase the variation around an individual's "true" behaviour (e.g. Camerer and Hogarth 1999), as participants might have either given more as they were unmotivated to recoup small rewards, or given less to make participation worthwhile. I believe that the relative contributions between in-group, neutral out-group, and rival out-group are unaffected, and ascertaining the effect of small stake size is an empirical question.

Finally, comprehensibility frustrated certain analyses in experiment 2 (Chapter 4) and experiment 3 (Chapter 5). In hindsight, these issues could have been prevented through extensive piloting (Gil-White 2004; Hruschka et al. 2018b),

which was avoided due to concerns of collusion in small-scale societies. I would emphasise collecting data from fewer participants, but ensure they demonstrated clear understanding of the game parameters.

Overall, were I to embark on the same doctoral project, I would trial games with greater ecological validity, and conduct more extensive piloting of the games. In doing so, I do not think the results would change qualitatively. For example, I am persuaded by the finding that the level of competition has little effect on in-group bias, given my updated ethnographic understanding of Siena and follow-up discussions with *contrada* members. However, I think more nuanced, contextual measures and greater comprehensibility would reduce uncertainty surrounding certain elements of the research.

6.3 Future directions

There is an opportunity to continue research in Siena, which will allow me, or another interested scholar, to expand upon the research presented in this thesis. Here, I outline potential projects that either capture real-world behaviour or suggest underlying moderators for in-group bias. In essence, the projects involve modifications to either the measured outcome or the explanatory variables.

In Section 1.2.5, I suggested economic games provide an objective and comparative approach to revealing individual cooperative preferences. This motivated the three field experiments, each of which largely adopted standard protocols for such experiments, namely one-shot decisions and anonymity of both actor and receiver. However, having completed the experiments, it is apparent that in order to capture real-world behaviour, fieldworkers should adopt more nuanced games that consider the social ties between particular persons within and between groups. In the real-world, human cooperation is motivated by personal and group characteristics of both the actor and the recipient, such as relative status, and interaction histories, such as reputation. Including these within a game framework would make measurement of cooperative games richer. Thankfully, anthropologists have already strategically altered the framing or design of economic games, so that they can more concretely provide insights into real-world behaviour (see overview in Pisor et al. 2019).

One option would be to employ the three "recipient identity-conditioned heuristics" (RICH) games developed in Gervais (2017), which aim to understand how individual characteristics structure real-world social relationships. Participants are presented with a photo array of members, from the same community, revealing the recipients' identities. In the first game, participants are asked to give resources to the photographed recipients; in the second game, they are asked to remove resources from the recipients; and in the third; they are asked to pay to reduce the payoffs of others. RICH games reveal how a preference to give to, exploit, or punish a particular recipient reflect the actor's characteristics (e.g., their resources), the recipient's characteristics (e.g., their reputation), and properties of the dyad (e.g., kinship, friendship). These three games complement the design of the dictator game in Chapter 3, yet because they include more information about the social ties between actor and recipient, they would reveal decisions of greater ecological

validity to the Sienese context. I would include members from different *contrade* in a future experiment involving RICH games, so between-group behaviour could also be assessed against these proprieties.

Explaining human behaviour requires consideration of the multiple networks that individuals are embedded in. RICH games can also be enhanced by considering the social network more explicitly. Complete network data for two or three smaller *contrade*, which comprise a few hundred individuals each, could be collected via a questionnaire. The questionnaire could include information on membership of the various sub-groups within the *contrada*, and on links to other *contrade* (e.g. through marriage or work). This will allow quantification of the degree of both direct and indirect contact between the *contrade*, providing an estimate of the "social distance" between them (Brown and Hewstone 2005).

One intriguing possibility then would be to extend the data collection to social media outlets such as Twitter and Instagram, focusing on content relating to the *palio* and to *contrada* life, including use of emotions about one's own *contrada* vs. others. The aim of this exercise would be to determine whether the social network structure and dynamics observed "in the cloud" match the patterns revealed by the data collection "on the ground". This is of great significance for researchers interested in human behaviour, as "big data" from social media and related sources are becoming ever more popular, including in the study of intra- and inter-group relations (e.g. Yardi and Boyd 2010).

This dissertation investigated behaviour in adults. However, the *contrada* is present for many members from birth: I observed infants being baptised, young children learning how to perform the flag-toss, and groups of teenagers socialising in the streets outside the clubhouse. Thus, the development of parochial behaviour could be traced, in both children and adolescents (as per Fehr et al. 2008, 2013). Studies tend to use a limited range of ages, and use either minimal or real groups (Lazić et al. 2020). These two features pose several problems for understanding parochialism in childhood and adolescence. First, how does parochialism vary with age, and when does it reflect the behaviour of adults in the population? Second, is the minimal group effect a template over which real-world attitudes form (Dunham 2018)? One option would be to recruit participants from age 3 to age 17, as well as a sample of adults, in order to see how parochialism varies with age, and when it becomes adult-like. A possible experimental design could also compare participants who play using real-world groups (the *contrade*) vs. minimal groups, so that I could assess how much of the behaviour toward real-world groups is explained by identification with minimal groups. The level of parochialism in the minimal group setting represents individual's basic and abstract notions of group membership, and subsequent response (Dunham 2018). The level of parochialism in the real group setting — predicted to be greater than that in the minimal group setting — represents social learning of in-group and out-group member behaviour, and relevant local norms (House et al. 2019).

6.4 Contributions to understanding in-group bias

The literature review in Section 1.2.4 discussed ultimate drivers for in-group bias, namely threats and resource asymmetries, and described how proximate mechanisms, such as group identity and norms, can either increase or decrease in-group bias given situational factors. The thesis makes three contributions to an evolutionary understanding of in-group bias in human cooperation. These are showing the effects of inter-group competition (Section 6.4.1), shared identity (Section 6.4.2), and group relationship (Section 6.4.3) on in-group bias.

6.4.1 The effect of competition on in-group bias

There was no evidence for an effect of the level of competition on cooperation in experiment 1 (Chapter 3). Threat posed by out-groups in a competitive setting did not increase in-group bias, neither through an increase in in-group cooperation nor through a decrease in out-group cooperation. The finding is in contrast to the predictions of parochial altruism, cultural group selection, and social identity theory (reviewed in Sections 1.2.3.1, 1.2.3.2, and 1.2.3.4), all of which predict an increase in in-group bias in competitive scenarios, relative to non-competitive settings. The finding was also unexpected given numerous experiments, mostly conducted in the laboratory, that show in-group bias increases when artificially created and natural groups are in competition with each other (see Rusch 2014).

In the discussion to experiment 1 (Chapter 3) (Section 3.4), I speculated that several contextual factors explained this result, such as the sample of adults having formed, during childhood and adolescence, a positive attitude towards their own *contrada* and negative attitudes towards other *contrade*. These positive and negative evaluations translate into in-group bias that is relatively unaffected by environmental cues such as the level of threat. I also suggested that inter-group competition has affected in-group and out-group cooperation in Siena. Competition, in the form of the *palio*, occurs every year. As soon as one *palio* ends, members are already thinking and preparing for the next one, and members begin contributing to the *contrada* to favour its chances next year. There is also the fact that events in the *palio* often lead to in-group bias, meaning that even after the race, members are more likely to favour their *contrada*. Together, members display in-group bias throughout the year.

Considering the finding that competition has a limited effect on in-group bias more broadly, I speculate that where group identities are strong, in-group bias is impervious to fluctuations in threat or levels of competition. Certainly, the presence of intractable conflicts throughout the world suggest that in-group bias, once established, can be resistant to factors that change it. For example, many Catholic and Protestant communities in Northern Ireland continue to behave parochially, even if sustained conflict ended with the Good Friday Agreement in 1998 (Silva and Mace 2014; Silva and Mace 2015). In order for groups to achieve their goal, whether the goal is victory in a symbolic competition like the *palio* or for political representation within a state, groups require loyalty from members, meaning individuals display bias at all times. Little variation in the level of in-group bias strengthens group identity, and *vice versa*. I acknowledge that in-group bias has

been shown to diminish with collaborative institutional environments, inter-group contact, and early interventions (e.g. Alexander and Christia 2011; Bauer et al. 2016; Brown and Hewstone 2005). Experiment 1 (Chapter 3) adds to the currently limited literature that seek to understand how in-group bias in cooperation does, and does not, vary over time in the real world; future research should continue to address the stability of cooperative preferences with respect to in-group and out-group members at different time points.

Broadly, the results from experiment 1 (Chapter 3) suggest that, while competition might have been a selection pressure on the emergence of in-group bias in human evolution (Section 1.2.3.1), it does not necessarily follow that competition is a proximate driver of in-group bias. Instead, a principal drivers of in-group bias might be the delineation of an in-group (Section 1.2.3.4). A group boundary cues interdependence and the possibility of reciprocity (Section 1.2.3.3). Although the Sienese context suggests otherwise, in-group bias can arise in the absence of other groups and/or inter-group competition between them.

6.4.2 Consideration of the level of identity

Experiment 3 (Chapter 5) investigated whether the in-group bias found in experiment 1 (Chapter 3) and experiment 2 (Chapter 4) could be "overcome" by priming a shared Sienese identity between rival *contrada* members, induced by a "common enemy". The results provided little support for this, with no reduction in in-group bias and no increase in the number of participants who perceived an out-group as sharing an identity when in competition with a common enemy. This was counter to the hypothesis developed in Section 5.1, and experimental evidence that shows a superordinate identity can be primed (Kramer and Brewer 1984), even in competitive settings (Dunham et al. 2018), with subsequent between-group cooperation. I did find, through an exploratory analysis, that those participants who perceived the out-group as being Sienese, rather than a rival *contrada* member, were generally less biased. This shared identity was not induced by the common enemy, i.e. it was found in participants across all experimental treatments.

Why did *contrada* members not unite against a common enemy? One explanation is that members more easily identify with the subordinate *contrada* identity, and not the superordinate Sienese identity. *Contrada* members are more likely to view the world through the *contrada* lens, as it is the *contrada* that structures most of their social interaction. Only at particular moments during the year do members perceive themselves as Sienese (see Parsons 2004); for example, Sienese identity is highlighted at Sienese New Year, a recently revived tradition celebrated on 25 March. That relatively more local identities tend to supersede larger and more global identities is a pattern of results found elsewhere. For example, local co-religionists are favoured over geographically distant co-religionists, in instances where the religion is less represented by moralistic gods that are punitive and knowing (Purzycki et al. 2016). Across the European continent national identities have taken precedence over a common European identity, as demonstrated by Britain exiting the European Union in 2016 (The Guardian 2016), and Italian

populist parties being voted into government in 2018 (The Economist 2018), to reference situations in the two countries in which this thesis has been written.

Another explanation is that the type of common enemy used in the experiment was unable to unite *contrada* members. The common enemy, people from Florence, represent a symbolic threat, based on a history of antagonism between Siena and Florence. The animosity is perhaps not as strong today; I measured members' attitude towards Florence ($M = 4.6$, $SD = 2.5$) and it was more positive than their attitude towards rival *contrade*, both for participants from the relevant study ($M = 3.9$, $SD = 2.3$; Chapter 5) and for other participants ($M = 1.6$, $SD = 0.9$; Section 2.3.3). Social identity theory suggests that identification with the in-group occurs in the presence of an out-group, and this leads to social competition, where the in-group tries to maximise the distinction between the "us" and "them"(see Section 1.2.3.4). Using Florence as the out-group did not cause *contrada* members to identify as Sienese.

The relevance of the type of common enemy, or common threat, is underscored by events in which the *contrade* do come together. At the start of my fieldwork, all of the *contrade* coordinated fundraisers and trips to visit and provide for victims of the earthquake that struck Central Italy in August 2016. More recently, in April 2020, rivals *Civetta* and *Leocorno* established a joint fund to raise donations for medical equipment in response to the coronavirus pandemic, a project entitled "rivals in the square, but united in life and in the fight against COVID-19" (Ita. *avversari sul campo, ma uniti nella vita e nella battaglia contro il Covid 19*). Where a threat poses actual risks to the health and safety of members and others in the community, individuals readily unite.

Experiment 3 (Chapter 5) considered the multi-dimensionality of human identity: individuals often identify with multiple groups. The multi-dimensionality of identity has long been recognised in social psychology (e.g., Brewer 2001; Gaertner et al. 1993) and social anthropology (e.g., Barth 1998/1969), but only recently has it been discussed within an evolutionary framework for cooperation (e.g., Smaldino 2019b). If this line of research — knowing how and when groups shift identities — continues it may help nuance our evolutionary understanding of in-group bias and help understand contemporary issues.

6.4.3 The importance of group relationship

The results of Chapter 2 revealed the importance of inter-group relationship on attitudes and ritualised behaviour. There were more positive evaluations and greater interaction among *contrade* that shared a positive relationship, i.e. allies, than *contrade* that shared a neutral relationship. There were also more negative evaluations and fewer interactions among *contrada* that shared a negative relationship, i.e., rivals, than *contrade* that shared a neutral relationship. Chapters 3 and 4 revealed the importance of inter-group relationship on cooperative behaviour. In general, there was significant cooperation among neutral out-groups, whereas there was limited cooperation with rival out-groups. The results of experiment 1 (Chapter 3) and experiment 2 (Chapter 4) are congruent with literature reviews

that highlight contexts in which out-group cooperation is prevalent, notably where groups are not antagonistic (Hruschka and Henrich 2013; Pisor and Surbeck 2019; Robinson and Barker 2017).

Experiments in the laboratory have systematically varied the relationship between groups (e.g. Diekhof et al. 2014; Weisel and Böhm 2015). Only recently have field experiments included multiple out-groups (e.g. Doğan et al. 2018; Pisor and Gurven 2016, 2018; Silva and Mace 2014). My research has provided further evidence that field experiments, involving multiple out-groups, can elicit results that are in line with the theoretical literature (Böhm et al. 2018; Pisor and Surbeck 2019; Robinson and Barker 2017; Rusch 2014). Researchers should consider inter-group relationship in future investigations, in other contexts, to understand how this manifests itself cross-culturally.

What drives a particular group relationship? It is difficult to parse the relative effects of threat, reciprocal behaviour, and norms, and all three likely operate in this context. Threat underpins the beginnings of a particular group relationship. In this context, the *palio* is the arena in which relationships are formed, whether positive or negative. Thus, group relationship is not distinct from the pressures of threat. Similarly, I speculate group relationship is maintained by reciprocity — expectations of positive interactions between neutral out-groups fosters cooperation, whereas expectations of negative interactions between rival out-groups does not. Reciprocity between out-groups suggests that reciprocity is unbounded (see Section 1.2.4.2). Group-level processes, such as norms and institutions, also explain differences in out-group cooperation, and play a central role in maintaining group relationships. In the Sienese context, rituals and traditions promote a norm of sharing among allies, and to an extent among neutral *contrade*, whereas they galvanise the lack of such institutions between rivals. It is not apparent from experiment 2 (Chapter 4) that norms are sustained by individuals engaging in third-party punishment.

The different group relationships in the *contrada* context draw attention to the multiplicity of group relationships within and between human societies. Scholars interested in evolutionary explanations for prosociality recognise that dichotomising cooperation into high in-group cooperation and low out-group cooperation removes nuance from the behaviour that people actually exhibit (e.g., Hruschka and Henrich 2013; Pisor and Surbeck 2019; Robinson and Barker 2017), nuance that I think reflects group relationship. Future research should also account for group relationship on cooperation.

6.5 In-group bias in the *contrada* context

As discussed in a recent colloquium, titled "Pressing Questions in the Study of Psychological and Behavioral Diversity", the neglect of cultural context presents a threat to the generalisability of our understanding of human behaviour (Hruschka et al. 2018a). Evolutionary anthropologists often highlight cultural context — informed through extended fieldwork — when presenting results from experiments, including studies of cooperative behaviour (e.g., Ensminger and Henrich 2014; Lesorogol 2005; Wiessner 2009). Informed by an extensive review of the literature on the *palio*,

the experiences during my time in Siena, and the results of my empirical research among the *contrade*, I conclude the thesis with some insights from the Sienese context into the overall finding that *contrada* members show strong in-group bias.

I propose four factors to explain in-group bias among the *contrade* — group identity, reciprocity, norms (group relationship), and competition — all of which can be linked to the theories for in-group bias presented in Section 1.2.3. I rely on a selection of quotes to support these claims, all of which were given by *contrada* members during the post-game interview, whose aim was to understand local interpretations of the observed data.

First, *contrada* members have a strong sense of group identity, resulting in a preference for in-group members over out-group members (following social identity theory, see Section 1.2.3.4). Group identity is fostered through social interactions that are predominantly within the *contrada*, and occur throughout the year (Chapter 2). For most members, group identity is solidified by socialising in *contrada* from a young age, with strong emotional bonds to other members. The result is a community of individuals that feel closely bonded, akin to a family: "the *contrada* should be an extended family [...] in general, people try and to do good for the family. It comes spontaneously"[5] Although inter-group interaction is not restricted in Siena — indeed many members have family, spouses, and friends from other *contrade* — the tendency for people to interact predominately with others from their own *contrada* over their lifetime encourages a preference for in-group members over out-group members.

Preference alone does not explain why there is in-group bias among the *contrade*, as preference is yoked to expectation, underscoring the role of reciprocity (Section 1.2.3.3). During the interview, reciprocity was mentioned by *contrada* members, in relation to why there was an equal splitting of resources between in-group members in the game: "[a]nd then maybe someone will hopefully do the same with you. Therefore, it's also a little bit like giving an example of how you should behave, in the social sphere. Those who have been left behind are helped, with the hope, unconscious perhaps, that you might be helped, so I also see it as a kind of social investment, of the sort: I'll give you a hand, but if one day I need it, you'll give one back to me. [...] [It happens] within the *contrada*. Help doesn't have a colour."[6] The above quote indicates that reciprocity is both driven by individuals, with repeated interactions between members resulting in reciprocation of help. The final point — "help doesn't have a colour" — suggests that reciprocity is generalised, with help given to all other people from the same *contrada*, regardless of who they are.

To give another example, that an informant regarded as flippant, but I believe characterises the seemingly irrelevant transactions between members that translate into wider-scale egalitarianism: "I think that it's a stupid example but if the question

5. Ita. *La* contrada *dovrebbe essere una famiglia allargata* [...] *In genere le persone cercano di fare il bene per la familia. Viene spontaneo.*

6. Ita. *[E] poi magari si spera che qualcuno faccia lo stesso nei tuoi confronti, quindi, e anche un po', dare un esempio di come si bisogna comportarsi, nel ambito sociale. C'è chi rimane indietro viene aiutato, con la speranza, inconscio magari, che tu possa essere aiutato, quindi lo vedo anche come una sorta di investimento sociale, di serie: ti do una mano, ma se un giorno ho bisogno, me la dai.* [...] *al interno della* contrada. *L'aiuto sociale non ha colore.*

had been "I have half or one litre of a drink in front of me, what do we do?" You divide it together [...] in the end it remains more or less a balanced thing with us."[7] With fewer opportunities for out-group members to establish relationships based on reciprocal exchange compared to in-group members, even with regards to trivial aspects of local life such as sharing a drink, expectations of out-group members will be lower. As such, expectations of out-group members reflect group relationship status, with lower expectation of cooperation among out-group members, meaning reduced cooperation with these groups (Chapters 3 and 4).

Reciprocity is also embedded in norms. The informant above suggested an injunctive norm by stating how a *contrada* member *should* behave. Norms are the result of *contrade* maintaining and transmitting civic traditions, as indicated by previous ethnographers, who have previously commented on how elders, property, and history are held in high esteem among the Sienese (Drechsler 2006; Dundes and Falassi 1975). The emphasis on tradition, community, and history encourages prosocial behaviour, particularly within the *contrada*. Between certain *contrade*, there are norms of sharing as well, particularly with allies who aside from currying favours during the *palio*, can be relied upon to share resources throughout the year for e.g. feasts. In extraordinary times, rivals also expected to come together; as mentioned above, the *contrade*, including rivals, coordinate fundraisers to provide for victims of crises such as the August 2016 Central Italy earthquake and the 2019–2020 coronavirus pandemic. In sum, norms guide interactions within and between groups, with communities cooperating with each other in response to particular rituals and atypical events.

Finally, the occurrence of competition in the form of the July and August *palio* encourages in-group cooperation and discourages out-group cooperation (Section 3.4), through the emotions associated with the *palio* horse race. These emotions have long-term, positive implications for in-group prosociality, with the intensity of the *palio* creating a tight bond among in-group members with ramifications on group identity. An informant spoke of the indelible mark the competition has left on him, one that started at a young age, but which he relives every *palio*: "[there are certain] emotions, which aren't always good ones, more often than not they are adrenaline-filled, but these are emotions that, perhaps we're presumptuous, but they aren't experienced everywhere. Not with this consistency, not with this punctuality. So, to give specific details, it's not often that you and a friend are side-by-side, and in front of you there are fifty people who want to beat you up. It's not that this situation happens every day [...] It's dangerous, that's the reality of it. There is a sharing of key moments, that won't happen to you throughout your life. They mark you. Maybe you experience them one or two times in your life, but they mark you. Or the victory, or the fact that your enemy wins, regardless they mark you. For better or for worse, they mark you, and they are ongoing these emotions, because it's not that you feel them again, but you risk feeling them again. The risk is that these sensations rise up again within

7. Ita. *Io penso che sia un esempio stupido pero se fosse stato "io c'ho mezzo litro di bevuta, o un litro di bevuta, che si fa?" si divide insieme.* [...] *. Alla fine rimane sempre una cosa equilibrata, più o meno equilibrata da noi.*

you."[8] In sum, the cumulative effect of each *palio* leads to positive associations with the in-group and negative associations with out-groups, and the cyclical nature of the *palio* means that these associations are reinforced across an individual's lifetime. Perhaps best captured by *Selva* members who, after their victory in 1980, commented *il ciclo vitale dell'amore e dell'odio ricomincia* (De Stigter 1981: 115): "the life cycle of love and hate begins again".

6.6 Concluding remarks

With summer approaching during my year-long stay in Siena, a few *Civetta* members invited me to interview Ambrogio, an approximately 60-year-old man, at his house. During our conversation, Ambrogio chronicled his upbringing in the *contrada*, how he was baptised and carried into the neighbourhood on the shoulders of others, how he began to copy fellow members in wearing outfits that matched the *contrada*'s colours, and how at age 20 he would find himself in altercations with those from *Leocorno*, the rival *contrada*. While we were discussing whether or not it was possible to explain the significance of the *contrada* to someone from outside Siena, Ambrogio said: "I think it's hard because you can't explain why [...] you as a Sienese, have certain feelings. You can't give an explanation because they are sensations within you. Like I said before, 'why do you breathe?' Well, it's natural."[9] The *contrada* is so fundamental to the identity of its members as to be "natural". Apparently, as a social group it cannot easily be understood by the Sienese, let alone by outsiders.

Although the *contrada* system represents a specific social context, the findings from this thesis can be related to other social environments and wider debates on the topics of group identity, group relationship, and inter-group competition. Specifically, this thesis found persistent and acute in-group bias in cooperation among members of the *contrade* of Siena. In-group bias was influenced by the relationship between the groups, but was unaffected by the level of competition and attempts to induce a shared identity. Thus, the thesis recapitulates the dual consequences of group identification in the real world: positive interactions among people who share the same identity, and negative ones among those who do not.

8. Ita. *Le emozioni, che non sempre sono positive, più delle volte adrenaliniche, ma sono emozioni che, forse siamo presuntuosi, non ovunque poi riprovare. Non con questa costanza, non con questa puntualità. Allora, sempre andare nello specifico, non capita molto spesso di essere fianco a fianco con un tuo amico, e di avere di fronte 50 persone che ti vogliono picchiare. Non è che ti capita tutti i giorni, di ritrovarsi in una situazione del genere. È pericolosa, è la realtà. C'è una condivisione di momenti topici, che non è che ti capita tutta la vita. Ti segnano. Magari ti capita uno o due volte nella vita, ma ti segnano. Oppure la vittoria, o il fatto che vinca la nemica, comunque ti segnano. Nel bene o nel male, ti segnano, e sono continuative ste cose, perché non e che le riprovi una volta, ma po rischi di riprovarli. Tu c'hai il rischio dentro che innalza queste sensazioni.*

9. Ita. *Credo che è difficile perché non riesci a spiegare perché c'hai certe, te Senese, hai certe sensazioni. Non gli da una spiegazione perche sono sensazioni in te stesso. Come ho detto prima: 'ma perché respiri?' Boh, è naturale.*

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R information

Information about R, the operating system, and attached or loaded packages:

- R version 4.0.2 (2020-06-22), x86_64-pc-linux-gnu
- Locale: LC_CTYPE=en_GB.UTF-8, LC_NUMERIC=C, LC_TIME=en_GB.UTF-8, LC_COLLATE=en_GB.UTF-8, LC_MONETARY=en_GB.UTF-8, LC_MESSAGES=en_GB.UTF-8, LC_PAPER=en_GB.UTF-8, LC_NAME=C, LC_ADDRESS=C, LC_TELEPHONE=C, LC_MEASUREMENT=en_GB.UTF-8, LC_IDENTIFICATION=C
- Running under: Ubuntu 16.04.7 LTS
- Matrix products: default
- BLAS: /usr/lib/libblas/libblas.so.3.6.0
- LAPACK: /usr/lib/lapack/liblapack.so.3.6.0
- Base packages: base, datasets, graphics, grDevices, grid, methods, parallel, stats, utils
- Other packages: afex 0.28-0, broman 0.70-4, car 3.0-9, carData 3.0-4, checkmate 2.0.0, dplyr 1.0.2, emmeans 1.5.0, forcats 0.5.0, formatR 1.7, ggpirate 0.1.2, ggplot2 3.3.5, ggpubr 0.4.0, gridExtra 2.3, kableExtra 1.2.1, knitr 1.31, lattice 0.20-41, lme4 1.1-23, lmerTest 3.1-2, lubridate 1.7.9, magrittr 2.0.1, Matrix 1.2-18, MBESS 4.8.0, metafor 2.4-0, nnet 7.3-14, optimx 2020-4.2, purrr 0.3.4, pwr 1.3-0, questionr 0.7.4, readr 1.3.1, scales 1.1.1, stringr 1.4.0, tableone 0.12.0, tibble 3.0.3, tidyr 1.1.2, tidyverse 1.3.0, TOSTER 0.3.4
- Loaded via a namespace (and not attached): abind 1.4-5, assertthat 0.2.1, backports 1.1.10, base64enc 0.1-3, blob 1.2.1, boot 1.3-25, broom 0.7.0, cellranger 1.1.0, class 7.3-17, cli 2.0.2, cluster 2.1.0, coda 0.19-3, codetools 0.2-16, colorspace 1.4-1, compiler 4.0.2, cowplot 1.0.0, crayon 1.3.4, curl 4.3, data.table 1.13.0, DBI 1.1.0, dbplyr 1.4.4, digest 0.6.25, e1071 1.7-3, ellipsis 0.3.1, estimability 1.3, evaluate 0.14, fansi 0.4.1, farver 2.0.3, fastmap 1.0.1, foreign 0.8-79, Formula 1.2-3, fs 1.5.0, gdata 2.18.0, generics 0.0.2, ggsci 2.9, ggsignif 0.6.0, glue 1.4.2, gtable 0.3.0, gtools 3.8.2, haven 2.3.1, highr 0.8, Hmisc 4.4-1, hms 0.5.3, htmlTable 2.1.0, htmltools 0.5.1.1, htmlwidgets 1.5.3, httpuv 1.5.4, httr 1.4.2, jpeg 0.1-8.1, jsonlite 1.7.1, labeling 0.3, labelled 2.7.0, later 1.1.0.1, latticeExtra 0.6-29, lifecycle 0.2.0, MASS 7.3-52, mgcv 1.8-32, mice 3.11.0, mime 0.10, miniUI 0.1.1.1, minqa 1.2.4, mitools 2.4, modelr 0.1.8, multcomp 1.4-13, munsell 0.5.0, mvtnorm 1.1-1, nlme 3.1-149, nloptr 1.2.2.2, numDeriv 2016.8-1.1, openxlsx 4.1.5, pbkrtest 0.4-8.6, pillar 1.4.6, pkgconfig 2.0.3, plyr 1.8.6, png 0.1-7, promises 1.1.1, R6 2.4.1, RColorBrewer 1.1-2, Rcpp 1.0.5, readxl 1.3.1, reprex 0.3.0, reshape2 1.4.4, rio 0.5.16, rlang 1.0.0, rmarkdown 2.6, rpart 4.1-15, rstatix 0.6.0,

rstudioapi 0.13, rvest 0.3.6, sandwich 2.5-1, shiny 1.5.0, splines 4.0.2, statmod 1.4.34, stringi 1.5.3, survey 4.0, survival 3.1-12, TH.data 1.0-10, tidyselect 1.1.0, tools 4.0.2, utf8 1.1.4, vctrs 0.3.4, viridisLite 0.4.0, webshot 0.5.2, weights 1.0.1, withr 2.2.0, xfun 0.21, xml2 1.3.2, xtable 1.8-4, zip 2.1.0, zoo 1.8-8

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Appendices

A

Antagonism during the *palio*

A1 Introduction

The *palio* horse race has been described as a "present-oriented competition between *contrade*" (Pomponio Logan 1978: 45). The intensity of competition is evident from fights (Ita. *cazzotti*) between *contrada* members, which often arise during the four days of the *palio* festival (Drechsler 2006; Operti et al. 2020). Although physical aggression occurs in anticipation of the race, the most well-known incidents are those that take place in the central square as a consequence of the race. For example, violence might break out if a jockey prevents another from running a successful race. Fights also occur throughout the rest of the year (see discussion in Drechsler 2006).

In order to show that antagonism regularly occurs during the *palio*, and to demonstrate that it is more common between rival *contrade*, I analyzed the number of sanctions that *contrade* received for behaviour during each *palio* festival between the years 1980 and 2016. Sanctions are meted by local authorities, and can be to *contrade* or jockeys (further information is provided in Section A2). Here, I focus on sanctions related to antagonistic behaviour between *contrade* (Filiani and Zaffaroni 2002: 159). In this context, antagonistic behaviour involves either provocations or fights between *contrada* members, between both individuals and groups.

I begin by describing the methods (Section A2), then present the results alongside their discussion (Section A3). The latter supplements the ethnographic account of the *contrade* in Chapter 2, and supports the formulation of the *palio* festival as a period of intense inter-group competition in Chapter 3.

A2 Methods

A2.1 Background information

Every year, the local authorities responsible for organizing the *palio* institute proceedings, collectively known as *giustizia paliesca* (lit. "*palio*-related justice"), that

Table A1: Examples of antagonistic sanctions

interaction	description	reason for sanction (translation)	*palio*	*contrade* involved
provocation	one *contrada* antagonises another through provoking behaviour	"[*Pantera*] for having, across multiple moments, violated the agreement with the rival *contrada* not to sing offensive songs against [*Aquila*] during the passage in its territory."	Aug 2011	*Pantera–Aquila*
individual assault	one *contrada* member assaults at least one individual from another *contrada*	"[*Lupa*] for having a member hit the [deputy] of [*Istrice*]."	Aug 2002	*Lupa–Istrice*
group fight	a group of *contrada* members participate in a fight with another group	"[*Nicchio*] for having their own members, taken part, after the *palio*, in a confrontation, with physical contact, in *Piazza del Campo*, with the members of [*Valdimontone*]."	Aug 2015	*Nicchio–Valdimontone*

detail behaviour during the preceding *palii* that merit sanctioning. The sanctions, whether to a *contrada* or a jockey, are covered by chapter 8 (articles 97–105) of the *palio* regulations (Ita. *Regolamento del Palio*). Sanctions directed at the *contrada* are covered by article 97 (Filiani and Zaffaroni 2002: 159), which states that *contrade* can be sanctioned for "damage caused to the preparation, development, or decorum of the *palio*" (Ita. *danno, alla preparazione, allo svolgimento o al decoro del Palio*, Falassi 2010a: 218). Formalized sanctions have been directed to *contrade* since 1966 (Filiani and Zaffaroni 2002: 160), while jockeys have been penalized since the eighteenth century (Filiani and Zaffaroni 2003: 145).

Sanctions to *contrade* vary in the level of punishment, dependent on the incident (Filiani and Zaffaroni 2002: 159). Currently, the lowest form of punishment is a "censor" (Ita. *censura*), followed by a "deploration" (Ita. *deplorazione*), then a "disqualification" (Ita. *squalifica*). A disqualification means that the *contrada* is prohibited from participating in at least one future *palio*. The first two sanctions can be accumulated over a number of years and result in a disqualification: four censors over five *palii* result in a deploration, and three deplorations over nine *palii* result in a disqualification.

A2.2 Data collation and analysis

I created a data set of relevant sanctions meted to *contrade*. Sanctions were from proceedings between 1980 and 2016. The final year was 2016 because data for the experimental studies (Chapters 3, 4, and 5) were collected in 2017 and 2018. Although sanctions have been given to *contrade* since 1966, publicly available records only extended to 1980.

The records of every proceedings from 1980 onwards were downloaded from the website of the municipality of Siena (Comune di Siena 2018). I was able to corroborate the records of 1990–2002 from Filiani and Zaffaroni (2002: 157–237) and the records of 2000–2016 from a website dedicated to the *palio* (Gabrielli 2018). The relevant website records were last consulted on 2018-09-16.

I only included sanctions classified as "antagonistic". In other words, those that captured antagonism between *contrade* (Table A1). Whether a sanction

Table A2: Sanctions by type of interaction, whether the *contrade* involved were running, and when the interaction occured.

interaction	n	%	*contrade* involved	n	%	period	n	%
group fight	36	66.7	both run	38	70.4	day one	4	7.4
individual assault	13	24.1	one run	15	27.8	day two	5	9.3
provocation	5	9.3	neither run	1	1.9	day three	4	7.4
						day four	8	14.8
						post palio	33	61.1

was antagonistic or not was based my interpretation of the events described in the relevant proceedings. I did not include other sanctions given to *contrade*, which could be classified as "dangerous" (e.g. a *contrada* member entered the track before the race had finished) or "illegal" (e.g. a jockey and *contrada* member engaged in a discussion during the race). The latter two sanctions do not capture antagonism between *contrade*.

For every *palio*, I noted the number of antagonistic sanctions. I then classified each antagonistic sanction by interaction type: "provocation", "individual assault", and "group fight" (see Table A1 for descriptions). Group fight included interactions where only a single *contrada* was sanctioned for starting a fight. If a *contrada* had multiple antagonistic sanctions for a single *palio*, I only recorded the most severe interaction, with group fight more severe than individual assault, and individual assault more severe than provocation.

I noted other information about the antagonistic sanction, such as which *contrada* was sanctioned (transgressor *contrada*) and which *contrada* was the victim of the sanctioned behaviour (victim *contrada*). I also noted whether the transgressor and/or the victim ran and/or won the *palio*, whether the transgressor and/or victim were sanctioned for the same behaviour (e.g., both *contrade* sanctioned for a group fight), and when the behaviour happened.

The analysis was descriptive, focusing on the total number of antagonistic sanctions and on variation in the sanctions based on the relationship between the transgressor and victim *contrade*. As discussed in Chapter 2, two *contrade* may be allies, rivals, or in a neutral relationship.

A3 Results and discussion

Between 1980–2016, 76 *palii* took place. Over this period, there was a total of 84 sanctions for antagonistic behaviour. Of these, 30 sanctions were for reciprocal behaviour, i.e. both *contrade* were sanctioned for their involvement. Therefore, over this period there was a total of 54 unique antagonistic sanctions. This corresponded to 0.71 incidents per *palio*, or an incident every 1.41 *palii*.

Figure A1 shows the number of unique sanctions over time. There is little indication that there was change in the amount of aggression and/or willingness to sanction over time. Thus, each *palio* presents a new competitive event.

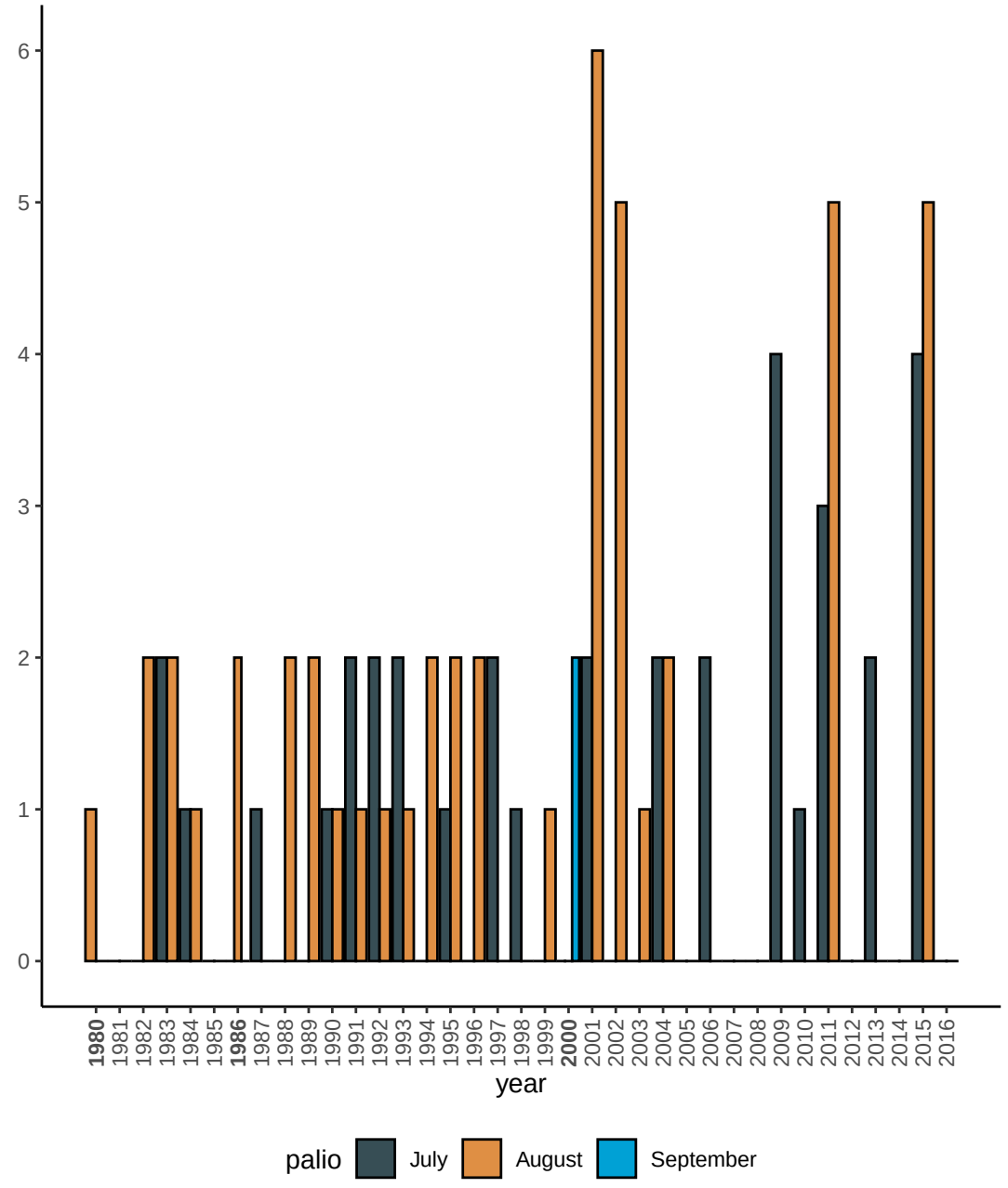


Figure A1: Number of unique antagonistic sanctions per year over the period 1980–2016. Years in bold signify a year in which an extraordinary *palio* was run in September.

Table A2 summarises characteristics of the 54 unique antagonistic sanctions. Antagonistic behaviour was most likely to be a group fight, between members of *contrade* that were both running the *palio*, that took place after the race. This description captures *cazzotti*, the typical form of physical aggression among *contrada* members (Drechsler 2006). As fighting usually follows the race, such violence can be considered the behavioural consequence of intense competition.

The relationship between the *contrade* influences aggressive behaviour: antagonism occurred most often between rivals. The total number of sanctions that involved a pair of rivals was 39 (72.2% of unique sanctions). Note that when *Onda* and *Torre* are not defined as rivals (Chapter 2), the number of sanctions was 37. The total number of sanctions that involved a pair of neutral *contrade* was 14 (25.9% of unique sanctions). One sanction was for a pair of allies: this was in 1980 between *Leocorno* and *Torre*, which ended the alliance.

In sum, the preliminary analysis shows that antagonism between *contrada* members, particularly rivals, regularly occurs during the *palio* festival. The analysis is probably an underestimate of overall antagonism, as sanctions are only incurred for incidents that occur over the four days of the *palio* festival, which have been witnessed and/or reported, and that are consequently discussed and voted upon by local authorities. Furthermore, the data only capture aggression, mostly fights, during the *palio* festival. Notwithstanding ethnographic accounts of fights throughout the year (see discussion in), there is generally less aggression outside the period of the *palio* festival.

The analysis further underscores the significance of group relationship in the Sienese context (Chapter 2). The majority of the incidents involved a pair of rival *contrade*. Thus, the behaviour of rival *contrade* during the *palio* incites aggression, which likely reinforces the rivalry, and so forth.

B

Supplementary information for Chapter 2

B1 Siena, the *palio*, and the *contrade*

Here we provide additional material to the *contrada* primer in Section 2.2.2. Specifically, we describe the current territorial boundaries and our interpretation of them (Section B1.1), provide the full names of the *contrade* (Section B1.2), and outline the governance structures of the *contrade* (Section B1.3).

B1.1 Siena and the boundaries of the 17 *contrade*

Italy is composed of 20 regions, most of which are divided into provinces. Provinces themselves are split into different *comuni* (lit. "municipalities"). A municipality corresponds to a city, town, or village, plus the sorrounding conurbations or countryside. Figure B1 shows the location of the municipality of Siena in central Italy, as well as the distinction between the municipality and the historic city centre. The municipality, or city, of Siena is composed of the historic city centre plus the sorrounding conurbation (Figure B1). The historic city centre is divided into three areas called *terzi* (lit. "thirds"): *Camollia*, *Città*, and *San Martino*. The three *terzi* comprise 17 territories, the *contrade* (Figure 2.1). Two main areas within the city centre are not part of any *contrada* territory: the cathedral (*Duomo*) and the central square (*Piazza del Campo*, including the space occupied by the town hall).

The geographical boundaries of the current 17 *contrade* were established in 1729 by a proclamation issued by the Governor of Siena, Princess Violante Beatrice of Bavaria (Parsons 2004: 48; Falassi 2010b: 34–37). The proclamation, entitled *Nuova divisione dei confini delle contrade* (lit. "New division of the boundaries of the *contrade*"), is known colloquially as the *bando di Violante*. The proclamation identified the roads (or which side of the road), squares, and buildings that composed each *contrada* territory. Note that one purpose of the proclamation was to make clear to the inhabitants of Siena which *contrada* territory they lived in (and by extension, which *contrada* they were a member of). As such, roads devoid of residential property were not mentioned.

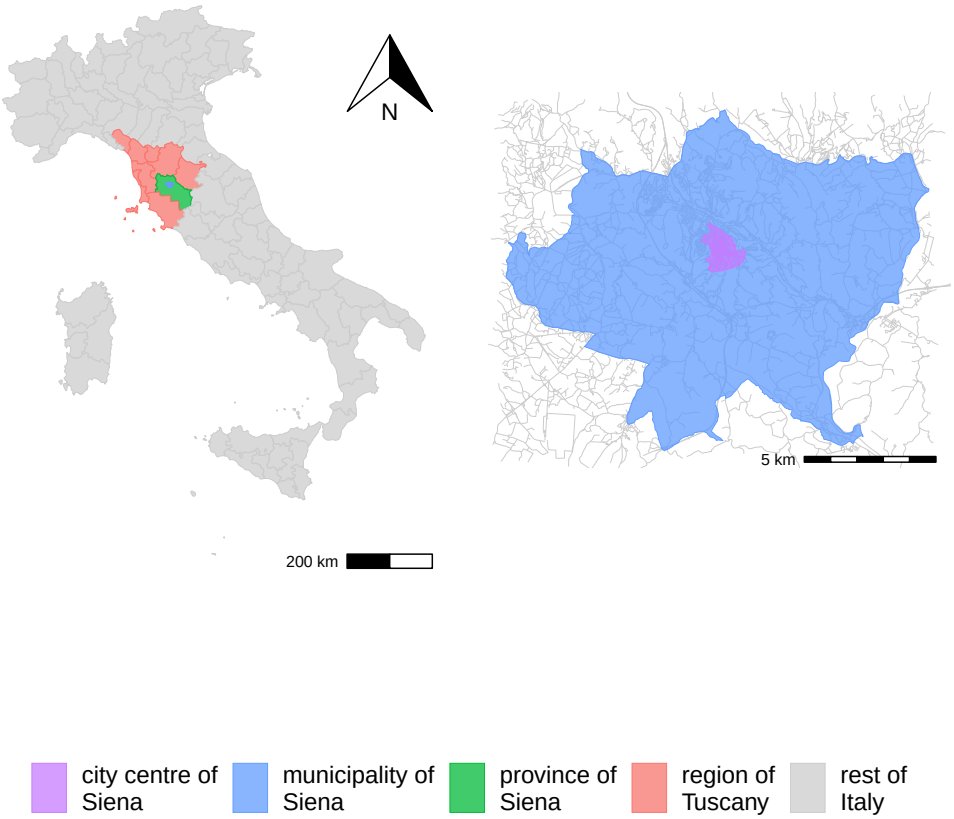


Figure B1: Location of Siena in Italy; see text for details.

Hitherto, the boundaries have remained largely unchanged. However, urban development since the proclamation has changed the topology of the city centre, by either modifying existing or introducing new roads, squares, and buildings. Various proposals have been brought forward and discussed with respect to whether the boundaries should change (Comune di Siena and Magistrato delle Contrade 1980: 145), and *contrade* still dispute certain boundaries (Ceccarelli 2000). The proclamation remains the original source for discussing changes and resolving disputes.

We created a version of the *contrada* boundaries, based on our interpretation of the proclamation, examination of previous maps, and discussions with *contrada* members. It was necessary to create our own version, as we could not find an accessible copy in an appropriate geographic information system file format. The data allowed us to produce maps, e.g. Figure 2.1, and to analyse the procession (Section 2.3.4).

We based the boundaries on the proclamation (the text we used is that reproduced in Falassi 2010b: 34–37), and several published versions of the boundaries (Dundes and Falassi 1984: 30; Falassi 2010a: 37; Fiorini 1986: pull-out map). A.R.K.

traced the boundaries in an online map editor (http://geojson.io). We consulted a local Sienese expert on 2019-05-31 to resolve any issues we came across delineating the boundaries and to discuss discrepancies between the boundaries we drew and the reproductions cited above. We noted any outstanding issues.

Figure B2 shows the boundaries we use. There are three significant discrepancies between our version and previous reproductions, highlighted by the dashed line in Figure B2. The reasons for these differences are as follows. The boundary between *Drago* (2) and *Istrice* (4) was based on consultation of the *Istrice* website (Contrada Sovrana dell'Istrice, n.d.). The boundary between *Giraffa* (3) and *Leocorno* (14) was based on discussions with current *Leocorno* members. The boundary between *Chiocciola* (8) and *Pantera* (10) was based on our interpretation of the proclamation (Falassi 2010b). The discrepancies arise because the boundary in question divides areas, e.g. orchards, that had no residential property at the time of the proclamation. Today they mostly remain non-residential zones.

Note that the time calculations would not change substantially if we had used alternative boundaries as described in Section B1.1.

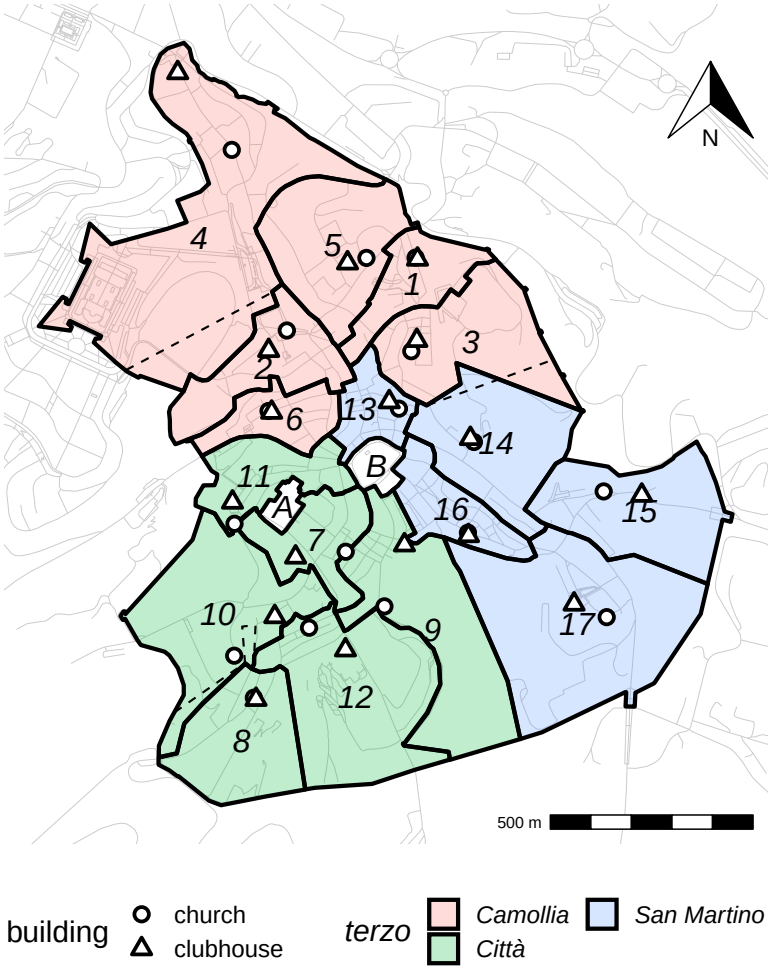


Figure B2: The territorial boundaries of the 17 *contrade* of Siena. Numbers correspond to those in Table 2.1. The two non-*contrada* territories are (A) the cathedral and it's square and (B) the central square, including the town hall and adjacent tower (B). Dashed line represents location of boundary according to a previous reproduction (Fiorini 1986: pull-out map). Base map data from OpenStreetMap (www.openstreetmap.org/copyright).

B1.2 Official titles of the *contrade*

Each *contrada* has an official title (Table B1). Colloquially, the title is shortened, e.g. *contrada della Torre* becomes *Torre*. The title follows the same pattern for nine of the *contrade*, with the word "*contrada*" followed by the colloquial name, as above. Eight *contrade* have an additional honorific adjective in their title, e.g. *nobile contrada dell'Oca* is the "noble *contrada* of the Goose". These are usually given in honour of a specific event. For example, *Oca* was bestowed the *nobile* title in 1846 for the actions of its military companies during a war in the sixteenth century (Falassi 1983: 9). See Falassi (1983: 9–10) for an explanation of each of the *contrada* titles.

Table B1: Official titles of the 17 *contrade* of Siena

terzo	*contrada*	*full title*[1]	English translation[2]
Camollia	*Bruco*	nobil contrada del Bruco	noble *contrada* of the Caterpillar
	Drago	contrada del Drago	*contrada* of the Dragon
	Giraffa	imperiale contrada della Giraffa	imperial *contrada* of the Giraffe
	Istrice	contrada sovrana dell'Istrice	sovereign *contrada* of the Porcupine
	Lupa	contrada della Lupa	*contrada* of the She-wolf
Città	*Oca*	nobile contrada dell'Oca	noble *contrada* of the Goose
	Aquila	nobile contrada dell'Aquila	noble *contrada* of the Eagle
	Chiocciola	contrada della Chiocciola	*contrada* of the Snail
	Onda	contrada capitana dell'Onda	captain *contrada* of the Wave
	Pantera	contrada della Pantera	*contrada* of the Panther
San Martino	*Selva*	contrada della Selva	*contrada* of the Forest
	Tartuca	contrada della Tartuca	*contrada* of the Tortoise
	Civetta	contrada priora della Civetta	prioress *contrada* of the Owl
	Leocorno	contrada del Leocorno	*contrada* of the Unicorn
	Nicchio	nobile contrada del Nicchio	noble *contrada* of the Shell
	Torre	contrada della Torre	*contrada* of the Tower
	Valdimontone	contrada di Valdimontone	*contrada* of the Ram

[1] Based on the titles used in the website of each *contrada*.
[2] Following the translations provided by Falassi (1983: 9–10).

B1.3 Governing and organisational structure of the *contrade*

Each *contrada* is composed of numerous structures. These ensure governance is in-line with the statute of the *contrada* and the interests of its members. They also organise important events, such as the *palio*, as well as rituals and activities throughout the year. There are also collective groups that involve the leadership of, and thus represent, all *contrade* with respect to matters concerning the *contrade* and the *palio*.

We outline the main governing structure of each *contrada* in Section B1.3.1 and the groups that organise the *palio* and other activities in Section B1.3.2, and describe the election process in Section B1.3.3. We present the collective *contrada* structures in Section B1.3.4.

B1.3.1 *Contrada* leadership

Each *contrada* is governed by the *seggio* or *sedia* (lit. "seat"), which is elected between every two and four years (Falassi 1983). The leadership, and thus the *contrada*, is headed and represented by the *priore* (lit. "prior"). In two *contrade*, *Bruco* and *Oca*, the head is called *rettore* and *governatore*, respectively. The leadership positions are similar across the *contrade*, although the number of positions and specific duties of each position vary. Smaller *contrade* often have fewer positions. See Dundes and Falassi 1984: 43–45; Parsons 2004: 119–120 for more details.

The *priore* is supported by various councillors, each with different responsibilities Dundes and Falassi 1984: 43–45; Parsons 2004: 119–120. Important positions include the *vicario generale* (deputy to the *priore*, in charge of administrative and organisational matters), the *bilanciere* and *camarlengo* (responsible for financial affairs), the *cancelliere* (responsible for all communications between the leadership and the membership, including in-house publications), the *economo* (maintains assets including residential property and material property such as costumes and flags), and the *archivista* (supervises historical items). Each position often has deputies.

The leadership also includes the *correttore* (the *contrada* priest), the *capitano* (lit. "captain", responsible for all activities related to the *palio*), and the presidents of various groups and commissions that are responsible for organising other activities and aspects of *contrada* life (see Section B1.3.2 below). Finally, the leadership is advised by a group called the *collegio dei maggiorenti*. This group is a composed of all previous heads and captains. It is headed by a *rettore* who participates in the leadership.

B1.3.2 Organisational groups

There are numerous groups (Ita. *gruppi*) that make up the *contrada*. The specific number of groups, their size, and their roles vary between *contrade*.

The *gruppo palio* or *dirigenza paliesca* is responsible for organising the *contrada*'s participation in the *palio* race, which includes making deals and hiring the jockey. The *palio* group is said to govern the *contrada* during the days of the *palio* festival (Dundes and Falassi 1984: 44). Other roles include the *mangino* (of which there are multiple, who support the *capitano*), the *barbaresco* (responsible for the horse

during the days of the *palio* festival), those who care for the stables, and those that guard the jockey during the days of the *palio* festival.

The *gruppo società* (lit. "clubhouse group") is responsible for organising and maintaining the social life of the *contrada* throughout the year. A president coordinates the group with support from numerous volunteers. It manages a physical space, also called the *società*. This is a communal area composed of bar, kitchen, indoor and outdoor dining space, and recreational zones. The *gruppo società* emerged in the nineteenth century to provide social support to members in difficulty (Parsons 2004: 117–118).

There are numerous other groups and commissions that organise specific activities or support specific members of the *contrada* (Pomponio Logan 1978: 49). Significant ones include the *gruppo piccoli* (lit. "children's group", for infant and child members), the *gruppo giovani* (lit. "youth group", for adolescent members) and the *gruppo donne* (lit. "women's group", for female members). Other groups and commissions collect dues, organise blood donations, and provide various recreational, educational, and cultural opportunities to members.

B1.3.3 Electoral process

The leadership is elected by *contrada* members who have *protettore* status and who are above a certain age, normally 18 years. All positions are elected, except for the priest who is assigned a *contrada* by the archdiocese. Elections occur between every two to four years, depending on the *contrada* (Falassi 1983).

Before the elections, a special electoral commission is established, composed of a number of members. The role of the electoral commission is to seek the views of as many members as possible with regards to potential candidates for each role. The commission then approaches potential candidates asking if they want to be balloted for the proposed position. A list is then drawn up with a candidate for each position.

During the vote, individuals either accept or decline the list. To accept, the piece of paper (with the list printed) is left unmarked and deposited in the ballot box. To decline, any number of candidates can be crossed out, and the name of another candidate provided for that position. The candidate is elected if the number of acceptances are above a certain threshold.

B1.3.4 Collective organisations of the *contrade*

The *Magistrato delle Contrade di Siena* (lit. "magistrate of the *contrade* of Siena") is an organisation that represents all 17 *contrade* (Magistrato delle Contrade di Siena, n.d. 74). The *Magistrato* is composed of all 17 *priori*, and led by one of the *priori*. The *Magistrato* meets regularly to discuss and to act upon matters of common interest to all *contrade*. It was established in 1894 to provide a permanent means of collective representation following various collaborations in the late nineteenth century (Parsons 2004: 71). The *Magistrato* also interacts with the local government and the two organisations described below.

The *Consorzio per la Tutela del Palio di Siena* (lit. "consortium for the safeguarding of the *palio* of Siena") is an organisation responsible for protecting the

image of the *palio* and the *contrade* (Consorzio per la Tutela del Palio di Siena, n.d.). It approves the commercial filming of the *palio* and holds the copyright to *contrada* symbols. The *Consorzio* is composed of a smaller number of *priori*, one of whom is elected as leader. The *Consorzio* was established in 1981 in response to increasing tourism, and as a means of preventing the commercialisation of the *palio*.

The *Comitato Amici del Palio* (lit. "friends of the *palio* committee") is an organisation that aims to safeguard the *palio* and revive historic Sienese traditions (Comitato Amici del Palio, n.d. Parsons 2004: 149). It also runs local initiatives to promote *contrada* culture. The *Comitato* was established in 1947.

B2 Estimates of *contrada* membership size

We obtained estimates of the size of *contrada* membership from two independent sources, one relating to 1981, the other to 2012–2013. We emphasize at the outset that the two sets of figures cannot be compared directly, and that they provide an approximate indication of relative membership size, rather than precise absolute values. Despite these shortcomings, the data collated here produce useful insights, given that information on *contrada* membership is not reported systematically.

We begin with a description of the two sources of data (Section B2.1), followed by the results (Section B2.2) and their discussion (Section B2.3). The latter focuses on issues that arise in interpretation of the data. In turn, this serves to clarify the relationship between residence in Siena, *contrada* membership, and *protettore* status in current practice, supplementing the information provided in Section 2.2.2.3.

B2.1 Data

The first set of figures comprises data gathered by the municipality of Siena (Ita. *Comune di Siena*) in 1981, as summarized in Falassi (1983: 13, 79). According to this source, the data "indicated a total of 21,818 Sienese who had declared themselves to be contradaioli on occasion of the census" (79). We assume this to be the national census of 1981, although no additional information is provided. In introducing the breakdown of the total by *contrada*, Falassi (1983: 79) notes that "[t]he data samples [relate] to a third of the population". It is not clear from the available information what this statement refers to, exactly, and we have not been able to obtain details from alternative sources, including the municipality (Graziella Leo, pers. comm., 15 October 2019). Therefore, we follow the interpretation given in Ascheri (2001: 23), which reports identical figures by *contrada*, characterizing them as the number of "Sienese [who] declared themselves to be *contradaioli*" in 1981. The reference provided in Ascheri (2001: 23) is to the original publication of the edited volume in which Falassi (1983) appears.

The second set of figures collates information provided by the head (Ita. *priore*) of each *contrada* in a series of interviews published between 22 October 2012 and 28 February 2013 in a local online newspaper (Siena Free 2012). The interviews include a section on the people (Ita. *popolo*) of the *contrada*. With the exception of the interview for *Tartuca* (Voltolini 2013g), this section features the number of *protettori* (lit. "protectors"), giving the exact value, an approximate figure, or a range. Broadly, in current practice *protettori* are individuals who support the *contrada* financially, through payment of an annual fee (Section 2.2.2.3; see discussion in Section B2.3). The interviews for *Chiocciola* (Voltolini 2012c), *Drago* (Voltolini 2012d), *Nicchio* (Voltolini 2013d), and *Torre* (Voltolini 2012i) provide additional information on the breakdown by gender and/or by age.

B2.2 Results

The 1981 figures are presented in Table B2, with the *contrade* arranged by *terzo*. Across the 17 *contrade*, the number of members ranges from 287 (*Civetta*) to 3,871

Table B2: Members by *contrada* in 1981[1]

terzo	*contrada*	*n*	rank[2]
Camollia	*Bruco*	1,711	5
	Drago	462	13
	Giraffa	441	15
	Istrice	3,871	1
	Lupa	1,039	8
	Oca	1,619	6
Città	*Aquila*	457	14
	Chiocciola	2,221	3
	Onda	768	10
	Pantera	484	12
	Selva	535	11
	Tartuca	1,009	9
San Martino	*Civetta*	287	17
	Leocorno	291	16
	Nicchio	3,233	2
	Torre	2,040	4
	Valdimontone	1,350	7

[1] Data from Falassi (1983: 79); see Section B2.1 for details.
[2] Descending rank (1: largest, 17: smallest).

(*Istrice*). The median value is 1,009 (*Tartuca*). The total number of members is 21,818. For comparison, the total population of Siena amounted to 61,974 inhabitants, of which 14,984 resided within the city walls (Falassi 1983: 13, 79).[1]

The 2012–2013 figures are presented in Table B3, with the *contrade* arranged by *terzo*. Across the 16 *contrade* (i.e. excluding *Tartuca*), the number of *protettori* ranges from approximately 750–800 (*Selva*) to 3,000–4,000 (*Istrice*) and approximately 3,500 (*Nicchio*, *Torre*). The median values are approximately 1,700–1,800 (*Lupa*) and approximately 1,800–2,000 (*Onda*). Again excluding *Tartuca*, the total number of *protettori* has a lower bound of 32,244 and an upper bound of 33,694. For context, in 2013 the total population of Siena amounted to 54,126 inhabitants, of which 10,623 resided in the historic city centre (Comune di Siena 2015-05-28).

The interview for *Drago* (Voltolini 2012d) specifies the breakdown by gender, with 614 (46.7%) women out of 1,314 *protettori*. Information relating to age from the interviews for *Chiocciola* (Voltolini 2012c), *Drago* (Voltolini 2012d), and *Torre* (Voltolini 2012i) is summarized in Table B4; the distribution of *protettori* across age groups for *Drago* and *Torre* is shown in Figures B3 and B4, respectively. Across the three *contrade*, the percentages of *protettori* up to 16 years of age vs. older

1. The official census indicates that the total population of Siena amounted to 61,989 inhabitants instead (Istituto Centrale di Statistica 1984). We have no explanation for the discrepancy between this figure and the one reported in Falassi (1983: 13, 79).

Table B3: *Protettori* by *contrada* in 2012–2013[1]

terzo	*contrada*	n[2]	rank[3]	reference
Camollia	*Bruco*	around 2,800–2,900	5	Voltolini (2012b)
	Drago	1,314	10	Voltolini (2012d)
	Giraffa	approximately 1,300	11	Voltolini (2012e)
	Istrice	3,000–4,000	1	Voltolini (2013b)
	Lupa	approximately 1,700–1,800	9	Voltolini (2012f)
	Oca	approximately 2,000	7	Voltolini (2013e)
Città	*Aquila*[4]	approximately 900	12	Voltolini (2012a)
	Chiocciola[5]	approximately 2,430	6	Voltolini (2012c)
	Onda	approximately 1,800–2,000	8	Voltolini (2013f)
	Pantera	approximately 900	12	Voltolini (2012g)
	Selva	approximately 750–800	16	Voltolini (2012h)
	Tartuca	NA	NA	Voltolini (2013g)
San Martino	*Civetta*	approximately 900	12	Voltolini (2013a)
	Leocorno	approximately 800	15	Voltolini (2013c)
	Nicchio	approximately 3,500	1	Voltolini (2013d)
	Torre	approximately 3,500	1	Voltolini (2012i)
	Valdimontone	approximately 2,900	4	Voltolini (2013h)

[1] Data from Siena Free (2012); see Section B2.1 for details.
[2] Variation in text reflects the original quotes in the interviews.
[3] Descending rank (1: largest, 16: smallest), using the mid-point for ranges. We assign the same rank to equivalent values.
[4] The figure refers specifically to *contradaioli protettori* (i.e. members of *Aquila* who pay the annual fee), as distinct from *protettori semplici* (lit. "ordinary protectors"), namely individuals who pay the fee but have no rights relating to *contrada* governance (e.g. they may be members of another *contrada*); see Section 2.2.2.3 and Section B2.3 for details.
[5] The interview mentions approximately 2,080 *protettori*, plus approximately 350 *piccoli* (lit. "little ones") up to 16 years of age. We provide the combined figure, on the assumption that *protettore* status applies to both; see Section 2.2.2.3 and Section B2.3 for details.

Table B4: *Protettori* up to 16 years of age vs. older by *contrada* in 2012–2013[1]

	≤ 16 years old		> 16 years old	
contrada[2]	n	%	n	%
Chiocciola	350	14	2,080	86
Drago[3]	364	28	950	72
Torre[4]	710	20	2,790	80

[1] Data from Siena Free (2012); see Section B2.1 for details.
[2] Figures for *Chiocciola* and *Torre* are approximate; see Table B3 for additional information.
[3] See Figure B3 for details.
[4] See Figure B4 for details.

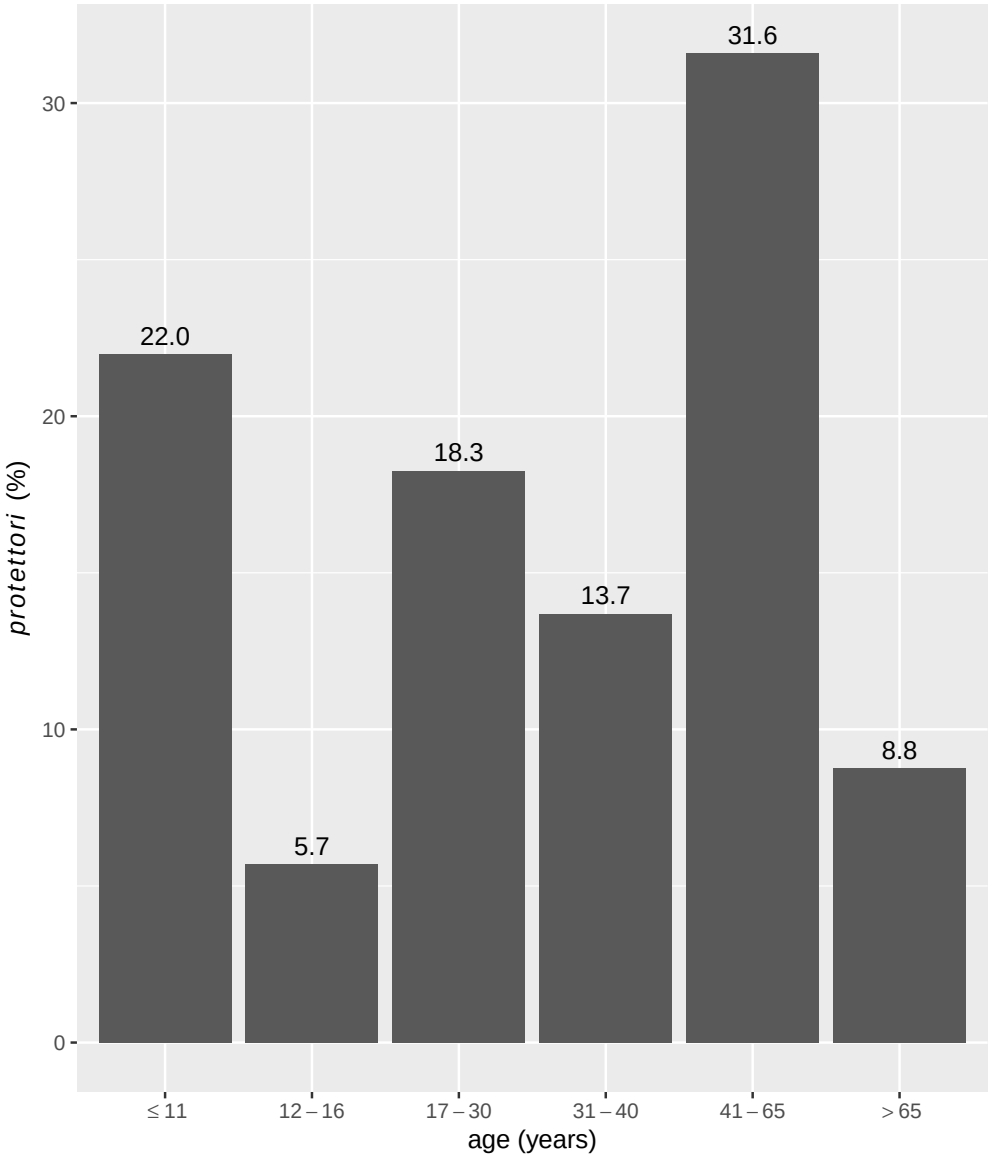


Figure B3: Distribution of *protettori* across age groups for *Drago* in 2012–2103. The Siena Free (2012) interview (Voltolini 2012d) specifies that the 1,314 *protettori* included 289 up to age 12 (Ita. *bambini*, lit. "children"), 75 up to age 16 (Ita. *novizi*, lit. "novices"), 240 between 17 and 30 (Ita. *giovani*, lit. "youths"), 180 between 30 and 40, 415 between 40 and 65, and 115 over 65. In the plot we adjust the age group boundaries for internal consistency.

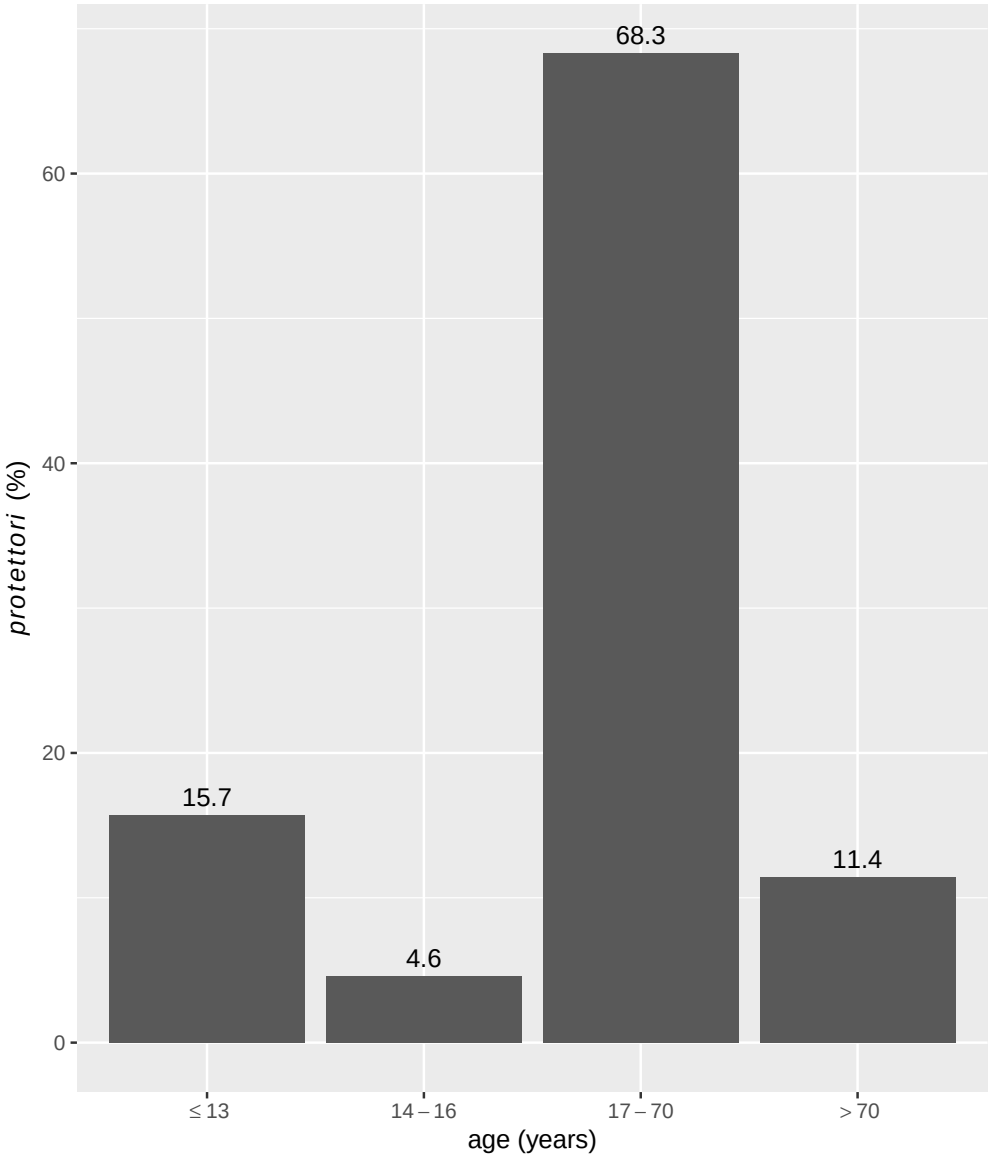


Figure B4: Distribution of *protettori* across age groups for *Torre* in 2012–2013. The Siena Free (2012) interview (Voltolini 2012i) specifies that the approximately 3,500 *protettori* included 550 up to age 14 (Ita. *piccoli*, lit. "little ones"), 160 between 14 and 16 (Ita. *giovani*, lit. "youths"), and 400 over 70. By implication, then, 2,390 *protettori* were between 17 and 70. In the plot we adjust the age group boundaries for internal consistency.

range from 14.4% vs. 85.6% (*Chiocciola*) to 27.7% vs. 72.3% (*Drago*). Finally, the interview for *Nicchio* (Voltolini 2013d) specifies that, of the approximately 3,500 *protettori*, approximately 1,000 (28.6%) were minors (Ita. *minorenni*). The age of majority is 18 in Italy, thus this estimate is in line with the ones in Table B4.

B2.3 Discussion

We obtained estimates of the size of *contrada* membership from two independent sources (Section B2.1). The first set of figures comprises data gathered by the municipality of Siena in 1981, relating to the number of Sienese who declared themselves to be *contrada* members, as reported in Falassi (1983: 13, 79). The second set of figures relates to the number of *protettori* in 2012–2013, based on a series of interviews with the head of each *contrada* published in a local online newspaper (Siena Free 2012).

Interpretation of the two sets of figures requires additional discussion of the relationship between residence in Siena, *contrada* membership, and *protettore* status (Section 2.2.2.3). Historically, the latter applied to what Silverman (1979: 416) denotes as "members of an honorary body of *contrada* dignitaries." These were nobles and other high-status individuals who supported the *contrada* financially and took on leadership positions, for example representing the *contrada* before local authorities and supervising its financial arrangements (Falassi 1983: 26–27; Silverman 1979). A *protettore* need not be a member of the *contrada* — indeed, the same person could be a *protettore* of multiple *contrade*.

The concept has broadened over the past century, following what Park (1992: 95) describes as "the way in which the status of being a *protettore* has undergone democratisation" — a shift attributed to a range of social and demographic changes, including greater availability of disposable income (Park 1992). Although there is no obligation for members to support the *contrada* financially, in current practice there is effectively an expectation that they do so, to the extent that payment of an annual fee (Ita. *protettorato*) is linked to certain rights relating to *contrada* governance (e.g. participation in the general assembly, the ability to vote in elections; Section 2.2.2.3).

One complication in interpreting the Siena Free (2012) interviews is that there is variation in terminology across *contrade*, and in particular whether the term *protettore* applies to any individual who provides financial support (e.g. Nobile Contrada dell'Aquila 2016), or only to members of the *contrada* who do so (e.g. Contrada della Lupa 2018). For *contrade* in which the term extends to non-members, the figure reported in the interview may thus overestimate membership size. To our knowledge, there is no straightforward way to systematically determine if this is the case across interviews. Consequently, we emphasize that the 2012–2013 figures are to be taken as an approximate indication of relative membership size, as inferred from information on the number of *protettori*.

This issue also complicates comparison of the two sets of figures. Although there is a clear interplay between residence in Siena, *contrada* membership, and *protettore* status, the preceding discussion highlights that these factors do not overlap completely in current practice (see also Section 2.2.2.3). Thus, for example, the

1981 figures likely exclude members and/or *protettori* not resident in Siena at the time of the census. Conversely, the 2012–2013 figures likely include *protettori* not resident in Siena.

Another relevant consideration is the substantial time-lag between the two sources of data. For example, a *contrada* securing multiple *palio* victories in the intervening period may have seen a disproportionate increase in the number of non-members who provide financial support, driven by a surge in the *contrada*'s relative "popularity". This may or may not reflect a corresponding increase in the number of members, further complicating comparison of the two sets of figures.

With these caveats in mind, the data collated here may be taken to corroborate the common perception of an increase in the number of members and/or *protettori* over recent decades (e.g. Park 1992; Silverman 1979). This perception echoes a view expressed by several *contrada* members over the course of our fieldwork. At the same time, we emphasize that both sets of figures likely overestimate the number of individuals who are active participants in *contrada* life, by e.g. regularly attending events and taking part in other activities (see discussion in Park 1992). For example, the interview for *Selva* (Voltolini 2012h) identifies a stable core of some 200 people who were actively involved in *contrada* life, out of approximately 750–800 *protettori* (Table B3). To our knowledge, no systematic information is available on active participation by *contrada* members and/or *protettori*, but observations during our fieldwork indicate that a similar pattern extends to other *contrade*.

Finally, the limited data relating to the breakdown of *protettori* by gender and by age in 2012–2013 suggest that roughly equal numbers of men and women contribute to the *contrada* financially, and that a substantial fraction of *protettori* are 16 or younger. This age cut-off is significant, in that it typically marks the acquisition of rights relating to *contrada* governance (Section 2.2.2.3).

In conclusion, the information presented here shows that membership size varies across *contrade* from a few hundred to several thousand individuals. Overall, the contemporary *contrada* system involves on the order of over 30,000 individuals who identify as *contrada* members and/or contribute to the *contrade* financially — men and women, old and young. This highlights the magnitude of the phenomenon for Siena and beyond.

B3 Background information to the fieldwork-based research

In this section we provide background information that applies generally to the fieldwork-based research presented in Sections B4 to B6.

The research was conducted as part of A.R.K.'s doctoral project at the University of Oxford, beginning in October 2015, funded by an Oxford–Leon E. and Iris L. Beghian Graduate Scholarship 2015–2018 at Magdalen College, Oxford. Table B5 provides an overall timeline for the project, together with supporting information, focusing on elements involving data collection. With the exception of a brief stint in May–June 2019, the latter occurred between August 2016 and August 2018. A.R.K. was based in Siena for approximately 14 months within this window. Throughout his time in Siena he frequently participated in *contrada* activities and events, at the invitation of *contrada* members. For example, he attended communal meals, assisted with event preparations, and observed annual ceremonies and rituals. During these activities he often engaged in formal and informal interviews and discussion, and observed interactions in a variety of contexts linked to *contrada* life. The insights thus generated strongly inform our interpretation of the research findings, as well as our reading of existing literature on the *contrade*, and on the *palio* more broadly.

L.F. conceived the idea of conducting research on social behaviour in Siena, focusing on intra- and inter-group interactions in the *contrada* context. She oversaw all aspects of the work, securing and managing related funding, and supervising A.R.K.'s doctoral project and subsequent related activities. She spent approximately one month in Siena in relation to the project, including research visits in May 2016, July 2017, and May–June 2019.

The research was funded through the John Fell Fund, University of Oxford (ref. no.: AED11770) and the Calleva Research Centre for Evolution and Human Sciences at Magdalen College, Oxford to L.F.. Funding in support of the fieldwork was also provided by an Owen F. Aldis Scholarship 2015 from the International Society for Human Ethology to A.R.K.. Additional funding was provided by Magdalen College, Oxford and the School of Anthropology and Museum Ethnography, University of Oxford.

Overall, the project focused on in-group bias in human cooperation, across three field experiments involving a behavioural economic game to investigate prosocial behaviour among *contrada* members. Furthermore, we obtained information on various aspects of *contrada* life through a survey of *contrada* members (Section 2.3.2 and Section B4). Finally, we assessed the significance of the pattern of relationships among the *contrade* through a psychological item measuring the attitudes of members towards different *contrade* (Section 2.3.3 and Section B5), and by tracking the annual *giro* procession (Section 2.3.4 and Section B6). Taken together, the latter three elements provide a quantitatively-informed description of key features of the contemporary *contrada* system. Therefore, they are presented jointly in this paper, and separately from the results of the field experiments.

The project was reviewed and approved by the School of Anthropology and Museum Ethnography Research Ethics Committee (SAME REC) at the University

of Oxford, across three separate applications (Table B5), between July and August 2016. Furthermore, beginning in March 2016 we liaised with the two organizations that represent the *palio* and the *contrade* in external matters, the Consortium and the Magistrate (Section B1.3.4). In December 2016, following approval by the Magistrate to conduct the research in collaboration with the *contrade*, A.R.K. approached each separately, by delivering a letter addressed to its head. Six responded, resulting in separate meetings with members of the *contrada* leadership between December 2016 and January 2017. Of the six, five agreed to take part in the project, nominating a contact acting as collaborator, to assist with the logistics of the studies. The collaborator was a member of the leadership of the *contrada*.

Research participants were members aged 18 years or older of one of these five *contrade* (Table B5), with participation on a voluntary basis. The recruitment process for each element is detailed in Sections B4 to B6. Informed consent was obtained from all participants. Throughout data collection, we endeavoured to minimize disruption to the *contrade*, and to the individuals involved. To this end, we recruited participants from the same *contrada* across the smallest possible number of sessions, and we combined elements if feasible to do so (Table B5). For example, the survey questions were administered across three periods, as part of the questionnaire for one of two experimental studies (Table B5). Consequently, the survey design reflects, in part, methodological and practical considerations linked to the set-up of the corresponding experiment (e.g. the sample size, the timing of data collection, and which *contrade* were involved in each period; Section B4).

We developed a coding scheme to refer to the *contrade* in reporting the work, so as to protect their identity and to preserve the anonymity of participants. Specifically, we randomly assigned each *contrada* an alphanumeric code, composed of the letter `C` followed by a number from `01` to `17`. To maximise comparability, the scheme applies to all elements of the project, also extending to subsequent work with the *contrade*. Across the project, the five *contrade* involved in the fieldwork-based research are `C05`, `C06`, `C08`, `C11`, and `C16`, including *Civetta*, *Leocorno*, and *Torre* (Table B5). We use *contrada* names, rather than the alphanumeric codes, if the identity of the *contrade* could be inferred from relevant information, such as the pattern of alliances and rivalries in the attitudes item (Section B5), or the trajectories of the *giro* procession in the GPS study (Section B6). Using the alphanumeric codes in reporting these elements would invalidate the coding scheme as a whole.

Table B5: Timeline and supporting information for fieldwork-based research with the *contrade*, 2017–2019

year	period	research elements[1]	*contrade* (no. of participants recruited per session)[2]	approval[3]
2017	February	experiment 1, **survey**	`C05` (27, 6), `C06` (45), `C08` (22), `C11` (48), `C16` (52)	A
	June–August	experiment 1, **survey**	`C05` (13, 13), `C06` (36, 11, 33), `C11` (15, 21), `C16` (25)	A
		experiment 2, **survey**	`C06` (27, 32, 18, 26), `C08` (12), `C11` (12)	B
		attitudes item	*Torre* (19)	A
2018	March	**attitudes item**	*Civetta* (3), *Leocorno* (1)	A
	June–August	**attitudes item**, **GPS study**	*Civetta* (12), *Leocorno* (7)	A
		experiment 2, **survey**	`C06` (10, 12), `C08` (5), `C11` (5)	B
		experiment 3	`C05` (29, 16, 31), `C16` (37, 15, 24)	C
2019	June	experiment 1 follow-up	`C16` (10)	A

[1] Elements shown on the same line were part of the same questionnaire; the elements highlighted in bold are presented in Sections B4 to B6.

[2] *Contrada* names are anonymized, except for the *contrade* participating in the attitudes item and the GPS study; see Section B3 for details. The *contrade* in experiments 1 and 2 and the survey are not consistent between periods; see Section B4.1. The number in parentheses corresponds to the number of participants recruited per session in which data were collected in that *contrada*; see Sections B4.1, B5.1, and B6.1.

[3] Reference number for approval by SAME REC. A: SAME_C1A_16_051, B: SAME_C1A_16_052, C: SAME_C1A_16_053.

B4 Survey of *contrada* members

As part of the fieldwork described in Section B3, we examined the membership of the *contrade* through a survey administered to participants from five *contrade*. We were motivated to assess the make-up of the contemporary *contrade* in light of relevant factors, such as membership criteria (see Section B2.2), as previous descriptions of *contrada* membership are mostly qualitative (see Section 2.2). We emphasize that we have a convenience sample, which limits generalisations to the entire population of members or *protettori* (Section 2.3.1 and Section B2). Notwithstanding this limitation, the data collected produce useful insights into the composition of the contemporary *contrade*, especially given that, to our knowledge, no large-scale survey of *contrada* members has been conducted to date.

We begin by describing the data collection procedure (Section B4.1) and the aims of the analysis (Section B4.2), then present the results (Section B4.3) followed by their discussion (Section B4.4). The latter serves to link the more quantitative results of the survey with the more qualitative *contrada* primer in Section 2.2.

B4.1 Data

As outlined in Section B3, the survey was administered as part of a questionnaire that included one of two experimental studies (Table B5). As shown in Table B5, data collection for the survey involved five *contrade*— `C05`, `C06`, `C08`, `C11`, and `C16` — across three periods between February 2017 and August 2018 (Section B3).

Recruitment occurred at pre-specified events held in each *contrada*, and specifically communal meals organised by the *contrada* and open to all its members. Following discussion with the collaborator, we choose events that were anticipated to be well attended, often held in celebration of a particular occasion, e.g. at the smaller scale, informal meals held in the *contrade* on regular basis; at the larger end, formal meals taking place in one of the four days of the *palio* festival. We did not note the number of attendees at these events, nor do the *contrade* keep systematic records. However, figures provided by a contact from `C16` (pers. comm., 26 January 2020), for meals held during the summers 2014–2019, indicate that these events attract approximately 50–500 attendees. Recruitment at these well-attended events, as opposed to other events involving fewer members, meant that the sample would come from a larger population of members, and be more reflective of the composition of the *contrada*.

For each period, experiment, and *contrada* (Table B5), we aimed to recruit participants and administer the questionnaire at a single event. This was to minimize the spread of information about the contents of the questionnaire among members of the *contrada*. Recruitment at a single event occurred for most surveys administered as part of experiments 1 and 2 (Table B5).

All attendees were informed of the questionnaire via a public announcement close to the start of the event, and they were invited to complete the questionnaire by either A.R.K., the collaborator, or a research assistant from the University of Siena (Ita. *Università di Siena*). Those who agreed to participate completed the questionnaire

privately and individually in a dedicated space within the clubhouse of the *contrada*. Multiple participants were allowed to complete the questionnaire at the same time.

We allowed individuals to participate in both experiment 1 and experiment 2, as we wanted to recruit sufficiently large sample sizes for the experiment, and the experimental designs were different. However, we aimed to prevent individuals completing the same experiment twice, as responses would be biased by previous exposure to the experimental design. Therefore, during the recruitment of participants for experiment 1 and experiment 2 in the second period, we asked individuals to orally confirm that they had not participated in the previous period. Only those who had not participated in the first period were allowed to participate in the second period.

Broadly, the questionnaire was similar across both experiment 1 and experiment 2. The questionnaire included three sections, two of which included survey questions, while the other related exclusively to the experiment. One section of the survey questions asked for demographic characteristics, while the other section asked about the participant's relationship to the *contrada* and Siena, which we label "*contrada* questions". In experiment 1 (Chapter 3), the order of the three sections was demographic characteristics, experimental game, and *contrada* questions. In experiment 2 (Chapter 4), the order was experimental game, demographic characteristics, and *contrada* questions.

The demographic characteristics covered year of birth, gender, employment status, personal income, and level of education. There were 10 *contrada* questions, which asked for: location of birth, residency, years lived outside of Siena, reason for membership, *protettore* status, current and past roles in the *contrada*, participation in the social and the organisational life of the *contrada*, affiliation of closest friends, and perception of superiority.

Most survey questions involved multiple-choice responses, although a few questions allowed for open-ended responses. The survey questions were similar across the two experiments, with any discrepancies between specific questions outlined in Section B4.3. See Section D2.2.7 for the original questionnaires and/or a translation of the questionnaire. An additional question was included in questionnaires administered in June–August 2017 and June–August 2018, asking participants to indicate whether they had previously participated in one of our experiments.

B4.2 Analysis

The analysis was largely descriptive, meaning we reported summaries of the responses to each question. We pooled responses across *contrade* and periods. In aggregating responses we alleviated potential sampling issues from recruiting at specific events across different *contrade* and different periods. We are aware however that as a convenience sample, our inferences about the population of *contrada* members might be limited, which we discuss in more detail in Section B4.4.

To ensure that we did not analyse the same participant twice, we excluded anyone who indicated they had completed the questionnaire during a previous period. As we only know the responses relating to the second time they completed

Table B6: Participants in the survey by period, experiment, and *contrada*[1]

		period and experiment (n)[2]					
		Feb 2017	June–Aug 2017		June–Aug 2018	total	
		exp. 1	exp. 1	exp. 2	exp. 2	n	%[3]
contrada (n)	C08	22	0	12	5	39	8
	C11	48	36	6	4	94	18
	C16	52	25	0	0	77	15
	C05	33	26	0	0	59	12
	C06	45	79	97	22	243	47
total	n	200	166	115	31	512	
	%[3]	39	32	22	6		

[1] See Table B5 for details.
[2] An n of 0 indicates a period, experiment, and/or *contrada* in which participants were not recruited by design.
[3] Percentages may not total 100 due to rounding.

the survey, we excluded the second set of responses. Additional exclusion criteria were applied following initial data analysis.

Participants who failed to respond to at least one question were not excluded from the sample. Instead, we reported the number of participants who did not respond to specific questions, and excluded these participants from summaries of the responses to the specific question(s). Additional exclusion criteria were applied to two questions — years lived outside Siena and the *contrada* membership of closest friends — as outlined in Section B4.3.

For ease of reading, the responses were divided into the two sections in the questionnaire, i.e. demographic characteristics and *contrada* questions. The questions were presented as per their order in each section. We provided additional analyses and figures where we either calculated a new variable or re-categorised responses.

B4.3 Results

We recruited a total of 526 participants across five *contrade* and three periods: 39 (7.4%) from C08, 101 (19.2%) from C11, 77 (14.6%) from C16, 59 (11.2%) from C05, and 250 (47.5%) from C06 (Table B5).

We analysed 512 participants across *contrade* and periods (Table B6), as we excluded 14 participants from all analyses. Of the 14 participants excluded, one participant withdrew after providing their consent but before answering any questions, one participant indicated in the questionnaire that they were a guest and as such we interpreted them to not be a *contrada* member (supported by the fact that they had not paid the annual dues), and 12 participants had completed a questionnaire in a previous period.

Non-responses to specific questions ranged from 4 to 17 participants, correspond-

ing to between 0.8% and 3.3% of the 512 participants analysed.

B4.3.1 Demographic characteristics

Participants had a mean age of 42.3 years (SD = 15.5 years, range 18–84 years), and 186 (36.6%) of 508 participants who provided a response were female. Table B7 shows the distribution of employment status, personal income, and level of education.

B4.3.2 *Contrada* questions

Table B8 shows the distribution of responses to eight of the ten *contrada* questions, namely location of birth, residency, reason for membership, *protettore* status, current and past roles in the *contrada*, participation in the social and the organisational life of the *contrada*, and perception of superiority. We provide further details of residency, reason for membership, social and organisational participation below, alongside information related to the other two questions, i.e. years lived outside of Siena and affiliation of closest friends.

Table B8 shows the number of participants resident in the historic city centre and in the municipality or province of Siena, which we have further information for. See Section B1.1 for a description of the differences between historic city centre, municipality, and province. One hundred and sixty six participants lived in the historic city centre, of which 86 (17.1% of the 503) lived in the territory of their own *contrada*, 67 (13.3%) lived in the territory of another *contrada*, and 13 (2.6%) indicated that they lived in the historic city centre but did not specify whether they lived in the territory of either their own *contrada* or another *contrada*. Three hundred and eleven participants lived in the municipality or province of Siena, of which 209 (41.6% of the 503) lived in the municipality of Siena, 73 (14.5%) lived in the province of Siena, and 29 (5.8%) did not specify whether they lived in the municipality or the province of Siena.

Participants were asked to indicate how many years and months, if any, they had lived outside the province of Siena, although this question was not included in the questionnaire administered to `C05` in February 2017. Therefore, we excluded the corresponding 33 participants (Table B6), such that the resultant sample was 479 participants. Participants indicated a mean of 4.6 years (SD = 10.5 years, range 0.0–63.0 years).

Using the number of years lived outside the province of Siena, we calculated the percentage of lifetime in Siena using: 1−(years lived outside the province of Siena/age)× 100. A value of 100% means the participant has always lived in the province of Siena, while a value of 0% means the participant has never lived in the province of Siena. The mean percentage of lifetime in Siena was 89.4% (SD = 23.7%). Of the 479 participants, 15 (3.1%) did not provide a response. Of the remaining 464 that did, 308 (66.4%) participants had a score of 100%, whereas 8 (1.7%) participants had a score of 0% (Figure B5). 42 (9.1%) participants had a score of 50% or less, i.e. they lived half or less of their life in the province of Siena (Figure B5).

Table B8 shows the reason for membership, as per the choices in the questionnaire. We categorised responses following our classification scheme in Section 2.2.2.3, i.e.

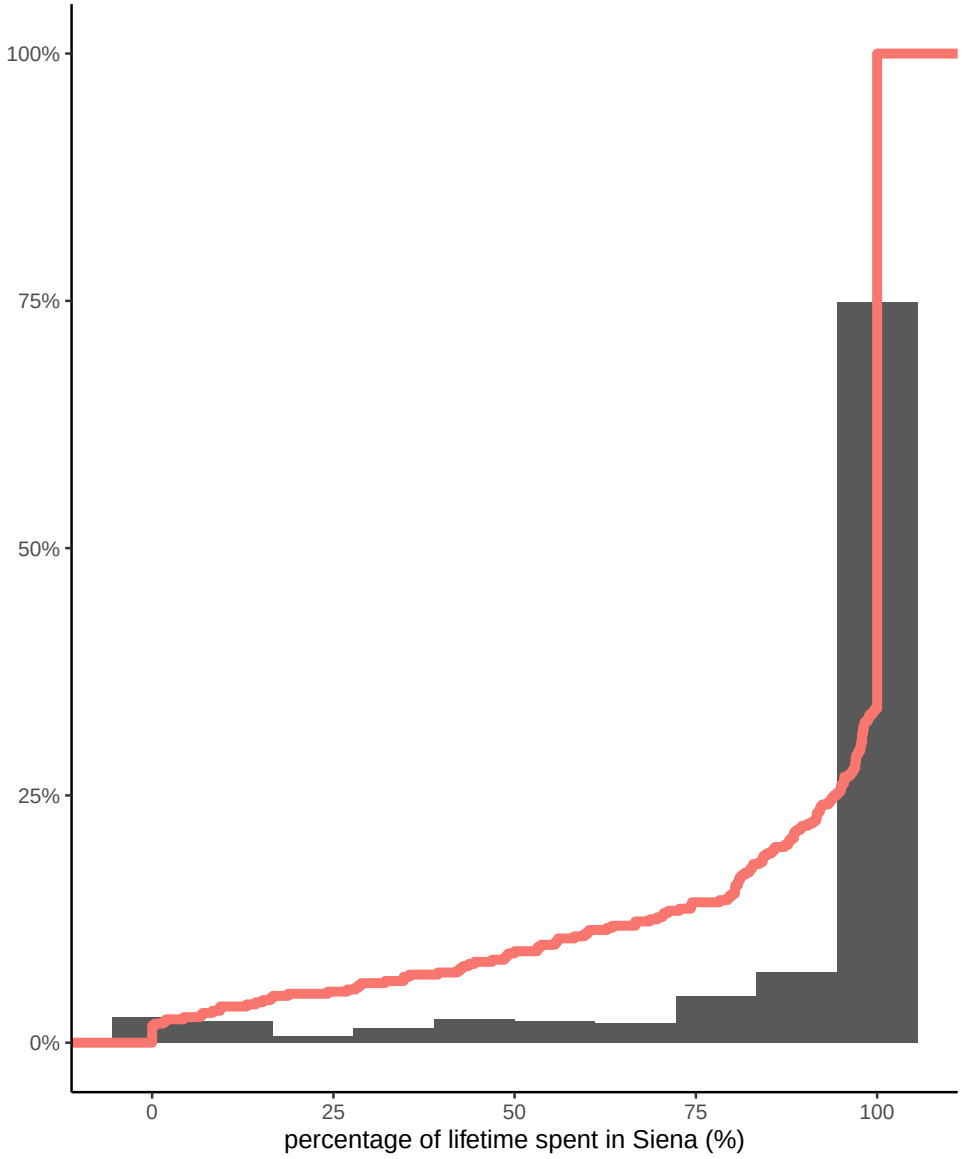


Figure B5: Percentage of lifetime lived in the province of Siena across 464 participants. A value of 100% means the participant has always lived in the province of Siena, a value of 0% means the participant has never lived in the province of Siena. Calculated from participants' age and number of years lived outside the province of Siena; see text for details.

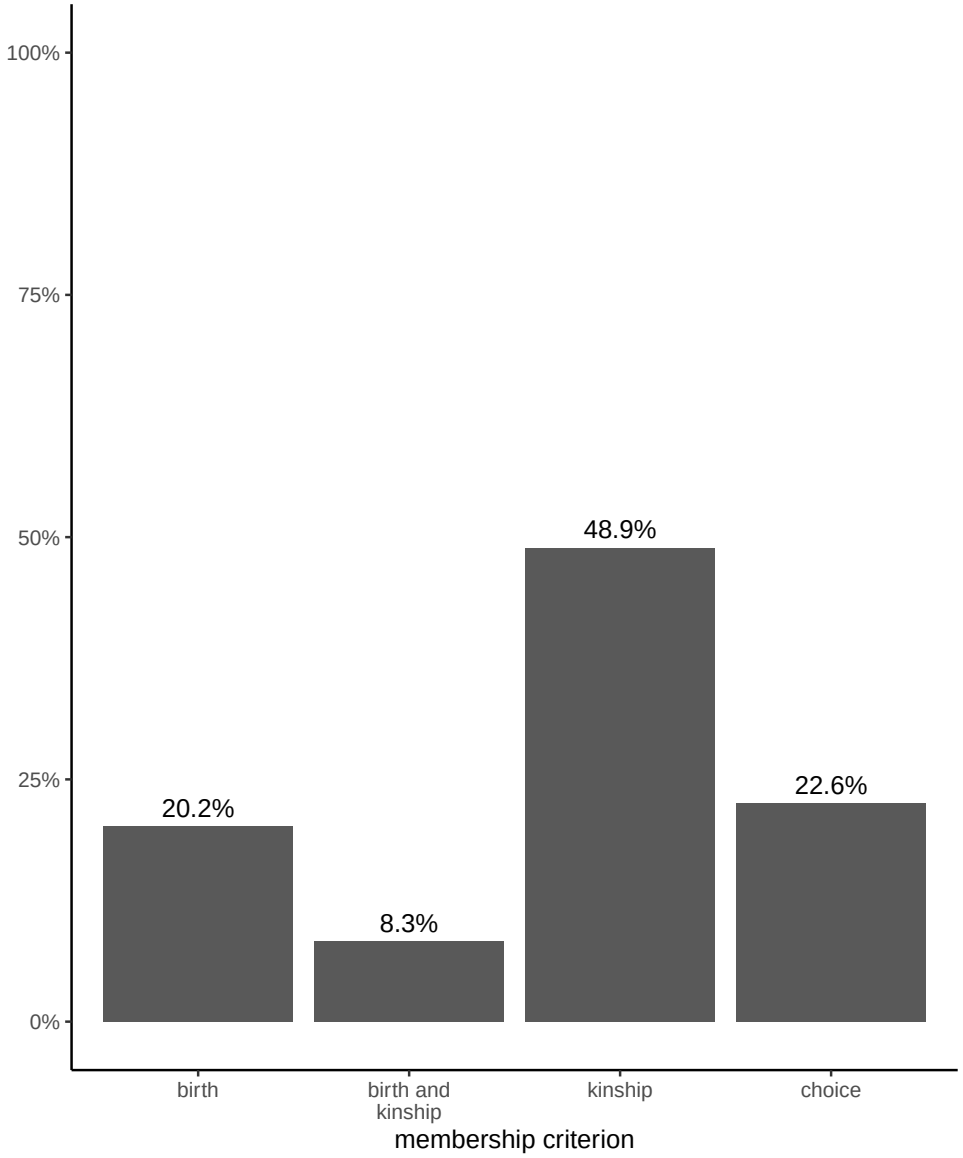


Figure B6: Reasons for being a *contrada* member across 505 participants. See Section 2.2.2.3 for details of the classification scheme.

birth, kinship, and choice, adding a birth and kinship criterion as participants indicated both. Note three participants indicated choice alongside one parent, which we classified as kinship. As participants who indicated "other" also provided a written response, we were able to assign a more specific membership criterion. Of the 40 participants who indicated other, eight and 30 were classified as kinship and choice, respectively. The remaining two participants provided either an uninformative or a blank response. Figure B6 shows the distribution of membership criteria across the 505 participants that provided a response that could be categorised as birth, birth and kinship, kinship, and choice. Kinship was the most common criterion, whether those who responded with both birth and kinship are included or excluded in the final tally (Figure B6).

We also analysed participants who indicated membership by kinship through at least one parent. Of the 281 participants who had indicated membership by either one parent or both parents, one (0.4%) participant indicated one parent but did not state whether it was through their mother or their father. Of the remaining 280 that did, 77 (27.5%) participants indicated both their parents, 72 (25.7%) participants indicated their mother, and 131 (46.8%) participants indicated their father. This corresponds to 15.2%, 14.3%, and 25.9% of all 505 participants who provided a classifiable response, respectively.

Table B8 shows how frequently participants were involved in the social and organisational life of the *contrada*. Figure B7 shows the relative frequencies during the winter, i.e. February 2017, and during the summer, i.e. June–August 2017 and June–August 2018 (Table B5). Focusing on participation in social life, the most common response was "every week" during the winter vs. "2–3 times a month" during the summer (Figure B7). Turning to participation in organisational life, the most common response was "2–3 times a month" during both the winter and summer (Figure B7).

We placed the responses to frequency of participation into one of two categories, "at least once a week" and "less than once a week". Eighty nine (44.9% of 198 participants) participated in the social life of the *contrada* at least once a week during the winter vs. 166 (53.7% of 309 participants) during the summer. Seventy three (37.1% of 197 participants) participated in the organisational life of the *contrada* at least once a week during the winter vs. 115 (37.5% of 307 participants) during the summer.

Participants were asked to think of their five closest friends, and indicate how many were a member of the same *contrada* as them, a member of a different *contrada* to them, and not a member of any *contrada*. Of the 512 participants, 10 (2.0%) participants did not provide a response. Furthermore, 50 (9.8% of all participants) participants indicated a total number of friends fewer or greater than five. We excluded the above participants, meaning we analysed the affiliation of friends with a sample of 452 participants, corresponding to a total of 2,260 friends. Across all 2,260 friends, 1,437 (63.6%) were members of the same *contrada*, 474 (21.0%) were members of a different *contrada*, and 349 (15.4%) were not a member of any *contrada*.

Figure B8 shows the distribution of friends across all possible combinations. Of the 452 participants who provided a total of five friends, 123 (27.2%) participants indicated all their closest friends were from the same *contrada*. Three hundred and three (67.0%) participants had a majority, i.e. 3 or more friends, from the same *contrada*, meaning 149 (33.0%) participants had a minority, i.e. 2 or fewer friends, from the same *contrada* (Figure B8). Finally, 273 (60.4%) participants indicated that all five friends were members of a *contrada*, whether the same or different, meaning 179 (39.6%) participants indicated that they had at least one close friend who was not a member of a *contrada* (Figure B8).

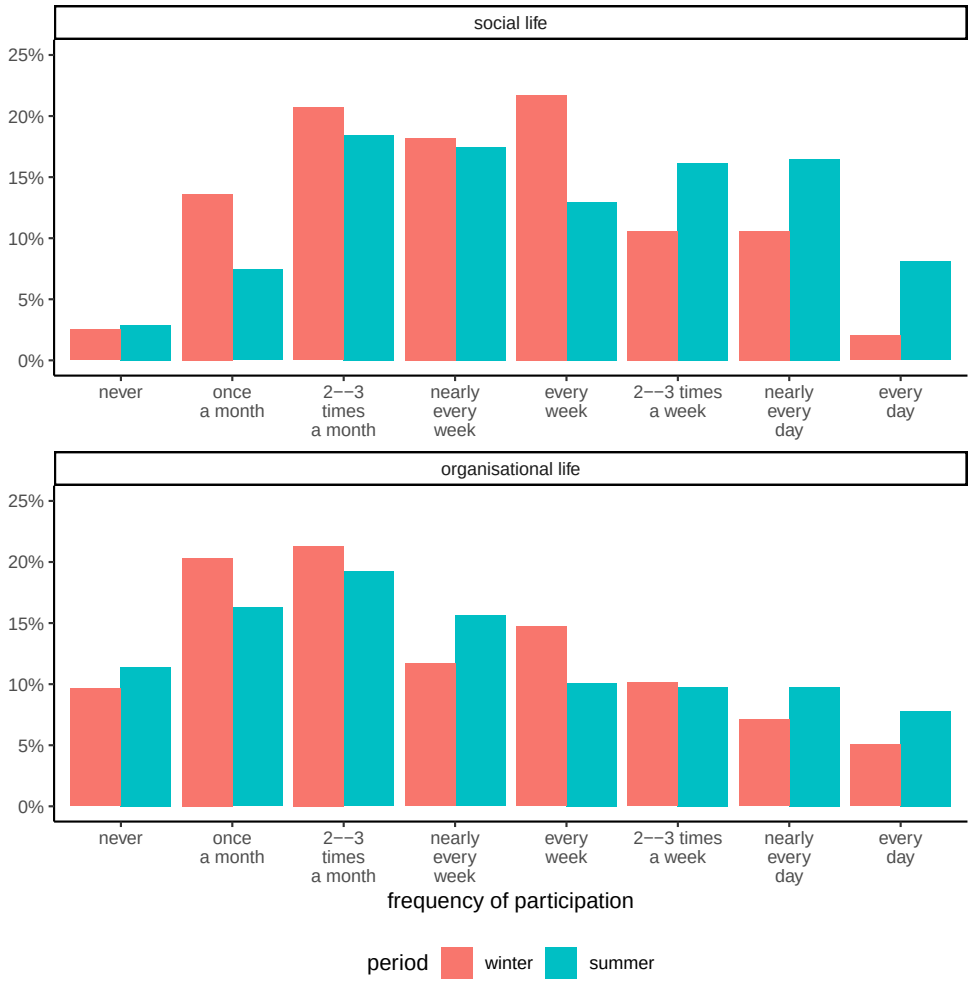


Figure B7: Frequency of participation in the social and organisational life of the *contrada* over the past month, during the winter (February 2017) and the summer period (June–August 2017 and June–August 2018). We analysed 507 and 504 participants for social and organisational participation, respectively.

Table B7: Distribution of demographic characteristics[1]

item[2]	responses[3]	level	*n*	%[4]
employment status	508	employed	361	71.1
		unemployed	20	3.9
		pensioned	48	9.4
		student	72	14.2
		other	7	1.4
personal income[5]	507	above the average	145	28.3
		similar to the average	212	41.4
		below the average	150	29.3
level of education	508	postgraduate degree	49	9.6
		undergraduate degree	123	24.2
		professional qualification	21	4.1
		high school	261	51.4
		middle school	50	9.8
		primary school	4	0.8

[1] Across 512 participants; see Section B4.3.
[2] Order as per demographic characteristics section of the questionnaire; see Section B4.1.
[3] Number of participants who provided a response to the question.
[4] Percentage out of the number of participants who provided a response (column 2); percentages may not total 100 due to rounding.
[5] Participants were asked to locate their personal income with respect to an average salary of €27,500 (gross annual).

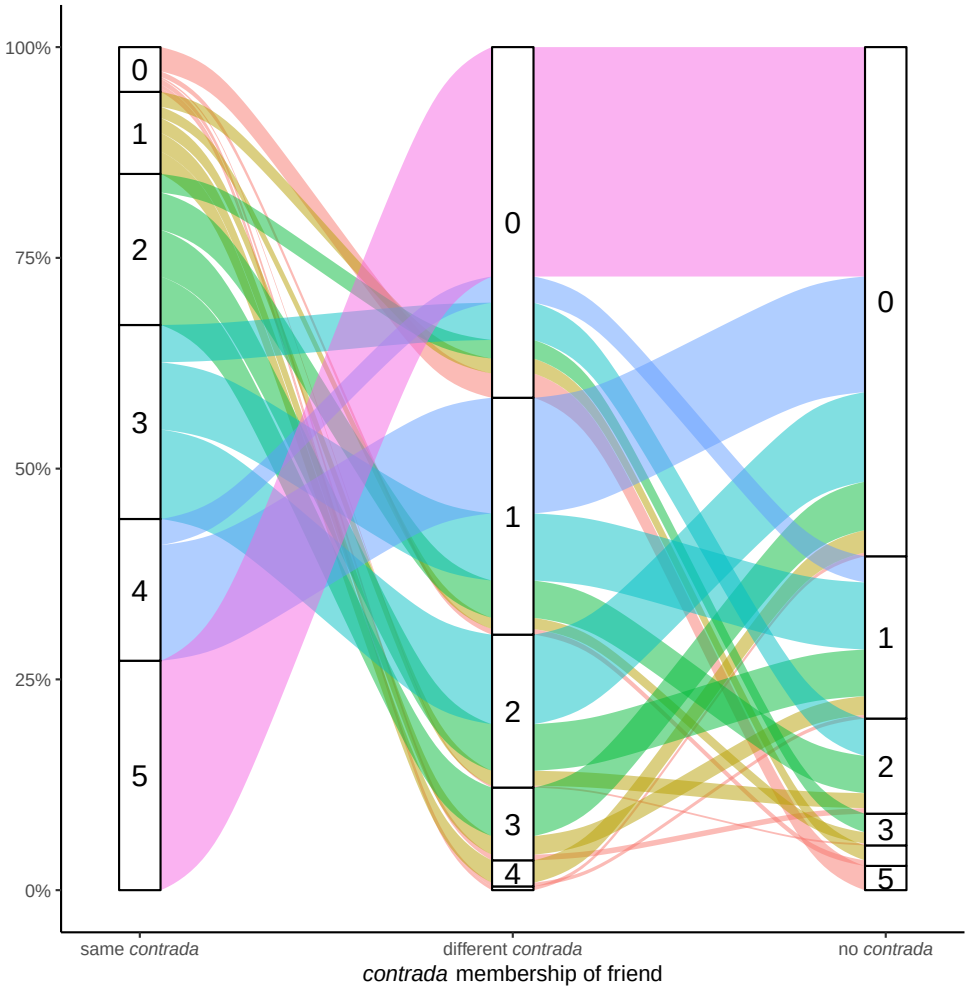


Figure B8: Distribution of the *contrada* membership of 452 participants' five closest friends. Each stacked bar represents the *contrada* membership of a friend, i.e. whether the friend was a member of the same *contrada*, a member of a different *contrada*, or not a member of a *contrada*. Within each stacked bar, a segment represents the total percentage of responses. Between stacked bars, the coloured flow represents a particular combination of friends e.g. the pink flow represents the combination of five friends who are of the same *contrada*, zero friends who are of a different *contrada*, and zero friends who are not a member of a *contrada*. Labels for segments with a total percentage of responses $< 2.5\%$ removed for legibility.

Table B8: Distribution of responses to *contrada* questions[1]

item[2]	responses[3]	level	*n*	%[4]
location of birth	507	historic city centre	207	40.8
		municipality of Siena	194	38.3
		outside the municipality of Siena	106	20.9
residence	503	historic city centre	166	33.0
		municipality or province of Siena	311	61.8
		region of Tuscany	14	2.8
		Italy	11	2.2
		abroad	1	0.2
reason for membership[5]	505	both parents were members	62	12.2
		both parents and born in territory	15	3.0
		one parent was a member	177	34.9
		one parent and in territory	27	5.3
		born in territory	102	20.1
		chose to be a member	84	16.6
		other	40	7.9
protettore[6]	506	yes	497	98.2
		no	9	1.8
role of responsibility[7]	504	current role and past role	78	15.5
		current role only	139	27.6
		past role only	125	24.8
		no current role and no past role	162	32.1
social participation	507	never	14	2.8
		once a month	50	9.9
		2–3 times a month	98	19.3
		nearly every week	90	17.8
		every week	83	16.4
		2–3 times a week	71	14.0
		nearly every day	72	14.2
		every day	29	5.7

(continued)

Table B8 (continued)

item[2]	responses[3]	level	*n*	%[4]
organisational participation	504	never	54	10.7
		once a month	90	17.9
		2–3 times a month	101	20.0
		nearly every week	71	14.1
		every week	60	11.9
		2–3 times a week	50	9.9
		nearly every day	44	8.7
		every day	34	6.7
superiority[8]	495	strongly agree	209	42.2
		agree	116	23.4
		neither agree nor disagree	131	26.5
		disagree	31	6.3
		strongly disagree	8	1.6

[1] Across 512 participants; see Section B4.3.
[2] Order as per the *contrada* questions section of the questionnaire; see Section B4.1.
[3] Number of participants who provided a response to the question.
[4] Percentage based on the number of participants who provided a response as per column 2. Percentages may not total 100 due to rounding.
[5] Responses were categorised into a classification scheme similar to that in Section 2.2.2.3, which outlined three broad categories, i.e. birth, kinship, and choice; see Section B4.3 for further manipulation.
[6] A *protettore* is an individual who supports the *contrada* financially, through payment of an annual fee; see Section 2.2.2.3 and Section B2.3. Participants were asked to indicate whether they had been a *protettore* over the last two years.
[7] Role of responsibility is an formal position within the structures of the *contrade*. See Section B1.3 for a details.
[8] Participants were asked how much they agreed with the statement "In general, my *contrada* is better than the majority of other *contrade*".

B4.4 Discussion

As part of the fieldwork described in Section B3 we conducted a large-scale survey of *contrada* members. Specifically, between February 2017 and August 2018 we recruited 526 participants across five *contrade*. Through a paper-based questionnaire, we asked participants to provide demographic characteristics and to describe their relationship with Siena and the *contrade* across a variety of multiple-choice questions. We analysed the responses of 512 members.

We emphasize that generalisations to all 17 *contrade*, and their members and/or *protettori*, may be limited, due to convenience sampling with respect to both the *contrade* and the participants. The results may not be representative of all *contrade*, due in part to variation in membership size (Section B2). Members most active in the life of the *contrada*, i.e. members who live nearby and/or those most likely to frequent *contrada* events, may be over-represented in the sample, while female members may be under-represented. Our recruitment strategy, with recruitment mostly at popular and well-attended events (Section B4.1), was designed to sample participants from as large a pool of members as possible, to capture less active members. Without access to the actual composition of *contrada* members, it is difficult to assess the deviation of the sample from the general population.

Despite these limitations, the data reveal three broad patterns about the membership of the *contrade*, especially those members who regularly participate in the life of the community. First, our sample suggests that the *contrade* are composed of members with a range of ages, with some variation in socio-economic indicators. Second, most individuals who frequent the *contrada* were born and/or currently live in Siena, with membership mostly conferred by birth and/or kinship, although there is a sizeable proportion of members from outside Siena and/or by choice. Third, the data show that the contemporary *contrade* are active communities whose members frequently interact among themselves. We elaborate on these findings below, with reference to existing ethnographic literature and observations made during our fieldwork.

Ethnographic potrayals emphasis that each *contrada* is composed of individuals of different age and socio-economic status (e.g. Dundes and Falassi 1984: 35). The sample suggests the *contrade* are composed of members that vary with respect to these characterisitcs. Age ranged from 18 years to 84 years, meaning *contrada* events are frequented by multiple age cohorts. Although the data are unable to demonstrate the existence of inter-generational ties, the attendance of events by members across ages permits such ties, and we observed interactions across age cohorts during our fieldwork. There is some variation in personal income, with nearly one-third of the sample indicating earnings less than, and a similar proportion indicating earnings more than, the local average — although without specific values we are unable to assess how significant these differences are. Generally, the *contrade* are populated by individuals in employment, and who are highly educated. Three-quarters of sample were employed, with around 5% unemployed. Around 90% of the sample had completed secondary education or higher, and around 35% hold a university degree.

Contrada membership is not, to our knowledge, biased in favour of a particular gender, and ethnographic accounts have long noted that "women are just as involved

in *contrada* life as men" (Pomponio Logan 1978: 51, emphasis in original). Here, the sample is biased towards men, with around 65% of the sample male. The only reliable data with which we can compare *contrada* composition in relation to gender are from the *Drago* interview (Voltolini 2012d), which states that 614 out of 1,314 *protettori* (46.7%) were female in 2012–2013 (Section B2.2). The skewed sample reflects our observation that most events are attended by men, and that currently, it is male members who occupy the most prestigious leadership roles and represent the *contrada* during important rituals, i.e. the procession is led by male costumed representatives (Section 2.2.2.6).

The survey allows us to assess the make-up of the contemporary *contrada* in light of relevant factors, such as membership criteria (Section B2.3). Historically, *contrada* membership was largely reserved for individuals born in the territory of Siena (Section B2.3). Being from Siena and being a *contrada* member was by and large analogous (Park 1992). However, significant social and demographic changes in the twentieth century displaced members from the city centre to the surrounding conurbations. Membership criteria were expanded, such that one could become a member by choice, in part a response to increasing immigration of non-Sienese to the city, and sustained interest from others not native to Siena (Park 1992).

The majority of members in the sample were born and/or currently live in Siena, which corroborates accounts over the past 50 years that the *contrada* community remains largely a "domain which is exclusively Sienese" (to borrow a description of the *palio* in Park 1992: 92; similar themese are in Parsons 2004; Pomponio Logan 1978). However, approximately one-quarter of the sample was born and/or currently live outside Siena. Of particular relevance to the aforementioned changes across the twentieth century, the data suggest two-thirds of members do not live in the city centre. Consequently, only a small proportion, around 15%, live in the territory of their own *contrada*. That approximately 15% of the most active members live in the territory demonstrates the magnitude of the physical displacement of members.

Given that most members were born in the municipality of Siena, it is unsurprising that most members have spent the majority of their life living in or near the city. Nearly two-thirds of our sample claimed to have never lived outside the province of Siena. The lack of emigration might be explained by attachment to the city and/or the *contrada*, as demonstrated by 's observation: "[i]t is my experience that almost every Sienese has at least one anecdote relating to the fabulous job which they were offered in Rome or Milan but which they turned down out of a sense of loyalty to their city" (Park 1992: 95). We note that the continuous presence of members likely allows for the transmission of *contrada* values and traditions from older to younger members.

As discussed in Section 2.2.2.3 and Section B2.3, birth in the *contrada* territory became infrequent during the twentieth century, and so inheritance of membership through family ties was permitted (e.g. Falassi 1983: 26; Park 1992). The data show that among contemporary *contrade*, the kinship criterion is more frequent than the birth one. However, approximately one-fifth indicated birth, so it remains an important criterion among the membership in the twentieth century. Generally, birth is cited by older participants, based on the finding that the mean age was

51.1 years ($SD = 13.7$ years) for those who stated birth vs. 36.5 years ($SD = 13.8$ years) for those who stated kinship. We note that the birth criterion means the individual was born in that *contrada* territory or the parents were resident in that *contrada* territory at the time of birth (Section 2.2.2.3). The latter was corroborated by some respondents who mentioned to A.R.K. that they interpreted birth to mean living in the *contrada* during infancy.

Around a quarter indicated membership by choice. Notwithstanding potential biases in the sample towards members who indicated birth and/or kinship the data indicate the importance of the choice criterion among contemporary *contrade*, with a significant proportion of individuals likely to not be from Siena associating with the *contrada* and attending events. Members in our sample who indicated choice were more often born outside Siena (60% born outside Siena vs. 40% born in Siena).

We derive two final insights from the questions relating to basic *contrada* characteristics. First, the responses show that membership influences relationships and marriage, with around 15% of members indicating that both their parents were from the same *contrada*. We are unable to make inferences about either the level of endogamy or whether affiliation is more likely through maternal or paternal kinship ties. However, we note that more members nominated a single parent (around 40% of all participants) rather than both parents (around 15% of all participants), and more members indicated membership through their father (around 25% of all participants) than their mother (around 15% of all participants). Second, the high percentage of members in our sample who paid the fee shows the considerable overlap between membership and *protettore* status (Section 2.2.2.3), although our sampling strategy means we were more likely to recruit members who pay e.g. members who do not pay might be less likely to attend events.

The survey also allows us to gauge member's association with the *contrada*. In particular, we can measure how active members are in the life of the *contrada*, and with whom they interact. These issues are pertinent given previous accounts of frequent informal socialising, e.g. social events that occur on a weekly basis (Dundes and Falassi 1984: 35). These variable also offer insights into the identification of members with their *contrada* (see Sections 2.2 and B5).

Members frequent the *contrada* to socialise both during the winter and the summer, suggesting that the *contrada* is active throughout the year. Comparing the responses when categorised into "at least once a week" vs. "less than once a week" suggests little difference in the frequency of participation during the winter and summer, as around 50% of the participants said at least once a weeks in both periods, although there is an increase in the percentage who claim to be present in the *contrada* every day during the summer (Figure B7). This corroborates discussions that many members frequent the *contrada* more during the days surrounding *palio* festival, who are often disparagingly referred to as *quattrogiornisti* (lit. "four-dayers", alluding to presence in the *contrada* only during the four days of the *palio* festival).

Nearly 70% has or had a role in the *contrada*, and thus been officially involved in organising the activities of the *contrada*. It is likely that our sample is over-represented by people who take on roles; they are likely to attend events out of duty and are likely to put themselves forward to benefit the *contrada*. However,

because the roles included less formal positions, that nearly half have or had a role shows that many members are willing to voluntarily commit time and effort into the life of their community. Figure B7 shows that members are involved in organisational activities a few times a month across the year. The frequency of participation increasing during the summer, which reflects the organisation needed to celebrate the *palio* festival and the patronal festival, both of which occur in the summer. Generally, there appears to be less frequent participation in the organisational life of the *contrada* than in the social life.

The survey indicates assortativity in friendship among *contrada* members. Approximately two-thirds of members in our sample have a majority of their closest friends from the *contrada*, with around a quarter nominating all their closest friends as from the same *contrada*. This shows that the *contrada* is a locus for forming social support networks. However, membership does not exclude social ties with individuals from outside the in-group. Three-quarters of members in our sample indicated at least one close friend from a different *contrada* or no *contrada*.

To an outsider, there are few objective difference between the *contrade*, i.e. each have a symbol, patronal festival etc. Although victorious *contrade* have bragging rights (Dundes and Falassi 1984: 49–53), there are few features at which one *contrada* consistently excels over others. Notwithstanding the lack of differences, that two-thirds of our sample believe their *contrada* to be better or superior than others (on some unspecified dimension) indicates that the *contrada* promotes a "typically ethnocentric attitude" (Falassi 1983: 29). However, the remaining one-third were neutral or disagreed that their *contrada* was superior, which might reflect a belief that all *contrada* are from Siena and thus share a larger, collective identity (Parsons 1997). Generally, the results from the superiority item are congruent with the results of the attitudes item (Section B5).

In conclusion, the survey shows that the contemporary *contrade* are communities whose members are predominantly from Siena, and that there is a core of members whose interactions are biased towards their own *contrade*. However, there is a notable proportion of members who are not from Siena and represent attachment to the *contrada* through personal associations. Additional insights may be generated from a future survey, ideally involving all 17 *contrade* and using a representative sample of members or *protettori* from each community.

B5 Evaluation of attitude towards the *contrade*

As part of the fieldwork described in Section B3, we assessed the attitude of *contrada* members towards the *contrade* through a questionnaire administered to participants from *Civetta*, *Leocorno*, and *Torre*. The focus is on variation in attitude by *contrada* status (i.e. towards own *contrada* vs. other *contrade*), and towards other *contrade* by relationship type (alliance, neutral relationship, or rivalry; Section 2.2.2.5). Although preliminary, the data are in line with existing ethnographic observations, with attitude varying systematically by *contrada* status and relationship type.

We proceed by describing the data collection procedure (Section B5.1), the aims of the analysis (Section B5.2), and the results (Section B5.3), followed by a discussion (Section B5.4). The latter situates the results in the Sienese context, and underscores the relevance of the relationship between *contrade* as discussed in Section 2.2.2.5.

B5.1 Data

As shown in Table B5, data collection for the attitudes item involved three *contrade* across three periods over the course of a year, between July 2017 and June 2018 (Section B3). Specifically, members of *Torre* were recruited at a communal *contrada* meal in July 2107; members of *Civetta* and *Leocorno*, either at their *contrada* museum in March 2018, or through participation in the GPS study in June 2018 (Section B6.1).

In all cases, *contrada* members were invited to take part by A.R.K.; those who agreed completed a paper-based questionnaire (Section B3). Participants recruited at the *Torre* meal did so in the *contrada* clubhouse; those recruited at the *Civetta* or *Leocorno* museum, in a dedicated space in the museum itself; those recruited as part of the GPS study, in the corresponding *contrada* clubhouse ahead of the procession (Section B6.1). Multiple participants were allowed to complete the questionnaire at the same time, but they were asked to do so without conferring with one another during and after the process. No dividers were used.

The standalone questionnaire comprised two parts. The first part included three questions, asking participants to indicate year of birth, gender, and *contrada* membership. The second part asked participants to state their general attitude towards the 17 *contrade*, in a table listing the *contrade* alphabetically against a scale from 1 (very negative) to 7 (very positive). Additionally, the questionnaire administered as part of the GPS study asked participants to state their role in the procession (Section B6.1), with the corresponding question placed between the two parts.

B5.2 Analysis

The analysis focused on variation in the attitude of participants by *contrada* status (i.e. towards own *contrada* vs. other *contrade*), and towards other *contrade* by relationship type. As discussed in Section 2.2.2.5, two *contrade* may be in a neutral relationship; alternatively, they may be allies or rivals. Neutral relationships can be viewed as the default status, whereas alliances and rivalries are formally stipulated

in the offical statute of the *contrade* involved, with alliances sanctioned by a treaty. All relationships are reciprocal, with one exception (discussed below).

As shown in Table 2.1, *Civetta*, *Leocorno*, and *Torre* have one rival each, whereas the number of allies varies across them — as, consequently, does the number of *contrade* with which each has a neutral relationship. Specifically, *Civetta* and *Leocorno* are reciprocal rivals, whereas *Torre* is a reciprocal rival to *Oca*. *Civetta* has four allies (*Aquila*, *Giraffa*, *Istrice*, *Pantera*), leaving 11 *contrade* with which it has a neutral relationship. *Leocorno* has two allies (*Pantera*, *Tartuca*), thus there are 13 *contrade* with which it has a neutral relationship. Finally, *Torre* has one ally (*Bruco*), thus there are 14 *contrade* with which it has a neutral relationship. In particular, *Torre* features in the only relationship pair that is not reciprocal: *Onda* stipulates *Torre* as a rival, but not *vice versa*. This asymmetry provides the opportunity to evaluate whether the attitude of *Torre* participants is in line with classification of the relationship to *Onda* as neutral.

We pooled responses across periods. With the data aggregated across the three *contrade*, we first investigated the effect of *contrada* status. Specifically, we used a Wilcoxon signed-rank test to determine whether the mean attitude of participants towards own *contrada* differs from their mean attitude towards all other *contrade*. Next, we investigated the effect of relationship type, using a linear mixed-effects model with attitude as outcome, *contrada* classification as fixed effect (with levels own *contrada*, alliance, neutral relationship, and rivalry), and the intercepts of each participant and of the three *contrade* as random effects. We tested for a main effect of *contrada* classification via a mixed-model ANOVA with type III sum of squares, using package `lmerTest` (Section 6.6). To compare the difference in attitude based on *contrada* classification, we conducted pair-wise comparisons with a Tukey correction, using package `emmeans` (Section 6.6). In all cases, significance was assessed at $p < .05$.

The final part of the analysis focused on the data for *Torre*, to explore the effect of the asymmetry in its relationship with *Onda*. To this end, we compared qualitatively the mean attitude of *Torre* participants towards *Onda*, vs. all other *contrade* with which *Torre* has a neutral relationship (Table 2.1), and vs. *Torre*'s rival (*Oca*).

B5.3 Results

We recruited 42 participants: 15 (35.7%) from *Civetta*, eight (19.0%) from *Leocorno*, and 19 (45.2%) from *Torre* (Table B5). Only one questionnaire was returned incomplete, with a participant from *Civetta* stating their general attitude towards this *contrada* only. We included data relating to all participants in the analysis.

Participants had a mean age of 35.1 years ($SD = 14.9$ years, range 18–82 years) and 2 (4.8%) of the 42 participants were female. The bias towards male participants likely reflects the convenience sampling, together with greater participation by men in *contrada* life generally, coupled with recruitment in *Civetta* and *Leocorno* as part of the GPS study (Section B6.1).

Figure B9 shows the distribution of attitude across participants by *contrada* status and by relationship type. Variation in the number of responses reflects

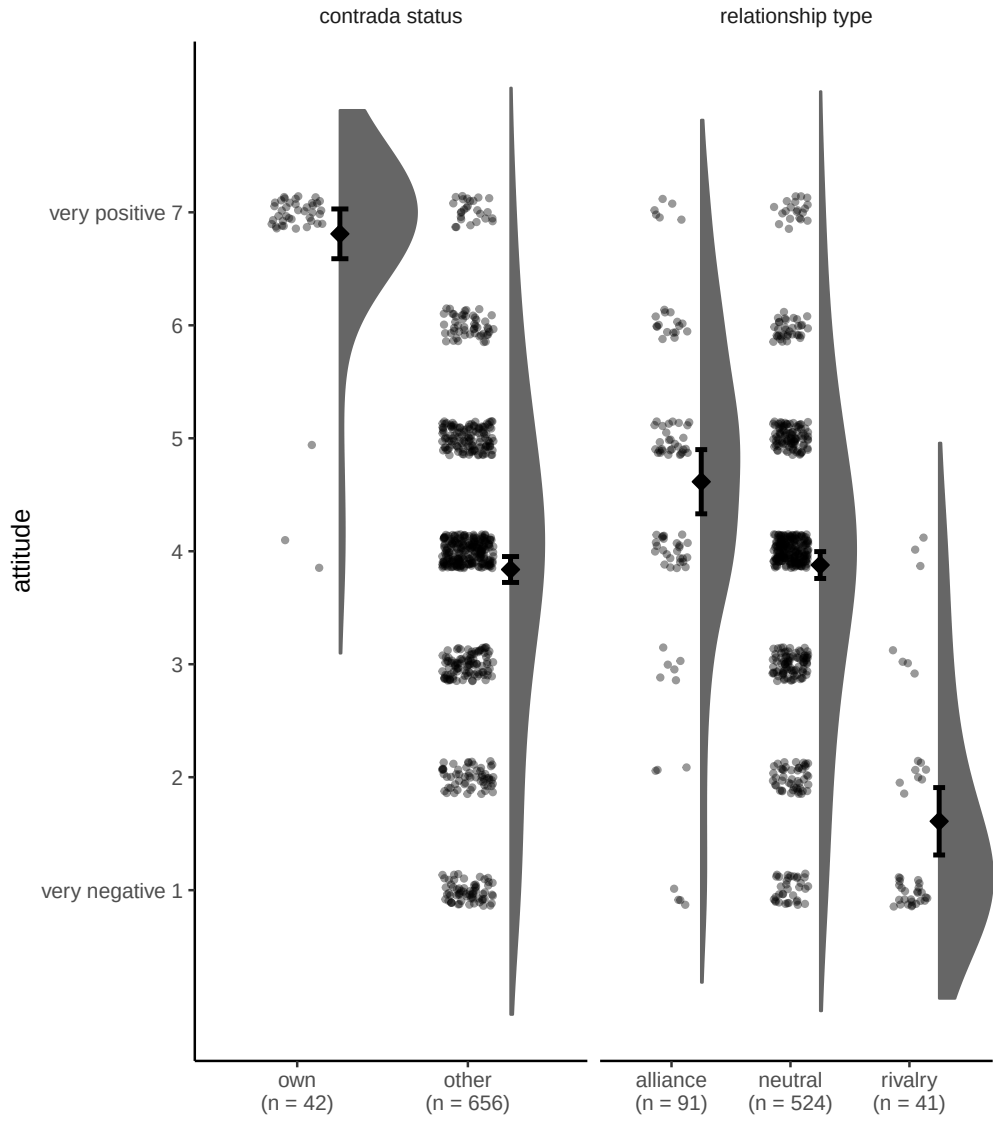


Figure B9: Distribution of attitude across 42 participants from *Civetta*, *Leocorno*, and *Torre* by *contrada* status and relationship type, on a 7-point scale from very negative to very positive. Shown is the mean and 95% confidence intervals. Variation in the number of responses n arises from specific features of the data collection and analysis; see Section B5.3 for details. In the plot we add random jitter to the values along both axes for visibility.

Table B9: Difference in attitude based on *contrada* classification[1]

contrast	Δ^2	SE	df	t	p	sig.[3]
own *contrada* vs. alliance	2.2	0.2	661	10	$< .001$	***
own *contrada* vs. neutral relationship	2.9	0.2	659	15	$< .001$	***
own *contrada* vs. rivalry	5.2	0.3	657	20	$< .001$	***
alliance vs. neutral relationship	0.8	0.1	633	6	$< .001$	***
alliance vs. rivalry	3.0	0.2	655	13	$< .001$	***
neutral relationship vs. rivalry	2.3	0.2	654	12	$< .001$	***

[1] Assessed via pair-wise comparisons with a Tukey correction.
[2] Mean difference between *contrada* classification in contrast.
[3] Significance: * $p < .05$, ** $p < .01$, *** $p < .001$

the within-subject design, the different numbers of alliances and of neutral relationships across the three *contrade*, and inclusion of the incomplete response for one *Civetta* participant.

Overall, mean attitude was higher for own *contrada* ($M = 6.8$, $SD = 0.7$) than for other *contrade* ($M = 3.8$, $SD = 1.5$; Wilcoxon signed-rank test, $V = 856.0$, $p < .001$). Focusing on relationship type, mean attitude was highest for alliances ($M = 4.6$, $SD = 1.4$), followed by neutral relationships ($M = 3.9$, $SD = 1.4$), followed by rivalries ($M = 1.6$, $SD = 0.9$). The model revealed a significant effect of *contrada* classification (mixed-model ANOVA, $F(3, 652.9) = 143.0$, $p < .001$), with significant differences between all contrasts (Table B9).

Focusing on *Torre* participants, mean attitude was 1.4 ($SD = 0.8$) towards *Onda*, 4.1 ($SD = 1.5$) towards the other 13 *contrade* with which *Torre* has a neutral relationship (Table 2.1), and 1.7 ($SD = 1.0$) towards *Torre*'s rival (*Oca*). This pattern suggests that the attitude of *Torre* participants does not align with classification of the relationship to *Onda* as neutral. It also raises the possibility that the results presented above may be affected by classification of this relationship as such in the analysis. However, the results did not change qualitatively neither if data relating to the *Torre* participants were excluded, nor if the relationship was coded as a rivalry instead (results not shown; see code).

B5.4 Discussion

As part of the fieldwork described in Section B3 we assessed the attitude of *contrada* members based on *contrada* status (as own vs. other) and on relationship type with other *contrade* (as alliance vs. neutral relationship vs. rivalry). Specifically, between July 2017 and July 2018 we recruited 42 members across three *contrade* (*Civetta*, *Leocorno*, and *Torre*). Through a paper-based questionnaire, we asked participants to state their general attitude towards the 17 *contrade* on a 7-point scale from very negative to very positive, alongside supporting information on year of birth, gender, and *contrada* membership.

We emphasize that the data suffer from important limitations, and the findings are therefore to be considered preliminary. In particular, participants were recruited

opportunistically from a subset of the *contrade*, and in different contexts over the course of a year, resulting in a small convenience sample that is strongly biased towards men.

Despite these limitations, the data reveal a clear pattern. Mean attitude is higher for own *contrada* than for other *contrade*. Responses for own *contrada* vary from the mid-point of the scale to the highest value, clustering tightly around the latter. By contrast, responses for other *contrade* show considerable variation across the scale, and the distribution appears symmetric about the mid-point. This variation is linked to relationship type, with mean attitude highest for alliance, followed by neutral relationship, followed by rivalry. Responses for rivarly vary from the mid-point of the scale to the lowest value, with a tendency to cluster around the latter. By contrast, responses for alliance and for neutral relationship show variation across the scale, and the distributions appear symmetric about the mid-point. Overall, we find evidence of an effect of *contrada* classification (as own *contrada*, alliance, neutral relationship, and rivalry), with differences in attitude between all pair-wise comparisons.

All *contrada* pairs feature reciprocal relationships, with the exception of *Onda* and *Torre*. Specifically, *Onda–Torre* is a rivalry, whereas *Torre–Onda* is a neutral relationship (Section 2.2.2.5). Qualitatively, our data suggest that the attitude of *Torre* participants does not align with this classification of the relationship to *Onda*. In particular, mean attitude of *Torre* participants towards *Onda* is lower than their mean attitude towards all other contrade with which *Torre* has a neutral relationship (Table 2.1), and comparable instead to their mean attitude towards *Torre*'s reciprocal rival (*Oca*).

Broadly, the results are in line with relevant ethnographic accounts. They also align with our understanding of relationships among the *contrade*, based on existing literature corrorborated by fieldwork observations. For example, the attitude towards own *contrada* has been characterised as "typically ethnocentric" (Dundes and Falassi 1984: 29), such that "the degree of love for one's contrada can only be exceeded by the degree of hate for the rival contrada" (49). In particular, "[t]he enmities between *contrade* are strong hatreds in some cases" (Pomponio Logan 1978: 53, emphasis in original). These characterizations map onto the findings that responses for own *contrada* and for rivalry cluster more or less tightly at the two ends of the scale — positive and negative, respectively.

Across all classification levels, the observed variation in responses may reflect variation in personal experience, based on an individual's social ties with, and exposure to, the different *contrade* (Pomponio Logan 1978). For instance, limited participation in *contrada* life, and/or negative interactions in this context, may account for the handful of responses for own *contrada* which fall between the mid-point and the positive end of the scale. Conversely, the relatively larger number of responses for rivalry which fall between the mid-point and the negative end of the scale may arise from a pattern of repeated positive interactions with members of the rival *contrada*, for example through friendship or marriage.

The limited variation in responses for own *contrada* and for rivalry is especially interesting compared to the pattern observed for the other two classification levels.

As noted, responses for alliance and for neutral relationship span the full extent of the scale. A key factor here is the varying number of *contrade* across levels. There is only one own *contrada*, by definition, and each of *Civetta*, *Leocorno*, and *Torre* features a single rivalry. By contrast, they feature between one and four alliances, and between 11 and 14 neutral relationships (Table 2.1). Consequently, across the three *contrade*, members are likely exposed to a broader range of experiences in the case of alliances and of neutral relationships, compared to own *contrada* and to rivalries.

As noted, mean attitude is lower for neutral relationship than for alliance. At least to the extent that the mid-point of the scale implies neutrality in attitude, the pattern of responses for neutral relationship corroborates interpretation of this relationship type as the default (Filiani and Zaffaroni 2002: 3–7) (Section 2.2.2.5). Conversely, the pattern of responses for alliance likely reflects the positive nature of this relationship type. As discussed in Section 2.2.2.5, alliances tend to be long-lasting — in the words of a *contrada* member, "because they are old, they are typically deeply felt by the people" (reported in Operti et al. 2020: 89). For instance, they often entail commitments throughout the year, such as honouring of an allied *contrada* during the *giro* ritual (Section B6).

Our findings about the attitude of *Torre* participants towards *Onda* provide a final set of insights. A brief overview of the relationship between the two *contrade* may shed light on the qualitative pattern emerging from the data. As discussed in Section 2.2.2.5, relationships between *contrade* are often mutable. Incidents in the course of a *palio* commonly trigger the explosion of simmering tensions, precipitating change. Generally, the underlying tensions tend to be linked to disputes over border delineations. Nowadays, for example, all existing rival pairs share a boundary, with the exception of *Oca* and *Torre* (Table 2.1).

The relationship between *Onda* and *Torre* fits this narrative (Filiani and Zaffaroni 2003: 59–78). Evidence of animosity between the two can be traced back to the sixteenth century, stemming from their adjacent locations (Figure 2.1). An alliance was formalised by treaty in the early twentieth century, but it was however frayed by events at the July *palio* of 1930. The ensuing breakdown in relations culminated in termination of the alliance, with *Onda* additionally stipulating *Torre* as a rival. To this day, the relationship is not reciprocal — to reiterate, *Onda–Torre* is a rivalry, whereas *Torre–Onda* is neutral (Table 2.1).

Contemporary accounts emphasize both the long-lasting nature of the relationship and its asymmetry. For example, in an interview with the head of *Onda* published in a local online newspaper in 2013 (Section B2.1), the interviewer introduces the topic as "the rivalry with Torre", adding that it is "deeply felt by members of Onda, but not in equal measure by the people of the adversary" (Voltolini 2013f). The head of *Onda* goes on to describe the relationship as "Siena's oldest rivalry", further noting that "it is deeply felt by members of Onda, and rightly so" (Voltolini 2013f). Consistently, our observations indicate that *Onda* seeks to prevent *Torre* from winning the *palio*, with members of *Onda* routinely mocking and goading *Torre*. As discussed in Section 2.2.2.5, this is a treatment reserved for rival *contrade*.

There is no discussion of the relationship to other *contrade* in the corresponding interview for *Torre* (Voltolini 2012i) (Section B2.1). Our observations indicate

that the outward posturing of *Torre* aligns with classification of the relationship to *Onda* as neutral. For example, as expected *Torre* does not extend the treatment described above to *Onda*; for comparison, it does apply instead to *Torre*'s reciprocal rival (*Oca*). At the same time, A.R.K. observed aggravation on the part of *Torre* informants following *Onda*'s victory in the August *palio* of 2017. Anecdotally, one member of *Torre* remarked that they were keen to leave town over the following weeks, so as to avoid exposure to the ensuing celebrations by *Onda*. This level of aggravation seems higher than what is typically observed in the case of victory by a *contrada* with which one's own has a neutral relationship.

In line with these observations, our data suggest that there may indeed be a departure between the outward posturing of *Torre* and the attitude of its members towards *Onda*. As noted, mean attitude of *Torre* participants towards *Onda* is closer to their mean attitude towards *Torre*'s reciprocal rival (*Oca*), than to their mean attitude towards other *contrade* with which *Torre* has a neutral relationship. Thus, the attitude of members of *Torre* does not align with classification of the relationship to this *contrada* as neutral. We emphasize however that any inference drawn from the qualitative pattern discussed here is, at best, tentative.

To summarize, our findings show that there is patterned variation in the attitude of *contrada* members towards the *contrade*. As expected based on ethnographic accounts, and in line with our fieldwork observations, attitude is most positive towards own *contrada*, followed by alliances, neutral relationships, and rivalries. Underlying this pattern is variation in attitude across individuals, which may reflect personal experience with the different *contrade*— including one's own. Reflecting the asymmetry in the relationship between *Onda* and *Torre*, the corresponding data are suggestive of a departure between attitude and classification of relationship type. Although preliminary, this finding supports the notion that relationships between *contrade* are, at one time, long-lasting and mutable (Section 2.2.2.5). Further investigation across a larger set of *contrade*, including systematic sampling, is required to confirm our insights, building on the preliminary study reported here, extending to how attitude relates to other measurements of group identification and to interactions among *contrada* members more broadly.

B6 The *giro* ritual reflects group relationship

We analysed the 2018 processions of two *contrade*, based on A.R.K.'s observations and a study involving GPS devices. Accounts of the procession are limited to brief, qualitative descriptions (e.g. Dundes and Falassi 1984: 47, 136–137; Falassi 1983: 28–29; Parsons 2004: 110–11); see Section 2.2.2.6 for details of the procession. The GPS data help visualise and quantify the procession more accurately. Furthermore, they demonstrate how the relationship between *contrade* affects ritualised behaviour.

We begin with a description of the method of data collection (Section B6.1) and analysis (Section B6.2), followerd by the results (Section B6.3) and their discussion (Section B6.4).

B6.1 Data

As shown in Table B5, the GPS study was conducted with two *contrade*— *Civetta* and *Leocorno*— during their processions in 2018. The *Civetta* procession took place on Sunday 17 June 2018, while the *Leocorno* one took place one week later on Sunday 24 June 2018. *Civetta* and *Leocorno* are reciprocal rivals situated in adjacent territories (Table 2.1 and Figure 2.1).

Participants were members of one of the two *contrade*, recruited one or two days before their respective procession, at a communal meal held in the *contrada*. Recruitment was assisted by the *contrada* member responsible for organising the procession (Ita. *economo*, lit. "treasurer"). The treasurer was instructed to identify members who were to take part in the procession as costumed representatives, i.e. as either flag-wavers or drummers. This was to ensure that participants would take part in the entirety of the procession, and that they would follow the predetermined route.

In all cases, *contrada* members were then invited to take part by A.R.K.; those who agreed completed a paper-based questionnaire (Section B3), described in Section B5.1. The questionnaire was completed privately in the clubhouse of their respective *contrada*. Following completion, participants were verbally instructed to meet A.R.K. in the clubhouse on the morning of the procession. Participants also received a voucher worth €5 usable within the clubhouse.

The questionnaire asked for year of birth, gender, *contrada* membership, and role in the procession (possible responses were "flag-waver", "drummer", or "other, with the option of a written response"). The questionnaire also included an attitudes item, as described in Section B5.1.

Twelve *Civetta* members agreed to participate, of which six were flag-wavers and six were drummers. Due to a number of *Leocorno* members who choose to withdraw their participation on the morning of the procession, we recruited 7 *Leocorno* members, of which four were flag-wavers, two were drummers, and one who indicated "other", i.e. not a costumed representative. Participants were all males between 21 and 46 years of age.

On the day of the procession, each participant was given a switched-on portable GPS device (model: Canmore GT-730FL-S) before the start of the procession, which was placed within a pocket or pleat of the costume. GPS devices were retrieved at the end of the procession. They were switched on approximately one

hour before the start of the procession, and switched off approximately one hour after the end of the procession, meaning they were left on over the break for lunch (Section 2.2.2.6). The GPS devices were set to record at intervals of 5 seconds.

The start of the procession was defined as the time of the initial church service (held in the *contrada*'s own church), and the end of the procession was defined as the conclusion of the final service (also held in the church). These times, as well as other times e.g. the lunch break, were noted by A.R.K., who observed each procession by following it throughout the day. He spoke informally with members participating in the procession. A.R.K. also counted the total number of costumed representatives, and noted other details.

B6.2 Analysis

Table B10: Definitions of terms used in analysis of the *Civetta* and *Leocorno* processions

term	definition
id	the identification code for each participant
interval	time between each position, set to 5 seconds on the GPS devices
period	one of two times in which the procession took place; morning for the period before lunch, and afternoon for the period after lunch
position	coordinates (longitude and latitude) recorded by the GPS device
route	a series of positions for a single participant
territory	either the territory occupied by one of the 17 *contrade* or the two non-*contrada* territories (the cathedral and the central square)
territory type	each territory is classified into one of five types: own, allied, neutral, rival, and non-*contrada*

The analysis was split into two parts. First, we provided general details of each procession, partly based on A.R.K.'s observations. Second, we used the GPS data to detail two features of the procession. As described in Section 2.2.2.6, the processioning *contrada* enters the territory of other "host" *contrade*, wherein the procession enters the host *contrada*'s church to pray, followed by a flag-toss with the host *contrada*. The GPS data assessed whether the time spent in each *contrada* territory and the number of visits to host *contrada*'s church, differed according to the relationship between the processioning *contrada* and the host *contrada*. A list of terms used throughout the analysis are collated in Table B10.

For each procession, we reported the total duration, distance, and number of costumed representatives. For the total distance, we re-created the route of the procession to provide a lower bound of the distance. We created an outline of the route on-line using openrouteservice.org. We sequentially added each building (church, clubhouse, or patronal site) as waypoints and set the route calculation in the browser to the setting "shortest" (i.e. trace the route that minimises the distance between waypoints). We manually adjusted the route where there were clear deviations from the GPS route. We calculated the distance from the outline

of the route using the package `geosphere`. We did not use the GPS data as "jumps" in the data — subsequent positions are often on the left-hand then the right-hand side of the road creating a "zig-zag" pattern — led to overestimates.

The GPS data was cleaned before analysis. We removed participants who did not indicate flag-waver or drummer (Section B6.1). We removed positions before the start of the procession, after the end of the procession, and during the pause for lunch. We also removed any obvious errors in the GPS data, e.g. a position approximately 25km north-east of Siena, and negative intervals. Notably, we manipulated any position that was recorded $\geq$ 120 seconds after the preceding position, which happened when participants e.g. entered a building and the connection between the GPS device and satellite was momentarily lost. For every position where the interval was $\geq$ 120 seconds we created an average between the preceding and subsequent position (a similar manipulation is in Pacheco-Cobos et al. 2010). We also calculated the percentage of the procession measured by the GPS devices, which is the number of positions recorded by each GPS device divided by the expected number of points, the latter based on the total duration.

The analysis of the GPS data focused on variation in each procession based on the classification of each area in the city centre of Siena into one of five territory types: own territory, allied territory, neutral territory, rival territory, and non-*contrada* territory. As discussed in Section 2.2.1, the city centre of Siena is divided into different territories, 17 of which are occupied by one of the *contrade*, plus two "non-*contrada* territories" occupied by the cathedral and central square (Figure 2.1). Furthermore, any pair of *contrade* may be in a neutral relationship, an alliance, or a rivalry (see Section 2.2.2.5). Therefore, each *contrada* territory can be classified by relationship type (alliance, neutral relationship, rivalry, as per Section B5.2), meaning for each *contrada* there are allied, neutral, and rival territories.

For each participant, we calculated the time spent in each territory i.e. the sum of the differences in time between any two subsequent positions that are within the same territory. We investigated the effect of territory type using a linear mixed-effects model with time spent as outcome, territory type (with levels own, ally, neutral, rival, non-*contrada* territory) as fixed effect, and the intercepts of each participant and participants' *contrada* as random effects. Significance was assessed at $p < .05$ via a mixed-model ANOVA with type III sum of squares. The model was analysed using the package `lmerTest` (Section 6.6). To compare the time spent based on territory type, we conducted post-hoc comparisons with a Tukey correction for multiple comparisons, using the package `emmeans` (Section 6.6).

Finally, we used the GPS data to demonstrate whether participants visited *contrada* churches. We do so across four steps. First, for each participant we created clusters of positions using a density-based clustering algorithm from the package `dbscan` (Section 6.6). Second, we estimated the centre of the cluster by taking the average of the positions in each cluster. Third, we created a polygon (that approximated a circle) around the centre of the cluster, of a given radius, set to 25 m. In the fourth and final step, we checked whether the coordinates of each *contrada* church is within a polygon created in the previous step. If the position of the church was in the polygon, then the participant was determined to have likely

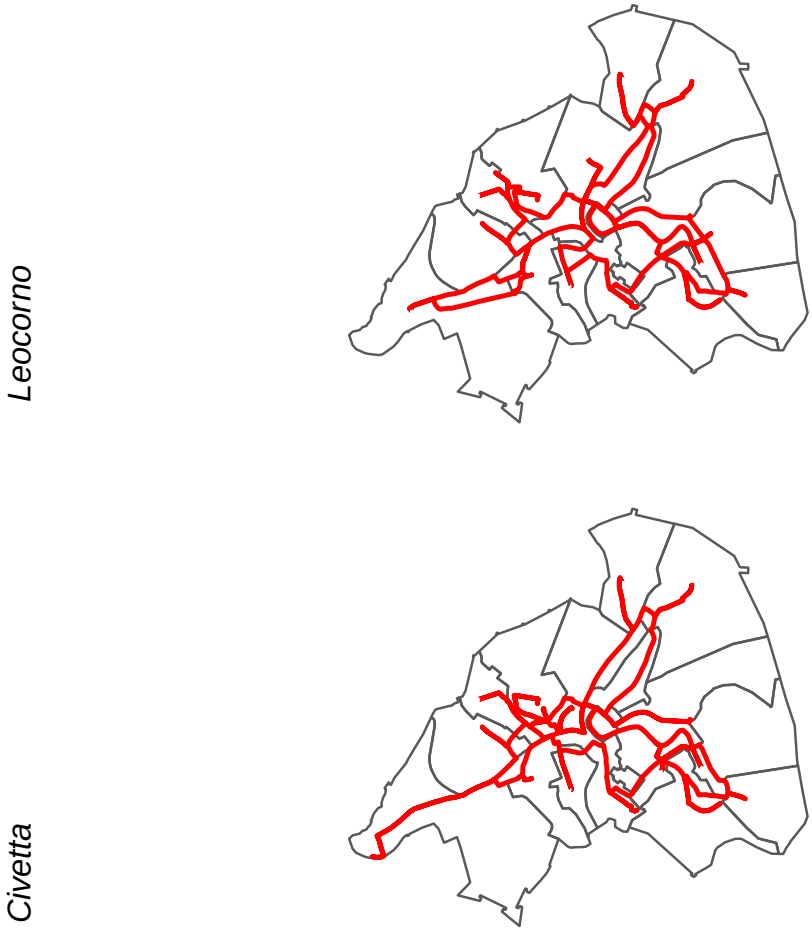


Figure B10: Outline of the *Civetta* and the *Leocorno* route. See Section B6.2 for more details.

been in, or at least near, the church or patronal site. We recorded this as a visit.

B6.3 Results

B6.3.1 General details of the processions

The *Civetta* procession began at 08:10 and ended at approximately 20:40, with a pause for lunch between 13:20 and 15:50. The *Leocorno* procession began at 08:10 and ended at 20:00, with a pause for lunch between 14:10 and 16:40. Therefore, the procession lasted 10.0 hours for *Civetta*, and 9.3 hours for *Leocorno*. The weather conditions were sunny for both processions, with a maximum temperature of 28.7°C for *Civetta* and 28.4°C for *Leocorno* (Siena Meteo 2018).

Figure B10 shows the outline of the route for *Civetta* and *Leocorno*, as described in Section B6.2. Based on the outline, the *Civetta* procession covered a distance of 12.1 km and the *Leocorno* procession 11.5 km.

A.R.K. counted a total of 79 and 90 costumed representatives, for *Civetta*

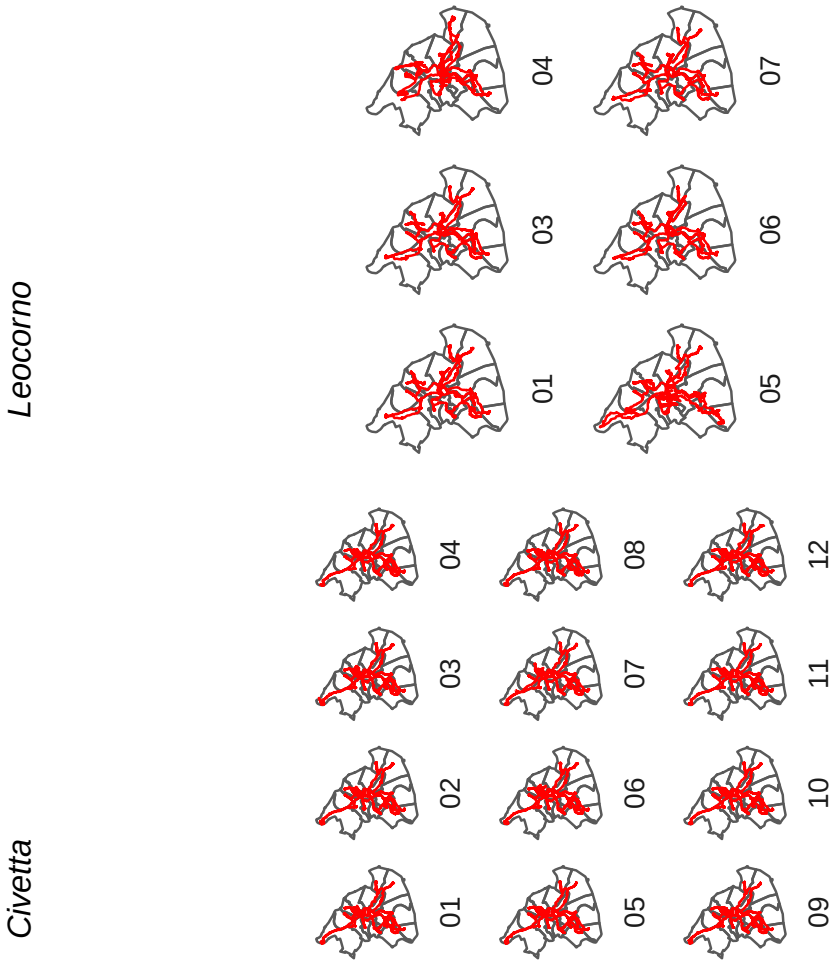


Figure B11: The route from the GPS devices for each *Civetta* and *Leocorno* participant. Number refers to device number.

and *Leocorno* respectively. Of these, 46 and 56 were flag-wavers, 28 and 30 were drummers, and 5 and 4 were pages, respectively.

Table B11: Time spent in each territory, order territory was visited, and the number of participants who visited the church of *contrada* territories, across 12 participants from *Civetta* [1]

		time (mins)			
territory type	name	*M*	*SD*	order[2]	visits[3]
own	*Civetta*	59	2	-	11
allied	*Giraffa*	67	3	5	12
	Istrice	64	2	2	12
	Pantera	63	11	13	11
	Aquila	58	11	16	11
neutral	*Onda*	34	2	6	12
	Lupa	25	2	3	12
	Nicchio	24	0	9	11
	Tartuca	23	2	15	10
	Selva	23	2	11	12
	Torre	23	1	7	12
	Valdimontone	22	1	8	12
	Drago	20	2	1	10
	Oca	20	1	10	12
	Bruco	20	3	4	11
	Chiocciola	15	1	14	12
rival	*Leocorno*	7	0	-	0
non-*contrada*	central square	21	1	17	-
	cathedral	8	0	12	-

[1] Order in table is by territory type, then by descending time spent.
[2] Order territories, excluding own, were visited i.e. a flag-toss was performed. All territories up to and including visit number 9 were in the morning, subsequent visits were in the afternoon. There is no figure for *Civetta* as it performs several flag-tosses in it's territory, and there is no figure for *Leocorno* as it was not visited.
[3] Visits based on cluster analysis; see Section B6.2.

B6.3.2 Time calculations and cluster analysis

The rest of the analysis used the data from the GPS devices. As detailed in Section B6.1, we removed the one *Leocorno* participant who indicated "other", meaning we analysed the procession of 12 *Civetta* members and six *Leocorno* members. Figure B11 shows the route for each participant. The percentage of the procession measured by the GPS devices, based on the number of positions recorded divided by the expected number of points, was 92.4% ($SD = 1.9$ %) and 95.3% ($SD = 4.1$ %) for *Civetta* and *Leocorno*, respectively.

As outlined in Section B6.2, we calculated the time spent in each of the 19 territories, i.e. the territories of the 17 *contrade* and the two non-*contrada* territories. Tables B11 and B12 and Figures B12 and B13 show the distribution of durations

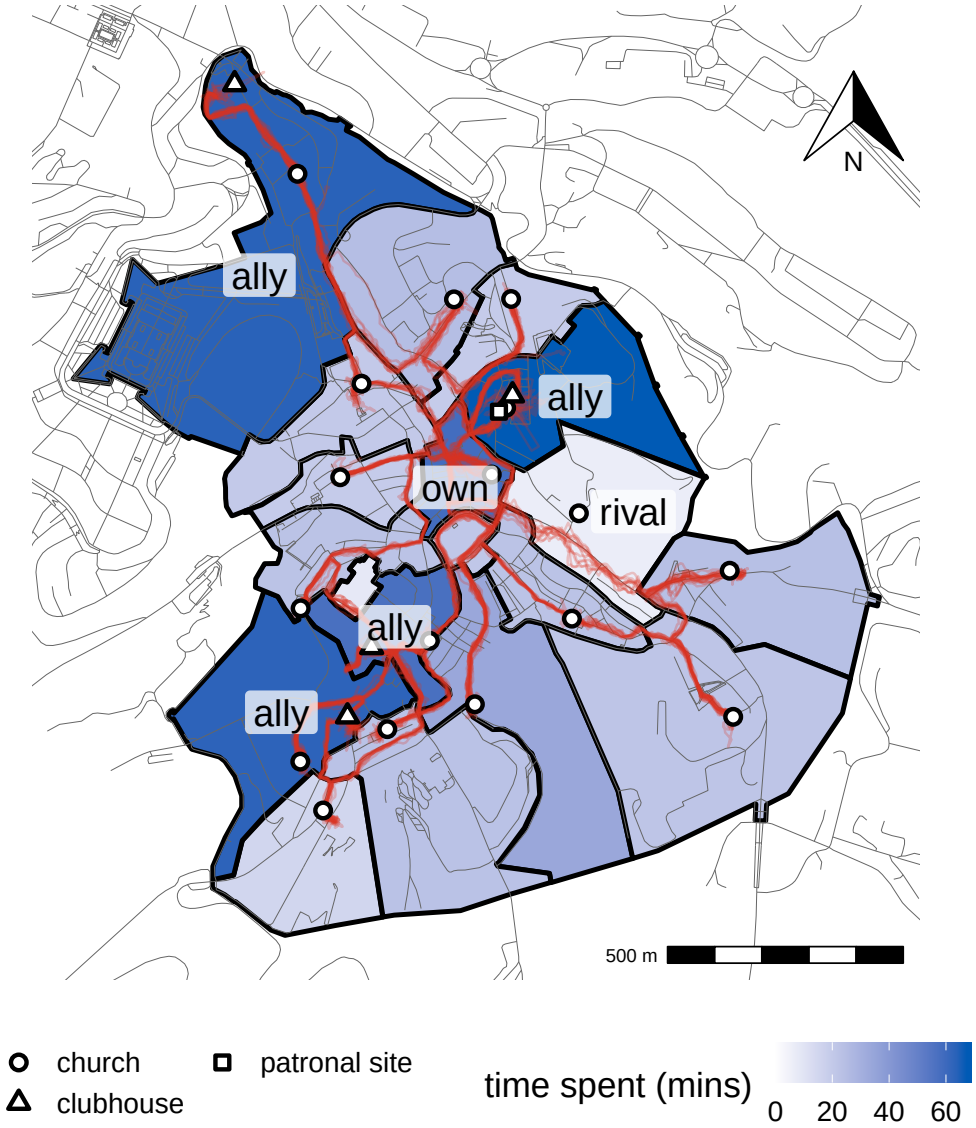


Figure B12: The GPS routes of the *Civetta* procession. The routes of the 12 participants are in red. The location of all *contrada* churches, ally *contrada* clubhouses, and the patronal site are indicated. The 19 territories, 17 *contrade* plus two non-*contrade* territories, are shaded with the time spent in each territory (in minutes). Labels for own, ally, and rival *contrade* territories are provided, while neutral and non-*contrada* territories are not. Base map data from OpenStreetMap (www.openstreetmap.org/copyright).

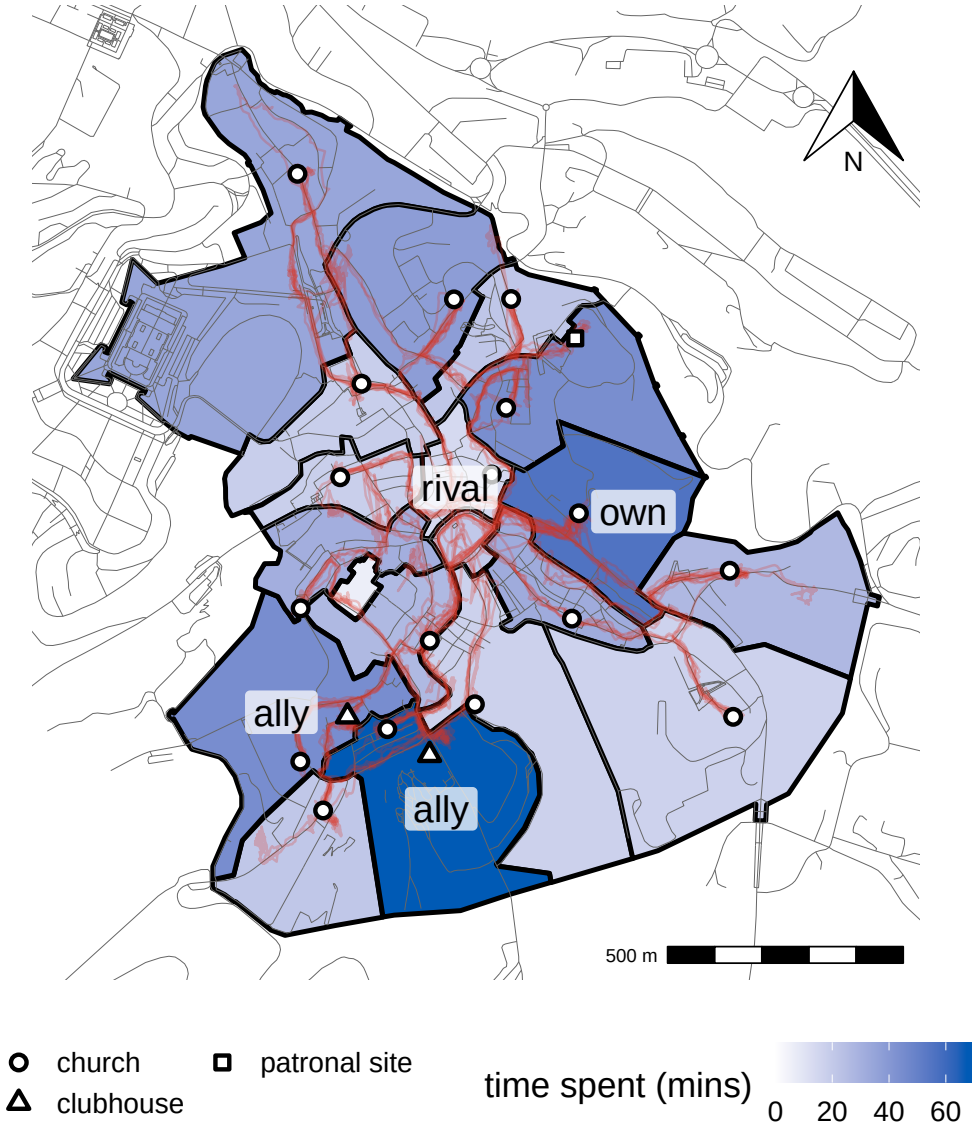


Figure B13: The GPS routes of the *Leocorno* procession. The routes of the 6 participants are in red. The location of all *contrada* churches, ally *contrada* clubhouses, and the patronal site are indicated. The 19 territories, 17 *contrade* plus two non-*contrade* territories, are shaded with the time spent in each territory (in minutes). Labels for own, ally, and rival *contrade* territories are provided, while neutral and non-*contrada* territories are not. Base map data from OpenStreetMap (www.openstreetmap.org/copyright).

Table B12: Time spent in each territory, order territory was visited, and the number of participants who visited the church of *contrada* territories, across six participants from *Leocorno* [1]

		time (mins)			
territory type	name	*M*	*SD*	order[2]	visits[3]
own	*Leocorno*	56	13	-	6
allied	*Tartuca*	67	7	11	5
	Pantera	45	9	7	4
neutral	*Giraffa*	44	1	12	5
	Lupa	38	16	14	6
	Istrice	35	3	16	4
	Torre	32	8	1	5
	Selva	31	12	5	4
	Nicchio	27	5	3	2
	Aquila	27	4	9	4
	Bruco	22	6	13	5
	Chiocciola	21	13	8	5
	Drago	19	10	15	4
	Oca	18	3	4	3
	Onda	17	3	10	5
	Valdimontone	17	8	2	4
rival	*Civetta*	14	2	-	0
non-*contrada*	central square	21	4	17	-
	cathedral	6	4	6	-

[1] Order in table is by territory type, then by descending time spent.
[2] Order territories, excluding own, were visited i.e. a flag-toss was performed. All territories up to and including visit number 11 were in the morning, subsequent visits were in the afternoon. There is no figure for *Leocorno* as it performs several flag-tosses in it's territory, and there is no figure for *Civetta* as it was not visited.
[3] Visits based on cluster analysis; see Section B6.2.

for *Civetta* and *Leocorno*. The pattern of time spent in *contrada* territory by relationship type was qualitatively similar for both *Civetta* and *Leocorno* (Tables B11 and B12). Taking the mean of both *contrade* (Table B14), the processions spent on average 57.3 minutes in their own territory. Focusing on the relationship type, the mean was highest in allied territories ($M = 59.5$ minutes), followed by neutral territories ($M = 24.8$ minutes), followed by rival territory ($M = 10.4$ minutes). The processions also spent on average 14.7 minutes in each of the two non-*contrada* territories. Table B14 shows that *Leocorno* spends more time in rival (*Civetta*) territory than vice versa (14.2 minutes vs. 6.7 minutes); this is because *Civetta* is located in the centre of the city, through which there are several main roads leading to other *contrade*.

Table B13: Difference in time spent by territory type[1]

territory type	Δ	SE	df	t	*p*	sig.[2]
own vs. allied	-4	2	326	-2	.377	
own vs. neutral	34	2	325	17	.000	***
own vs. rival	49	3	325	18	.000	***
own vs. non-*contrada*	43	2	325	18	.000	***
allied vs. neutral	38	1	326	31	.000	***
allied vs. rival	53	2	326	24	.000	***
allied vs. non-*contrada*	47	2	326	27	.000	***
neutral vs. rival	15	2	325	8	.000	***
neutral vs. non-*contrada*	9	2	326	6	.000	***
rival vs. non-*contrada*	-6	2	325	-2	.125	

[1] Based on post-hoc comparisons with a Tukey correction for multiple comparisons
[2] Significance: * $p < .05$, ** $p < .01$, *** $p < .001$

Table B14: Time spent in each territory for *Civetta* and *Leocorno* [1]

	Civetta		*Leocorno*		
territory type	*M*	*SD*	*M*	*SD*	overall
own	58.8	2.0	55.8	12.8	57.3
allied	62.9	8.4	56.1	14.2	59.5
neutral	22.7	4.7	26.8	11.4	24.8
rival	6.7	0.5	14.2	2.2	10.4
non-*contrada*	15.0	6.7	14.4	8.5	14.7

[1] Order in table is by territory type; time is in minutes.

The model revealed a significant effect of territory type on time spent $F(4, 325.7) = 357.1$, $p < .001$), with significant differences between all contrasts, except between own and allied territories and rival and non-*contrada* territories (Table B13).

Tables B11 and B12 also shows the order territory was visited, and the number of participants who visited the church of contrada territories. The cluster analysis found at least 10 out of 12 participants from *Civetta*, and at least 2 out of 6 participants from *Leocorno*, visited all *contrada* churches except the rival *contrada*'s church, which was not visited by any of the participants.

B6.4 Discussion

We analysed the 2018 processions of two *contrade*— *Civetta* and *Leocorno*– using data from GPS devices distributed to members participating in the annual ritual. We tracked the movement of 12 *Civetta* and 6 *Leocorno* costumed representatives as they walked around the 17 *contrade* and two non-*contrada* territories that compose the city centre of Siena. A.R.K. also followed each procession making observations.

We preface the discussion of the procession with a few caveats. We used location data to estimate the duration in each territory, which is more reliable than a purely descriptive analysis. However, the estimates should still be considered approximate as there were inaccuracies with the GPS data, few participants were recruited from *Leocorno*, and we used territorial boundaries whose interpretation can differ (Section B1.1). Although the pattern of time calculations would be qualitatively the same with alternative boundaries. Furthermore, behaviour is ritualised, so the procession provides little information about the movement of members on an average day, a point we return to below.

With these caveats in mind, the analysis of the two processions — the results of which are largely applicable to the processions of the other 15 *contrade*— has two broad implications. First, we speculate that participation in the procession promotes affiliation with the in-group. Factors purported to have a positive effect on group processes are present during the ritual. The procession involves physical effort, as the procession lasts 9.3–10.0 hours, with many participants covering a distance of approximately 11.5–12.1 km in costumes made of thick velvet during summer months. Throughout the procession there is synchronous movement (e.g. performance of the flag-toss) and emotional arousal (e.g. collective singing in church and while perambulating). Several members A.R.K. spoke to during the procession highlighted how important the event was to members.

We calculated the time spent in the territory of each *contrada* by territory type (own, ally, neutral, and rival *contrada*, as well as non-*contrada* territory). Table B14 shows that the time spent in host *contrada* territory varied with relationship type, with the pattern of time spent in *contrada* territory by relationship type qualitatively similar for both *Civetta* and *Leocorno*. The analysis demonstrated how the relationship between *contrade* influences ritualised behaviour in Siena. Table B14 shows that the time spent in different *contrada* territories varies systematically by whether the territory is that of an ally, neutral, or rival *contrada*. Based on the average of both *Civetta* and *Leocorno*, the processions spent about an hour in their own territory and allied territory, then approximately 25 minutes in neutral territory, and approximately 10 minutes in rival territory. Minimal time is spent in rival *contrada* territory because the procession neither visits the rival's church — as demonstrated by the GPS data (Tables B11 and B12) — nor does the host *contrada* provide a reception. More time is spent in ally *contrada* territory — compared to neutral *contrade* — because each ally prepares a large sit-down meal where members from both *contrade* are present and speeches are exchanged. Commensality explains the time spent in the ally *contrade*.

The movement during the procession respects local symbolic patrimony. On a typical day, *contrada* relationship has less influence on the routes members take

when walking around the city centre. However, conversations during our fieldwork suggest that movement is constrained, particularly with respect to a rival. Members avoid walking through, and living in, a rival territory, citing a sense of discomfort. A *Civetta* member interviewed in June 2019 indicated that avoidance of rival areas can start from a young age: "but even when you're a child, you don't go to play in [the rival *contrada*] [...] I've always been afraid to go beyond [church at the boundary between the *contrade*], down there in that dump. We used to stop there, as far as I can remember, we never went any further [...] we would stay there."[2]

Finally, we highlight some features of the procession, notable from the analysis. The route of the *Civetta* and *Leocorno* processions are also broadly similar, because each procession follows major roads within the city centre. Note that the *Civetta* and *Leocorno* procession follow a different order (Tables B11 and B12). The processioning *contrada* has to coordinate approximate times with the host *contrade* before the procession, and as such the order varies between *contrade*.

Within each *contrada*, individual routes vary (Figure B11a). Major deviations between participants are due to individuals deliberately visiting other locations. During the procession, a few costumed representatives occasionally break away from the rest of the procession to perform a flag-toss at other locations, such as non-*contrada* churches or the homes of *protettori* who request it, as described below. These individuals may either be determined beforehand, or spontaneously during the procession. In particular, the routes among the *Leocorno* participants vary more than those among *Civetta* participants. For example, *Leocorno* participant `05` visits locations further north and south than the other *Leocorno* participants (Figure B11). This is because flag-tosses are performed outside the homes of *Leocorno* members who request a flag-toss. Note that visiting other homes during the procession is not a feature shared with *Civetta* or many other *contrade*, based on conversations A.R.K. had with *Leocorno* members during the procession.

Our analysis of the *giro* procession using data from GPS devices shows that ritualised behaviour is affected by the relationship between groups. Previous accounts have described the importance of relationship during the *giro* (Section 2.2.2.6). For example, Dundes and Falassi (1984: 136) notes that "[t]he visiting pattern [...] underscores the dynamics of the inter-contrada relationships, relationships which are also involved in the palio. In other words, one could tell simply from observing which contrade are visited by a contrada celebrating its saint's day something about the lines of alliance likely to be in effect at a given point in historical time." Our analysis has quantified this statement, and the procession more generally. We have been able to show that allied *contrade* spent more than twice as much time with each other than neutral *contrade*, with no visits between rival *contrade*. It is likely that the significant amount of time allied *contrade* spend with each other allows for interactions among their members and positive perceptions, with the lack of time between rival *contrade* providing no opportunity

2. From experiment 1 follow-up (Table B5); Ita. *"ma anche da bambini, non ci si va a giocare [nella* contrada *], nel senso. C'è, io sempre avuto remora andare oltre [name of church], la giù in quella postaccio. C'e, noi ci si fermava lì, che ricordi, non siamo mai andati oltre. Che io mi ricordi, ci si stava lì."*

for interaction and reinforcing negative attitudes (Section B5), although explicit testing is required to show such a link.

C

Supplementary information for Chapter 3

C1 Supplementary methods

Supplementary methods are divided into three sections. First, Section C1.1 includes additional details about the participants, namely the justification of the sample size (Section C1.1.1), exclusion criteria (Section C1.1.2), and a summary of the demographic characterisitics of the sample following exclusion (Section C1.1.3). Second, Section C1.2 includes additional details on the experimental design, i.e., whether data was collected before the July or August *palio* (Section C1.2.1) and the relationship between the *contrade* involved (Section C1.2.2). Finally, Section C1.3 provides additional details about the general procedure.

C1.1 Study population and participants

C1.1.1 Sample size justification

Sample size was determined as a compromise between logistical feasibility and statistical considerations. A power analysis was conducted before data collection, with $\alpha = 0.05$, $\beta = 0.80$, and an effect size $d = 0.60$. The effect size was derived from in-group and out-group cooperation among Catholic and Protestant neighbourhods in Belfast, Nortern Ireland (Silva and Mace 2015):

A minimal sample size of 45 participants per competition period was required, based on a two-sample t-test:

We decided to collect as many participants as possible during data collection. We successfully recruited at least 45 participants across low and high competition for the *contrade* with a rival, and low competition for the single *contrada* without a rival (*contrade* with a rival, low competition = 151; *contrade* with a rival, high competition = 131; *contrada* without a rival, low competition = 49; *contrada* without a rival, high competition = 36; all pre-exclusion). In total, we collected

more participants than required.

A subsequent power analysis shows that our sample size of 124 participants (number of participants in *contrade* with a rival during low competition) has a power of beta ≥ 0.80 at $\alpha = 0.05$ for effect sizes $d = 0.25$ (paired sample t-test):

C1.1.2 Exclusion criteria

We excluded a total of 39 participants. We excluded 22 participants from `C08`, due to interference from the `C08` collaborator during data collection. We excluded 8 participants who returned invalid questionnaires, i.e., failed to respond to the DG or saw the questionnaire before completion. We excluded 9 participants who indicated they had not paid the annual fee over the past two years, or who had returned incomplete questionnaires i.e., failed to respond to a single DG or saw the questionnaire before completion. We excluded participants who had not paid the annual fee as these would not be an official member of the *contrada*.

C1.1.3 Demographic characteristics

The following demographic information were collected before the games were played: age, sex, wealth, employment, and education. The following demographic information was collected after the game, alongside other survey questions: location of birth, location of residency, and percentage of lifetime spent in Siena. See Section C1.3.6 for complete list of survey questions.

Wealth is self-reported personal annual (net) income compared to the average local income. Employment has two levels, employed and not employed (including unemployed, student, and retired). Education is highest completed qualification and has two levels, lower and higher (lower = up to secondary school, higher = university degree). Born and residency each have two levels, not in Siena and in Siena (in Siena means within the province of Siena). Lifetime in Siena is percentage of lifetime spent living in Siena.

Distribution by *contrada*

Table C1: Demographic characteristics by *contrada*

		contrada			
	overall	C16	C05	C06	C11
n	**328**	73	57	120	78
age (mean (SD))	**44.0 (15.3)**	42.7 (14.1)	40.7 (15.4)	48.7 (14.9)	40.5 (15.5)
sex = male (%)	**64.6**	64.4	63.2	74.2	51.3
wealth (%)					
above	**33.8**	34.2	33.3	37.5	28.2
similar	**41.2**	34.2	49.1	47.5	32.1
below	**25.0**	31.5	17.5	15.0	39.7
employment = employed (%)	**74.4**	74.0	77.2	76.7	69.2
education = higher (%)	**36.6**	41.1	38.6	33.3	35.9
born = in Siena (%)	**75.5**	68.5	75.4	72.5	87.0
residency = in Siena (%)	**93.5**	100.0	91.2	88.1	97.4
% lifetime in Siena (mean (SD))	**88.3 (24.8)**	89.5 (21.2)	78.6 (33.7)	86.0 (28.7)	93.8 (15.6)

Table C1 shows the distribution of demographic characteristics by *contrada*, using Kruskal Wallis tests to compare across *contrade*. There was a significant difference between the *contrade* by age ($p = .016$), sex ($p = .012$), wealth ($p = .022$), location of birth ($p = .046$), and residency ($p = .005$). There was no significant difference between the *contrade* by education ($p = .729$), employment ($p = .647$), or lifetime spent in Siena ($p = .131$). Differences between *contrade* did not affect cooperation (see Section C2.2 below for an analysis of cooperation by *contrada*).

Distribution by competition

Table C2: Demographic characteristics by *contrada* type and by competition

	with rivals			without rivals		
	overall	low	high	**overall**	low	high
n	**250**	126	124	**78**	44	34
age (mean (SD))	**45.1 (15.1)**	47.3 (13.6)	42.9 (16.3)	**40.5 (15.5)**	41.4 (15.0)	39.4 (16.3)
sex = male (%)	**68.8**	66.7	71.0	**51.3**	36.4	70.6
wealth (%)						
above	**35.6**	38.1	33.1	**28.2**	20.5	38.2
similar	**44.0**	38.9	49.2	**32.1**	36.4	26.5
below	**20.4**	23.0	17.7	**39.7**	43.2	35.3
employment = employed (%)	**76.0**	79.4	72.6	**69.2**	72.7	64.7
education = higher (%)	**36.8**	38.1	35.5	**35.9**	36.4	35.3
born = in Siena (%)	**72.0**	73.0	71.0	**87.0**	86.4	87.9
residency = in Siena (%)	**92.3**	98.4	86.1	**97.4**	97.7	97.1
% lifetime in Siena (mean (SD))	**86.3 (27.2)**	90.3 (20.3)	83.1 (31.3)	**93.8 (15.6)**	94.0 (13.4)	93.5 (18.2)

Table C2 shows the distribution of demographic characteristics by competition in both the *contrade* with a rival and the *contrada* without a rival. Two-sided Mann Whitney U tests were used to compare across competition. For the *contrade* with a rival, there was a significant difference between low and high competition by age ($p = .012$) and residency ($p = .012$). For *contrade* with a rival there was no significant difference across competition by sex ($p = .465$), wealth ($p = .929$), employment ($p = .211$), education ($p = .670$), location of birth ($p = .720$), or percentage of lifetime spent in Siena ($p = .360$).

For the *contrade* with a rival, there was a significant difference between competition by sex ($p = .003$). For the *contrada* without a rival there was no significant difference across competition by age (p = .538), wealth ($p = .191$), employment ($p = .453$), education ($p = .928$), location of birth ($p = .853$), residency ($p = .882$), or percentage of lifetime spent in Siena ($p = .675$).

C1.2 Experimental design

C1.2.1 Assignment to high competition

Table C3 shows whether the data for high competition was collected in the two weeks preceding either the July or August *palio* 2017. In order to understand why two different *palii* were used, it is helpful to understand how participation in the *palio* is decided (for more information see Dundes and Falassi 1984: 58–60). Note that the July and August *palio* are two distinct events: participation in the July *palio* does not influence participation in the August *palio*.

Only ten of the 17 *contrade* participate in each *palio*, as there is not enough space to accommodate all 17 in the square. We knew seven of the ten *contrade* participating in the July *palio* 2017 before commencing this study, because these seven had not participated in the July *palio* 2016. Likewise, we knew seven of the ten *contrade* participating in the August *palio* 2017 before commencing this study, because these seven had not participated in the August *palio* 2016. This rule operates every year (Figure C1).

We knew only six weeks before the July *palio* 2017 which three *contrade* would be participating alongside the other seven *contrade*. Likewise for the August *palio* 2017. This is because every year three *contrade* from those not participating are randomly selected to participate ony six weeks before the *palio*. This selection process means that any one *contrada* could run no, one, or two *palii* in a given year.

Therefore we knew before data collection if and when the rival pairs (`C16` and `C05`, and `C08` and `C06`) were participating in the same *palio*. `C16` and `C05` were both participating in July 2017, and `C08` and `C06` in August. This is why we decided to collect data before different *palii* for different *contrade* (as discussed in Section C1.1.2 above, we subsequently decided to not collect data for `C08`). `C11` was participating in both the July and August *palio*. We decided to collect data during the August *palio* for logistical reasons. This way, we collected data for two *contrade* during the period preceding the July *palio* and two *contrade* during the period preceding the August *palio* (Table C3).

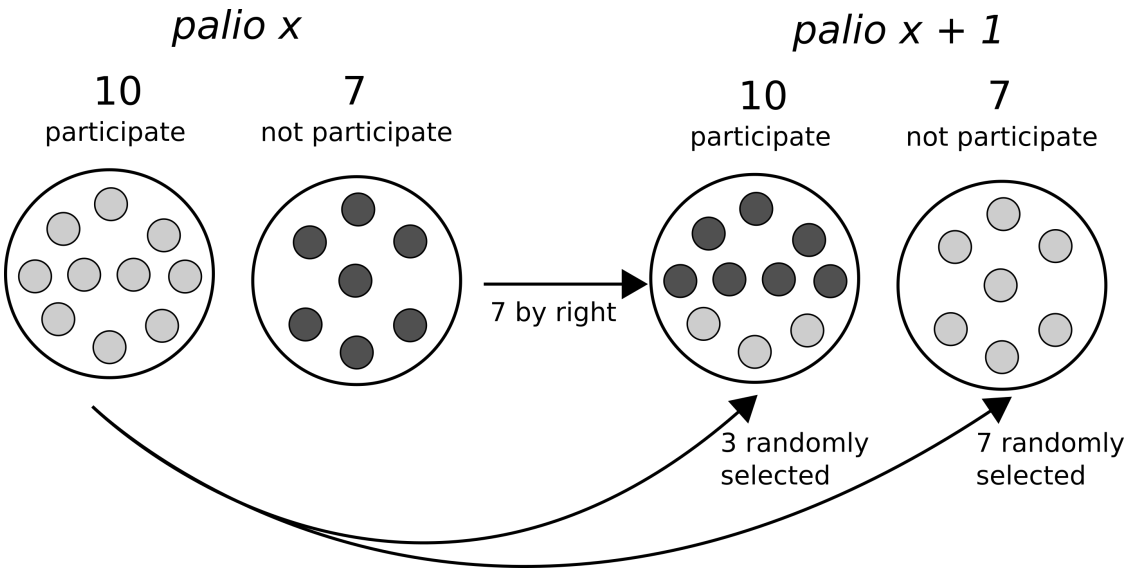


Figure C1: *Contrada* assignment process for each *palio*. Ten *contrade* participate in any one *palio* (*palio* x). The seven *contrade* that did not participate in *palio* x participate by right in the *palio* the following year (*palio* $x+1$). Three of the ten *contrade* that participated in *palio* x are randomly selected to participate in *palio* $x+1$ six weeks before *palio* $x+1$. The seven that were not randomly selected participate by right in *palio* $x+2$ and so on. Note that this assignment process is in place for the July and August *palio* separately, as they are two distinct events.

C1.2.2 Relationships between *contrade*

Table C3 shows the relationship between the *contrade* involved in the study. Two additional *contrade* were involved in the study but not included in the analysis (`C08` and `C03`). Data from `C08` was collected during low competition, but was excluded from analysis were removed due to interference from the `C08` collaborator (Section C1.1.2). Because of this, we decided not to collect data in `C08` for this study during high competition.

`C03` had initially agreed to participate in this study but subsequently declined, so data was not collected with them. However, we had already decided to use `C03` as the neutral out-group for `C16`.

In some cases the neutral out-group did participate in the *palio* in which data was collected for high competition, and in other cases the neutral out-group did not participate (Table C3). For `C16` the neutral out-group (`C03`) participated because it was randomly selected to participate six weeks before the July *palio* (see above). For `C11` the neutral out-group was known to participate during low competition — we decided to use `C06` as the neutral out-group so that each *contrada* was equally represented across the decisions of participants.

Table C3: Relationship between the sample of *contrade* analysed

		neutral out-group				
contrada	*palio*[1]	neutral *contrada*	ally *contrada*[2]	rival *contrada*	anonymous[3]	participated[4]
with a rival						
C16	July	-	C03	C05	-	yes
C05	July	C08	-	C16	-	no
C06	August	C05	-	C08	-	no
without a rival						
C11	August	C06	-	-	yes	yes

[1] whether data for high competition was collected before the July or the August *palio* 2017.
[2] analysed as a neutral out-group.
[3] whether an anonymous out-group was included.
[4] whether the neutral out-group participated in the *palio*.

C1.3 General procedure

C1.3.1 Selection of *contrade*

All 17 *contrade* were invited to participate in the study. The five *contrade* involved in the study were those that agreed to participate. A.R.K. coordinated appropriate dates and logistics for data collection with a collaborator from each *contrada*, who was a member of the *contrada*'s leadership team. The five *contrade* involved were thus not selected at random.

C1.3.2 Participant recruitment

Recruitment was carried out in a "walk-into-the-lab" fashion. Data collection occurred at well-attended *contrada* events, mainly before communal meals, where it was known that many *contrada* members would be present. Participants were recruited from among those present by either A.R.K., the collaborator, or a research assistant. Participation was voluntary. Participants were invited to a separate, private location within the clubhouse of the *contrada*, where they completed the questionnaire individually in sessions of between 1 and 8 participants.

Within each *contrada*, the sample of participants likely do not represent the total population of official *contrada* members. However, during recruitment, all members present at the event were invited to participate. Thus, our recruitment strategy captures a sample that represents members who actively participate in the *contrada*. This partly explains the male bias in participants, as more men frequent the *contrada* buildings and participate in the social and administrative side of the *contrada*.

Across the five *contrade* we have a more representative sample of *contrada* members, due to collection occurring over multiple events.

C1.3.3 Experimental procedure

Upon questionnaire administration, A.R.K. or the research assistant gave participants brief instructions in Italian (Section C1.3.7). Participants then completed the questionnaire in private. Questionnaires took between 10 and 20 minutes to complete. Upon completion, participants returned the questionnaire to A.R.K. or the research assistant directly. Further instructions for earnings were then given.

Each participant retained a raffle ticket with a number corresponding to their questionnaire. Participants were asked to return at the end of the event to collect their earnings, showing their raffle ticket. Participants earned on average €1.93 (SD = €0.72). Earnings for the recipient were on average €1.07 (SD = €0.71).

C1.3.4 Randomisation

Order Multiple versions of the questionnaire with the order of DGs randomised were generated by computer. For each *contrada*, questionnaires were then manually shuffled.

Earnings Earnings were based on a randomly determined preference DG, chosen by rolling a three-sided die. The numbers 1, 2, and 3 represented the corresponding preference DG.

C1.3.5 Language

Recruitment and oral instructions were completed in Italian. The questionnaire, in Italian, was written by A.R.K. and L.F. and proofread by collaborators and an Italian research assistant.

C1.3.6 Survey

The questionnaire comprised multiple sections. The final section was a survey. Some survey data, related to key demographic information, have been summarised in Section C1.1.3. All the survey data has been analysed in Chapter 2, together with other survey data collected during a separate study (Chapter 4). For completeness, the questions that formed part of the survey are included here.

- Location of birth
- Residency
- Percentage of lifetime spent in Siena
- Reasons for *contrada* membership
- Paid member
- Leadership role
- Frequency of social and organisational participation
- *Contrada* membership of closest friends
- Feeling of *contrada* superiority
- Religious participation

Responses to the survey questions were not analysed in models, although the "paid member" question was used to exclude participants who were not members who had payed the annual fee (Section C1.1.2). The survey questions were not asked before the DG and therefore did not influence decisions in the game.

C1.3.7 Scripts

The following instructions were read aloud by either A.K. or the research assistant in Italian. An English translation is provided. All scripts correspond to instructions read to participants who completed the study as the participant.

Game administration *Ciao, grazie per la sua partecipazione! Lo studio è composto da questo breve questionario. Prima di compilare il questionario è pregata di leggere le informazioni, e dare il suo consenso. Se non dà il consenso non potrà partecipare! Tutto dovrebbe essere spiegato nelle informazioni, ma rimango a sua disposizione per rispondere a qualsiasi domanda.*

Grazie per il consenso. C'è una tavola qui apposta per compilare in privato. Quando ha finito per favore consegna il questionario a me, poi spiegherò il pagamento.

Hello, thank you for participating in this study! You will be handed this small pack which contains a questionnaire. Before you complete the questionnaire, please read the information sheet on the first page, and give your consent. If you do not give your consent, you cannot complete the questionnaire. Please read this information sheet here, and ask me if you are unsure of anything. *(Hand over pack, and wait for participant to read information sheet. Answer any questions, ensuring the aim of the study is not shared. Once consent is given, continue with script).*

Thank you for providing consent. If you could please make your way to the [designated] space over there *(gesture)*, where you can fill the questionnaire in private. Once you have finished, return the questionnaire to me. I will then explain how you will receive your payment.

Game retrieval *Grazie per aver completato il questionario. Questo dado hai deciso il suo pagamento: il numero corresponde alla uno delle sue decisione in situazione A. Sarà pagato quello che ha deciso lei, eppure un altro a caso. Adesso inserisco il suo pagamento in una busta. Alla fine della serata (insert expected end time), se viene da me con questo bigliettino potrà ritirare una piccola somma, in base ad una sua decisione.*

Thank you for completing the questionnaire. In order to decide your payment, this die was rolled. The number that came up will correspond with the order of one of the decisions you made in situation A. You will get paid the amount that you decided, as will the other random person. Now I will count out your payment, and place it into this envelope. Your envelope corresponds to this ticket number. Please pick up the envelope with your payment at the end of the study today, at around *(Insert expected end time).*

Pay outs *Ciao ancora, grazie per la sua partecipazione. Ha il bigliettino? Perfetto, grazie. Dunque questa busta è sua. Grazie!*

Hello again, thank you for participating! Did you complete the questionnaire? *(wait for answer, if 'yes')* Excellent, thank you. Now if you can pass me your raffle ticket *(wait for ticket)* I can give you the corresponding envelope. Here you go, thank you!

C1.3.8 Questionnaire

The original questionnaire (in Italian), followed by an English translation, are included here. Collaborator and *contrada* names have been removed and placed within square brackets, as have contact details. *Contrada* flags have been removed to preserve anonymity. The order of the games differed between participants. The raffle ticket was stapled to the final page.

La socialità contemporanea a Siena: uno studio antropologico

Questionario sulle Contrade per l'Università di Oxford

Il presente questionario è parte integrante di un progetto di studio sulla vita sociale contemporanea a Siena, in particolare come le persone si relazionano al Palio, alla propria Contrada, ed alle altre Contrade. Lo studio, condotto in collaborazione con le Contrade, si svolgerà nell'arco di un anno.

Il progetto è finalizzato alla realizzazione della tesi di dottorato di Adam Kenny, dottorando presso la facoltà di antropologia dell'Università di Oxford.

Per qualsiasi informazione puoi rivolgerti al ricercatore (o al suo assistente) presente durante lo studio, o a [COLLABORATOR NAME].

Benvenuto a questo studio e grazie per la tua partecipazione!

Sei pregato di compilare il questionario **da solo/a**. Mentre stai compilando il questionario è importante che eviti di parlare con i tuoi vicini di tavola. Inoltre, cerca di evitare che altri leggano il questionario e le tue risposte — le risposte sono personali! Appena finito il questionario, per favore consegnalo direttamente al ricercatore (o al assistente) presente o a [COLLABORATOR NAME]. Alla fine di non influenzare le risposte di altri, ci affidiamo alla tua discrezione riguardo allo studio!

Puoi cominciare il questionario dopo aver letto le informazioni ed aver dato il tuo consenso sulla pagina seguente. Se non dai il tuo consenso, non puoi partecipare!

Informazioni e consenso

Informazioni generali

Lo studio è composto da questo questionario. Dovrebbe durare al massimo 10 minuti. Il questionario è diviso in tre sezioni. Nella prima dovrai fornire delle informazione di base, per esempio su età e sesso. Nella seconda dovrai prendere delle decisioni. Nell'ultima sezione ci saranno delle domande su Siena e sulle Contrade. **I dati saranno anonimi dall'inizio e non potrai essere identificato dagli stessi.**

Consenso

- **Confermo di aver letto le informazioni** ☐ Sì ☐ No
- **Dichiaro di avere almeno 18 anni di età** ☐ Sì ☐ No
- **Do il mio consenso a partecipare a questo studio** ☐ Sì ☐ No

---

Informazioni specifiche

Chi conduce la ricerca? La ricerca è condotta da Adam Kenny (dottorando, Università di Oxford) e Laura Fortunato (ricercatore principale, Università di Oxford).

Come si svolge lo studio? Lo studio durerà al massimo 10 minuti, ed è composto da un questionario diviso in tre sezioni, in cui dovrai: 1) fornire alcune informazioni di base, 2) prendere delle decisioni in una serie di "giochi", 3) rispondere a domande su Siena e sulle Contrade. Nei giochi dovrai decidere come distribuire una piccola somma (€3,00). In base alle tue decisioni durante i giochi, alla fine del questionario potrai ricevere almeno una parte di questa somma.

Chi finanzia questo studio? Questo studio è finanziato dal John Fell Fund dell'Università di Oxford. Quindi non c'è nessun costo per te, per le Contrade, o per il ricercatore.

Devo participare? La decisione se partecipare allo studio è tua. Se decidi di participare, potrai ritirarti in un momento successivo (unitamente ai tuoi dati), avvisando il ricercatore della tua decisione. Questo non comporterà alcuna conseguenza negativa.

Che cosa succede ai dati forniti? I dati della ricerca saranno archiviati in modo sicuro e confidenziale. I dati saranno anonimi dall'inizio e non potrai essere identificato dagli stessi. I ricercatori vedranno solo le informazioni fornite nel questionario.

La ricerca sarà pubblicata? I risultati della ricerca saranno inclusi nella tesi di dottorato del ricercatore. Alla conclusione del dottorato, la tesi sarà depositata sia a stampa che on-line negli archivi dell'Università di Oxford, per facilitare il suo utilizzo in ricerche future. Inoltre, i risultati della ricerca potranno essere pubblicati in una rivista accademica e/o su altre pubblicazioni accademiche. A sostegno di queste pubblicazioni, i dati anonimi potranno essere pubblicati on-line con accesso aperto al pubblico.

Chi ha riveduto questo studio? Il questionario è stato revisionato in collaborazione con le Contrade coinvolte. Lo studio ha ricevuto approvazione etica dalla seguente commissione: *Departmental Research Ethics Committee, School of Anthropology and Museum Ethnography, University of Oxford.*

Chi devo contattare se ho un quesito riguardante lo studio e/o voglio presentare un reclamo? Se hai un quesito su qualsiasi aspetto dello studio, sei pregato di parlarne con il ricercatore (Adam Kenny, email: [EMAIL ADDRESS], tel: [TELEPHONE NUMBER]) o con il suo relatore (Laura Fortunato). Il ricercatore dovrà risponderti entro 10 giorni lavorativi e darti un'indicazione di come intende rispondere al quesito. Se rimani insoddisfatto e/o desideri effettuare un reclamo formale, sei pregato di contattare il responsabile della commisione *Departmental Research Ethics Committee*, che si impegnerà a risolvere il tuo quesito in un tempo ragionevolmente rapido: *[CHAIR],Departmental Research Ethics Committee, School of Anthropology and Museum Ethnography, University of Oxford, 51/53 Banbury Road, Oxford, OX2 6PE, UK; email: [EMAIL ADDRESS]*

Sezione 1: Domande su di te

1. **In che anno sei nato?** _____
2. **Di che sesso sei?** ☐ Maschio ☐ Femmina
3. **Descrivi al meglio la tua situazione lavorativa**
   - ☐ Occupato:
     - ☐ settore pubblico
     - ☐ settore privato
     - ☐ dipendente
     - ☐ imprenditore
   - ☐ Disoccupato
   - ☐ Pensionato
   - ☐ Studente
   - ☐ Altro: _____
4. **Rispetto al reddito medio nazionale di €27.500 (annuo lordo), in quale fascia si colloca il tuo?**
   ☐ Più della media ☐ Simile alla media ☐ Meno della media
5. **Qual è il tuo titolo di studio?** ***Indica il livello completato più alto.***
   - ☐ Licenza elementare
   - ☐ Licenza media
   - ☐ Qualifica professionale
   - ☐ Diploma di scuola superiore
   - ☐ Laurea
     - ☐ triennale
     - ☐ specialistica/magistrale
   - ☐ Post-laurea (master o dottorato)
   - ☐ Nessuno
   - ☐ Altro: _____

Sezione 2: Giochi di decisione

Adesso parteciperai ad una serie di giochi di decisione. Per ogni gioco, il ricercatore metterà a disposizione una piccola somma (in totale €3,00).

Di questa somma, una parte sarà data a te, e il resto sarà dato ad un'altra persona. Questa persona è un altro contradaiolo scelto a caso e tu non ne conoscerai l'identità.

Ci sono due scenari:

- **Scenario A** In questo scenario, *tu decidi* come ridistribuire il denaro tra te e l'altra persona rispetto alla distribuzione iniziale.
- **Scenario B** In questo scenario, devi indicare come *tu pensi* che l'altra persona *ridistribuirebbe* il denaro rispetto alla distribuzione iniziale.

Questo è un **esempio** di **scenario A**.

Tu ricevi €2,50. L'altra persona riceve €0,50. Come vuoi ridistribuire il denaro?

tu prendi dall'altra persona ⟵ | **distribuzione iniziale** ⇓ | tu dai all'altra persona ⟶

Io (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Altro/a (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decisione								✗								

Devi segnare con **una sola croce** la tua decisione nell'ultima riga della tabella, come sopra. In questo caso, tu hai deciso che la distribuzione finale sarà €2,10 a te e €0,90 all'altra persona. Quindi, rispetto alla distribuzione iniziale, tu hai dato €0,40 all'altra persona.

Questo è un **esempio** di **scenario B**.

Tu ricevi €0,50. L'altra persona riceve €2,50. Come *pensi* che l'altra persona *ridistribuirebbe* il denaro?

l'altra persona prende da te ⟵ | **distribuzione iniziale** ⇓ | l'altra persona dà a te ⟶

Altro/a (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Io (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decisione				✗												

Devi segnare con **una sola croce** la tua decisione nell'ultima riga della tabella, come sopra. In questo caso, tu pensi che la distribuzione finale decisa dall'altra persona sarà €2,70 a sé e €0,30 a te. Quindi, rispetto alla distribuzione iniziale, tu pensi che prenderebbe €0,20 da te.

Adesso farai decisioni in 6 giochi: 3 per **scenario A** e 3 per **scenario B**.

Una volta completato il questionario, una delle tue decisioni in **scenario A** verrà scelto a caso, e tu e l'altra persona riceverete somme corrispondenti a questa decisione.

Scenario A: Tu ricevi €2,50. L'altra persona riceve €0,50.
L'altra persona è [CONTRADA NAME 1].



Come vuoi ridistribuire il denaro?

Io (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Altro/a (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decisione																

Scenario A: Tu ricevi €2,50. L'altra persona riceve €0,50.
L'altra persona è [CONTRADA NAME 2].



Come vuoi ridistribuire il denaro?

Io (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Altro/a (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decisione																

Scenario A: Tu ricevi €2,50. L'altra persona riceve €0,50.
L'altra persona è [CONTRADA NAME 3].



Come vuoi ridistribuire il denaro?

Io (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Altro/a (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decisione																

Scenario B: Tu ricevi €0,50. L'altra persona riceve €2,50.
L'altra persona è [CONTRADA NAME 1].



Come pensi l'altra persona ridistribuirebbe il denaro?

Altro/a (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Io (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decisione																

Scenario B: Tu ricevi €0,50. L'altra persona riceve €2,50.
L'altra persona è [CONTRADA NAME 2].



Come pensi l'altra persona ridistribuirebbe il denaro?

Altro/a (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Io (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decisione																

Scenario B: Tu ricevi €0,50. L'altra persona riceve €2,50.
L'altra persona è [CONTRADA NAME 3].



Come pensi l'altra persona ridistribuirebbe il denaro?

Altro/a (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Io (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decisione																

Sezione 3: Tu, Siena, e la Contrada

1. **Dove sei nato?**
   - ☐ Fuori dal Comune di Siena
   - ☐ Nel Comune di Siena
   - ☐ Sulle lastre

2. **Dove abiti?**
   - ☐ Dentro le mura:
     - ☐ nella tua Contrada
     - ☐ in un'altra Contrada
   - ☐ Fuori dalle mura:
     - ☐ nel Comune di Siena
     - ☐ nella Provincia di Siena
   - ☐ in Toscana
   - ☐ in Italia
   - ☐ all'estero

3. **Ti è capitato di vivere per qualche tempo fuori dalla Provincia di Siena?**
   - ☐ No
   - ☐ Sì, per _____ anni e _____ mesi (complessivamente)

4. **Sei contradaiolo di questa Contrada perché:**
   - ☐ Entrambi i tuoi genitori eranno contradaioli di questa Contrada
   - ☐ Uno dei tuoi genitori era contradaiolo di questa Contrada:
     - ☐ madre ☐ padre
   - ☐ Sei nato nel territorio della Contrada
   - ☐ Hai scelto di fare parte di questa Contrada
   - ☐ Altro: _____

5. **Sei stato un *protettore* negli ultimi due anni?** ☐ Sì ☐ No

6. **Hai avuto un incarico nella direzione della Contrada?** ***Puoi indicare più di una risposta.***
   - ☐ Sì, in questo momento:
     - ☐ Seggio direttivo
     - ☐ Dirigenza Paliesca
     - ☐ Consiglio di Società
     - ☐ Altro: _____
   - ☐ Sì, in passato:
     - ☐ Seggio direttivo
     - ☐ Dirigenza Paliesca
     - ☐ Consiglio di Società
     - ☐ Altro: _____
   - ☐ No

7. **Nell'*ultimo mese*, con quale frequenza hai partecipato alla vita <u>sociale</u> della Contrada?** ***Per esempio, partecipando alle cene, frequentando la Società o altro.***
   - ☐ Mai
   - ☐ Una volta al mese
   - ☐ 2–3 volte al mese
   - ☐ Quasi ogni settimana
   - ☐ Ogni settimana
   - ☐ 2–3 volte alla settimana
   - ☐ Quasi ogni giorno
   - ☐ Ogni giorno

8. **Nell'*ultimo mese*, con quale frequenza hai partecipato alla vita <u>organizzativa</u> della Contrada?** ***Per esempio, partecipando alle assemblee, aiutando in iniziative degli organismi o altro.***
   - ☐ Mai
   - ☐ Una volta al mese
   - ☐ 2–3 volte al mese
   - ☐ Quasi ogni settimana
   - ☐ Ogni settimana
   - ☐ 2–3 volte alla settimana
   - ☐ Quasi ogni giorno
   - ☐ Ogni giorno

9. Pensa ai tuoi 5 migliori amici. Di questi 5, quanti:

a. sono contradaioli della *tua* Contrada?	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5
b. sono contradaioli di *un'altra* Contrada?	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5
c. *non* sono contradaioli?	□ 0	□ 1	□ 2	□ 3	□ 4	□ 5

Per favore, assicurati che il totale delle risposte alle domande a.–c. sia 5!

10. *In generale, la mia Contrada è meglio della maggior parte delle altre Contrade.* Quanto sei d'accordo con questa frase?

□	□	□	□	□
Decisamente d'accordo	D'accordo	Né d'accordo né in disaccordo	In disaccordo	Decisamente in disaccordo

11. Con quale frequenza assisti a riti religiosi?

- □ Mai
- □ Una volta all'anno
- □ Più volte all'anno
- □ Più volte al mese
- □ Ogni settimana
- □ Più volte alla settimana

12. Negli scenari A dei giochi precedenti, quanti € potevi avere nella distribuzione finale per massimizzare la tua somma *personale*?

□ €2,50 □ €3,00 □ €5,00

13. Negli scenari A dei giochi precedenti, quanti € potevi avere nella distribuzione finale per massimizzare la somma *dell'altra persona*?

□ €0,50 □ €1,00 □ €2,50

14. Hai già fatto parte di questo studio?

□ No □ Si, ho completato il questionario

GRAZIE PER LA TUA PARTECIPAZIONE!
Per favore, **consegna il questionario direttamente** al ricercatore (o al suo assistente) presente durante lo studio, o a [COLLABORATOR NAME].

Prima di consegnare il questionario, sei pregato di **strappare il biglietto** di sopra. Questo biglietto va presentato al ricercatore (o al assistente presente) alla fine della serata, per ritirare la somma corrispondente ad una tua decisione.

Contemporary sociality in Siena: an anthropological study

Questionnaire about the Contrade for the University of Oxford



This questionnaire forms part of a project on contemporary social life in Siena, in particular on how people relate to the Palio, and the Contrade. The project, conducted in collaboration with the Contrade, is being conducted over the course of a year.

The project is in support of a doctoral thesis by Adam Kenny, student at the faculty of anthropology at the University of Oxford.

For further information please refer to the researcher (or to his assistant) present throughout the study, or to [COLLABORATOR NAME].

Welcome to this study and thank you for your participation!

You are invited to complete the questionnaire **by yourself**. Whilst answering the questionnaire it is important that you avoid talking to those around you. Furthermore, avoid having others read your questionnaire — the answers are personal! Once complete, please hand the questionnaire directly to the researcher (or his assistant). So as not to influence others, we appreciate your discretion with regards to the questionnaire and the questions therein!

You may begin the questionnaire after you have read the information and given your consent on the next page. If you do not give your consent, you cannot participate!

Information and consent

General information

The study is composed of this questionnaire. It should last about 5 minutes. The questionnaire is divided into three sections. In the first, you will have to provide some basic information, for example age and sex. In the second, you will have to make some decisions. In the last section there will be some questions on Siena and the Contrade. **Data will be anonymised from the beginning and it will not be possible to identify you from the data.**

Consent

- **I have read the information sheet** ☐ Yes ☐ No
- **I confirm that I am 18 years of age or older** ☐ Yes ☐ No
- **I give my consent to participate in this study** ☐ Yes ☐ No

Specific information

Who is conducting the research? The research is conducted by Adam Kenny (postgraduate student, University of Oxford) and Laura Fortunato (principal researcher, University of Oxford).

What will happen in the study? The study will last about 5 minutes, and is composed of this questionnaire divided in three sections, in which you'll have to: 1) provide some basic information, 2) make decisions in a series of "games", 3) reply to questions on Siena and the Contrade. In the games you'll have to decide how to distribute a small sum (€3,00). Based on your decisions during the games, at the end of the questionnaire you can receive at least a part of this sum.

Who is funding this study? This project is funded by the John Fell Fund of the University of Oxford. Therefore there is no cost for you, the Contrade, the School, or the researcher.

Do I have to take part? You can choose whether to participate in the study. If you agree, you may withdraw yourself or your data from the study at any time by advising the researchers of your decision. This will not impose any adverse consequences.

What happens to the research data provided? The research data will be securely and confidentially stored. The data will be anonymised from the beginning and cannot be traced back to you. The persons conducting the study will see only information provided in the questionnaire.

Will the research be published? The results of the research may be included in the researcher's doctoral thesis. On successful submission of the thesis, it will be deposited both in print and online in the University archives, to facilitate its use in future research. Furthermore, the research may be published as a research article in an academic journal and/or other academic publications. The anonymised data may also be published online with open access in support of these publications.

Who has reviewed this project? The questionnaire has been reviewed in collaboration with the involved Contrade. This project has been reviewed by, and received ethics clearance through the following commissions: *Departmental Research Ethics Committee, School of Anthropology and Museum Ethnography, University of Oxford.*

Who do I contact if I have a concern about the study or I wish to complain? If you have a concern about any aspect of this project, please speak to the relevant researcher (Adam Kenny, email: [EMAIL ADDRESS], tel: [TELEPHONE NUMBER]) or his supervisor (Laura Fortunato), who will do their best to answer your query. The researcher should acknowledge your concern within 10 working days and give you an indication of how he/she intends to deal with it. If you remain unhappy or wish to make a formal complaint, please contact the chair of the *Departmental Research Ethics Committee, School of Anthropology and Museum Ethnography*, who will seek to resolve the matter in a reasonably expeditious manner: *[CHAIR], Departmental Research Ethics Committee, School of Anthropology and Museum Ethnography, University of Oxford, 51/53 Banbury Road, Oxford, OX2 6PE, UK; email: [EMAIL ADDRESS]*

Section 1: Questions about you

1. **In what year were you born?** _____
2. **What sex are you?** ☐ Male ☐ Female
3. **Which best describes your working situation.**
   - ☐ Employed:
     - ☐ Public sector
     - ☐ Private sector
     - ☐ staff member/worker
     - ☐ entrepreneur/business owner
   - ☐ Unemployed
   - ☐ Pensioner
   - ☐ Student
   - ☐ Other: _____
4. **With respect to the average Italian salary of €27,500 (gross annual), where would you locate yours?**
   - ☐ Above the average ☐ Similar to the average ☐ Less than the average
5. **What qualification do you have?** ***Indicate the highest level completed.***
   - ☐ Primary school certificate
   - ☐ Secondary school (middle school) certificate
   - ☐ Vocational diploma
   - ☐ Secondary school (high school or college) certificate
   - ☐ University degree
     - ☐ bachelor's
     - ☐ master's
   - ☐ Post-graduate (e.g. doctorate)
   - ☐ None
   - ☐ Other: _____

Section 2: Decision games

You will now be presented with a series of decision games. For every game, the researcher will provide a small sum (in total €3.00).

A part of this sum will be given to you, and the rest shall be given to another person. This person is a randomly selected Contrada member and you will not know their identity.

There are two scenarios:

- **Scenario A** In this scenario, *you decide* how to redistribute the money between yourself and the other person, with respect to the initial distribution.
- **Scenario B** In this scenario, you have to indicate how *you think* the other person *would* redistribute the money, with respect to the initial distribution.

This is an **example** of **scenario A**.

You receive €2.50. The other person receives €0.50. How would you like to redistribute the money?

you take from the other person ⟵ | **initial distribution** ⇓ | you give to the other person ⟶

Me (€)	3.00	2.90	2.80	2.70	2.60	**2.50**	2.30	2.10	1.90	1.70	1.50	1.30	1.10	0.90	0.70	0.50
Other (€)	0.00	0.10	0.20	0.30	0.40	**0.50**	0.70	0.90	1.10	1.30	1.50	1.70	1.90	2.10	2.30	2.50
Decision								✗								

You have to indicate your decision with **one single cross** in the last line of the table, as above. In this case, you would have decided that the final distribution will be €2.10 for you and €0.90 for the other person. Therefore, with respect to the initial distribution, you would have given €0.40 to the other person.

This is an **example** of **scenario B**.

You receive €0.50. The other person receives €2.50. How do you *think* the person *would redistribute* the money?

the other person takes from you ⟵ | **initial distribution** ⇓ | the other person gives to you ⟶

Other (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Me (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decision				✗												

You have to indicate your decision with **one single cross** in the last line of the table, as above. In this case, you think that that the final distribution decided by the other person would be €2.70 for you and €0.30 for the other person. Therefore, with respect to the initial distribution, you think the other person would have taken €0.20 from you.

You will now make decisions in 6 games: 3 for **scenario A** and 3 for **scenario B**.

Once you have completed the questionnaire, one of your decisions **scenario A** will be randomly selected, and you and the other person will receive the amount corresponding with that decision.

Scenario A: You receive €2,50. The other person receives €0,50.
The other person is from the [CONTRADA NAME 1].



How would you like to redistribute the money?

Me (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Other (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decision																

Scenario A: You receive €2,50. The other person receives €0,50.
The other person is from the [CONTRADA NAME 2].



How would you like to redistribute the money?

Me (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Other (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decision																

Scenario A: You receive €2,50. The other person receives €0,50.
The other person is from the [CONTRADA NAME 3].



How would you like to redistribute the money?

Me (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Other (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decision																

Scenario B: You receive €0,50. The other person receives €2,50.
The other person is from the [CONTRADA NAME 1].



How do you think the person would redistribute money?

Other (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Me (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decision																

Scenario B: You receive €0,50. The other person receives €2,50.
The other person is from the [CONTRADA NAME 2].



How do you think the person would redistribute money?

Other (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Me (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decision																

Scenario B: You receive €0,50. The other person receives €2,50.
The other person is from the [CONTRADA NAME 3].



How do you think the person would redistribute money?

Other (€)	3,00	2,90	2,80	2,70	2,60	**2,50**	2,30	2,10	1,90	1,70	1,50	1,30	1,10	0,90	0,70	0,50
Me (€)	0,00	0,10	0,20	0,30	0,40	**0,50**	0,70	0,90	1,10	1,30	1,50	1,70	1,90	2,10	2,30	2,50
Decision																

Section 3: You, Siena, and the Contrade

1. **Where were you born?**
   - ☐ Outside the Comune of Siena
   - ☐ In the Comune of Siena
   - ☐ On the paving stones

2. **Where do you live?**
   - ☐ Within the walls:
     - ☐ in your own Contrada
     - ☐ in another Contrada
   - ☐ Outside the walls:
     - ☐ in the Comune of Siena
     - ☐ in the Province of Siena
   - ☐ in Tuscany
   - ☐ in Italy
   - ☐ abroad

3. **Have you ever lived outside of the Province of Siena?**
   - ☐ No
   - ☐ Yes, for _____ year and _____ months (overall)

4. **You're a contradaiolo of this Contrada because:**
   - ☐ Both of your parents were contradaioli of this Contrada
   - ☐ One of yout parents was a contradaiolo of this Contrada:
     - ☐ mother ☐ father
   - ☐ You were born in the territory of the Contrada
   - ☐ You chose to be a part of this Contrada
   - ☐ Other: _____

5. **Have you been a *protettore* in the last two years?** ☐ Yes ☐ No

6. **Have you had a role in the leadership of the Contrada?** ***You can indicate more than one response.***
   - ☐ Yes, now:
     - ☐ Seggio direttivo
     - ☐ Dirigenza Paliesca
     - ☐ Consiglio di Società
     - ☐ Other: _____
   - ☐ Yes, in the past:
     - ☐ Seggio direttivo
     - ☐ Dirigenza Paliesca
     - ☐ Consiglio di Società
     - ☐ Other: _____
   - ☐ No

7. **In the *last month*, how often have you participated in the social life of the Contrada?**
   For example, attending dinners, visiting the Società or other.
   - ☐ Never
   - ☐ Once a month
   - ☐ 2–3 times a month
   - ☐ Nearly every week
   - ☐ Every week
   - ☐ 2–3 time a week
   - ☐ Nearly every day
   - ☐ Every day

8. **In the *last month*, how often have you participated in the organisational life of the Contrada?**
   For example, attending assemblies, helping with committee activities or other.
   - ☐ Never
   - ☐ Once a month
   - ☐ 2–3 times a month
   - ☐ Nearly every week
   - ☐ Every week
   - ☐ 2–3 time a week
   - ☐ Nearly every day
   - ☐ Every day

9. Think of your 5 closest friends. Of these 5, how many:

a. are contradaioli of *your* Contrada? □ 0 □ 1 □ 2 □ 3 □ 4 □ 5

b. are contradaioli of *another* Contrada? □ 0 □ 1 □ 2 □ 3 □ 4 □ 5

c. are *not* contradaioli? □ 0 □ 1 □ 2 □ 3 □ 4 □ 5

Please ensure the sum of the answers to questions a.–c. is 5!

10. *In general, my Contrada is better than the majority of other Contrade.*
How much do you agree with this sentence?

□ Strongly agree □ Agree □ Neither agree nor disagree □ Disagree □ Strongly disagree

6. How often do you attend religious events?

□ Never
□ Once a year
□ Many times a year
□ Many times a month
□ Every week
□ Many times a week

11. Have you already taken part in this study?

□ No □ Yes, I have previously completed the questionnaire

THANK YOU FOR YOUR PARTICIPATION!
Please, **hand the questionnaire directly to** the researcher (or his assistant), or [COLLABORATOR NAME].

Before handing in the questionnaire, please **remove the above raffle ticket**. This ticket is to be presented to the researcher at the end of the study, so that you can receive the sum corresponding to one of your decisions.

C2 Supplementary analysis: the effect of order and *contrada*

We include control analyses, which show that the order of DGs does not affect decisions (Section C2.1) and that pooling the three *contrade* with a rival together (Section C2.2).

C2.1 Order effects

A major confound may be the order in which cooperation and expectation decisions were made. Six decisions were made in total, meaning 720 possible orders. This is too large a number to include in the analysis, and more than the number of participants.

Order effects are assessed by seeing what effect, if any, there is of having made a cooperation or expectation decision first for a given group membership level. If one influences the other, but not the other way around, we should expect an order effect interacting with group membership. This effect is critical to being able to analyse cooperation or expectation decisions separately. We perform a LME analysis on *contrade* with a rival *contrade* with cooperation as dependent variable. Fixed effects are order (first vs. second), group membership (in-group, neutral out-group, vs. rival out-group), expectation, and their interaction. Random effects were included for the intercepts of each participant and *contrada*. The two *contrada* types are not analysed together because of the difference in out-group relationship (rival out-group for *contrade* with a rival vs. anonymous out-group for *contrada* without a rival).

Does expectation affect cooperation? Table C4 shows the effect of order. For the *contrade* with a rival *contrade*, order has no effect on cooperation ($\chi^2(1) = 0.59$, $p = .547$), nor does the interaction between order and group membership ($\chi^2(2) = 0.84$, $p = .661$). The same is found with the *contrada* without a rival *contrada*, as order has no effect on cooperation ($\chi^2(1) = 1.84$, $p = .221$), nor does the interaction between order and group membership ($\chi^2(2) = 1.66$, $p = .661$) Therefore expectation and cooperation are independent with respect to the order in which the decision is made.

C2.2 Between-*contrada* differences

The three *contrade* with a rival are pooled together. We expect little difference in the level of in-group and out-group cooperation between *contrade*. However, we conduct additional analyses to assess whether there is any difference between the *contrade* with a rival. One reason for this is the sampled *contrade* differ in one potentially important dimensions, group size, which is known to affect cooperation (Barcelo and Capraro 2015).

Furthermore, two features of the experimental design need assessment. One is that data collection during high competition differed between *contrade* (Table C3). Data collection for two *contrade* (*contrade Civetta* and *Leocorno*) occured during

Table C4: The effects of order on cooperation

		with a rival		without a rival	
variable	df	χ^2	p	χ^2	p
order	1	0.6	.55	2	.22
expectation	1	4.8	.08	20	< .001 ***
group membership	2	10.7	.02 *	1	.62
order * expectation	1	0.0	.98	2	.19
order * group membership	2	0.8	.66	2	.47
expectation * group membership	2	14.0	< .01 **	8	.02 *
order * expectation * group membership	2	3.8	.18	1	.59

Note: The full model with the variable in question is compared against a model without the variable in question. p-values are obtained by parametric bootstrapping over 1,000 repetitions.
* $p < .05$, ** $p < .01$, *** $p < .001$

the July *palio*, and for the other (*contrada Torre*) during the August *palio*. This was to ensure that rival out-groups were both running the *palio*.

The other feature is that the neutral out-group differed between the *contrade* (Table C3), as mentioned in Section 3.2.3. For *contrada Civetta*, the neutral out-group was an ally *contrada*, that also participated in the *palio* during data collection. For *contrada Leocorno*, the neutral out-group was a neutral *contrada* and did run the *palio* during data collection. For *contrada Torre*, the neutral out-group was a neutral *contrada* but did not run the *palio* during data collection. For these reasons, we compare decisions across *contrade* to see if the variation in the neutral out-group being a neutral or ally, or running or not running, had any impact on DG decisions.

Based on our understanding of the context, and more importantly, supported by statistical analysis, pooling the *contrade* with a rival is justified, as discussed below.

Pooled *contrade*: contextual justification We expect little difference in the level of cooperation between *contrade*. Traditions and activities are equivalent across *contrade* (Chapter 2), meaning attitudes and behaviour towards the in-group are similar. Denigration towards out-group *contrade*, particularly rival out-groups, is also simlar across *contrade* (Filiani and Zaffaroni 2002). For example, songs that insult rivals follow the same melody, with the name of the corresponding rival inserted (Dundes and Falassi 1975: 49–53).

Pooled *contrade*: statistical justification Figure C2 shows cooperation and expectation between the *contrade* with a rival. Visualisation suggests there is little difference between *contrade*.

An LME including *contrada* as a fixed effect shows whether there is a significant effect of *contrada* on cooperation. There is no main effect of *contrada* ($F(2, 292.17) = 1.76$, $p = .173$), but there is an effect of the interaction between *contrada* and condition ($F(4, 488) = 2.61$, $p = .035$). Pairwise contrasts reveal that there is a

significant difference at $p < .05$ between two *contrade* — *contrade Civetta* and *Torre* — within the in-group condition (t(630) = -2.52, $p = .032$). This difference is during high competition (t(630) = -2.25, $p = .064$).

A separate LME including *contrada* as a fixed effect shows whether there is a significant effect of *contrada* on expectation. There is a significant effect at $p < .05$ of *contrada* (F(2, 300) = 2.05, $p = .131$), and an effect of the interaction between *contrada* and condition (F(4, 487) = 2.93, $p = .021$). Pairwise contrasts reveal that there is a signiciant difference between both *contrade Civetta* and *Leocorno* (t(663) = 2.47, $p = .036$) and *contrade Leocorno* and *Torre* (t(663) = -3.54, $p = .001$) within the out-group condition.

In summary, there is little difference between neutral out-groups among the *contrade* with a rival for cooperation and expectation. There are however some differences among rival out-groups for expectation decisions.

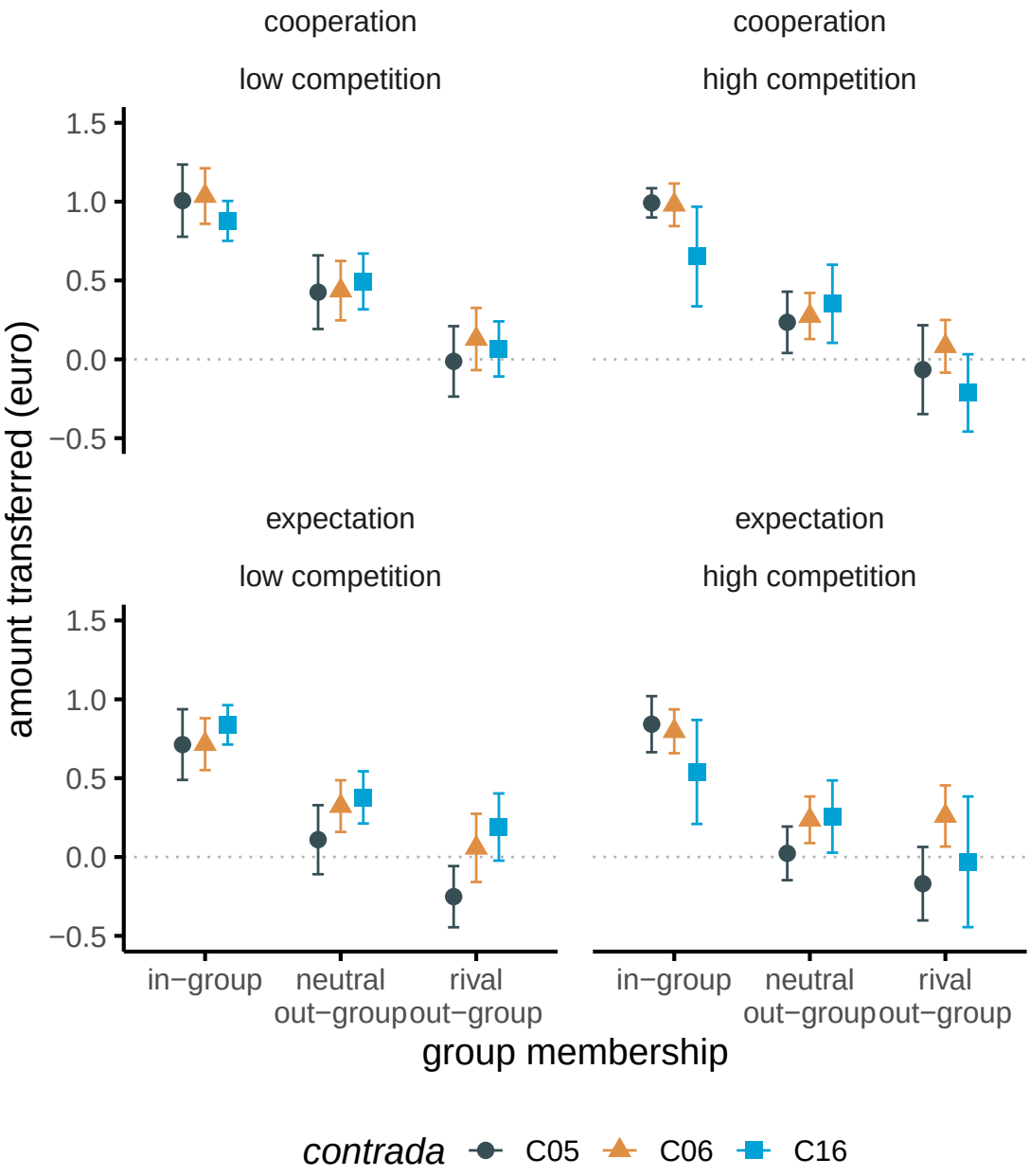


Figure C2: Mean cooperation and expectation dependent on group membership and competition across the three *contrade* with a rival. Error bars are the standard error.

C3 Supplementary analysis: model specifications and complete results

We include the the model specifications and results of each analysis presented in Section 3.3.

Table C5: The effects of competition and group membership on cooperation in *contrade* with a rival [1]

variable	df	χ^2	p	
group membership	2	15	.005	**
competition	1	2	.224	
competition X group membership	2	1	.542	

[1] The full model with the variable in question was compared against a model without the variable in question. p-values were obtained by parametric bootstrapping over 1,000 repetitions: * $p < .05$, ** $p < .01$, *** $p < .001$

Table C6: Difference in cooperation in *contrade* with a rival for the effect of competition within group membership[1]

group membership	contrast	Δ	SE	df	t	p
in	low–high	0.10	0.1	6	1.0	.335
neutral	low–high	0.18	0.1	5	1.6	.161
rival	low–high	0.09	0.1	6	0.8	.457

[1] Assessed via post-hoc comparisons with a Tukey correction. Contrast is between low and high competition. Δ shows the mean difference. * $p < .05$, ** $p < .01$, *** $p < .001$.

C3.1 Analysis of cooperation in *contrade* with a rival

The model for the *contrade* with a rival, outcome cooperation was specified as:

```
## pref ~ group * period + (1 | id) + (group + period | contrada)
```

Table C7: The effects of competition and group membership on cooperation in *contrada* without a rival [1]

variable	df	χ^2	p	
group membership	2	26.37	.001	***
competition	1	0.05	.810	
competition X group membership	2	0.17	.912	

[1] The full model with the variable in question was compared against a model without the variable in question. p-values were obtained by parametric bootstrapping over 1,000 repetitions: * $p < .05$, ** $p < .01$, *** $p < .001$

Table C8: Difference in cooperation in *contrada* without a rival for the effect of competition within group membership[1]

group membership	contrast	Δ	SE	df	t	p
in	low–high	-0.03	0.1	200	-0.2	.819
neutral	low–high	0.03	0.1	200	0.2	.821
anonymous	low–high	-0.02	0.1	200	-0.1	.897

[1] Assessed via post-hoc comparisons with a Tukey correction. Contrast is between low and high competition. Δ shows the mean difference. * $p < .05$, ** $p < .01$, *** $p < .001$.

C3.2 Analysis of cooperation in *contrada* without a rival

The model for the *contrada* without a rival, outcome cooperation was specified as:

```
## pref ~ group * period + (1 | id)
```

Table C9: The effects of competition and group membership on expectation in *contrade* with a rival [1]

variable	df	χ^2	p	
group membership	2	2e+02	.001	**
competition	1	5e-02	.841	
competition X group membership	2	3e+00	.256	

[1] The full model with the variable in question was compared against a model without the variable in question. p-values were obtained by parametric bootstrapping over 1,000 repetitions: * $p < .05$, ** $p < .01$, *** $p < .001$

Table C10: Difference in expectation in *contrade* with a rival for the effect of competition within group membership[1]

group membership	contrast	Δ	SE	df	t	p
in	low–high	0.02	0.1	3	0.2	.856
neutral	low–high	0.11	0.1	3	1.0	.384
rival	low–high	-0.07	0.1	3	-0.7	.562

[1] Assessed via post-hoc comparisons with a Tukey correction. Contrast is between low and high competition. Δ shows the mean difference. * $p < .05$, ** $p < .01$, *** $p < .001$.

C3.3 Analysis of expectation in *contrade* with a rival

The model for the *contrade* with a rival, outcome expectation was specified as:

```
## belief ~ group * period + (1 | id) + (period | contrada)
```

Table C11: The effects of competition and group membership on expectation in *contrada* without a rival [1]

variable	df	χ^2	p	
group membership	2	14.1	.003	**
competition	1	0.2	.658	
competition X group membership	2	4.6	.085	

[1] The full model with the variable in question was compared against a model without the variable in question. p-values were obtained by parametric bootstrapping over 1,000 repetitions: * $p < .05$, ** $p < .01$, *** $p < .001$

Table C12: Difference in expectation in *contrada* without a rival for the effect of competition within group membership[1]

group membership	contrast	Δ	SE	df	t	p	
in	low–high	-0.06	0.1	213	-0.5	.654	
neutral	low–high	0.30	0.1	213	2.1	.034	*
anonymous	low–high	0.08	0.1	213	0.6	.553	

[1] Assessed via post-hoc comparisons with a Tukey correction. Contrast is between low and high competition. Δ shows the mean difference. * $p < .05$, ** $p < .01$, *** $p < .001$.

C3.4 Analysis of expectation in *contrada* without a rival

The model for the *contrada* without a rival, outcome expectation was specified as:

```
## belief ~ group * period + (1 | id)
```

Table C13: The effects of competition and group membership on decision type in *contrade* with a rival [1]

variable	df	χ^2	p	
group membership	2	477.3	.001	**
competition	1	0.6	.434	
competition X group membership	2	5.1	.090	

[1] The full model with the variable in question was compared against a model without the variable in question. p-values were obtained by parametric bootstrapping over 1,000 repetitions: * $p < .05$, ** $p < .01$, *** $p < .001$

Table C14: Difference in decision type in *contrade* with a rival conditional on competition and group membership[1]

group mem.	comp.	contrast	Δ	SE	df	t	p	
in	low	cooperation–expectation	0.21	0.07	1255	3.0	.002	**
in	high	cooperation–expectation	0.16	0.07	1255	2.4	.018	*
neutral	low	cooperation–expectation	0.17	0.07	1255	2.5	.012	*
neutral	high	cooperation–expectation	0.09	0.07	1255	1.2	.213	
rival	low	cooperation–expectation	0.02	0.07	1255	0.2	.806	
rival	high	cooperation–expectation	-0.12	0.07	1255	-1.7	.082	

[1] Assessed via post-hoc comparisons with a Tukey correction. Contrast is between cooperation and expectation. Δ shows the mean difference. * $p < .05$, ** $p < .01$, *** $p < .001$.

C3.5 Analysis of decision type in *contrade* with a rival

The model for the *contrade* with a rival, outcome decision type was specified as:

```
## measurement ~ group * period * decision_type + (1 | id) + (period |
##     contrada)
```

Table C15: The effects of competition and group membership on decision type in *contrada* without a rival [1]

variable	df	χ^2	p	
group membership	2	38.6	.001	***
competition	1	0.2	.669	
competition X group membership	2	3.4	.185	

[1] The full model with the variable in question was compared against a model without the variable in question. p-values were obtained by parametric bootstrapping over 1,000 repetitions: * $p < .05$, ** $p < .01$, *** $p < .001$

Table C16: Difference in decision type in *contrada* without a rival conditional on competition and group membership[1]

group mem.	comp.	contrast	Δ	SE	df	t	p
in	low	cooperation–expectation	0.20	0.1	400	1.8	.071
in	high	cooperation–expectation	0.17	0.1	400	1.3	.182
neutral	low	cooperation–expectation	-0.03	0.1	400	-0.3	.789
neutral	high	cooperation–expectation	0.24	0.1	400	1.9	.055
anonymous	low	cooperation–expectation	0.05	0.1	400	0.5	.621
anonymous	high	cooperation–expectation	0.16	0.1	400	1.2	.215

[1] Assessed via post-hoc comparisons with a Tukey correction. Contrast is between cooperation and expectation. Δ shows the mean difference. * $p < .05$, ** $p < .01$, *** $p < .001$.

C3.6 Analysis of decision type in *contrada* without a rival

The model for the *contrada* without a rival, outcome decision type was specified as:

```
## measurement ~ group * period * decision_type + (1 | id)
```

C3.7 Out-group hostility as help avoidance or harm giving

Table C17: Odds ratios and 95% confidence intervals estimated from a categorical linear mixed model regression with the *contrade* with a rival [1]

	give		avoid		harm	
variable	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
high competition	0.50 (0.20–1.22)	.126	3.57 (0.96–13.29)	.058	1.01 (0.28–3.57)	.990
neutral outgroup	0.10 (0.05–0.23)	< .001 ***	9.17 (2.68–31.42)	< .001 ***	6.61 (2.45–17.81)	< .001 ***
rival outgroup	0.04 (0.02–0.08)	< .001 ***	5.55 (1.56–19.67)	.008 **	26.85 (10.27–70.21)	< .001 ***
expectation	0.30 (0.13–0.71)	.006 **	4.72 (1.31–17.00)	.018 *	2.09 (0.69–6.29)	.191
high competition X neutral out-group	1.22 (0.44–3.40)	.707	0.47 (0.11–1.99)	.306	1.20 (0.30–4.84)	.798
high competition X rival out-group	1.18 (0.41–3.39)	.755	0.44 (0.10–1.98)	.286	1.23 (0.31–4.79)	.768
high competition X expectation	1.63 (0.55–4.86)	.380	0.38 (0.08–1.76)	.218	1.00 (0.21–4.76)	.999
neutral out-group X expectation	2.23 (0.83–5.98)	.109	0.25 (0.06–1.03)	.054	0.70 (0.20–2.44)	.580
rival out-group X expectation	2.27 (0.83–6.19)	.110	0.28 (0.06–1.22)	.089	0.58 (0.17–1.95)	.381
high competition X neutral out-group X expectation	0.61 (0.17–2.24)	.455	2.15 (0.38–12.24)	.389	1.12 (0.19–6.47)	.896
high competition X rival out-group X expectation	1.28 (0.34–4.89)	.716	1.27 (0.20–7.90)	.801	0.77 (0.14–4.28)	.766
(intercept)	14.63 (7.15–29.93)	< .001 ***	0.02 (0.01–0.08)	< .001 ***	0.04 (0.02–0.10)	< .001 ***

[1] For each regression, the behavioural type (give, avoid, or harm) was coded as 1 and the other two as 0. Fixed effects of interest are out-group (vs. in-group), expectation (vs. cooperation), and competition (vs. low). Random effects included individuals and *contrada*. * $p < .05$, ** $p < .01$, *** $p < .001$

Table C18: Odds ratios and 95% confidence intervals estimated from a categorical linear mixed model regression with the *contrada* without a rival [1]

	give		avoid		harm	
variable	OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
high competition	1.67 (0.46–6.08)	.439	1.33 (0.31–5.77)	.700		
neutral outgroup	0.43 (0.16–1.15)	.094	3.33 (0.97–11.45)	.056	2.41 (0.71–8.20)	.158
rival outgroup	0.53 (0.19–1.44)	.215	1.28 (0.32–5.13)	.725	3.36 (1.03–10.94)	.044 *
expectation	1.00 (0.34–2.95)	.999	1.28 (0.32–5.13)	.725	2.11 (0.61–7.34)	.238
high competition X neutral out-group	0.57 (0.11–2.82)	.490	0.58 (0.09–3.59)	.561		
high competition X rival out-group	0.70 (0.14–3.59)	.668	1.01 (0.14–7.29)	.993		
high competition X expectation	0.37 (0.07–2.00)	.248	0.78 (0.10–5.91)	.810		
neutral out-group X expectation	1.11 (0.27–4.50)	.885	0.37 (0.06–2.17)	.270	1.09 (0.24–4.97)	.914
rival out-group X expectation	0.61 (0.15–2.45)	.482	1.79 (0.29–10.97)	.529	0.78 (0.18–3.44)	.743
high competition X neutral out-group X expectation	1.33 (0.16–11.29)	.795	2.71 (0.20–35.95)	.451		
high competition X rival out-group X expectation	2.94 (0.34–25.71)	.329	0.20 (0.01–3.68)	.280		
(intercept)	4.50 (2.09–9.68)	< .001 ***	0.10 (0.04–0.28)	< .001 ***	0.05 (0.02–0.15)	< .001 ***

[1] For each regression, the behavioural type (give, avoid, or harm) was coded as 1 and the other two as 0. Fixed effects of interest are out-group (vs. in-group), expectation (vs. cooperation), and competition (vs. low). Random effects included individuals. The model of the harm behavioural against the other two behavioural types does not include competition, as during high competition, there was no harm decision (see Figure 3.3). Inclusion of harm would result in a large and unreliable estimate of the odds ratio. * $p < .05$, ** $p < .01$, *** $p < .001$

C4 Exploratory analysis: the effect of individual characteristics on cooperation

The exploratory analysis assessed the effect of individual characteristics on cooperation. These individual characteristics include demographic characteristics and responses to the survey. Here we describe the methods for determining which individual characteristics to include in the analysis (Section C4.1), then present the results (Section C4.2), followed by a brief discussion (Section C4.3).

C4.1 Methods

Each participant provided five demographic characteristics and ten *contrada*-related variables (Sections C1.3.6 and D2.2.7). We pursued only a subset of these characteristics in the exploratory analysis. Aside from issues relating to insufficient power, inclusion of all variables in a linear-mixed effects model would make it intractable and uninterpretable. With fewer variables we can run a comprehensible model.

Of the five demographic characteristics for each participant — age, gender, employment status, personal income, and level of education — we included age and gender. Age is a standard demographic characteristic to include in the analysis of cooperation. Furthermore, age varies by period among rival *contrade*, with participants slightly older in low competition vs. high competition (Section C1.1). Gender is also a standard demographic characteristic, which has been shown to influence biased cooperation, with more discrimination among samples composed of a majority of men compared to women (Balliet et al. 2014).

To determine which of the ten *contrada*-related variables to include, we conducted a principal component analysis (principal component analysis). A principal component analysis can reduce n-variables to a set of principal components that explain the variation between them.

To create the components, we first made all the survey questions binary variables, with a value of 1 indicative of a closer association to the *contrada* or to Siena, and a value of 0 indicative of a looser association. For example, for the location variable, 1 = born in Siena, while 0 = born outside Siena.

Participants with any missing survey variable were excluded, as the principal component analysis can only function with complete data. Thus, the exploratory analysis was conducted on 300 participants.

Using the standard technique of including components up to and including the first "elbow" in a scree plot, we included the first two components in our analysis. Specifically, 28.56% and 17.79% of the variance was explained by principal component 1 (PC1) and principal component 2 (PC2) respectively.

The survey variables that explained most of the variance in PC1 were social participation and organisational participation. The next two variable that loaded onto PC1 were residence and membership of closest friends, although the loadings were a third of the two participation variables. PC1 makes sense in the Sienese context; those who frequently participate in the life of the *contrada* are those who

live in Siena and whose friends are from the same community. We labelled PC1 "*contrada* involvement". Participants who frequently engaged in the life of the *contrada*, e.g. attend social events, scored highly in *contrada* involvement.

The survey variables that explained most of the variance in PC2 were location of birth and membership reason. In other words, those born in Siena are those who are members through birth or kinship. The next two variables that loaded onto PC2 were percentage of lifetime in Siena and membership of closest friends. We labelled PC2 "Sienese member". Participants born in Siena and members through birth or kinship scored highly in Sienese member, and represent "traditional" Sienese members (Chapter 2).

Age, gender, *contrada* involvement, and Sienese member were included in our LME model. Given previous research, we expected no effect of age, but an effect of gender, with greater in-group cooperation and lower out-group cooperation among males. Given our understanding of the *contrade*, we expected that those who have a higher involvement and authenticity will be more biased, i.e. show greater in-group cooperation and/or lower out-group cooperation.

We also ran a model using the variables that loaded most onto PC1 and PC2, i.e. social participation, organisational participation, location of birth, and membership criterion.

Following suggestions, we also ran other models, specified below. We compared the AIC for each one, and reported the model with the lowest AIC.

```
# model 1: # model with interaction of period
cooperation ~ group * period * (age + gender + PC1 + PC2) +
          (1 | id) + (group + period | contrada)

## cooperation ~ group * period * (age + gender + PC1 + PC2) + (1 |
##     id) + (group + period | contrada)

# model 2: # model 1 minus interaction of period
cooperation ~ group * (age + gender + PC1 + PC2) +
          (1 | id) + (group | contrada)

## cooperation ~ group * (age + gender + PC1 + PC2) + (1 | id) +
##     (group | contrada)

# model 3: # model 1 with two terms that load most onto PCs 1/2
cooperation ~ group * period * (age + gender + participation_social + participation_organisati
          location_birth + member_reason) +
          (1 | id) + (group + period | contrada)

## cooperation ~ group * period * (age + gender + participation_social +
##     participation_organisational + location_birth + member_reason) +
##     (1 | id) + (group + period | contrada)

# model 4: # model 2 with two terms that load most onto PCs 1/2
cooperation ~ group * (age + gender + participation_social + participation_organisational +
          location_birth + member_reason) +
          (1 | id) + (group | contrada)
```

```
## cooperation ~ group * (age + gender + participation_social +
##     participation_organisational + location_birth + member_reason) +
##     (1 | id) + (group | contrada)

# model 5: # model 2 with several terms from survey
cooperation ~ group * (age + gender + participation_social + participation_organisational +
          location_birth + member_reason +
          residence + lifetime_siena + friends_same) +
          (1 | id) + (group | contrada)

## cooperation ~ group * (age + gender + participation_social +
##     participation_organisational + location_birth + member_reason +
##     residence + lifetime_siena + friends_same) + (1 | id) + (group |
##     contrada)
```

Table C19: The effects of competition, group membership, and individual characteristics on cooperation in *contrade* with a rival [1]

variable	df	χ^2	p
group membership	2	13.86	.006 **
age	1	0.01	.918
gender	1	1.12	.301
PC1	1	1.26	.280
PC2	1	0.07	.800
group membership X age	2	2.09	.347
group membership X gender	2	1.29	.537
group membership X PC1	2	1.18	.566
group membership X PC2	2	1.61	.473

[1] The full model with the variable in question was compared against a model without the variable in question. p-values were obtained by parametric bootstrapping over 1,000 repetitions: * $p < .05$, ** $p < .01$, *** $p < .001$

C4.2 Analysis of cooperation in *contrade* with a rival

The model for the *contrade* with a rival, outcome cooperation was specified as:

```
## measurement ~ group * (age + gender + PC1 + PC2) + (1 | id) +
##     (group | contrada)
```

Model 2 had the lowest AIC (1100), followed by model 1 (1127), model 5 (1155), model 4 (1427), and model 3 (1466).

Based on model 2, analyses revealed no significant effect of age, gender, *contrada* involvement, and Sienese member on cooperation, whether as a main effect or in an interaction with group (Table C19). Figure C3 shows how cooperation with the in-group, neutral out-group, and rival out-group varied with age and gender. Figure C3 shows how cooperation with the in-group, neutral out-group, and rival out-group varied with *contrada* involvement and Sienese member, clearly showing there was no relationship between either *contrada* involvement or Sienese member with cooperation.

Model 1 also revealed no significant effect of age, gender, and *contrada* involvement and Sienese member on cooperation, whether as a main effect or in an interaction with group and/or period (see code). Furthermore, the other three models revealed no significant effect of the main components in *contrada* involvement (social and organisational participation) and Sienese member (location of birth and membership reasons), or other survey items (see code).

C4.3 Discussion

The exploratory analysis suggests that decisions in the DG, whether towards in-group or out-group members, are not explained by age, gender, the involvement in the *contrada*, and the authenticity of the *contrada* member. That there is no

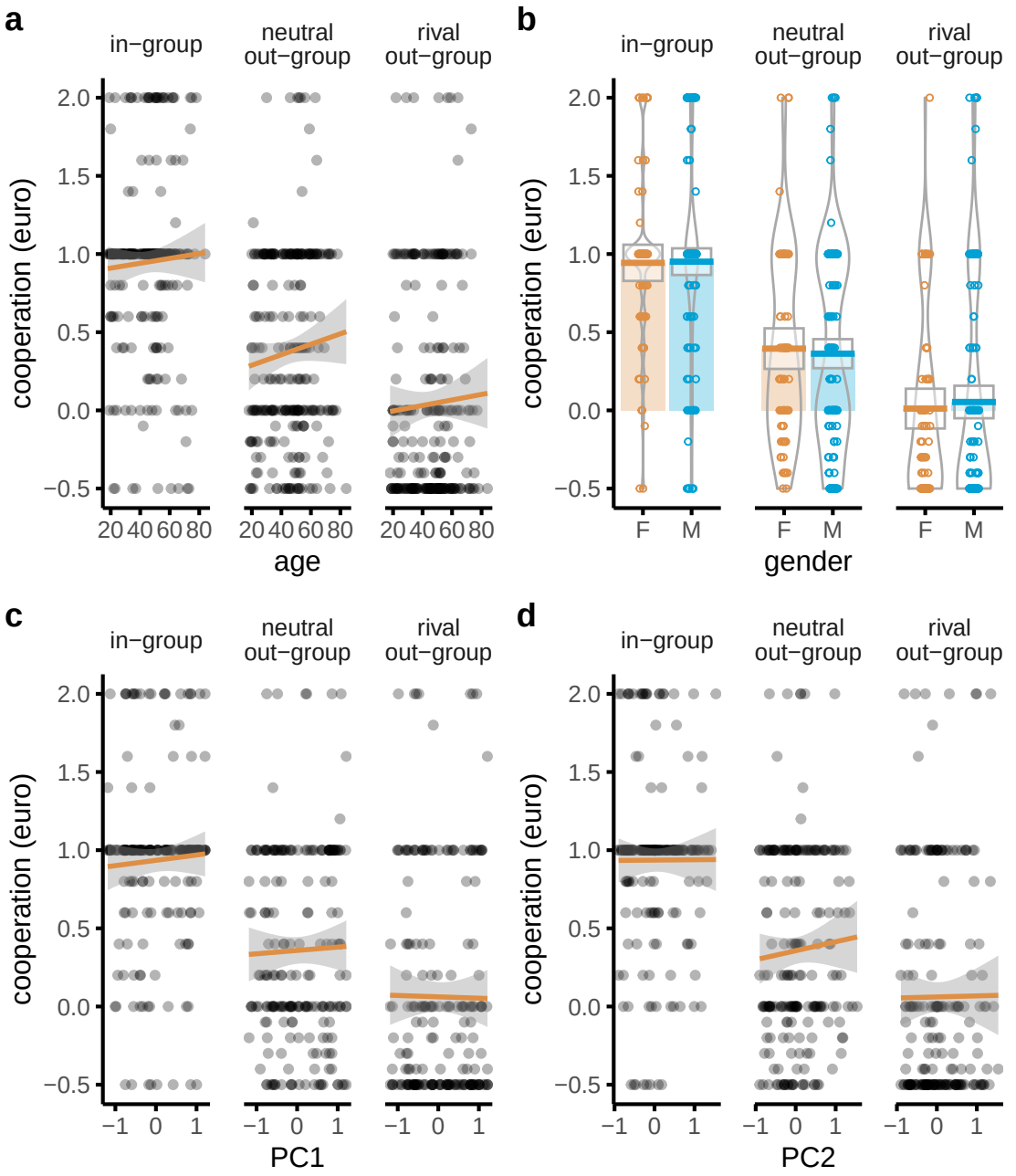


Figure C3: Variation in cooperation by a) age, b) gender, c) *contrada* involvement (PC1), and d) Sienese member (PC2). Linear fit and 95% CIs for a), c), and d); Mean and 95% CIs for b).

effect of *contrada* involvement and Sienese member is perhaps surprising, given that it is reasonable to presume those more involved and more authentic are likely to show greater in-group bias. Particularly in the latter case, where members who are born into the *contrada* might learn to dislike the rival, from parents, family members, and peers as they grow up. In the *contrada* context then, those who participate infrequently cooperate with in-group and out-group members as those who participate more frequently. Furthermore, those who are less authentic (individuals born outside Siena and/or who chose to be members of the *contrada*) cooperate with in-group and out-group members as those who are more authentic (individuals born in Siena and/or who are members by birth and/or kinship).

C5 Post-game study

Recently, researchers have been encouraged to engage with the participants and the communities they work with before, during, and after the execution of studies Nzinga et al. 2018. In particular, there has been an increasing awareness of the importance of returning to communities after data have been collected, and presenting findings. Post-study engagement is not only ethical; it can improve the rigour and the validity of results. As researchers interested in an accurate understanding of our results, post-study engagement allows us to "test our interpretation of the observed data with local knowledge" Hruschka et al. 2018b.

We conducted a brief post-game study with a sample of individuals from one of the *contrade* involved in the DG. We aimed to gauge *contrada* member's interpretations of the DG results, which provided us with an opportunity to assess whether local interpretations were in-line with our own interpretations. It also allowed us to "give back" to the communities we had studied.

We took a qualitative approach, using a focus group composed of *contrada* members. We also administered a questionnaire so that members could indicate their level of support in the our interpretations. The post-game study was conceived and designed after data was collected and analysed, and after we had provided interpretations.

We first present the rationale behind the post-game study focus group (Section C5.1. We then describe the methods (Section C5.3), followed by the results (Section C5.4). We conclude with a discussion of the results, and comment on the reception of this study by *contrada* members (Section C5.5).

C5.1 Introduction

We had designed our study to assess the effect of competition and inter-group relationship on cooperation, using the DG. As discussed in Section 3.1, we had expected to find an overall in-group bias, with greater contributions among in-group members than neutral out-group members and rival out-group members. We also expected in-group and out-group cooperation to be affected by the level of competition: we expected in-group cooperation to increase during high vs. low competition, and out-group cooperation to decrease during high vs. low competition. While we found an overall in-group bias, we found no evidence for an effect of level of competition on in-group and out-group cooperation. See Section 3.3 for the full set of results.

Based on our reading of the ethnographic literature and previous fieldwork experience, we posited factors that explained the general pattern of in-group bias:

1. **Social learning** Most members frequent the *contrada* from birth, and thus develop positive and negative associations with various *contrade* from a young age. These attitudes are solidified by adulthood and translate into in-group bias in cooperation.
2. **Traditions** Most annual rituals occur within the *contrada*. Where there is interaction between *contrade*, most occur with allies or neutral *contrade*. Rival

contrade are often avoided. Traditions maintain boundaries and reinforce in-group bias.

3. **Active participation throughout the year** Many members frequent the *contrada* all year round, favouring interactions with, and strong attachment toward, individuals within the same *contrada*. Repeat interactions establish trust, positive reputations, and reciprocal relationships among in-group members, which favour in-group cooperation.

We also suggested that one of our null findings — no significant effect of competition on cooperation — was not evidence for competition affecting cooperation more generally in the Sienese setting. Instead, we suggested that competition has had a cumulative effect on cooperation over a long period of time:

> The *palio* occurs every year — and has done for centuries — and represents a moment of intense and direct competition between *contrade* (Dundes & Falassi, 1975). Over time, periodic competition means adult *contrada* members develop strong "in-group love" for their own *contrada*, and "out-group hate" for their rival *contrada*.

In essence, the current level of competition has little effect, but recurrent competition in the form of the *palio* does. The recurrence of the *palio* is captured by the Sienese expression "the *palio* is run all year long", which we believe demonstrates how the *palio* and associated inter-group dynamics are present at all times, and how the *contrada* is central to the lives of it's members.

In sum, we interpreted the results of the DG using the three factors listed above, as well as recurrent competition. Through this study we seek to see whether *contrada* members have similar interpretations.

C5.2 Current study

We designed this study to inform participants of our results, provide an opportunity for the *contrade* to provide their interpretation of the results, and assess whether our interpretations are valid.

We took a qualitative approach, using focus groups as described below. We ensured that the study design gave space to *contrada* members to voice their interpretation without our influence. We also designed the study to qualitatively assess whether our interpretation is plausible in the eyes of members. The first part of the focus group involved a semi-structured interview with questions that are more open ended, which restricts the opportunity for confirmation bias on our behalf. The second part involved a more structured interview with more directed questions, to act as a confirmatory test of our interpretation.

We have not adopted this methodology before so we treated this study as a pilot, choosing only to conduct the study with a small number of participants and focusing on just one of our previous experimental studies. We do not know any unintended consequences of this research.

C5.3 Methods

We conducted one qualitative semi-structured interview as a focus group discussion. First, we describe the participants (Section C5.3.1), then the design of the focus group (Section C5.3.2).

C5.3.1 Participants and recruitment

For logistical reasons, we decided to only recruit participants from `C16`, one of the five *contrade* that participated in the experiment. In doing so, we also reduced the risk of potential unwanted effects, e.g., contagion in future studies arising from *contrada* members knowing detailed results.

Recruitment was by a collaborator, who was instructed to recruit *contrada* members. The collaborator was asked to recruit an equal number of participants by gender, and to collect a range of ages. We specified that it did not matter whether participants had taken part in the experimental study.

We met participants in the *contrada* clubhouse, which is where the focus group took place. Participants were provided with food and drink at the end of the focus group.

C5.3.2 Interview design

We held a single focus group discussion. We initially aimed for multiple focus groups of 3–5 participants each, but following discussion with the collaborator, we held a single discussion with all participants together.

The focus group discussion was in a semi-structured interview format, where we followed a script. A.R.K. read the script aloud, while L.F. made notes. The session was voice-recorded. Participants were also provided with a questionnaire so they could indicate responses to specific questions when prompted.

The discussion was split into three parts, following an ice-breaker asking participants to introduce themselves and indicate their year of birth and gender. Each part had a different aim, and was designed to scaffold the discussion. In the first part, we sought local expectations, before presenting the results. In the second part, we sought local interpretations following presentation of the results, but unbiased by our interpretations. In the third part, we provided our interpretations to gauge whether local interpretations were similar to ours.

The details of each part as follows. The first part explained the economic game, to ensure the participants understood the experimental design. They were shown a diagram in which participants had made their decision in the game (question 1 and 2), and were asked to indicate what personal decision they would make. Following further explanation of the game, participants were asked to indicate their expected results for the average decisions across all participants with the in-group, neutral out-group, and rival out-group (question 3a, b, c). We also broke from the script to ask them the same question for an ally group, asking participants to indicate it on the sheet. This allowed participants to provide their (local) expectations, unbiased by the results.

In the second part, we presented the results, with the aid of a simplified bar plot (similar to Figure 3.2a). At this point, we asked for their interpretation of the results. We allowed participants to discuss the results liberally, meaning participants provided their (local) interpretations.

In the third part, we provided our interpretations, in order to assess more explicitly whether our interpretations were valid according to the participants. We explained that we interpreted the results against the four factors discussed in Section C5.1, namely competition, (social) learning, participation, and traditions. We asked participants to indicate how much they agreed that each factor explained the results. Specifically, they were asked "How much do you agree that the following factors explain the results" on a five-point scale ("strongly agree", "agree", "neither agree nor disagree", "disagree", "strongly disagree"). We then allowed participants to discuss each factor. Note that each factor was addressed separately. We ended the discussion with the opportunity for participants to provide feedback and suggestions for future work.

C5.3.3 Analysis

We analysed all three parts described in Section C5.3.2, with part one labelled "expectations", and parts two and three grouped together under "interpretations". For part one, expectations, we reported the decisions of participants during the post-study, and compared them with the results of the main study. Comparison is qualitative, as the sample size in the post-study is small.

For part two, interpretations (local), A.R.K. transcribed the recording of the second part of the relevant section. A.R.K. then read the transcript to identify suggestions and see if they could be organised into themes and ideas. We noted the number of interpretations provided by participants that were in-line with our interpretations.

For part three, interpretations (personal), we summarised the results from the statements described in Section C5.3.2.

C5.4 Results

C5.4.1 Participants

A total of 10 participants participated in the focus group. Participants had a mean age of 37.6 years (SD = 1 7.82, min = 18, max = 65) and 2 (20%) were female. The session lasted approximately 90 minutes.

C5.4.2 Expectations

Figure C4 shows the personal decision participants made i.e. what they would do if they were playing the game. The pattern is for in-groups is similar to the study, with participants giving about half to an in-group member. Participants in the post-study appear to give more to the rival, which may be due to demand characteristics and the lack of anonymity, although we hesitate to draw any strong inferences given the small sample size.

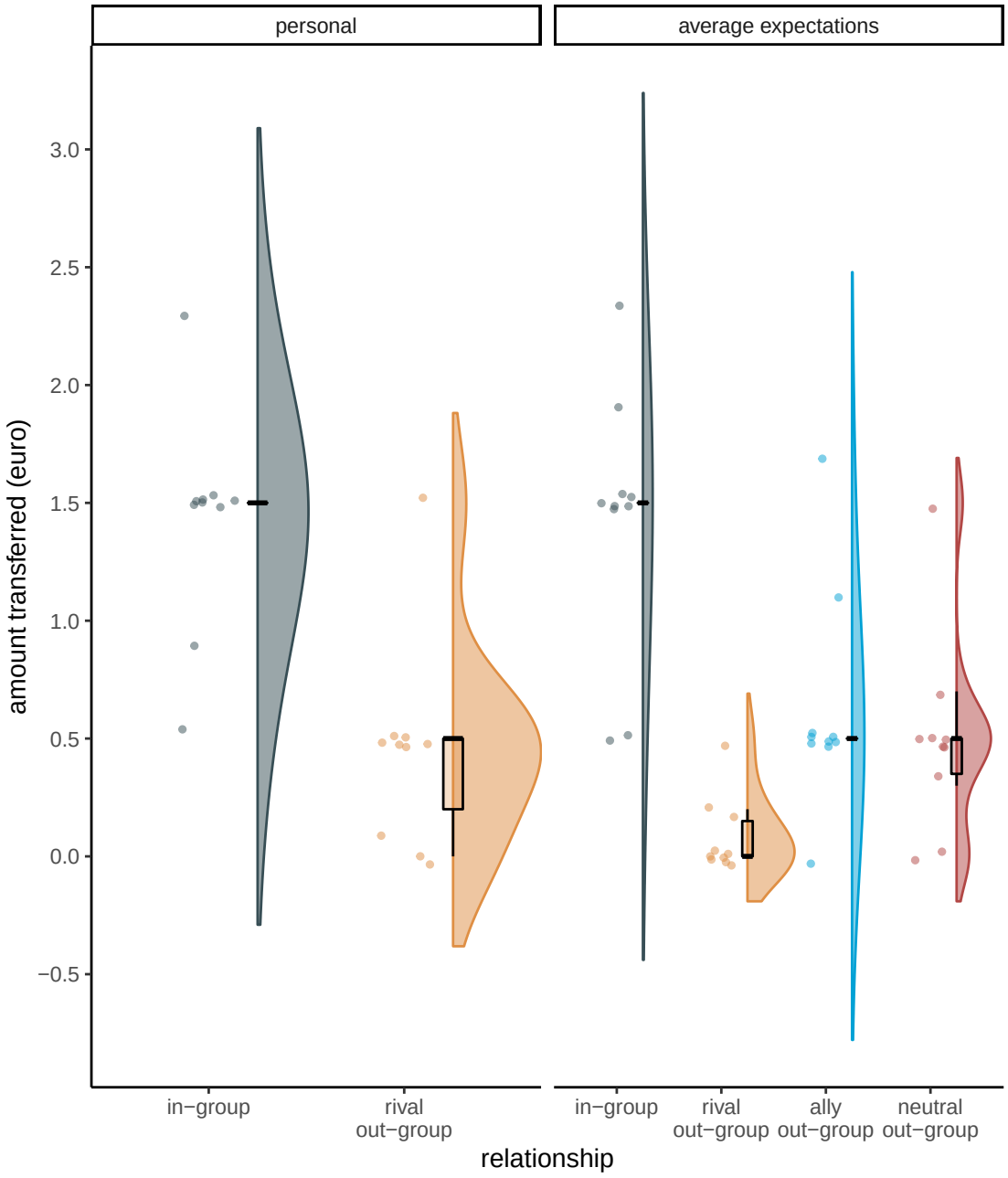


Figure C4: Participants decisions in the DG, for personal decisions ("how would you like to distribute the money") and average expectations ("what was the decision made by others?").

Figure C4 also shows the expectations of participants in the post-study. These closely match the results of the study, with participants giving €1.42 (SD) to an in-group, €0.63 (SD) to a neutral out-group, and €0.09 (SD) to a rival out-group.

C5.4.3 Interpretations (local)

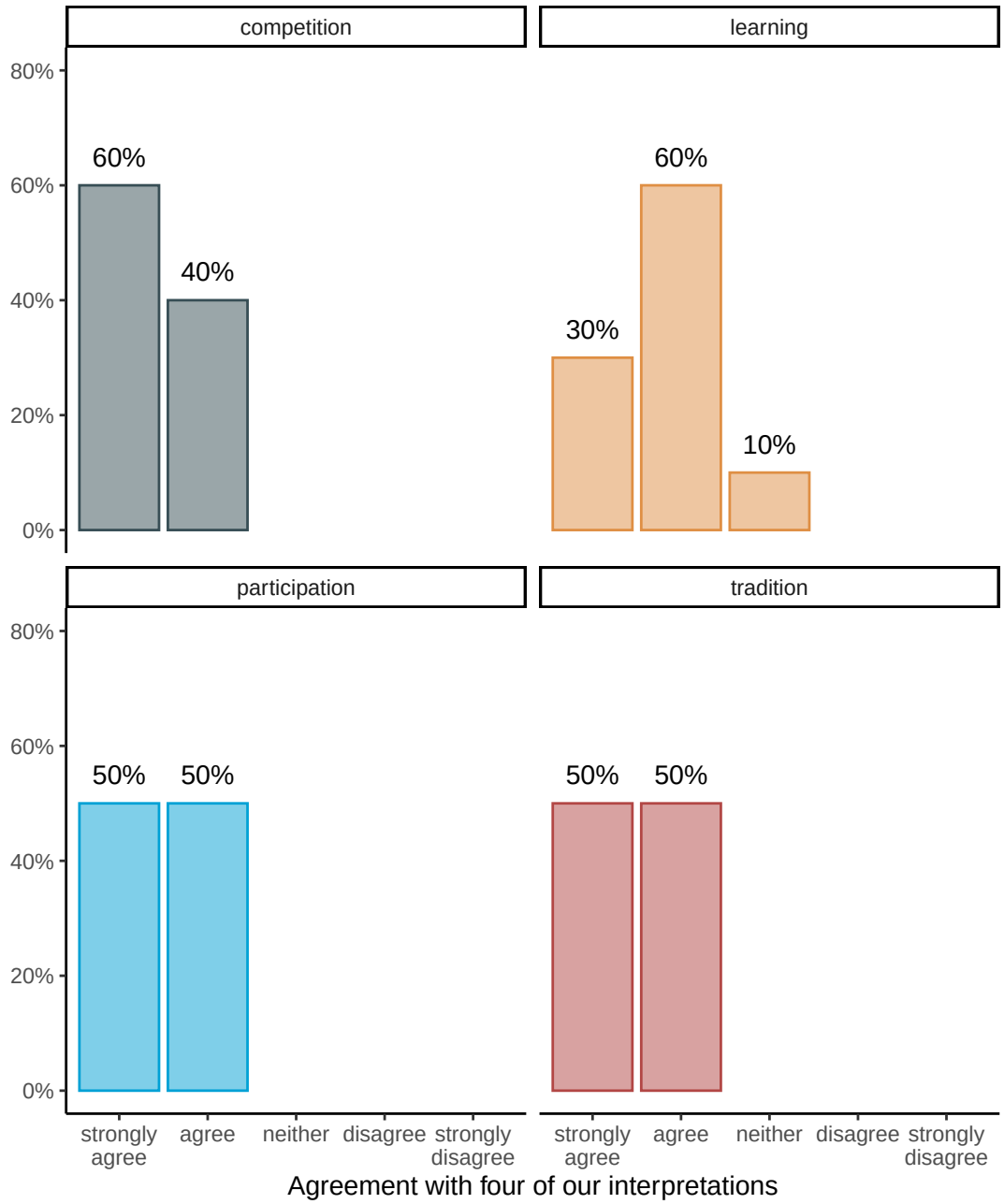


Figure C5: Participants response to how much the agreed that our four interpretations — competition, (social) learning, participation, and tradition — explained the results of the main study.

Figure C5 shows that all participants either strongly agreed or agreed with

all four interpretations, except for a single participant who neither agreed nor disagreed with the learning interpretation.

C5.5 Discussion

The interview was designed to prevent us biasing the discussion towards our interpretations, as we asked for local expectations and interpretations before providing our own. Notwithstanding the design, we did provide our own interpretations, so this is not conclusive evidence for our results being correct.

There is likely some confirmation bias due to demand characteristics, as we asked participants to respond to our interpretations in a setting where decisions were not made in private and potentially visible to researchers. However, had our interpretations been inappropriate, we are confident that participants in the post-study would have said so.

Generally, we received positive feedback from members, notably a member of the leadership, who appreciated the opportunity for old and young members to exclusively discuss *contrada* matters in a private forum. We take this as a sign that future researchers should engage with participants and communities after the execution of studies (Brand and Mesoudi 2019; Hruschka et al. 2018b; Nzinga et al. 2018) not only to improve interpretations of the observed data, but to express gratitude.

D

Supplementary information for Chapter 4

D1 Literature review

We conducted a systematic review of the literature on third-party punishment and group membership. The aim was to find experimental research that we could compare our study results to. Specifically, we wanted to compare the punishment decisions in our study with punishment decisions in comparable treatments, i.e. punishment of in-group members for (non-)cooperation with in-group or out-group members. Note that this systematic review was conducted after we completed our study.

Here we describe the methods (Section D1.1) then present the results (Section D1.2), alongside a discussion (Section D1.3).

D1.1 Methods

We conducted a search on Web of Science using the terms "third-party", "punishment", and "group". Articles for consideration were sourced from Web of Science on 2020-01-23. Articles we were already aware of through researching and in writing the literature review were also included.

As such, we established a set of criteria in order for the study to included in the summary. The criteria were that the article conducted a TPPG among human participants. The TPPG had to involve three players: player A and player B, who played an economic game involving monetary stakes, and player C, who could punish a player for their decisions. Initially, this meant punishing player A, but during the search we came across experimental designed/instances where player B was also punished for their decision, and we included this paradigm.

Furthermore, in order for the results to be comparable to ours, we only included games where the group membership manipulations included two treatments, termed ABC and AC. In the ABC treatment, all three players were from the same group. In the AC treatment, player A and player C were from the same group, whereas player B was from an out-group.

For each article, we noted sample characteristics and study characteristics. The sample characteristics included sample size (total and per condition), country that participant's were from, and whether the sample was composed of students or included non-students. The study characteristics included experiment type (laboratory, field, online), group manipulation (natural groups vs. minimal groups), and what economic game player A and player B played (dictator game, prisoner's dilemma, and trust game). We also noted any other design feature.

For each article, we summarised the results under four headers. We summarised the punishment trend for both ABC and AC. This compared how punishment changed from unfair allocations (or deception) to fair allocations (or cooperation). We compared punishment decisions in the ABC treatment vs. the AC treatment at the most unfair decision/defection, punishment decisions in the ABC treatment vs. the AC treatment at the most fair decision/defection.

These results were based on our assessment of relevant figures (which we noted), and associated statistical tests, provide in the article text or the supplementary materials.

D1.2 Results

The web of knowledge search generated 63 articles. 6 articles met the criteria for inclusion. To this we supplemented 3 articles, which were articles we were already aware of. In total, we analysed 9 articles.

In all cases expect one, the articles involved a single study. Goette et al. (2012) compares two studies; one involving natural groups, the other involving minimal groups. However, the study involving natural groups was previously reported in Goette et al. (2006). Therefore, we only report the study involving minimal groups in our review of Goette et al. (2006). From herein, we refer to studies, not articles.

Table D1 shows the summary statistics of the studies, ordered by year. The studies were published between 2,006 and 2,017. Sample sizes per condition varied between 16 and 99. The samples of 8 studies were composed of participants from WEIRD societies, e.g. Switzerland, although one of these studies included Italian and Chinese students (Rabellino et al. 2016). 1 study exclusively involved participants from a non-WEIRD society, Papua New Guinea. 4 studies involved samples of exclusively students, whereas 5 involved non-students.

7 studies involved experiments conducted in the laboratory (including FMRI studies), compared to 1 field experiment and 1 online experiment. 7 involved natural groups, and 2 involved minimal groups. 4 used the TPPG with a variant of the DG, 4 used a prisoner's dilemma, while 1 used a TG.

Table D1: Studies included in literature review of TPPGs with group manipulations[1]

	sample			study characteristics			results			
study	n	country	pool	type	groups	measure	trend ABC	trend AC	N-C	C
Bernhard et al. (2006)	16–17	PG	N	F	N	DG	decreases	decreases	greater	similar
Goette et al. (2006)	circa 29	CH	N	L	N	PD	decreases	decreases	greater	similar
Baumgartner et al. (2012)	16	CH	N	L	N	PD	decreases	decreases	similar	less
Goette et al. (2012)	circa 29	CH	N	L	M	PD	decreases	decreases	similar	similar
Baumgartner et al. (2014)	36	CH	S	L	N	PD	NA	NA	greater	similar
Rabellino et al. (2016)	52	##	S	L	N	DG	decreases	decreases	greater	similar
Morese et al. (2016)	21	IT	S	L	N	DG	NA	NA	greater	similar
Daughters et al. (2017)	99	EU	S	L	M	TG	decreases	decreases	greater	less
Delton and Krasnow (2017)	circa 65	US	N	O	N	DG	decreases	flat	similar	similar

[1] Group manipulation involved player B from the ing or outg to players B and C; see Section D1.1 for details of inclusion criteria.
[2] Number of participants per treatment; in some instances we estimated the figure as it was not provided.
[3] Country of participants in the sample; ## = study included participants from multiple countries; CH = Switzerland; EU = study likely used participants from a European country; IT = Italy; PG = Papua New Guinea; US = United States.
[4] Demographics of participants; N = includes non-students; S = exclusively students.
[5] Type of experiment; F = field; L = lab; O = online.
[6] Group manipulation; M = minimal groups; N = natural groups.
[7] Measure of cooperation i.e. game played by player A and player B; DG = dictator game; PD = prisoner's dilemma; TG = trust game.
[8] Trend in the ABC/AC treatment; to be read as "as cooperation increases, punishment [insert cell]".
[9] Average punishment at non-cooperative allocations; to be read as "punishment is [insert cell] in the ABC treatment vs. the AC treatment".
[10] Average punishment at cooperative allocations; to be read as "punishment is [insert cell] in the ABC treatment vs. the AC treatment".

Table D1 also shows the results from each study. The punishment trend for treatments ABC and AC decreased in all 7 studies were a trend could be analysed, with one exception (trend flat in the AC treatment Delton and Krasnow 2017). This means that as cooperation increased, punishment decreased.

While the trend is nearly always decreasing, we note that in 5 of the 7 studies, the slopes in the ABC and AC treatments differed, with a steeper slope in the ABC treatment compared to the AC treatment. This was due to greater punishment of non-cooperation/defection in the ABC treatment compared to the AC treatment and/or less punishment of cooperation in the ABC treatment compared to the AC treatment.

Overall, punishment of non-cooperation was greater in the ABC treatment vs. the AC treatment for 6 of the 9 studies, with punishment similar in the remainig 3 studies. Punishment of cooperation was similar in the ABC treatment vs. the AC treatment for 7 of the 9 studies, and less in the remaining 2 studies.

D1.3 Discussion

The results suggest a clear pattern for punishment decisions: as allocations become more cooperative, there is less punishment. This is true for both ABC and AC. In the ABC treatment, this is expected given the theoretical literature on norms, and other theories such as partner choice. Within groups, individual punish in instances were in-group members are harmed, not when they receive benefits. As noted by Bernhard et al. (2006), one of the earliest publications, it is puzzling that the punishment pattern in the AC treatment is similar to the ABC treatment.

We note up front some limitations of this review. First, it was completed after the study was conducted, meaning we may be biased towards certain results. Second, by deciding on the coding scheme after several of the papers had already been analysed, we might have biased the search/coding. Third, the coding of the results were based on A.R.K.'s interpretation of the results of the original paper using relevant figures and reported statistical tests. In some instances, the original authors might not have aimed to make the comparisons we reported. Thus, there might be minor discrepancies between our interpretation and the interpretation of the original authors.

Notwithstanding the limitations, the literature review does suggest general patterns that are useful for situating our study and future studies into punishment in group contexts. In summary, the three main results, again with caveats in mind, from the literature are: 1) punishment of an in-group member decreases with increasing cooperation, regardless of whether they cooperated with an in-group or out-group member; 2) in-group members are punished for not cooperating with other in-group members more than they are punished for cooperating with out-group members; and 3) in-group members are not punished for cooperating with other in-group members as much for they are not punished for cooperating with out-group members.

The first finding is clear from the results. The second finding is based on there being slightly more instances where punishment in the ABC is greater than in the AC at non-cooperative decisions, combined with this result occuring more

often in experiments using natural groups. Natural groups are more reflective of real-world behaviours, so their finding, we argue, has more weight. The third finding is based on there being three times as many instance where punishment was similar in both the ABC and the AC at cooperative decisions, compared to punishment being less in the ABC.

Table D2: Participants recruited by period and *contrada*[1]

		period (n)			
		June 2017	June 2018	n	%
contrada (n)	C08	12	5	17	11
	C11	12	5	17	11
	C06	103	22	125	79
total	n	127	32	159	
	%	80	20		

[1] See Section D2.1 for details.

D2 Supplementary methods

Supplementary methods are divided into two sections. First, Section D2.1 includes additional details about the participants, namely the exclusion criteria and a summary of the demographic characterisitics of the sample following exclusion. Second, Section D2.2 provides additional details about the general procedure.

D2.1 Participants and exclusions

We recruited a total of 159 participants across the three *contrade* and the two periods (Table D2). We analysed the participants from both periods together, unless otherwise stated.

1 participant withdrew themselves from the questionnaire after providing their consent, but before answering any quesion. This participant was excluded from all analyses. Following their exclusion, there was a total of 158 participants.

Participants were excluded if they failed to demonstrate comprehension of the game. The comprehension check involved three questions across three different scenarios, i.e. participants had to note the payoff of player A, player B, and player C across three different scenarios.

We determined that those who answered at least two scenarios correctly demonstrated comprehension, and those who answered no or one scenario failed to demonstrate comprehension. We had not decided a priori what an appropriate threshold should be. We avoid applying a more restrictive threshold in order to have a sample size in line with our aim of 17 participants per treatment.

61 participants failed to demonstrate comprehension. Following their exclusion, there was a total of 87 participants (Table D3). This total was analysed in all analyses, unless otherwise stated.

D2.2 Experimental procedure

D2.2.1 Selection of *contrade*

The three *contrade* involved were not selected at random. *Contrada Torre* was chosen to be the in-group (and the *contrada* with the most participants) because

Table D3: Participants analysed by period and *contrada*[1]

		period (n)			
		June 2017	June 2018	n	%
contrada (n)	C08	12	5	17	20
	C11	7	3	10	11
	C06	50	10	60	69
total	n	69	18	87	
	%	79	21		

[1] See Section D2.1 for details.

it i) was a large *contrada*, ii) had a rival, and iii) had been reliable during our previous study (Chapter 3). Both the neutral out-group and the rival out-group had also participated in the previous study (Chapter 3).

D2.2.2 Participant recruitment

Recruitment was carried out in a "walk-into-the-lab" fashion. Data collection occurred at well-attended *contrada* events, mainly before communal meals, where it was known that many *contrada* members would be present. Participants were recruited from among those present by either A.R.K., the collaborator, or a research assistant (research assistant). Participation was voluntary. Participants were invited to a separate, private location within the clubhouse of the *contrada*, where they completed the questionnaire individually in sessions of between 1 and 6 participants.

Within each *contrada*, the sample of participants likely do not represent the total population of official *contrada* members. However, during recruitment, all members present at the event were invited to participate. Thus, our recruitment strategy captures a sample that represents members who actively participate in the *contrada*.

In order to have the same number of participants as Bernhard et al. (2006), recruitment occured over two periods. The first period was June–July 2017, and the second was June–July 2018. Recruitment was over multiple events. For *contrada Torre*, recruitment occured over four events during the first period (2017-06-13, 2017-06-20, 2017-06-27, 2017-06-30), and two events during the second period (2018-06-26, 2018-06-30). For *contrada Selva*, recruitment occured over one event during the first period (2017-06-23) and one event during the second period (2018-07-01). For *contrada Oca*, recruitment occured over one event during the first period (2017-06-23) and one event during the second period (2018-06-30).

D2.2.3 Experimental procedure

Upon questionnaire administration, A.R.K. or the research assistant gave participants brief instructions in Italian. Participants completed the questionnaire individually, but were given oral instructions before making their decisions. Questionnaires took between 10 and 20 minutes to complete. Upon completion, participants

returned the questionnaire to A.R.K. or the research assistant directly. Further instructions for earnings were given.

D2.2.4 Randomisation

Order Participants were randomly assigned to player role (the participant, the recipient, and player C).

Earnings Participants were randomly matched by treatment in R. Where there were any unmatched participants, the average earning was given.

D2.2.5 Language

Recruitment and oral instructions were completed in Italian. The questionnaire, in Italian, was written by A.R.K. and L.F. and proofread by an Italian research assistant.

D2.2.6 Survey

The questionnaire comprised multiple sections. The final section was a survey. All the survey data has been analysed in Chapter 2, together with other survey data collected during a separate study (Chapter 3). For completeness, the questions that formed part of the survey are included here.

- Location of birth
- Residency
- Percentage of lifetime spent in Siena
- Reasons for *contrada* membership
- Paid member
- Leadership role
- Frequency of social and organisational participation
- *Contrada* membership of closest friends
- Feeling of *contrada* superiority
- Religious participation

Responses to the survey questions were not analysed in models, although the "paid member" question was used to exclude participants who were not members who had paid the annual fee. The survey questions were not asked before the TPPG and therefore did not influence decisions in the game.

D2.2.7 Questionnaire

The original questionnaire used is in Section D4 alongside an English translaion. Certain sections of the questionnaire differ between the participant, the recipient, and player C. These are the game instructions and decision sections, and have been highlighted. The questionnaire was based on instructions found in Bernhard et al. (2006). Collaborator and *contrada* names have been removed and placed within square brackets, as have contact details.

Table D4: Model comparison using the AIC

model	log likelihood	parameters	AIC
1	-152	5	320
2	-127	6	284
3	-130	6	279
4	-148	6	317
5	-148	6	317

D3 Supplementary analysis and results

Supplementary analysis and results are divided into two sections. First, Section D3.2 includes all details of the analysis of interpretations (Section D3.2). Second, Section D3.3 collates supplementary figures and tables referenced in the main text.

D3.1 Model selection

We compared the Akaike information criterion (AIC) of different probit regression models to see which model best fits the data (Burnham and Anderson 2004). The model with the smallest AIC is the one that best predicts the sampled data. The models varied in how group membership was included as a parameter. We vary group membership because we are interested in how punishment patterns differ, which in turn reflect different norms between *contrade*. Note that all the models below included the four punishment expectations, but for clarity they are not shown here.

```
## model 1 (no group membership)
punishment ~ allocation +
    (1 | id)

## models 2--5  (including group membership)
punishment ~ allocation + group-membership +
    (1 | id)
```

Model 2 had all three group membership levels: in-group, neutral out-group, and rival out-group. Model 3 split group membership into the in-group vs. the two out-groups combined. Model 4 split group membership into the in-group and the neutral out-group combined vs. the rival out-group. Model 5 split group membership into the in-group and the rival out-group combined vs. the neutral out-group.

Table D4 shows that model 3 best fits the data. This suggests that punishment between the in-group and the two out-groups are different, while punishment for the two out-groups is broadly similar.

D3.2 Interpretations

The seven categories of responses were: "no response" (no written response); "off topic" (response with no mention of the game); "confusion" (response which references confusion over the understanding or aim of the game); "money" (response explicitly mentions dividing money, with no reference to the *contrada*); "generic contrada life" (response mentions the *contrada*, but generically), "palio related" (response says the game captures *palio*-related behaviour), "contrada attachment or prosociality" (response says the game captures an aspect of within or between *contrada* attachment or prosociality). Participants who could have been assigned multiple categories were only assigned the last category in the above order. An example quote from each category is included in Table D5.

Table D5: Responses by type with examples

interpretation	**translation of quote (ID)**	**number**	**percentage**
no response	-	55	35
off topic	very interesting (LU204)	32	20
confusion	interesting and original even if I don't understand the aim (AN612)	10	6
money	(...) to find out how kids behave with respect to money (RO310)	2	1
generic contrada	useful for outsiders to understand the life of a *contrada* member (GL109)	18	11
palio related	reminds me of the *palio* and the deals between *contrade* (CI212)	4	2
contrada prosociality	understand the capacity of *contrada* members to cooperate with each other (AN608)	38	24

D3.3 Cooperation and punishment

This section includes figures and tables referenced in text. These are the effects of group membership and player role on allocation (Tables D6 and D7) and the effect of group membership and punishment expectations on the three behavioural types (Table D8) as discussed in Section 4.3.2. An additional plot of punishment decisions (Figure D1, the effect of group membership and punishment type on punishment (Table D9) and subsequent post-hoc comparisons (Table D10), and a table of punishment slopes (Table D11), as discussed in Section 4.3.3, are also included.

Table D6: Results of ANOVA with allocation as outcome and group membership and player role (the participant vs. the recipient) as fixed effects.

effect	df	F	p	
group membership	2	11	< .001	***
player role	1	0	.986	
group membership X player role	2	3	.077	

* $p < .05$, ** $p < .01$, *** $p < .001$

Table D7: Pairwise contrasts with Tukey corrections between actual allocation and allocation expectations by group membership.

group membership	estimate	CI (low)	CI (high)	p
in-group	-1.2	-4	2	.816
neutral out-group	2.1	-1	5	.390
rival out-group	-0.2	-3	2	1.000

* $p < .05$, ** $p < .01$, *** $p < .001$

Table D8: Logistic regression of the three behavioural types (give, avoid, harm) against group membership and punishment expectations

	give				avoid				harm			
effect	estimate	SE	z	p	estimate	SE	z	p	estimate	SE	z	p
neutral outgroup (ref: in-group)	-1.73	2	-0.93	.350	0	1e+05	0	1.000	1.73	2	0.93	.350
rival outgroup (ref: in-group)	-1.80	2	-1.06	.291	0	1e+05	0	1.000	1.80	2	1.06	.291
punishment expectation (take 2)	1.82	1	1.39	.164	0	1e+05	0	1.000	-1.82	1	-1.39	.164
punishment expectation (give 0)	0.06	2	0.04	.968	0	1e+05	0	1.000	-0.06	2	-0.04	.968
punishment expectation (give 5)	-2.21	2	-1.29	.196	0	1e+05	0	1.000	2.21	2	1.29	.196
punishment expectation (give 6)	1.06	2	0.63	.531	0	1e+05	0	1.000	-1.06	2	-0.63	.531
(intercept)	2.03	1	1.43	.153	-26	1e+05	0	1.000	-2.03	1	-1.43	.153

Note: For each regression, the behavioural type (give, avoid, or harm) was coded as 1 and the other two as 0.
* $p < .05$, ** $p < .01$, *** $p < .001$

Table D9: Results of ANOVA with punishment as outcome and allocation, group membership and punishment decision type (actual vs. expectation) as fixed effect

effect	dfn	dfd	F	p	
allocation	3	250	4	.011	*
decision type	1	304	0	.861	
group membership	2	71	0	.959	
allocation X decision type	3	250	1	.305	
allocation X group membership	6	250	8	< .001	***
decision type X group membership	2	300	1	.331	
allocation X decision type X group membership	6	250	2	.122	

* $p < .05$, ** $p < .01$, *** $p < .001$

Table D10: Pairwise contrasts with Tukey corrections between actual punishment and punishment expectations across four allocations and for each group membership

allocation	estimate	SE	df	t	p	
in-group						
-2	1.05	0.3	289	3.04	.003	**
0	0.07	0.3	289	0.21	.832	
5	-0.18	0.3	289	-0.52	.601	
6	-0.26	0.3	289	-0.75	.456	
neutral out-group						
-2	-0.29	0.3	270	-0.95	.341	
0	-0.47	0.3	270	-1.53	.128	
5	0.16	0.3	270	0.52	.601	
6	-0.04	0.3	270	-0.13	.895	
rival out-group						
-2	-0.01	0.3	273	-0.04	.968	
0	-0.03	0.3	273	-0.10	.918	
5	-0.26	0.3	273	-0.93	.353	
6	-0.32	0.3	273	-1.12	.265	

* $p < .05$, ** $p < .01$, *** $p < .001$

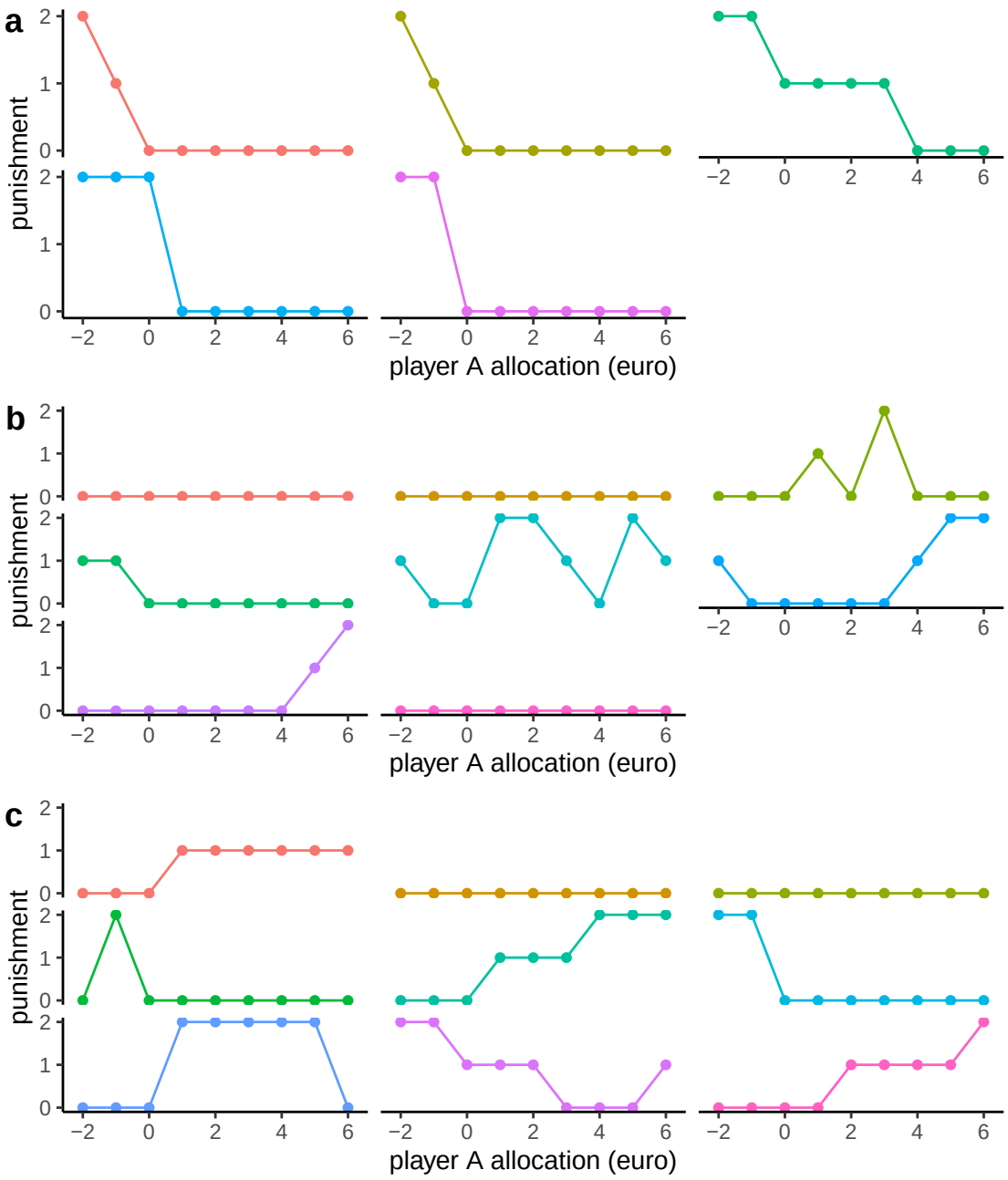


Figure D1: Punishment decisions across all possible allocations by each participant, in the three group membership treatments: a) in-group, b) neutral out-group, c) rival out-group.

Table D11: Positive, zero, and negative slopes of punishment decisions

	slope	count	%
in-group	negative	5	100
neutral out-group	negative	1	12
neutral out-group	zero	6	75
neutral out-group	positive	1	12
rival out-group	negative	1	11
rival out-group	zero	5	56
rival out-group	positive	3	33

Note: derived from the slopes in a linear model regressing punishment over allocation for each participant.

D4 Questionnaires

The first document is the original questionnaire in Italian (Section D4.1). The second document is the English translation of the questionnaire (Section D4.2). The participant, the recipient, and player C received different instructions and decision pages, which are provided below. The first two pages and the final four pages were identical across all three players.

D4.1 Questionnaire in Italian

La socialità contemporanea a Siena: uno studio antropologico

Questionario sulle Contrade per l'Università di Oxford

Benvenuto a questo studio e grazie per la tua partecipazione!

Il presente questionario è parte integrante di un progetto di studio sulla vita sociale contemporanea a Siena, in particolare come le persone si relazionano al Palio, alla propria Contrada, ed alle altre Contrade. Lo studio, condotto in collaborazione con le Contrade, si svolgerà nell'arco di un anno.

Il progetto è finalizzato alla realizzazione della tesi di dottorato di Adam Kenny, dottorando presso la facoltà di antropologia dell'Università di Oxford.

Per qualsiasi informazione puoi rivolgerti al ricercatore (o al suo assistente) presente durante lo studio, o a [COLLABORATOR NAME].

Sei pregato di compilare il questionario **da solo/a**. Mentre stai compilando il questionario è importante che eviti di parlare con i tuoi vicini di tavola. Inoltre, cerca di evitare che altri leggano il questionario e le tue risposte — le risposte sono personali! Appena finito il questionario, per favore consegnalo direttamente al ricercatore (o al assistente) presente. Alla fine di non influenzare le risposte di altri, ci affidiamo alla tua discrezione riguardo allo studio!

Consenso

Puoi cominciare il questionario dopo aver letto le informazioni ed aver dato il tuo consenso. Se non dai il tuo consenso, non puoi partecipare!

Informazioni generali

Lo studio è composto da questo questionario. Dovrebbe durare al massimo 10 minuti. Il questionario è diviso in tre sezioni. Nella prima dovrai fornire delle informazione di base. Nella seconda dovrai prendere delle decisioni in una serie di "giochi". Nell'ultima sezione ci saranno delle domande su te, Siena e sulle Contrade. **I dati saranno anonimi dall'inizio e non potrai essere identificato dagli stessi.** Nei giochi dovrai decidere come distribuire una somma di denaro (o €7 o €12). In base alle tue decisioni durante i giochi, alla fine dello studio potrai ricevere almeno una parte di queste somme. In più riceverai un buono per usare nella Società.

Se desideri più informazioni il ricercatore (o il suo assistente) puo fornire un foglio con le informazioni specifiche.

Consenso

- **Confermo di aver letto le informazioni generali** ☐ Sì ☐ No
- **Dichiaro di avere almeno 18 anni di età** ☐ Sì ☐ No
- **Do il mio consenso a partecipare a questo studio** ☐ Sì ☐ No

Codice segreto

Il codice segreto serve a collegare le risposte fornite adesso con quelle nel futuro, e per ricevere il ricompenso. Il codice è composto da quattro domande. Questo codice segreto renderà le tue risposte anonime.

Per favore, costruisci il codice segreto in base a queste domande:

1. **La prima lettera del nome della tua madre.**
   p.es. se tua madre si chiama Rhea Silvia, scrivi R

   _____

2. **La seconda lettera del nome della tua madre.**
   p.es. se tua madre si chiama Rhea Silvia, scrivi H

   _____

3. **L'ultimo numero del numero civico.**
   p.es. se abiti a numero civico 101, scrivi 1
   p.es. se abiti a numero civico 1, scrivi 1

   _____

4. **Il mese in cui sei stato nato.**
   p.es. se sei nato a giugno, scrivi 06

   _____

D4.1.1 Player A instructions and decisions

Gioco di decisione

Istruzioni

Ci sono 3 giocatori in questo gioco: Persona A, Persona B, e Persona C. Tutti e tre sono contradaioli. Tu sei Persona A. Persona B è del/la [CONTRADA] e Persona C è del/la [CONTRADA]. Nessuno conoscera l'identità precisa di quelli con cui sta giocando. Solo il ricercatore sa e non lo dirà mai a nessuno.

Tu sei Persona A. Ti saranno dati €2.

Qualcun'altro è Persona B. Gli saranno dati €2.

A te saranno dati altri €10.

Tu devi decidere quanto di questi €10 vuoi dare a Persona B e quanto vuoi tenere per te stesso. Altrimenti, puoi decidere quanto dei €2 vuoi togliere da Persona B.

Persona B sarà pagato quello che decidi.

Tu sarai pagato il risultato della tua decisione e della decisione di Persona C.

Qualcun'altro è Persona C. Gli saranno dati €7.

Persona C può fare tre cose con i suoi €7:

1) Può punire la tua decisione pagando €1 cosi €3 ti saranno dedotti dalla somma finale.
2) Può punire più fortemente la tua decisione pagando €2 cosi €6 ti saranno dedotti dalla somma finale.
3) Può non punire la tua decisione pagando €0 cosi tiene i suoi €7 e lascia tutti i soldi della tua somma finale.

Esempi

Adesso tre esempi. Ricorda che tu e Persona B avete €2 all'inizio, poi a te vengono dati €10:

I) Supponi di dare €2 a Persona B del/la [CONTRADA] e tenere €10 per te stesso. Adesso supponi che Persona C del/la [CONTRADA] afferma che in questo caso, ti punirà e pagherà €1 per ridurre la tua somma finale di €3. In questo caso:
   - Tu finisci con €7 (€12 meno i €2 che hai dato a Persona B e meno i €3 decisi da Persona C)
   - Persona B del/la [CONTRADA] finisce con €4 (€2 più i €2 che hai dato)
   - Persona C del/la [CONTRADA] finisce con €6 (€7 meno €1)

II) Supponi di togliere €1 da Persona B del/la [CONTRADA]. Avrai €13 per te stesso. Adesso supponi che Persona C del/la [CONTRADA] afferma che in questo caso, ti punirà fortemente e pagherà €2 per ridurre la tua somma di €6. In questo caso:
   - Tu finisci con €7 (€12 più €1 che hai tolto da Persona B, meno €6 deciso da Persona C)
   - Persona B del/la [CONTRADA] finisce con €1 (€2 meno €1 che hai tolto)
   - Persona C (del/la [CONTRADA]) finisce con €5 (€7 meno €2)

III) Supponi di dare €0 a Persona B del/la [CONTRADA] e tenere €12 per te stesso. Adesso supponi che Persona C del/la [CONTRADA] afferma che in questo caso, non ti punirà quindi pagherà €0 per non ridurre la tua somma finale. In questo caso:
   - Tu finisci con €12 (€12 meno i €0 che hai dato)
   - Persona B del/la [CONTRADA] finisce con €2 (€2 più i €0 che hai dato)
   - Persona C del/la [CONTRADA] finisce con €7 (€7 meno €0)

Adesso puoi rispondere a queste domande?

1. Supponi di dare €4 a Persona B del/la [CONTRADA] e Persona C del/la [CONTRADA] afferma che pagherà €0 e lascerà tutto com'è.

a. Quanto avrai? □ €8 □ €2

b. Quanto avrà Persona B? □ €4 □ €6

c. Quanto avrà Persona C? □ €7 □ €5

2. Supponi di dare €4 a Persona B del/la [CONTRADA] e Persona C del/la [CONTRADA] afferma che pagherà €2 cosi vengono ridotti €6 dalla tua somma finale.

a. Quanto avrai? □ €8 □ €2

b. Quanto avrà Persona B? □ €4 □ €6

c. Quanto avrà Persona C? □ €7 □ €5

3. Supponi di dare €6 a Persona B del/la [CONTRADA] e Persona C del/la [CONTRADA] afferma che pagherà €1 cosi vengono ridotti €3 dalla tua somma finale.

a. Quanto avrai? □ €3 □ €6

b. Quanto avrà Persona B? □ €8 □ €6

c. Quanto avrà Persona C? □ €7 □ €6

Adesso giochi!

Tu sei Persona A. Ti saranno dati €2.

Persona B è del/la [CONTRADA]. Gli saranno dati €2.

A te saranno dati altri €10.

Tu devi decidere quanto di questi €10 vuoi dare a Persona B del/la [CONTRADA] e quanto vuoi tenere per te stesso. Altrimenti, puoi decidere quanto dei €2 vuoi togliere da Persona B del/la [CONTRADA].

Adesso devi indicare se preferisci dare o togliere, e quanto.

*Se preferisci **dare**, indica qui quanto vuoi dare:*

€0	€1	€2	€3	€4	€5	€6
☐	☐	☐	☐	☐	☐	☐

*Se preferisci **togliere**, indica qui quanto vuoi togliere:*

€0	€1	€2
☐	☐	☐

Grazie. A Persona B sarà data la somma che hai deciso di dare, o sarà tolto la somma che hai deciso di togliere. Tu sarai pagato il risultato della tua decisione e della decisione di Persona C del/la [CONTRADA].

D4.1.2 Player B instructions and decisions

Gioco di decisione

Istruzioni

Ci sono 3 giocatori in questo gioco: Persona A, Persona B, e Persona C. Tutti e tre sono contradaioli. Tu sei Persona B. Persona A è del/la [CONTRADA]]e Persona C è del/la [CONTRADA]. Nessuno conoscera l'identità precisa di quelli con cui sta giocando. Solo il ricercatore sa e non lo dirà mai a nessuno.

Qualcuno è Persona A. Saranno dati a Persona A €2. Tu sei Persona B. Ti saranno dati €2.

A Persona A saranno dati altri €10. Persona A deve decidere quanto di questi €10 vuole dare a te e quanto vuole tenere per se stesso. Altrimenti, Persona A può decidere quanto dei €2 vuole togliere da te.

Tu sarai pagato quello che decide Persona A. Persona A sarà pagato il risultato della sua decisione e della decisione di Persona C.

Qualcun'altro è Persona C. Gli saranno dati €7. Persona C può fare tre cose con i suoi €7:

1) Può punire la decisione di Persona A del/la [CONTRADA]]pagando €1 cosi €3 saranno dedotti da Persona A.
2) Può punire più fortemente la decisione di Persona A del/la [CONTRADA]]pagando €2 cosi €6 saranno dedotti da Persona A.
3) Può non punire la decisione di Persona A del/la [CONTRADA]]pagando €0 cosi tiene i suoi €7 e lascia a Persona A tutti i suoi soldi.

Tu sarai pagato quello che decide Persona A. A Persona A sarà pagato il risultato della sua decisione meno la decisione di Persona C.

Esempi

Adesso tre esempi. Ricorda che Persona A e Persona B hanno €2 all'inizio, poi a Persona A viene dato €10:

I) Supponi che Persona A del/la [CONTRADA]]dia €2 a te e tenga €10 per se stesso. Adesso supponi che Persona C del/la [CONTRADA] affermi che in questo caso, punirà €1 per ridurre la somma di Persona A di €3. In questo caso:
   - Persona A del/la [CONTRADA]]finisce con €7 (€12 meno i €2 che ha dato a te e meno meno i €3 decisi da Persona C)
   - Tu finisci con €4 (€2 più i €2 che hai ricevuto da Persona A)
   - Persona C del/la [CONTRADA] finisce con €6 (€7 meno €1)

II) Supponi che Persona A del/la [CONTRADA]]tolga €1 da te. Avrà €13 per se stesso. Adesso supponi che Persona C del/la [CONTRADA] afferma che in questo caso, punirà fortemente pagando €2 per ridurre la somma di Persona A di €6. In questo caso:
   - Persona A del/la [CONTRADA]]finisce con €7 (€12 più €1 che ha tolto da te, meno i €3 decisi da Persona C)
   - Tu finisci con €1 (€2 meno €1 che Persona A ha tolto da te)
   - Persona C del/la [CONTRADA] finisce con €5 (€7 meno €2)

III) Supponi che Persona A del/la [CONTRADA]]dia €0 a te e tenga €12 per se stesso. Adesso supponi che Persona C del/la [CONTRADA] afferma che in questo caso, non punirà. Quindi pagherà €0 per non ridurre la somma di Persona A. In questo caso:
   - Persona A del/la [CONTRADA]]finisce con €12 (€12 meno i €0 che ha dato a te)
   - Tu finisci con €2 (€2 più i €0 che hai ricevuto da Persona A)
   - Persona C del/la [CONTRADA] con €7 (€7 meno €0)

La decisione di Persona A del/la [CONTRADA]]è una decisione vera. Però non saprai la decisione di Persona A prima di ricevere la tua somma. Quindi ti sarà chiesto di indicare quale decisione *tu pensi che prendereste* Persona A.

Adesso puoi rispondere a queste domande?

1. **Supponi che Persona A del/la [CONTRADA]]dia €4 a te e Persona C del/la [CONTRADA] afferma che pagarà €0 e lasciarai tutto com'è.**

a. Quanto avrà Persona A? □ €8 □ €2

b. Quanto avrai? □ €4 □ €6

c. Quanto avrà Persona C? □ €7 □ €5

2. **Supponi che Persona A del/la [CONTRADA]]dia €4 a te e Persona C del/la [CONTRADA] afferma che pagarà €2 per ridurre di €6 la somma finale di Persona A.**

a. Quanto avrà Persona A? □ €8 □ €2

b. Quanto avrai? □ €4 □ €6

c. Quanto avrà Persona C? □ €7 □ €5

3. **Supponi che Persona A del/la [CONTRADA]]dia €6 a te e Persona C afferma che pagarà €1 per ridurre di €3 la somma finale di Persona A.**

a. Quanto avrà Persona A? □ €3 □ €6

b. Quanto avrai? □ €8 □ €6

c. Quanto avrà Persona B? □ €7 □ €6

Adesso giochi!

Tu sei Persona B. Ti saranno dati €2.

Persona A è del/la [CONTRADA]]. Gli saranno dati €2.

In più a Persona A del/la [CONTRADA]]saranno dati altri €10.

Persona A del/la [CONTRADA]]deve decidere quanto di questi €10 vuole dare a te e quanto vuole tenere per se stesso. Altrimenti, può decidere quanto dei €2 vuole togliere da te.

La decisione di Persona A del/la [CONTRADA]]è una decisione vera. Però non saprai la decisione di Persona A prima di ricevere la tua somma. Quindi ti sarà chiesto di indicare quale decisione *tu pensi che prendereste* Persona A.

Adesso devi indicare se pensi che Persona A del/la [CONTRADA]]preferisce dare a te o togliere da te, e quanto.

*Se pensi che Persona A preferisce **dare**, indica qui quanto vuole dare:*

€0	€1	€2	€3	€4	€5	€6
☐	☐	☐	☐	☐	☐	☐

*Se pensi che Persona A preferisce **togliere**, indica qui quanto vuole togliere:*

€0	€1	€2
☐	☐	☐

Grazie. A te sarà dato la somma che ha deciso Persona A di dare, o sarà tolto la somma che ha deciso Persona A di togliere.

D4.1.3 Player C instructions and decisions

Gioco di decisione

Istruzioni

Ci sono 3 giocatori in questo gioco: Persona A, Persona B, e Persona C. Tutti e tre sono contradaioli. Tu sei Persona C. Persona A è del/la [CONTRADA]]e Persona B è del/la [CONTRADA]. Nessuno conoscerà l'identità precisa di quelli con cui sta giocando. Solo il ricercatore sa e non lo dirà mai a nessuno.

Qualcuno è Persona A e qualcun'altro è Persona B. Saranno dati a Persona A e a Persona B €2 ciascuno. A Persona A saranno dati altri €10. Persona A deve decidere quanto di questi €10 vuole dare a Persona B e quanto vuole tenere per se stesso. Altrimenti, Persona A può decidere quanto dei €2 vuole togliere da Persona B.

Tu sei Persona C. Adesso saranno dati a te €7. Tu puoi fare tre cose con i tuoi €7:

1) Puoi punire la decisione di Persona A del/la [CONTRADA]]pagando €1 cosi €3 saranno dedotti da Persona A.

2) Puoi punire più fortemente la decisione di Persona A del/la [CONTRADA]]pagando €2 cosi €6 saranno dedotti da Persona A.

3) Puoi non punire la decisione di Persona A del/la [CONTRADA]]pagando €0 cosi tiene i tuoi €7 e lasci a Persona A tutti i suoi soldi.

A Persona B sarà pagato quello che decide Persona A. A Persona A sarà pagato il risultato della sua decisione meno la tua decisione. Tu sarai pagato la tua decisione.

Esempi

Adesso tre esempi. Ricorda che Persona A e Persona B hanno €2 all'inizio, poi a Persona A viene dato €10:

I) Supponi che Persona A del/la [CONTRADA]]dia €2 a Persona B del/la [CONTRADA] e tenga €10 per se stesso. Adesso supponi di aver affermato che in caso Persona A decidesse questo, tu lo puniresti pagando €1 per ridurre la somma di Persona A di €3. In questo caso:
   - Persona A del/la [CONTRADA]]finisce con €7 (€12 meno i €2 che ha dato e meno meno i €3 decisi da te)
   - Persona B del/la [CONTRADA] finisce con €4 (€2 più i €2 che ha ricevuto da Persona A)
   - Tu finisci con €6 (€7 meno €1)

II) Supponi che Persona A del/la [CONTRADA]]tolga €1 da Persona B del/la [CONTRADA]. Avrà €13 per se stesso. Adesso supponi di aver affermato che in caso Persona A decidesse questo, tu lo puniresti fortemente pagando €2 per ridurre la somma di Persona A di €6. In questo caso:
   - Persona A del/la [CONTRADA]]finisce con €7 (€12 più €1 che ha tolto da Persona B, meno i €3 decisi da te)
   - Persona B del/la [CONTRADA] finisce con €1 (€2 meno €1 che Persona A ha tolto)
   - Tu finisci con €5 (€7 meno €2)

III) Supponi che Persona A del/la [CONTRADA]]dia €0 a Persona B del/la [CONTRADA] e tenga €12 per se stesso. Adesso supponi di aver affermato che in caso Persona A decidesse questo, tu non lo puniresti. Quindi pagherai €0 per non ridurre la somma di Persona A. In questo caso:
   - Persona A del/la [CONTRADA]]finisce con €12 (€12 meno i €0 che ha dato)
   - Persona B del/la [CONTRADA] finisce con €2 (€2 più i €0 che ha ricevuto da Persona A)
   - Tu finisci con €7 (€7 meno €0)

La decisione di Persona A del/la [CONTRADA]]è una decisione vera. Però non saprai la decisione di Persona A prima di prendere la tua decisione. Quindi ti sarà chiesto di indicare quale decisione prenderesti *per ogni possibile decisione* di Persona A. La tua decisione decide veramente quello che prenderai e prenderà Persona A alla fine del giocho. Nota bene che non potrai cambiare idea dopo avere scoperto la decisione di Persona A.

Adesso puoi rispondere a queste domande?

1. **Supponi che Persona A del/la [CONTRADA]]dia €4 a Persona B del/la [CONTRADA] e tu affermi che pagarai €0 e lasciarai tutto com'è.**

a. Quanto avrà Persona A? □ €8 □ €2

b. Quanto avrà Persona B? □ €4 □ €6

c. Quanto avrai? □ €7 □ €5

2. **Supponi che Persona A del/la [CONTRADA]]dia €4 a Persona B del/la [CONTRADA] e tu affermi che pagarai €2 per ridurre di €6 la somma finale di Persona A.**

a. Quanto avrà Persona A? □ €8 □ €2

b. Quanto avrà Persona B? □ €4 □ €6

c. Quanto avrai? □ €7 □ €5

3. **Supponi che Persona A del/la [CONTRADA]]dia €6 a Persona B del/la [CONTRADA] e tu affermi che pagarai €1 per ridurre di €3 la somma finale di Persona A.**

a. Quanto avrà Persona A? □ €3 □ €6

b. Quanto avrà Persona B? □ €8 □ €6

c. Quanto avrai? □ €7 □ €6

Adesso giochi!

Ricorda che Persona A del/la [CONTRADA]]e Persona B del/la [CONTRADA] hanno €2 all'inizio, poi a Persona A vengono dati €10.

Persona A del/la [CONTRADA]]può dare a Persona B del/la [CONTRADA] o può togliere da Persona B del/la [CONTRADA].

Quindi ti sarà chiesto di indicare quale decisione prenderesti *per ogni possibile decisione* di Persona A.

---

1. Se Persona A del/la [CONTRADA]]**toglie €2** da Persona B del/la [CONTRADA] vorresti:
- □ **pagare €1** cosi €3 saranno dedotti dalla somma finale di Persona A
- □ **pagare €2** cosi €6 saranno dedotti dalla somma finale di Persona A
- □ **pagare €0** cosi €0 saranno dedotti dalla somma finale di Persona A

2. Se Persona A del/la [CONTRADA]]**toglie €1** da Persona B del/la [CONTRADA] vorresti:
- □ **pagare €1** cosi €3 saranno dedotti dalla somma finale di Persona A
- □ **pagare €2** cosi €6 saranno dedotti dalla somma finale di Persona A
- □ **pagare €0** cosi €0 saranno dedotti dalla somma finale di Persona A

3. Se Persona A del/la [CONTRADA]]**dà €0** a Persona B del/la [CONTRADA] vorresti:
- □ **pagare €1** cosi €3 saranno dedotti dalla somma finale di Persona A
- □ **pagare €2** cosi €6 saranno dedotti dalla somma finale di Persona A
- □ **pagare €0** cosi €0 saranno dedotti dalla somma finale di Persona A

4. Se Persona A del/la [CONTRADA]]**dà €1** a Persona B del/la [CONTRADA] vorresti:
- □ **pagare €1** cosi €3 saranno dedotti dalla somma finale di Persona A
- □ **pagare €2** cosi €6 saranno dedotti dalla somma finale di Persona A
- □ **pagare €0** cosi €0 saranno dedotti dalla somma finale di Persona A

5. Se Persona A del/la [CONTRADA]]**dà €2** a Persona B del/la [CONTRADA] vorresti:
- □ **pagare €1** cosi €3 saranno dedotti dalla somma finale di Persona A
- □ **pagare €2** cosi €6 saranno dedotti dalla somma finale di Persona A
- □ **pagare €0** cosi €0 saranno dedotti dalla somma finale di Persona A

6. Se Persona A del/la [CONTRADA]]**dà €3** a Persona B del/la [CONTRADA] vorresti:
- □ **pagare €1** cosi €3 saranno dedotti dalla somma finale di Persona A
- □ **pagare €2** cosi €6 saranno dedotti dalla somma finale di Persona A
- □ **pagare €0** cosi €0 saranno dedotti dalla somma finale di Persona A

7. Se Persona A del/la [CONTRADA]]**dà €4** a Persona B del/la [CONTRADA] vorresti:
- □ **pagare €1** cosi €3 saranno dedotti dalla somma finale di Persona A
- □ **pagare €2** cosi €6 saranno dedotti dalla somma finale di Persona A
- □ **pagare €0** cosi €0 saranno dedotti dalla somma finale di Persona A

8. Se Persona A del/la [CONTRADA]]**dà €5** a Persona B del/la [CONTRADA] vorresti:
- □ **pagare €1** cosi €3 saranno dedotti dalla somma finale di Persona A
- □ **pagare €2** cosi €6 saranno dedotti dalla somma finale di Persona A
- □ **pagare €0** cosi €0 saranno dedotti dalla somma finale di Persona A

9. Se Persona A del/la [CONTRADA]]**dà €6** a Persona B del/la [CONTRADA] vorresti:
- □ **pagare €1** cosi €3 saranno dedotti dalla somma finale di Persona A
- □ **pagare €2** cosi €6 saranno dedotti dalla somma finale di Persona A
- □ **pagare €0** cosi €0 saranno dedotti dalla somma finale di Persona A

D4.1.4 All players

Adesso deve indicare cosa pensi che gli altri faranno in generale.

1. Se Persona A **toglie €2** da Persona B, pensi che la maggioranza delle persone giocando come Persona C pagheranno per punire Persona A?
   - □ No
   - □ Sì, pagando €1
   - □ Sì, pagando €2
2. Se Persona A **dà €0** a Persona B, pensi che la maggioranza delle persone giocando come Persona C pagheranno per punire Persona A?
   - □ No
   - □ Sì, pagando €1
   - □ Sì, pagando €2
3. Se Persona A **dà €5** a Persona B, pensi che la maggioranza delle persone giocando come Persona C pagheranno per punire Persona A?
   - □ No
   - □ Sì, pagando €1
   - □ Sì, pagando €2
4. Se Persona A **dà €6** a Persona B, pensi che la maggioranza delle persone giocando come Persona C pagheranno per punire Persona A?
   - □ No
   - □ Sì, pagando €1
   - □ Sì, pagando €2

Domande su di te

1. **In che anno sei nato?** _____
2. **Di che sesso sei?** □ Femmina □ Maschio
3. **Descrivi al meglio la tua situazione lavorativa**
   - □ Occupato
   - □ Disoccupato
   - □ Pensionato
   - □ Studente
   - □ Altro: _____
4. **Rispetto al reddito medio nazionale di €27.500 (annuo lordo), in quale fascia si colloca il tuo?**
   - □ Più della media □ Simile alla media □ Meno della media
5. **Qual è il tuo titolo di studio?** ***Indica il livello completato più alto.***
   - □ Licenza elementare
   - □ Licenza media
   - □ Diploma di scuola superiore
   - □ Qualifica professionale
   - □ Laurea (triennale o specialistica o magistrale)
   - □ Post-laurea (master o dottorato)
   - □ Nessuno
   - □ Altro: _____

Tu, Siena, e la Contrada

1. **Dove sei nato?**
   - ☐ Fuori dal Comune di Siena
   - ☐ Nel Comune di Siena
   - ☐ Sulle lastre

2. **Dove abiti?**
   - ☐ Dentro le mura:
     - ☐ nella tua Contrada
     - ☐ in un'altra Contrada
   - ☐ Fuori dalle mura:
     - ☐ nel Comune di Siena
     - ☐ nella Provincia di Siena
   - ☐ in Toscana
   - ☐ in Italia
   - ☐ all'estero

3. **Ti è capitato di vivere per qualche tempo fuori dalla Provincia di Siena?**
   - ☐ No
   - ☐ Sì, per _____ anni e _____ mesi (complessivamente)

4. **Sei contradaiolo di questa Contrada perché:**
   - ☐ Entrambi i tuoi genitori eranno contradaioli di questa Contrada
   - ☐ Uno dei tuoi genitori era contradaiolo di questa Contrada:
     - ☐ madre ☐ padre
   - ☐ Sei nato nel territorio della Contrada
   - ☐ Hai scelto di fare parte di questa Contrada
   - ☐ Altro: _____

5. **Sei stato un *protettore* negli ultimi due anni?** ☐ Sì ☐ No

6. **Hai avuto un incarico nella direzione della Contrada?** ***Puoi indicare più di una risposta.***
   - ☐ Sì, in questo momento
   - ☐ Sì, in passato
   - ☐ No

7. **Nell'*ultimo mese*, con quale frequenza hai partecipato alla vita sociale della Contrada?**
   Per esempio, partecipando alle cene, frequentando la Società o altro.
   - ☐ Mai
   - ☐ Una volta al mese
   - ☐ 2–3 volte al mese
   - ☐ Quasi ogni settimana
   - ☐ Ogni settimana
   - ☐ 2–3 volte alla settimana
   - ☐ Quasi ogni giorno
   - ☐ Ogni giorno

8. **Nell'*ultimo mese*, con quale frequenza hai partecipato alla vita organizzativa della Contrada?**
   Per esempio, partecipando alle assemblee, aiutando in iniziative degli organismi o altro.
   - ☐ Mai
   - ☐ Una volta al mese
   - ☐ 2–3 volte al mese
   - ☐ Quasi ogni settimana
   - ☐ Ogni settimana
   - ☐ 2–3 volte alla settimana
   - ☐ Quasi ogni giorno
   - ☐ Ogni giorno

9. Pensa ai tuoi 5 migliori amici. Di questi 5, quanti:

a. sono contradaioli della *tua* Contrada? ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

b. sono contradaioli di *un'altra* Contrada? ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

c. *non* sono contradaioli? ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Per favore, assicurati che il totale delle risposte alle domande a.–c. sia 5!

10. Quanto sei d'accordo con la seguente frase:

"In generale, la mia Contrada è meglio della maggior parte delle altre Contrade."

Decisamente d'accordo	D'accordo	Né d'accordo né in disaccordo	In disaccordo	Decisamente in disaccordo
☐	☐	☐	☐	☐

11. Con quale frequenza assisti a riti religiosi? ***(non legati alla Contrada)***

- ☐ Mai
- ☐ Una volta all'anno
- ☐ Più volte all'anno
- ☐ Ogni mese
- ☐ Più volte al mese
- ☐ Ogni settimana
- ☐ Più volte alla settimana

12. Hai già fatto parte di uno studio simile?

- ☐ No
- ☐ Sì, dove: _____

13. Cosa pensi di questo studio? Secondo te, qual era lo scopo di questo studio? Ti fa ricordare a qualcosa?

GRAZIE PER LA TUA PARTECIPAZIONE!
Per favore, **consegna il questionario direttamente** al ricercatore (o al suo assistente) presente durante lo studio. Potrai ricevere il ricompenso da loro, ed altri informazioni.

D4.2 Questionnaire in English

Contemporary sociality in Siena: an anthropological study

Questionnaire about the Contrade for the University of Oxford

Welcome to this study and thank you for your participation!

This questionnaire forms part of a project on contemporary social life in Siena, in particular on how people relate to the Palio, and the Contrade. The project, conducted in collaboration with the Contrade, is being conducted over the course of a year.

The project is in support of a doctoral thesis by Adam Kenny, student at the faculty of anthropology at the University of Oxford.

For further information please refer to the researcher (or to his assistant) present throughout the study, or to [COLLABORATOR NAME].

You are invited to complete the questionnaire **by yourself**. Whilst answering the questionnaire it is important that you avoid talking to those around you. Furthermore, avoid having others read your questionnaire — the answers are personal! Once complete, please hand the questionnaire directly to the researcher (or his assistant). So as not to influence others, we appreciate your discretion with regards to the questionnaire and the questions therein!

Consent

You may begin the questionnaire after you have read the information and given your consent on the next page. If you do not give your consent, you cannot participate!

General information

The study is composed of this questionnaire. It should last at most 10 minutes. The questionnaire is divided into three sections. In the first, you will have to provide some basic information, for example age and sex. In the second, you will have to make some decisions. In the last section there will be some questions on Siena and the Contrade. **Data will be anonymised from the beginning and it will not be possible to identify you from the data.** In the games you will have to decide how to distribute a small sum of money (either €7 or €12). Based on your decisions during the games, at the end of the questionnaire you will receive at least a part of this sum. Furthermore you will receive a voucher to use in the Società.

If you want more information the researcher (or to his assistant) can give an information sheet with specific information.

Consenso

- **I have read the general information** ☐ Yes ☐ No
- **I confirm that I am 18 years of age or older** ☐ Yes ☐ No
- **I give my consent to participate in this study** ☐ Yes ☐ No

Secret code

The secret code helps to join responses you give now with those in the futre, and to recieve the earnings. The code is made of four questions. The secret code makes your responses anonymous.

Please construct the secret code based on the following questions:

1. **The first letter of your mother's name.**
   e.g. if your mother is called Rhea Silvia, write R

   _____

2. **The second letter of your mother's name.**
   e.g. if your mother is called Rhea Silvia, write H

   _____

3. **The last number of your house number.**
   e.g. if you live at house number 101, write 1
   e.g. if you live at house number 101, write 1

   _____

4. **The month in which you were born.**
   e.g. if you are born in June, write 06

   _____

D4.2.1 Player A instructions and decisions

Decision games

Instructions

There are 3 players in this game: Person A, Person B, and Person C. All three are contrada members. You are Person A. Person B is from [CONTRADA] and Person C is from [CONTRADA]. None of you will know the precise identity of those with whom you are interacting. Only the researcher knows and will never never tell anyone else.

You are Person A. €2 will be given to you.

Someone else is Person B. €2 will be given to them.

You will be given another €10.

You have to decide how much of the €10 you want to give to Person B and how much you want to keep for yourself. Alternatively, you can decide how much of the €2 you want to take from Person B.

Person B will be paid that which you decide.

You will be paid the result of your decision and Person C's decision.

Someone else is Person C. They will be given €7.

Person C can do three things with their €7:

1) Punish your decision by paying €1 so that €3 will be deducted from your final sum.
2) Punish your decision by paying €2 so that €6 will be deducted from your final sum.
3) Punish your decision by paying €0 so that they keep their €7 and leaves all of your money for your final sum.

Examples

Here are some examples. Remember you and Person B have €2 at the start, then €10 is given to you:

I) Suppose you give €2 to Person C from [CONTRADA] and keep €10 for yourself. Suppose now that Person C from [CONTRADA] states that in this case, they will punish €1 to reduce the your final sum by €3. In this case:
   - You finish with €7 (€12 minus €2 you have given to Person B and minus €3 decided by Person C)
   - Person B from [CONTRADA] finishes with €4 (€2 plus €2 you have given)
   - Person C from [CONTRADA] finishes with €6 (€7 minus €1)

II) Suppose you take €1 from Person B from [CONTRADA]. You will have €13 for yourself. Suppose now that Person C from [CONTRADA] states that in this case, they will punish you strongly paying €2 to reduce your sum by €6. In this case:
   - You finish with €7 (€12 minus €1 you have taken from Person B, minus €3 decided by Person C)
   - Person B finishes with €1 (€2 minus €1 that you have taken)
   - Person C from [CONTRADA] finishes with €5 (€7 minus €2)

III) Suppose you give €0 to Person B from [CONTRADA] and keep €12 for yourself. Suppose now that Person C from [CONTRADA] states that in this case, they will not punish. Therefore they will pay €0 to not reduce your final sum.
   - You finish with €12 (€12 minus €0 you have given to Person B)
   - Person B from [CONTRADA] finishes with €2 (€2 plus €0 you have given)
   - Person C from [CONTRADA] finishes with €7 (€7 minus €0)

Now can you answer these questions?

1. Imagine that you give €4 to Person B from [CONTRADA] and Person C from [CONTRADA] states that they will pay €2 and leave things unchanged.

a. How much will you have? □ €8 □ €2

b. How much will Person B have? □ €4 □ €6

c. How much will Person C have? □ €7 □ €5

2. Imagine you give €4 to Person B from [CONTRADA] and Person C from [CONTRADA] states that they will pay €2 to reduce by €6 your final sum.

a. How much will you have? □ €8 □ €2

b. How much will Person B have? □ €4 □ €6

c. How much will Person C have? □ €7 □ €5

3. Imagine that you give €6 to Person B and Person C states that they will pay €1 to reduce by €3 your final sum.

a. How much will you have? □ €3 □ €6

b. How much will Person B have? □ €8 □ €6

c. How much will Person C have? □ €7 □ €6

Now it is your turn to play!

You are Person A. You will be given €2.

Person B is from [CONTRADA]. They will be given €2.

You wil be given another €10.

You will decide how much of these €10 you want to give to Person B from [CONTRADA] and how much you want to keep for yourself. Alternatively, you can decide how much of the €2 you want to take from Person B from [CONTRADA].

Now you need to indicate if you would prefer to give or to take, and by how much.

*If you would prefer to **give**, indicate here how much you would like to give:*

€0	€1	€2	€3	€4	€5	€6
☐	☐	☐	☐	☐	☐	☐

*If you would prefer to **take**, indicate here how much you would like to take:*

€0	€1	€2
☐	☐	☐

Thank you. Person B will be given the amount you decided to give, or will have the amount taken away. You will be paid the result of your decision and the decision of Person C from [CONTRADA].

D4.2.2 Player B instructions and decisions

Decision games

Instructions

There are 3 players in this game: Person A, Person B, and Person C. All three are contrada members. You are Person B. Person A is from [CONTRADA] and Person C is from [CONTRADA]. None of you will know the precise identity of those with whom you are interacting. Only the researcher knows and will never never tell anyone else.

Someone is Person A. €2 will be given to Person A. You are Person B. €2 will be given to you.

Person A will be given another €10. Person A has to decide how much of the €10 they want to give to you and how much they want to keep for themselves. Alternatively, Person A can decide how much of €2 they want to take from you.

You wil be paid Person A's decision. Person A will be paid the result of their decision and Person C's decision.

Someone else is Person C. They will be given €7. Person C can do three things with their €7:

1) Punish the decision made by Person A from [CONTRADA] by paying €1 so that €3 will be deducted from Person A.
2) Punish the decision made by Person A from [CONTRADA] by paying €2 so that €6 will be deducted from Person A.
3) Punish the decision made by Person A from [CONTRADA] by paying €0 so that they keep their €7 and leaves Person A all of their money.

You will be paid Person A's decision. Person A will be paid the result of their decision minus Person C's decision.

Examples

Here are some examples. Remember Person A and Person B have €2 at the start, then €10 is given to Person A:

I) Suppose Person A from [CONTRADA] gives €2 to you and keeps €10 for themselves. Suppose now that Person C from [CONTRADA] states that in this case, they will punish €1 to reduce the sum of Person A by €3. In this case:
   - Person A from [CONTRADA] finishes with €7 (€12 minus €2 given to you and minus €3 decided by Person C)
   - You finish with €4 (€2 plus €2 that you received from Person A)
   - Person C from [CONTRADA] finishes with €6 (€7 minus €1)

II) Suppose Person A from [CONTRADA] takes €1 from you. They will have €13 for themselves. Suppose now that Person C from [CONTRADA] states that in this case, they will punish strongly paying €2 to reduce Person A's sum by €6. In this case:
   - Person A from [CONTRADA] finishes with €7 (€12 minus €1 they have taken from you, minus €3 decided by Person C)
   - You finish with €1 (€2 minus €1 that Person A has taken from you)
   - Person C from [CONTRADA] finishes with €5 (€7 minus €2)

III) Suppose Person A from [CONTRADA] gives €0 to you and keeps €12 for themselves. Suppose now that Person C from [CONTRADA] states that in this case, they will not punish. Therefore they will pay €0 to not reduce the sum of Person A.
   - Person A from [CONTRADA] finishes with €12 (€12 minus €0 they have given to you)
   - You finish with €2 (€2 plus €0 that you received from Person A)
   - Person C from [CONTRADA] finishes with €7 (€7 minus €0)

The decision of Person A from [CONTRADA] is a real decision. However you will not know the decision of Person A before receiving your sum. Therefore you will be asked to indicate what decision *you think Person A will make*.

Now can you answer these questions?

1. Imagine that Person A from [CONTRADA] gives €4 to you and that Person C from [CONTRADA] states that they will pay €0 and leave things unchanged.

a. How much will Person A have? □ €8 □ €2

b. How much will you have? □ €4 □ €6

c. How much will Person C have? □ €7 □ €5

2. Imagine that Person A from [CONTRADA] gives €4 to you and Person C from [CONTRADA] states that they will pay €2 to reduce by €6 the final sum of Person A.

a. How much will Person A have? □ €8 □ €2

b. How much will you have? □ €4 □ €6

c. How much will Person C have? □ €7 □ €5

3. Imagine that Person A from [CONTRADA] gives €6 to you and Person C states that they will pay €1 to reduce by €3 the final sum of Person A.

a. How much will Person A have? □ €3 □ €6

b. How much will you have? □ €8 □ €6

c. How much will Person C have? □ €7 □ €6

D4.2.3 Player C instructions and decisions

Decision games

Instructions

There are 3 players in this game: Person A, Person B, and Person C. All three are contrada members. You are Person C. Person B is from [CONTRADA] and Person C is from [CONTRADA]. None of you will know the precise identity of those with whom you are interacting. Only the researcher knows and will never never tell anyone else.

Someone is Person A and someone else is Person B. €2 will be given to both Person A and Person B. Person A will be given another €10. Person A has to decide how much of the €10 they want to give to Person B and how much they want to keep for themselves. Alternatively, Person A can decide how much of €2 they want to take from Person B.

You are Person C. Now you will given €7. You can three things with your €7:

1) You can punish Person A from [CONTRADA]'s decision paying €1 so that €3 will be deducted from Person A.
2) You can strongly punish Person A from [CONTRADA]'s decision paying €2 so that €6 will be deducted from Person A.
3) You can not punish Person A from [CONTRADA]'s decision paying €0 so that you keep your €7 and you leave Person A all of their money.

Person B will be paid that which Person A decides. Person A will be paid the result of their decision minus your decision. You will be paid your decision.

Examples

Here are some examples. Remember Person A and Person B start with €2, then €10 is given to Person A:

I) Suppose Person A from [CONTRADA] gives €2 to Person B from [CONTRADA] and keeps €10 for themselves. Suppose now that you have stated that in this case, you will punish €1 to reduce the sum of Person A by €3. In this case:
   - Person A from [CONTRADA] finishes with €7 (€12 minus €2 they have given and minus €3 you have decided)
   - Person B from [CONTRADA] finishes with €4 (€2 plus €2 that they received from Person A)
   - You finish with €6 (€7 minus €1)

II) Suppose Person A from [CONTRADA] takes €1 from Person B from [CONTRADA]. They will have €13 for themselves. Suppose now that you have stated that in this case, you will punish strongly paying €2 to reduce Person A's sum by €6. In this case:
   - Person A from [CONTRADA] finishes with €7 (€12 minus €1 they have taken from Person B, minus €3 decided by you)
   - Person B from [CONTRADA] finishes with €1 (€2 minus €1 that Person A has taken)
   - You finish with €5 (€7 minus €2)

III) Suppose Person A from [CONTRADA] gives €0 to Person B from [CONTRADA] and keeps €12 for themselves. Suppose now that you have stated that in this case, you will not punish. Therefore you will pay €0 to not reduce the sum of Person A.
   - Person A from [CONTRADA] finishes with €12 (€12 minus €0 they have given)
   - Person B from [CONTRADA] with €2 (€2 plus €0 that they have received from Person A)
   - You finish with €7 (€7 minus €0)

The decision of Person A from [CONTRADA] is a real decision. However you will not know the decision of Person A before making your decision. Therefore you will be asked to indicate what decision you would make *for every possible decision* Person A could make. Your decision will really decide that which you and Person A will receive at the end of the game. Note that you will not be able to change your mind after you know Person A's decision.

Now can you answer these questions?

1. Imagine that Person A from [CONTRADA] gives €4 to Person B from [CONTRADA] and you state that you will pay €0 and leave things unchanged.

a. How much will Person A have? □ €8 □ €2

b. How much will Person B have? □ €4 □ €6

c. How much will you have? □ €7 □ €5

2. Imagine that Person A from [CONTRADA] gives €4 to Person B from [CONTRADA] and you state that you will pay €2 to reduce by €6 the final sum of Person A.

a. How much will Person A have? □ €8 □ €2

b. How much will Person B have? □ €4 □ €6

c. How much will you have? □ €7 □ €5

3. Imagine that Person A from [CONTRADA] gives €6 to Person B from [CONTRADA] and you state that you will pay €1 to reduce by €3 the final sum of Person A.

a. How much will Person A have? □ €3 □ €6

b. How much will Person B have? □ €8 □ €6

c. How much will you have? □ €7 □ €6

Now it is your turn to play!

Remember that Person A from [CONTRADA] and Person B from [CONTRADA] have €2 at the start, then Person A will be given €10.

Person A from [CONTRADA] can give to Person B from [CONTRADA] or can take from Person B from [CONTRADA].

Therefore you will be asked to indciate what decision you would make *for every possible decision* Person A could make.

---

1. If Person A from [CONTRADA] **takes €2** from Person B from [CONTRADA] would you like to:
- □ **pay €1** so that €3 will be deducted from the final sum of Person A
- □ **pay €2** so that €6 will be deducted from the final sum of Person A
- □ **pay €0** so that €0 will be deducted from the final sum of Person A

2. If Person A from [CONTRADA] **takes €1** from Person B from [CONTRADA] would you like to:
- □ **pay €1** so that €3 will be deducted from the final sum of Person A
- □ **pay €2** so that €6 will be deducted from the final sum of Person A
- □ **pay €0** so that €0 will be deducted from the final sum of Person A

3. If Person A from [CONTRADA] **gives €0** to Person B from [CONTRADA] would you like to:
- □ **pay €1** so that €3 will be deducted from the final sum of Person A
- □ **pay €2** so that €6 will be deducted from the final sum of Person A
- □ **pay €0** so that €0 will be deducted from the final sum of Person A

4. If Person A from [CONTRADA] **gives €1** to Person B from [CONTRADA] would you like to:
- □ **pay €1** so that €3 will be deducted from the final sum of Person A
- □ **pay €2** so that €6 will be deducted from the final sum of Person A
- □ **pay €0** so that €0 will be deducted from the final sum of Person A

5. If Person A from [CONTRADA] **gives €2** to Person B from [CONTRADA] would you like to:
- □ **pay €1** so that €3 will be deducted from the final sum of Person A
- □ **pay €2** so that €6 will be deducted from the final sum of Person A
- □ **pay €0** so that €0 will be deducted from the final sum of Person A

6. %If Person A from [CONTRADA] **gives €3** to Person B from [CONTRADA] would you like to:
- □ **pay €1** so that €3 will be deducted from the final sum of Person A
- □ **pay €2** so that €6 will be deducted from the final sum of Person A
- □ **pay €0** so that €0 will be deducted from the final sum of Person A

7. If Person A from [CONTRADA] **gives €4** to Person B from [CONTRADA] would you like to:
- □ **pay €1** so that €3 will be deducted from the final sum of Person A
- □ **pay €2** so that €6 will be deducted from the final sum of Person A
- □ **pay €0** so that €0 will be deducted from the final sum of Person A

8. If Person A from [CONTRADA] **gives €5** to Person B from [CONTRADA] would you like to:
- □ **pay €1** so that €3 will be deducted from the final sum of Person A
- □ **pay €2** so that €6 will be deducted from the final sum of Person A
- □ **pay €0** so that €0 will be deducted from the final sum of Person A

9. If Person A from [CONTRADA] **gives €6** to Person B from [CONTRADA] would you like to:
- □ **pay €1** so that €3 will be deducted from the final sum of Person A
- □ **pay €2** so that €6 will be deducted from the final sum of Person A
- □ **pay €0** so that €0 will be deducted from the final sum of Person A

D4.2.4 All players

Now you have to indicate what others would do in general.

1. If Person A **takes €2** from Person B, do you think most people playing as Person C would pay in order to punish Person A?
   - □ No
   - □ Yes, paying €1
   - □ Yes, paying €2
2. If Person A **gives €0** from Person B, do you think most people playing as Person C would pay in order to punish Person A?
   - □ No
   - □ Yes, paying €1
   - □ Yes, paying €2
3. If Person A **gives €5** from Person B, do you think most people playing as Person C would pay in order to punish Person A?
   - □ No
   - □ Yes, paying €1
   - □ Yes, paying €2
4. If Person A **gives €6** from Person B, do you think most people playing as Person C would pay in order to punish Person A?
   - □ No
   - □ Yes, paying €1
   - □ Yes, paying €2

Questions about you

1. **In what year were you born?** _____
2. **What sex are you?** □ Female □ Male
3. **Which best describes your working situation.**
   - □ Employed
   - □ Unemployed
   - □ Pensioner
   - □ Student
   - □ Other: _____
4. **With respect to the average Italian salary of €27,500 (gross annual), where would you locate yours?**
   - □ Above the average □ Similar to the average □ Less than the average
5. **What qualification do you have?** ***Indicate the highest level completed.***
   - □ Primary school certificate
   - □ Secondary school (middle school) certificate
   - □ Vocational diploma
   - □ Secondary school (high school or college) certificate
   - □ University degree (Bachelor's or Master's)
   - □ Post-graduate (e.g. doctorate)
   - □ None
   - □ Other: _____

You, Siena, and the Contrade

1. **Where were you born?**
   - ☐ Outside the Comune of Siena
   - ☐ In the Comune of Siena
   - ☐ On the paving stones

2. **Where do you live?**
   - ☐ Within the walls:
     - ☐ in your own Contrada
     - ☐ in another Contrada
   - ☐ Outside the walls:
     - ☐ in the Comune of Siena
     - ☐ in the Province of Siena
   - ☐ in Tuscany
   - ☐ in Italy
   - ☐ abroad

3. **Have you ever lived outside of the Province of Siena?**
   - ☐ No
   - ☐ Yes, for _____ year and _____ months (overall)

4. **You're a contradaiolo of this Contrada because:**
   - ☐ Both of your parents were contradaioli of this Contrada
   - ☐ One of yout parents was a contradaiolo of this Contrada:
     - ☐ mother ☐ father
   - ☐ You were born in the territory of the Contrada
   - ☐ You chose to be a part of this Contrada
   - ☐ Other: _____

5. **Have you been a *protettore* in the last two years?** ☐ Yes ☐ No

6. **Have you had a role in the leadership of the Contrada?** ***You can indicate more than one response.***
   - ☐ Yes, now
   - ☐ Yes, in the past
   - ☐ No

7. **In the *last month*, how often have you participated in the social life of the Contrada?** ***For example, attending dinners, visiting the Società or other.***
   - ☐ Never
   - ☐ Once a month
   - ☐ 2–3 times a month
   - ☐ Nearly every week
   - ☐ Every week
   - ☐ 2–3 time a week
   - ☐ Nearly every day
   - ☐ Every day

8. **In the *last month*, how often have you participated in the organisational life of the Contrada?** ***For example, attending assemblies, helping with committee activities or other.***
   - ☐ Never
   - ☐ Once a month
   - ☐ 2–3 times a month
   - ☐ Nearly every week
   - ☐ Every week
   - ☐ 2–3 time a week
   - ☐ Nearly every day
   - ☐ Every day

9. Think of your 5 closest friends. Of these 5, how many:

a. are contradaioli of *your* Contrada? □ 0 □ 1 □ 2 □ 3 □ 4 □ 5

b. are contradaioli of *another* Contrada? □ 0 □ 1 □ 2 □ 3 □ 4 □ 5

c. are *not* contradaioli? □ 0 □ 1 □ 2 □ 3 □ 4 □ 5

Please ensure the sum of the answers to questions a.–c. is 5!

10. How much do you agree with the following phrase:

"In general, my Contrada is better than the majority of other Contrade."

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
□	□	□	□	□

11. How often do you attend religious events?

□ Never
□ Once a year
□ Many times a year
□ Every month
□ Many times a month
□ Every week
□ Many times a week

12. Have you already taken part in a similar study?

□ No □ Yes, where: _____

13. What do you think of this study? According to you, what was the aim of this study? Does it remind you of anything?

THANK YOU FOR YOUR PARTICIPATION!
Please, **hand the questionnaire directly to** the researcher (or his assistant). You can receive the voucher from them, and other information.

E

Supplementary information for Chapter 5

E1 Supplementary methods

Supplementary methods are divided into four sections. Section E1.1 describes the power analysis conducted before the study. Section E1.2 explains the data manipulation and exclusion procedure. Section E1.3 explains how the target was calculated. Section E1.4 describes the differences between the treatments in the questionnaire.

E1.1 Power analysis

The power analysis was informed by statistical consultancy with the Center for Open Science, conducted on 2018-04-30. In sum, the power analysis involved i) an analysis of data from a previous study in order to calculate expected effect sizes, before ii) a power analysis based on the hypothesis calculated with a t-test.

The data for the power analysis was of in-group and out-group decisions made by a sample of 256 participants from a previous study conducted with *contrada* members (Chapter 3). We calculated an effect size of Cohen's $d = 1.06$. Even though the pilot sample had 256 pairs, which is a large sample size for lab-in-the-field studies, we also calculated the safeguard power effect size estimate to hedge against the possibility that the sample happened to fall in the upper half of the curve of sample estimates around the true population effect size (Perugini et al. 2014). The safeguard power effect size was Cohen's $d = 1.00$.

We used the safeguard effect size as the expected effect size for the difference between in-group and out-group decisions for the combination of the standard control, third-party control, and target control treatments. The results of the power analysis showed that with a sample size of 144 participants, we would have 95% power to see a difference between the within-subject effects of the standard control, third-party control, and target control treatments vs. common-enemy treatment as long as the effect size in the common-enemy treatment was about $d = 0.3$ or less. With a sample size of 144 participants we would also have 80% to detect an

effect size in the common-enemy treatment of about $d = 0.5$ or less. This would represent an effect size half that of the other treatments.

We tested a single hypothesis: "the difference between in-group and out-group pairs will be larger in treatments standard control, third-party control, and target control than in the common-enemy treatment". There are three reasons why we only provided a single hypothesis for PGG contributions.

First, the study aimed to test a theoretically driven "common enemy effect". This assumed that only competition with the common enemy could reduce bias. This strict interpretation meant we only expected a reduced difference between in-group and out-group pairs in the common-enemy treatment.

Second, it was not clear a priori that the reduction in bias would be to 0, i.e., participants make similar contributions in in-group and out-group pairs in the common-enemy treatment. We conducted equivalence tests to assess whether we could design the study to have sufficient power to test whether the difference in contributions is less than a certain effect size of interest (bounds) that is equivalent to an effect size of 0 (Lakens 2017). However, even for large bounds (-0.5, 0.5), a sample size of 248 participants would have been required. A sample size greater than 200 participants was not logistically feasible. Furthermore, to our knowledge, there was no previous experimental study on a common enemy effect from which to derive sensible bounds.

Third, a more complex set of hypotheses would have resulted in a severe alpha correction using the Bonferroni correction, again requiring a sample size greater than logistically feasible.

In sum, we settled on a minimum sample size of 144 because this provided 80% power to detect an effect size of 0.5 or less in the common-enemy treatment at $\alpha = 0.05$. This would be an effect size half that of the other treatments; a reduction that would suggest the possibility of a common enemy effect.

E1.2 Data manipulation and exclusion

The following were covariates: *age* (continuous variable); *gender* (dummy variable: female = 0, male = 1); *Sienese* (dummy variable: born in Siena = 0, not born in Siena = 1); *PGG order* (dummy variable: in-group PGG first = 0, out-group PGG first = 1); and *comprehension* (dummy variable: at least one error = 0, no error = 1). Comprehension was assessed via two questions.

We had no exclusion criteria apart from respondent's failing to answer both PGGs. Missing data did not result in exclusion, with any response left blank coded as "NA". 148 participants, 74 from `C16` and 74 from `C05`, each had missing data for either: i) categorisation; ii) out-group PGG; iii) attitudes for out-group, Siena, and Florence; or iv) both quiz questions.

We also asked whether participants had participated in previous studies with the researcher (*experience*). 28% had previous experience. Experience was not be included in analyses nor used as an exclusion criterion. The figure was for the researcher's records. Excluding previous participants would have been too restrictive on sample size in this setting.

Table E1: Comparison of covariates across the two *contrade*[1]

	overall[2]	C16	C05	p[3]
n	134	66	68	
demographics				
age	37.9 (14.1)	36.4 (12.9)	39.4 (15.0)	.225
gender = male	76 (56.7)	36 (54.5)	40 (58.8)	.745
Sienese = yes	114 (85.1)	52 (78.8)	62 (91.2)	.077
experience = yes	38 (28.4)	16 (24.2)	22 (32.4)	.396
public goods game				
quiz = one correct	68 (50.7)	35 (53.0)	33 (48.5)	.728
attitudes				
in-group *contrada*	8.4 (1.1)	8.5 (0.9)	8.3 (1.2)	.473
out-group *contrada*	4.0 (2.3)	3.7 (2.2)	4.2 (2.4)	.190
Siena	7.9 (1.5)	8.0 (1.4)	7.9 (1.7)	.537
Florence	4.6 (2.5)	4.7 (2.3)	4.4 (2.7)	.510

[1] Mean (SD) for age and attitudes, count (%) for all other measures.
[2] Includes only analysed participants.
[3] Derived from Mann-Whitney U tests comparing the two *contrade*.

E1.3 Calculation of target

In the main study (Chapter 5), we informed participants that the value of the target was "about half the endowment" (Section 5.2.3). This information was consistent across the common-enemy, third-party control, and target control treatments. In the common-enemy treatment the target was determined by individuals from Florence, in the third-party control treatment by individuals from Siena, and in the target control treatment it was set by us. The values in the common-enemy treatment and third-party control treatment are the result of two experimental sessions, henceforth targets study.

In the targets study, students attending the main local university in Florence and Siena were recruited. In order to guarantee participants from Florence or Siena, the advertisement made clear the requirement to have either been born in the municipality of Siena or residents of the municipality of Siena before matriculation. The municipality of Siena is the basic administrative unit in Italy. Italian citizens are officially registered as residents of a particular municipality of Siena. This was confirmed by the inclusion of additional residency questions.

Participants completed a one-shot, four person PGG. Participants had an endowment of 100 monetary units. Contributions, which could take any value between 0 and 100 units, to a group pot were doubled and redistributed equally among participants within each group. The exchange rate was 10 units = €1.

Across two separate sessions, 32 participants were recruited, 16 from the Università degli Studi di Firenze (University of Florence) and 16 from the Università degli Studi di Siena (University of Siena). Recruitment was via email, shared

with students registered to participate in studies at either the Behavioural and Experimental Economics Lab (BEELab) in Florence or the Experimental Economics Laboratory (LabSi) in Siena. The experiment was completed via pen and paper questionnaire. Payment was received immediately after the session, based on the PGG, a €5 show-up fee, and an additional decisions from a series of dictator game decisions.

The samples were similar in age (Florence: M = 23 years, SD = 1 years; Siena: M = 24 years, SD = 24 years). The sample from Florence had more males than the sample from Siena, with 11 out of 16 participants (69%) from Florence indicating male vs. 8 out of 16 participants (50%) from Siena indicating male.

The average contribution among participants from Florence was 48 units (SD = 38 units), and among participants from Siena was 52 units (SD = 37) units. There was no significant difference between participants from Florence and Siena (Mann-Whitney U test; W = 118, p = .701).

The average contribution made by individuals from Florence and individuals from Siena was approximately 50% of their endowments. The inclusion of "about half" in the main study is justified. The targets study employed a PGG that differs marginally from the methodology in the study because we (i) used a two person PGG and thus (ii) have a lower multiplication factor of 1.2. However, the general structure and procedure of the games is similar e.g. monetary value of endowment and use of pen-and-paper questionnaire. For this reason, we informed participants that the targets were generated by decisions in "similar games".

The targets in the main study are therefore genuine, which avoids the use of deception. Deception is generally proscribed in experimental research, especially where participants are from a common pool. Our field site is anticipated to be in use for further research — using deception will likely have a negative impact on recruitment and results in the future, and we wished to avoid its implementation.

E1.4 Treatments in the questionnaires

The text used for each treatment is in Table E2. The treatment was presented at two points: before the examples and before the PGG decisions were made.

The original questionnaire is provided in Section E3, together with an English translation. The two points where the treatment was presented is indicated by "INSERT TREATMENT HERE". Otherwise all questionnaires across the four treatments were equivalent. Note that the names of the *contrade* have been replaced with [in-group/out-group] to preserve anonymity.

E2 Supplementary results

Supplementary results are divided into three sections. Analysis of the effect of comprehension is in Section E2.1 and analysis of the effect of day and session is in Section E2.2. Section E2.3 contains supplementary tables referenced in the main text.

Table E2: Difference between treatments in the questionnaire

treatment	text[1]
standard control	(left blank)
common-enemy	*In un gioco simile condotto l'anno scorso con gruppi di Firenze, in media il totale versato alla cassa comune è stato circa la metà dei punti a disposizione.* In a similar game conducted last year with groups from Florence, on average total contributions were about half of the points at their disposal.
third-party control	*In un gioco simile condotto l'anno scorso con gruppi di Siena, in media il totale versato alla cassa comune è stato circa la metà dei punti a disposizione.* In a similar game conducted last year with groups from Siena, on average total contributions were about half of the points at their disposal.
target control	*In giochi di questo tipo, in media il totale nella cassa comune è circa la metà dei punti a disposizione.* In games of this type, on average total contributions are about half of the points at disposal.

[1] Original text in Italian with English translation below.

E2.1 Re-analysis considering comprehension

A large proportion of participants failed to answer both questions of the quiz correctly. 66 (49.3%) of the participants answered both correctly, 68 (50.7%) of the participants answered only a single question correctly, and 14 (10.4%) of the participants answered both incorrectly or failed to answer the questions.

The analyses reported in the main text included everyone who participated in the study, independent of whether or not they correctly answered the comprehension questions, as specified in the analysis plan. However, given that so many participants failed the comprehension check, we re-consider the analyses in the main text using different samples and/or including comprehension as a control and an independent variable.

First, we construct five linear-mixed effects models of contribution (see code below). The first three involve the minimal model and use three different samples: all participants regardless of comprehension, participants who answered at least one question correctly, and participants who answered both questions correctly Then, we construct a model that includes comprehension as a covariate, then comprehension as an independent variable.

```
## all participants
model_1 <- cooperation ~ treatment * pair +
    (1 + pair | id_code) + (1 | contrada)
```

```
## participants who answered at least one question correctly
model_2 <- cooperation ~ treatment * pair +
    (1 + pair | id_code) + (1 | contrada)

## participants who answered both questions correctly
## NB pair not included as random intercept so that model can converge
model_3 <- cooperation ~ treatment * pair +
    (1 | id_code) + (1 | contrada)

## comprehension as covariate
model_4 <- cooperation ~ treatment * pair + comprehension +
    (1 + pair | id_code) + (1 | contrada)

## comprehension as independent variable
model_5 <- cooperation ~ treatment * pair * comprehension +
    (1 + pair | id_code) + (1 | contrada)
```

Second, we conduct a Welch's t-test on the mean difference between in-group and out-group pair contributions in the common-enemy and the other three treatments combined, in three samples: all participants regardless of comprehension, participants who answered at least one question correctly, and participants who answered both questions correctly.

We provide these tests but stress that, as the sample sizes for the analyses with participants who answered either at least one question or both questions correcly, we caution against strong inferences.

Table E3 shows the effect of treatment and pair type across the three different samples. There was a significant effect of pair type on contribution across all three samples, with contributions greater in in-group pairs than out-group pairs. There was no significant effect of treatment and no significant effect of the interaction between treatment and pair type across all three samples.

Table E4 shows the effect of comprehension as a covariate, and as an independent variable in an ineraction with treatment and pair type. In both cases, comprehension had a main effect on contribution at $p < .10$. There was also an effect of the interaction of comprehension and pair type at $p < .10$. Post-hoc comparisons show that the difference in contribution of comprehension by pair type is with out-groups (t = 3, $p = .008$), where non-comprehenders cooperate by 2 units more in the PGG than comprehenders. Comprehension had no effect on in-group cooperation (t = -0.2, $p = .814$). See Figure E1a.

Table E3: The effect of treatment, pair type, and comprehension on PGG contributions considering different samples based on number of correct responses to two comprehension questions

	all participants (n = 148)			≥ one correct (n = 134)			both correct (n = 66)		
variable	df	F	p	df	F	p	df	F	p
treatment	(3, 139.06)	1.5	.224	(3, 66.71)	0.7	.586	(3, 61.50)	1	.250
pair type	(1, 112.43)	65.0	< .001 ***	(1, 53.77)	19.2	< .001 ***	(1, 62.00)	53	< .001 ***
treatment X pair type	(3, 137.73)	0.7	.574	(3, 67.22)	0.5	.662	(3, 62.00)	0	.856

* $p < .05$, ** $p < .01$, *** $p < .001$

Table E4: The effect of treatment, pair type, and comprehension on PGG contributions with comprehension included as covariate or independent variable

	covariate			independent variable		
variable	df	F	p	df	F	p
treatment	(3, 138.05)	1.4	.252	(3, 148.53)	1.34	.262
pair type	(1, 112.43)	65.3	$< .001$ ***	(1, 112.89)	60.01	$< .001$ ***
comprehension	(1, 134.60)	3.0	.086	(1, 131.37)	3.68	.057
treatment X pair type	(3, 137.65)	0.7	.578	(3, 133.59)	0.67	.570
treatment X comprehension				(3, 130.48)	0.72	.541
pair type X comprehension				(1, 127.12)	3.86	.052
treatment X pair type X comprehension				(3, 128.89)	0.07	.977

* $p < .05$, ** $p < .01$, *** $p < .001$

Overall, there was no evidence of a difference in the degree of bias between the common enemy treatment and the other three treatments combined in all three comprehension sub-samples. Among all participants regardless of comprehension, there was no evidence of a difference in the degree of bias between the common-enemy treatment (M = 4.0, SD = 5.2) and the other three treatments combined (M = 2.9, SD = 4.1; Welch's test: t(1, 46) = 1, p = .250). Among participants who answered at least one question correctly, there was no evidence of a difference in the degree of bias between the common-enemy treatment (M = 3.4, SD = 5.8) and the other three treatments combined (M = 2.0, SD = 3.9; Welch's test: t(1, 24) = 1, p = .320). Among participants who answered both questions correctly, there was no evidence of a difference in the degree of bias between the common-enemy treatment (M = 4.9, SD = 4.2) and the other three treatments combined (M = 3.8, SD = 4.1; Welch's test: t(1, 20) = 0.9, p = .392).

E2.2 Day and session effects

A potential issue with collecting data among small communities over multiple days is communication between participants, which can result in contagion, collusion, or contamination. Participants who complete the experiment on the first day, or earlier sessions within days, could influence subsequent participants by communicating aspects of the game. We tried to prevent the influence of communication by reducing the time between days, conducting the experiments over three/four days, and conducting the sessions sequentially in a single time 2–3 hour period within a day. Furthermore, it was noticed that participants tended to participate in friendship groups i.e. individuals with whom the experiment would most likely be discussed. Therefore the recruitment strategy reduced the chances of contagion. However, we can assess the effects of day and session with an ANOVA including day and session.

The ANOVAs with contribution as dependent variables and pair, day number (as factor 1–3) and session number (continuous) as independent variables including their interaction, revealed no effect of either day (F(2, 124) = 2, p = .176) or session (F(1, 137) = 0.3, p = .567). See Figure E1b.

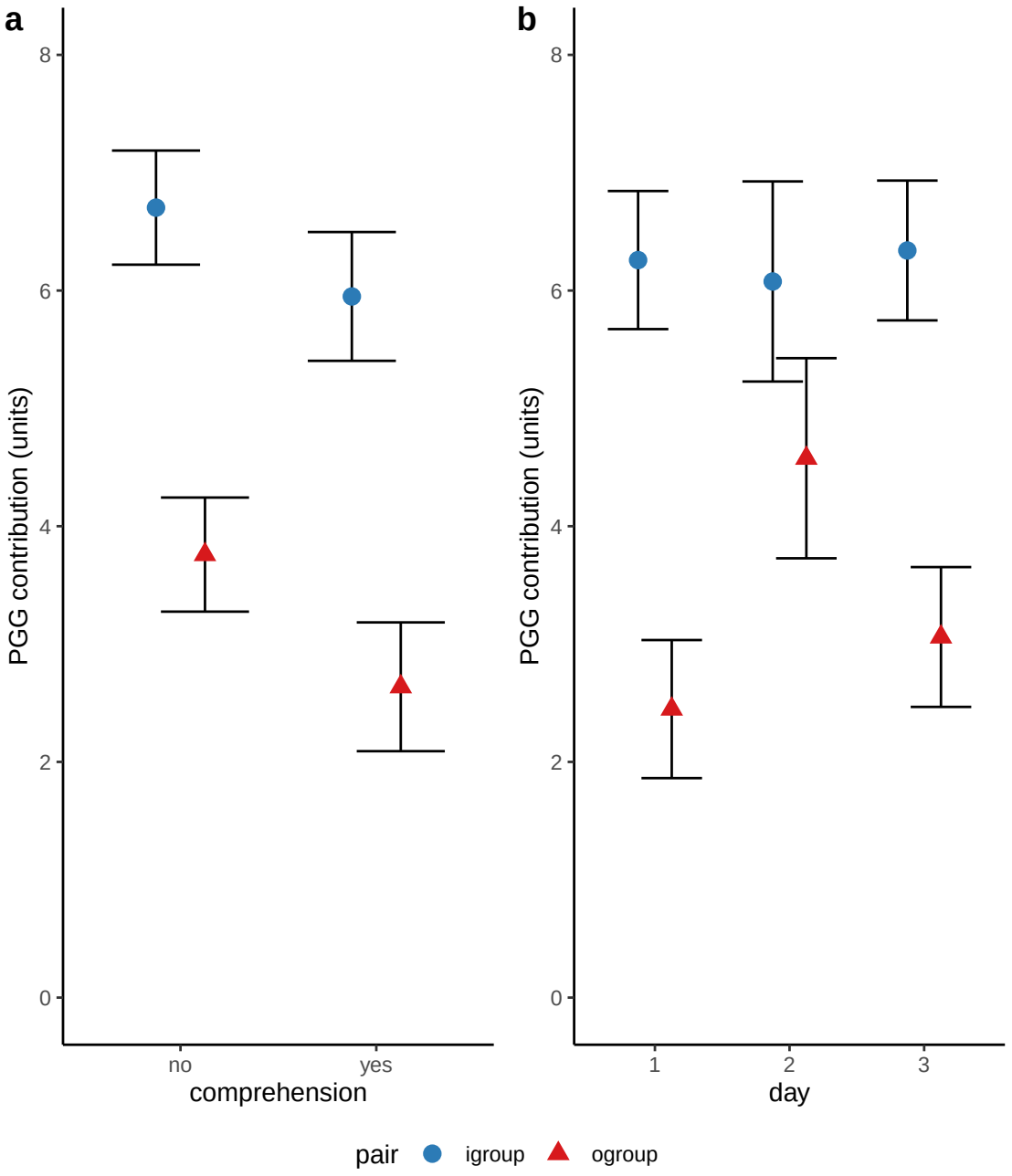


Figure E1: PGG contribution by a) comprehension and b) day. Error bars are the standard error.

Table E5: Pairwise contrasts with Tukey corrections between subordinate and superordinate groups on attitudes

contrast	estimate	SE	df	t	p	
in-group *contrada*– out-group *contrada*	4.5	0.2	126	20	$< .001$	***
in-group *contrada*– Siena	0.5	0.1	120	3	$< .01$	**
in-group *contrada*– Florence	3.9	0.2	126	16	$< .001$	***
out-group *contrada*– Siena	-4.0	0.2	126	-17	$< .001$	***
out-group *contrada*– Florence	-0.6	0.2	126	-3	.06	
Siena – Florence	3.4	0.2	126	14	$< .001$	***

* $p < .05$, ** $p < .01$, *** $p < .001$

E2.3 Supplementary tables

This section includes tables referenced in text. Table E6 summarises the results of pairwise contrasts between subordinate and superordinate groups on attitudes, as discussed in Section 5.3.2. Table E6 summarises the results of pairwise contrasts between treatments on categorisation, as discussed in Section 5.3.4. Table E6 summarises the results of a linear mixed-effects model of categorisation on PGG contributions, as discussed in Section 5.3.4.

Table E6: Pairwise contrasts with Tukey corrections between treatment on categorisation

contrast	estimate	SE	df	t	p
common enemy – standard control	-0.3	0.8	129	-0.4	.971
common enemy – target control	0.3	0.7	126	0.4	.972
common enemy – third-party control	1.0	0.8	129	1.3	.576
standard control – target control	0.7	0.7	128	0.9	.809
standard control – third-party control	1.3	0.8	129	1.7	.309
target control – third-party control	0.7	0.7	128	0.9	.814

* $p < .05$, ** $p < .01$, *** $p < .001$

Table E7: The effect of categorisation and pair type on PGG contributions

variable	df	F	p	
categorisation	(1, 135.78)	18	$< .001$	***
pair type	(1, 135.63)	33	$< .001$	***
categorisation X pair type	(1, 141.98)	2	.192	

* $p < .05$, ** $p < .01$, *** $p < .001$

E3 Questionnaires

The first document is the original questionnaire in Italian (Section E3.1). The second document is the English translation of the questionnaire (Section E3.2).

E3.1 Questionnaire in Italian

La socialità contemporanea a Siena:
uno studio antropologico

Questionario sulle Contrade per l'Università di Oxford



Benvenuto/a e grazie per la tua partecipazione!

Il progetto di studio riguarda la vita sociale contemporanea a Siena, ed in particolare il modo in cui le persone si relazionano al Palio, alla propria Contrada, ed alle altre Contrade. Lo studio è condotto in collaborazione con le Contrade.

Il progetto è finalizzato alla realizzazione della tesi di dottorato di Adam Kenny, dottorando presso la Facoltà di Antropologia dell'Università di Oxford.

Ulteriori informazioni sono fornite di seguito. Per qualsiasi domanda puoi rivolgerti al ricercatore (o al suo assistente), o a [collaborator name].

Sei pregato/a di compilare il questionario **da solo/a**, evitando di parlare con i tuoi vicini. Inoltre, evita che altri vedano il tuo questionario. Le risposte sono strettamente personali!

Puoi consegnare il questionario completato direttamente al ricercatore (o al suo assistente). Confidiamo nella tua discrezione al fine di non influenzare le risposte altrui!

Informazioni generali

Per partecipare allo studio devi completare il presente questionario, della durata di 15 minuti circa. Per ringraziarti della partecipazione, alla consegna del questionario completato riceverai un buono del valore di 5€ da utilizzare in Società.

Il questionario pone una serie di domande. Alcune di esse sono "giochi di decisione". In ogni gioco avrai a disposizione 10 punti, pari a 10€, da distribuire fra te ed un'altra persona. In base alle decisioni prese da entrambi, al termine dello studio riceverai una somma compresa tra 6€ e 16€.

I dati forniti saranno anonimi sin dall'inizio e non permetteranno di identificarti.

Informazioni specifiche

Chi conduce la ricerca? La ricerca è condotta da Adam Kenny (dottorando, Università di Oxford) e dalla sua relatrice Laura Fortunato (ricercatore principale e professore associato, Università di Oxford).

Come si svolge lo studio? Per partecipare allo studio devi completare il presente questionario, della durata di 15 minuti circa. Per ringraziarti della partecipazione, alla consegna del questionario completato riceverai un buono del valore di 5€ da utilizzare in Società. Il questionario pone una serie di domande. In particolare, dovrai partecipare a due "giochi di decisione" e rispondere ad alcune domande su di te. In ogni gioco avrai a disposizione 10 punti, pari a 10€, da distribuire fra te ed un'altra persona. In base alle decisioni prese da entrambi, al termine dello studio (ed entro un mese dalla tua partecipazione) riceverai una somma compresa tra 6€ e 16€.

Chi finanzia lo studio? Lo studio è finanziato dal John Fell Fund dell'Università di Oxford.

Devo partecipare? La decisione se partecipare allo studio è interamente tua. Se decidi di partecipare potrai ritirarti in qualsiasi momento, unitamente ai dati forniti, avvisando il ricercatore. Ciò non comporterà alcuna conseguenza negativa, e potrai trattenere il buono da utilizzare in Società.

Cosa succede ai dati forniti? I ricercatori avranno accesso esclusivamente alle informazioni fornite nel questionario. I dati forniti saranno anonimi sin dall'inizio e non permetteranno di identificarti. Al termine dello studio verranno archiviati in modo sicuro e confidenziale.

La ricerca verrà pubblicata? I risultati della ricerca verranno inclusi nella tesi di dottorato del ricercatore. La tesi sarà depositata in formato sia cartaceo che digitale negli archivi dell'Università di Oxford, per facilitare il suo utilizzo in ricerche future. Inoltre, i risultati della ricerca potranno essere pubblicati in una rivista e/o altra pubblicazione accademica. A sostegno di queste pubblicazioni, i dati anonimi potranno essere pubblicati on-line con accesso aperto al pubblico.

Chi ha approvato lo studio? Lo studio è stato approvato dal comitato responsabile per l'etica della ricerca presso la Facoltà di Antropologia dell'Università di Oxford.

Chi devo contattare se ho un quesito o se desidero effettuare un reclamo? Se hai un quesito puoi rivolgerti al ricercatore (Adam Kenny, e-mail: [email address], tel.: [telephone number]) o alla sua relatrice (Laura Fortunato, e-mail: [email address], tel.: [telephone number]), i quali si impegnano a risponderti entro 10 giorni lavorativi. Se non sei soddisfatto/a, o se desideri effettuare un reclamo, puoi rivolgerti al responsabile del suddetto comitato, il quale si impegna a risponderti in tempi brevi. Puoi contattare il responsabile del comitato tramite e-mail o per posta (e-mail: [email address], posta: [address]).

Consenso

- **Confermo di aver letto le informazioni** □ Sì □ No
- **Dichiaro di avere almeno 18 anni di età** □ Sì □ No
- **Acconsento a partecipare a questo studio** □ Sì □ No

Codice unico

Ricorda, in base alle decisioni prese nei giochi, al termine dello studio (ed entro un mese dalla tua partecipazione) riceverai una somma compresa tra 6€ e 16€.

A questo scopo, e per mantenere l'anonimità dei dati forniti, ti verrà attribuito un codice unico formato dalle risposte alle seguenti domande.

1. **La prima lettera del nome di tua madre.**
   esempio: se tua madre si chiama Maria Rossi, scrivi M

   _____

2. **La seconda lettera del nome di tua madre.**
   esempio: se tua madre si chiama Maria Rossi, scrivi A

   _____

3. **L'ultima cifra del tuo numero civico.**
   esempio: se abiti al numero civico 201, scrivi 1
   esempio: se abiti al numero civico 3, scrivi 3

   _____

4. **Il mese in cui sei nato/a.**
   esempio: se sei nato/a a giugno, scrivi 06
   esempio: se sei nato/a a novembre, scrivi 11

   _____

Istruzioni

Per partecipare ai giochi di decisione è importante che tu legga le seguenti istruzioni con attenzione!

Parteciperai a due giochi di decisione. In ciascuno di essi farai parte di un gruppo formato da te e da un'altra persona — anch'esso/a contradaiolo/a.

L'altro/a partecipante del tuo gruppo è reale ma anonimo/a — ovvero, non conoscerai la sua identità. Anche a lui/lei verrà chiesto di prendere una decisione nel medesimo gioco.

In ogni gioco la procedura è la seguente:

1) ad ogni partecipante vengono assegnati 10 punti;
2) ogni partecipante decide quanti punti (da 0 a 10) versare ad una cassa comune per il gruppo, trattenendo il resto;
3) il totale dei punti nella cassa comune viene moltiplicato per un fattore di 1,2 ed il risultato viene poi diviso equamente tra i due partecipanti.

Ricorda, spetta a te decidere quanti punti versare alla cassa comune per il tuo gruppo! Puoi versare da 0 a 10 dei punti che ti vengono assegnati all'inizio del gioco, trattenendo il resto. Alla fine del gioco avrai i punti trattenuti più quelli ottenuti dalla cassa comune. Quanti punti avrai dipende quindi dalla tua decisione e da quella dell'altro/a partecipante. Alcuni esempi concreti sono alla pagina seguente.

Al termine dello studio i punti verranno convertiti in denaro. Ogni punto vale 1€, e tu riceverai una somma compresa tra 6€ e 16€. La somma sarà pari ai punti che avevi alla fine di uno dei due giochi, scelto a caso tramite computer.

INSERT TREATMENT HERE.

Di seguito sono alcuni esempi concreti:

Esempio 1 Sia tu che l'altro/a partecipante decidete di versare alla cassa comune 5 dei 10 punti a disposizione, trattenendo 5 punti ciascuno. Quindi la cassa comune per il tuo gruppo contiene un totale di 10 punti, che moltiplicato per un fattore di 1,2 dà 12 punti. Questi vengono divisi equamente fra te e l'altro/a partecipante. Alla fine del gioco avrete quindi 11 punti ciascuno, ovvero i 5 trattenuti più i 6 ottenuti dalla cassa comune.

Esempio 2 Sia tu che l'altro/a partecipante decidete di versare alla cassa comune tutti e 10 i punti a disposizione, trattenendo 0 punti ciascuno. Quindi la cassa comune per il tuo gruppo contiene un totale di 20 punti, che moltiplicato per un fattore di 1,2 dà 24 punti. Questi vengono divisi equamente fra te e l'altro/a partecipante. Alla fine del gioco avrete quindi 12 punti ciascuno, ovvero solamente quelli ottenuti dalla cassa comune.

Esempio 3 Tu decidi di versare 0 punti, trattenendo 10 punti; l'altro/a partecipante decide invece di versare 10 punti, trattenendo 0 punti. Quindi la cassa comune per il tuo gruppo contiene un totale di 10 punti, che moltiplicato per un fattore di 1,2 dà 12 punti. Questi vengono divisi equamente fra te e l'altro/a partecipante. Alla fine del gioco tu avrai quindi 16 punti, ovvero i 10 trattenuti più i 6 ottenuti dalla cassa comune; l'altro/a partecipante avrà invece 6 punti, ovvero solamente quelli ottenuti dalla cassa comune.

Riassumendo:

- se decidi di contribuire alla cassa comune, alla fine del gioco tu avrai meno punti di quelli che avresti altrimenti;
- se l'altro/a partecipante decide di contribuire alla cassa comune, alla fine del gioco tu avrai più punti di quelli che avresti altrimenti.

Quindi, contribuendo alla cassa comune si aumentano i punti che l'altro/a partecipante avrà alla fine del gioco, mentre si diminuiscono i propri!

Quiz

Le seguenti domande servono a verificare che tu abbia compreso le istruzioni per i giochi di decisione. Per ogni domanda, indica con una croce la risposta che ritieni esatta!

1. **A quanti giochi parteciperai?**
   - □ Uno
   - □ Due
   - □ Tre
2. **Alla fine di un gioco, tu avrai il numero massimo di punti se decidi di versare alla cassa comune. . .**
   - □ . . . 0 punti
   - □ . . . 10 punti
   - □ . . . un numero qualsiasi di punti

Vai alla pagina seguente per partecipare al primo gioco di decisione!

INSERT TREATMENT HERE.

Per ulteriori informazioni puoi fare riferimento agli esempi riportati precedentemente.

Adesso gioca!

L'altro/a partecipante del tuo gruppo appartiene alla Contrada [of] [in-group].

Quanti punti vuoi versare alla cassa comune per il tuo gruppo?

0	1	2	3	4	5	6	7	8	9	10
□	□	□	□	□	□	□	□	□	□	□

Vai alla pagina seguente per partecipare al secondo gioco di decisione!

INSERT TREATMENT HERE.

Per ulteriori informazioni puoi fare riferimento agli esempi riportati precedentemente.

Adesso gioca!

L'altro/a partecipante del tuo gruppo appartiene alla Contrada [of] [out-group].

Quanti punti vuoi versare alla cassa comune per il tuo gruppo?

0	1	2	3	4	5	6	7	8	9	10
□	□	□	□	□	□	□	□	□	□	□

Nel gioco con [the] [out-group], come hai percepito l'altro/a partecipante?
Rispondi su una scala da 1 a 9 (1 = "più come un/una [out-group member]", 9 = "più come un/una senese").

1	2	3	4	5	6	7	8	9
□	□	□	□	□	□	□	□	□

Alcune domande su di te

1. **In che anno sei nato/a?** _____
2. **Di che sesso sei?** □ Maschio □ Femmina
3. **Sei nato/a nella provincia di Siena?** □ Sì □ No
4. **Hai partecipato ad uno studio condotto l'anno scorso dal ricercatore?** □ Sì □ No
5. **Qual è il tuo atteggiamento generale verso persone appartenenti ai seguenti gruppi?**
   Rispondi su una scala da 1 a 9 (1 = "molto negativo", 9 = "molto positivo").

	1	2	3	4	5	6	7	8	9
[in-group]	□	□	□	□	□	□	□	□	□
[out-group]	□	□	□	□	□	□	□	□	□
Siena	□	□	□	□	□	□	□	□	□
Firenze	□	□	□	□	□	□	□	□	□

GRAZIE PER LA TUA PARTECIPAZIONE!
Per favore, consegna il questionario al ricercatore (o al suo assistente),
dal quale riceverai il buono da utilizzare in Società.

E3.2 Questionnaire in English

Contemporary sociality in Siena:
an anthropological study

Questionnaire about the Contrade for the University of Oxford



Welcome and thank you for your participation!

The research project is about contemporary social life in Siena, in particular how people relate to the Palio, to their own Contrada, and to other Contrade. The research is conducted in collaboration with the Contrade.

The project is in support of Adam Kenny's doctoral thesis, a student at the faculty of anthropology at the University of Oxford.

Further information is provided below. Any question can be answered by the researcher (or his assistant), or by [collaborator name].

You are invited to complete the questionnaire **by yourself**, and avoid talking to those around you. Furthermore, avoid having others read your questionnaire. The answers are strictly personal!

Please hand the completed questionnaire directly to the researcher (or his assistant). To not influence others' responses, we appreciate your discretion!

General information

To participate in this study you have to complete this questionnaire, which lasts circa 15 minutes. To thank you for your participation, you will receive a voucher worth 5€ that can be used in the Società, upon handing in the completed questionnaire.

The questionnaire poses a series of questions. Some of these are "decision games". In every game you will have 10 points at your disposal, worth 10€, to distribute between yourself and another person. At the end of the study you will receive a sum between 6€ and 16€, based on the decisions made by both of you.

The data provided will be anonymous from the beginning and it will not be possible to identify you.

Specific information

Who is conducting the research? The research is conducted by Adam Kenny (postgraduate student, University of Oxford) and his supervisor Laura Fortunato (principal researcher and associate professor, University of Oxford).

What will happen in the study? To participate in this study you have to complete this questionnaire, which lasts circa 15 minutes. To thank you for your participation, you will receive a voucher worth 5€ that can be used in the Società, upon handing in the completed questionnaire. The questionnaire poses a series of questions. Specifically, you will participate in two "decision games" and respond to some questions about you. In each game you will have 10 points at your disposal, worth 10€, to distribute between yourself and another person. At the end of the study (and within a month of your participation) you will receive a sum between 6€ and 16€, based on the decisions made by both of you.

Who is funding this study? The study is funded by the John Fell Fund of the University of Oxford.

Do I have to participate? The decision to participate in the study is entirely yours. If you decide to participate you may withdraw yourself at any time, alongside the data provided, by advising the researchers of your decision. This will not impose any adverse consequences, and you can keep the voucher to use in the Società.

What happens to the data provided? The researchers will have exclusive access to the information provided in the questionnaire. he data will be anonymised from the beginning and it will not be possible to identify you. At the end of the study the data will be securely and confidentially stored.

Will the research be published? The results of the research will be included in the researcher's doctoral thesis. The thesis will be deposited both in print and online in the University of Oxford archives, to facilitate its use in future research. Furthermore, the results of the research may be published in a journal and/or other academic publications. The anonymised data may also be published online with open access in support of these publications.

Who has approved this project? The study has been approved by the committee responsible for research ethics at the faculty of Anthropology at the University of Oxford.

Who do I contact if I have a concern about the study or wish to make a complaint? If you have a concern you can refer to the researcher (Adam Kenny, email: [email address], tel.: [telephone number]) or his supervisor (Laura Fortunato, email: [email address], tel.: [telephone number]), who will do their best to respond to your query within 10 working days. If you remain unsatisfied, or wish to make a formal complaint, please contact the person responsible for the above committee, who will do their best to respond in as short a time as possible. You can contact the head of the committee via email or by post (e-mail: [email address], post: [address]).

Consent

- **I confirm that I have read the information** □ Yes □ No
- **I declare to have at least 18 years of age** □ Yes □ No
- **I consent to participate in this study** □ Yes □ No

Unique code

Remember, based on the decisions made in the games, at the end of the study (and within one month of your participation) you will receive a sum between 6€ and 16€.

To this end, and to maintain the anonymity of the data provided, you will be assigned a unique code based on the response to the following questions.

1. **The first letter of your mother's name.**
   example: if you mother is called Maria Rossi, write M

   _____

2. **The second letter of your mother's name.**
   example: if your mother is called Maria Rossi, write A

   _____

3. **The last number of your house number.**
   example: if you live at house number 201, write 1
   example: if you live at house number 3, write 3

   _____

4. **The month in which you were born.**
   example: if you were born in June, write 06
   example: if you were born in November, write 11

   _____

Instructions

To participate in the decision games it is important that you read the following instructions attentively!

You will participate in two decision games. In each one of these you will be part of a group composed of you and another person — they are also a contradaiolo [contrada member].

The other participant in your group is real but anonymous — that is, you will not know their identity. Even they will be asked to make a decision in the same game.

The procedure in each game is as follows:

1) every participant will be given 10 points;
2) every participant decides how many points (from 0 to 10) to contribute to a common pot for the group, retaining the rest;
3) the total number of points in the common pot are multipled by a factor of 1,2 and the result split are then evenly split between the two partecipants.

Remember, you decide how many points you want to contribute to your group's common pot. You can contribute from 0 to 10 of the points which will be given to you at the start of the game, retaining the rest. At the end of the game you will have the retained points plus those obtained from the common pot. How many points you will have therefore depends on your decision and that of the other participant. Some concrete examples are on the following page.

At the end of the study the points will be converted into money. Every point is worth 1€, and you will receive a sum between 6€ and 16€. The sum will be equivalent to the points you had at the end of one of the two games, chosen at random by a computer.

INSERT TREATMENT HERE.

Here are some concrete examples:

Example 1 Both you and the other participant decide to contribute 5 of the 10 points at your disposal to the common pot, each retaining 5 points. Therefore your group's common pot contains a total of 10 points, which multiplied by a factor of 1,2 gives 12 points. These are split equally between you and the other participant. Therefore at the end of the game you will have 11 points each, in other words the 5 retained points plus the 6 obtained from the common pot.

Example 2 Both you and the other participant decide to contribute all of the 10 points at your disposal to the common pot, each retaining 0 points. Therefore your group's common pot contains a total of 20 points, which multiplied by a factor of 1,2 gives 24 points. These are split equally between you and the other participant. Therefore at the end of the game you will have 12 points each, in other words only those obtained from the common pot.

Example 3 You decide to contribute 0 points, retaining 10 points; instead the other participant decides to contribute 10 points, retaining 0 points. Therefore your group's common pot contains a total of 10 points, which multiplied by a factor of 1,2 gives 12 points. These are split equally between you and the other participant. Therefore at the end of the game you will have 16 points, in other words the 10 retained points plus the 6 obtained from the common pot; instead the other participant will have 6 points, in other words only those obtained from the common pot.

In summary:

- if you decided to contribute to the common pot, at the end of the game you will have fewer points than you would have otherwise;
- if the other participant decides to contribute to the common pot, at the end of the game you will have more points than you would have otherwise.

Therefore, you contributing to the common pot means an increase in the number of points of the other participant at the end of the game, whereas yours decrease!

Quiz

The following questions help to verify that you have understood the instructions for the decision games. For every question, indicate with a cross the response you think is correct!

1. **How many games will you play?**
   - □ One
   - □ Two
   - □ Three
2. **At the end of the game, you will have the maximum number of points if you decide to contribute to the common pot. . .**
   - □ . . . 0 points
   - □ . . . 10 points
   - □ . . . any number of points

Go to the next page to participate in the first decision game!

INSERT TREATMENT HERE.

For further information you can refer to the examples given previously.

Now you play!

The other participant in your group belongs to the Contrada of [in-group].

How many points to you want to contribute to your group's common pot?

0	1	2	3	4	5	6	7	8	9	10
□	□	□	□	□	□	□	□	□	□	□

Go to the next page to participate in the second decision game!

INSERT TREATMENT HERE.

For further information you can refer to the examples given previously.

Now you play!

The other participant in your group belongs to the Contrada of [out-group].

How many points to you want to contribute to your group's common pot?

0	1	2	3	4	5	6	7	8	9	10
□	□	□	□	□	□	□	□	□	□	□

In the game with the [out-group], how did you perceive the other participant?
Respond on a scale from 1 to 9 (1 = "more as an [out-group] member", 9 = "more as a Sienese").

1	2	3	4	5	6	7	8	9
□	□	□	□	□	□	□	□	□

Some questions about you

1. **In what year were you born?** _____
2. **What sex are you?** □ Male □ Female
3. **Were you born in the provincia [province] of Siena?** □ Yes □ No
4. **Have you participated in a study conducted last year by the researcher?** □ Yes □ No
5. **What is your general attitude towards people from the following groups?**
   Respond on a scale from 1 to 9 (1 = "very negative", 9 = "very positive").

	1	2	3	4	5	6	7	8	9
[in-group]	□	□	□	□	□	□	□	□	□
[out-group]	□	□	□	□	□	□	□	□	□
Siena	□	□	□	□	□	□	□	□	□
Florence	□	□	□	□	□	□	□	□	□

THANK YOU FOR YOUR PARTICIPATION!
Please hand in your questionnaire to the researcher (or his assistant),
from whom you will recieve the voucher to use in Società [society].

Colophon

This thesis is typeset in Computer Modern Roman. The body text is set at 12 pt.

It was written in LaTeX, and rendered into PDF using `knitr` and PDFLaTeX. References were produced with `Biber`.

It made use of "OxThesis" (version 2015-04-30), a LaTeXtemplate for an Oxford University thesis.

The revised version of the thesis was submitted to the Examiners on July 23, 2020, with leave to supplicate granted on August 26, 2020. This version of the thesis was generated on September 16, 2022. The lag between versions is due to the COVID-19 pandemic, which postponed graduation to September 23, 2022. No changes have been made in line with regulations, aside from minor corrections to formatting, grammatical, and typographical errors. The archive version deposited to the Oxford University Research Archive (ORA) is the finalized version.

Subsequent outputs of chapters have been revised in preparation for submission to a peer-reviewed journal. A pre-print of Chapter 2 is available at `https://doi.org/10.31235/osf.io/hxyvc`. Additional pre-prints, supplemental materials, and/or presentations related to the thesis can be found via my Open Science Framework (OSF) page at `https://osf.io/jcsq9/`. All publications can be found at `https://orcid.org/0000-0001-9306-3091`. I can be contacted at adam.kenny@anthro.ox.ac.uk and/or adam.kenny@cantab.net.