The Evolutionary Ecology of Cooperation & Conflict

A case study of Catholics and Protestants in Northern Ireland

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I, Antonio S. Silva, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Abstract

The evolution of large-scale cooperation in humans presents one of the most crucial evolutionary puzzles yet to be solved. Two theoretical frameworks - inclusive fitness and cultural group selection – have been proposed to explain this evolutionary dilemma. Inclusive fitness theory expects individuals to behave according to an individual fitness maximising strategy, which varies with individual and ecological parameters. Cultural group selection proposes that inter-group competition permits the evolution of group beneficial traits, such as altruism, through the differential survival and reproduction of groups. Empirically, a cultural group selection framework has yet to be accurately tested. Studies measuring cooperative behaviour tend to rely on economic games - whose real world validity is increasingly being questioned - and fail to distinguish between different targets of cooperative behaviour (i.e. out-group, in-group or unbiased).

The main aims of this thesis are to empirically test cultural group selection theories on the evolution of cooperation through inter-group conflict and religion, and to determine how ecological and individual characteristics affect the variation in cooperative behaviour. I use naturalistic measures of cooperation (donations, lost letters, dropped coins and lost tourist experiments) to quantify the variation in the cooperative behaviour of Catholics and Protestants - two endogamous groups with an on-going and long history of violent conflict - in a sample of different neighbourhoods in Belfast, Northern Ireland.

Overall, I find that conflict and religiosity do not increase cooperative behaviour towards the in-group, with individual and neighbourhood socio-economic characteristics being the main positive predictors of cooperation across all the measures. These findings challenge the current cultural group selection perspectives on the origins of human cooperation and highlight the importance of using real world measures of cooperation to empirically test theories on the evolution of cooperation.

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1 Introduction

In May 1940, the German army invaded Belgium and swiftly defeated the French, Belgium and British armies in what was to become a defining moment of the 2nd World War. By the end of May, the remaining Allied troops found themselves surrounded by the German army at the port of Dunkirk in Belgium. On the 27th May the evacuation efforts were initiated and in just over a week 338.226 British and French soldiers were evacuated from Dunkirk with the help of a flotilla of hundreds of civilian fishing boats, pleasure crafts and working badges (Thomson 2011). The term *Dunkirk Spirit* came into common use following the effort of the civilians involved in this operation, who put themselves at great risk, with over 200 of the non-military vessels being destroyed (about a third of all ships), many of them still manned by civilians (Churchill 1949).

This historic example highlights how conflict seemingly promotes altruistic acts that benefit one's group, while at the same time impose costs on people from other groups. Cooperation and hostility are widespread human behaviours that form the basis of this PhD project and its investigation of the variation of human cooperative behaviour and the dynamics of inter-group interactions. The fact that humans are able to cooperate on a large scale with unrelated individuals is widely accepted, but this prompts a crucial question. Why do individuals apparently behave in a manner that does not maximise their fitness (or utility) and how could this behaviour have evolved?

The evolution of large-scale human cooperation has been explained through the theoretical frameworks of inclusive fitness and cultural group selection. An inclusive fitness framework proposes to explain the variation of cooperative behaviour at the individual level, in which ecological parameters constrain individual cost and benefit outcomes. Mechanisms then based on (direct and indirect) reciprocity (Trivers 1971; Axelrod 1981; Nowak & Sigmund 1992) and costly signalling (Zahavi 1975) allow cooperation between non-kin to evolve. Alternatively, in a cultural group selection framework, the variation in cooperative behaviour would predominantly occur between cultural groups (e.g. ethnic groups, countries or religions) and competition through differential survival of groups would enable selection to act on group cooperative behaviour (Boyd & Richerson 1982; Boyd & Richerson 1985; Soltis et al. 1995). Studies have pointed to the existence of variation in cooperative behaviour at the cultural group level (Henrich et al. 2005; Henrich et al. 2006; Henrich, Ensminger, et al. 2010). Theoretical models have also shown that selection at the group level can potentially occur in situations of inter-group conflict, in which groups with group beneficial norms - such as in-group altruism - outcompete groups without these norms

(Turchin 2003; Choi & Bowles 2007). It has been argued that cultural evolutionary processes, driven by inter-group competition, can then result in the evolution of norms and beliefs promoting group cohesion, such as religious beliefs (Atran & Henrich 2010).

The main goal of this thesis is to determine how ecological and individual characteristics affect the variation in cooperative behaviour and to investigate how inter-group conflict mediates these effects. Specifically it will examine how levels of religiosity and exposure to sectarian violence predict parochial altruism - the combination of in-group altruism and out-group hostility. I use a sample of different neighbourhoods in Belfast, Northern Ireland and employ various naturalistic measures of cooperative behaviour to quantify the relative variation of unbiased and biased cooperative behaviour between and within two religious groups, Catholics and Protestants. In addition I use data on ethnic markers (sectarian flags) and secondary survey data to determine the role of cultural differences and coordination issues that are relevant in explaining the existence of parochial altruism.

This thesis starts with a review of the current state of theoretical and empirical research on the different evolutionary frameworks that attempt to explain the evolution of cooperation, followed by a description of the data and methodology used in the thesis in chapter 2. In chapters 3 and 4 I test the hypothesis that inter-group conflict is associated with parochial altruism using cross sectional and longitudinal data respectively. In chapter 5 I investigate the role of religion in the variation of biased and unbiased cooperative behaviour. In chapter 6 I assess the potential role of ethnic markers and cultural differences in explaining parochial altruism. I conclude in chapter 7 with the analyses of four different measures of cooperative behaviour to establish the key determinants of variation in cooperation in the real-world.

1.1 Literature Review

1.1.1 The Evolution of Cooperation

The evolution of cooperation in humans presents one of the most crucial evolutionary puzzles yet to be solved. Altruism is understood as a behaviour that increases the chance of survival and reproduction of another unrelated individual, at the expense of the altruist's fitness. From an evolutionary perspective, the emergence of altruism is difficult to explain as selfish individuals should, in principle, have an advantage over altruistic individuals and as a result have higher reproductive success and spread the selfish gene in a population to the detriment of altruistic genes. However, cooperative behaviour is widespread in human societies, but whether individuals behave to benefit others or solely for their self-interest is still uncertain.

For the majority of human existence, groups were small and cooperation was likely to have been mostly restricted to kin interactions for which Hamilton's Rule and inclusive fitness theory (Hamilton 1964a; Hamilton 1964b) provide a clear and ingenious explanation: genetic relatedness among kin allows cooperation between kin to evolve as the benefits associated with helping kin outweigh the cost, since they share derived genes. For non-kin interactions, reciprocity allows the maximisation of individual fitness through conditional cooperation in the form of direct (*I help you, you will help me later*) and indirect (*I help you because you helped someone else*) reciprocity (Trivers 1971; Nowak & Sigmund 1998; Nowak & Sigmund 2005). However, the premises behind these mechanisms - repeated encounters between the same individuals in the case of direct reciprocity and reputation in the case of indirect reciprocity - fail to account for a range of cooperative interactions present in a large-scale society, where one-shot interactions are common and reputation difficult to establish due to the scale and frequency of interactions. Despite this, the existence of widespread and large-scale cooperation between non-kin in human societies is undeniable, even in situations where there is no apparent benefit to the cooperative individual. This has been primarily demonstrated through various economic games in which people repeatedly behave in a way that does not maximise their individual payoffs (Camerer 2003), posing a theoretical dilemma for both the utility and fitness maximisation approaches of economics and biology.

Spurred by this dilemma, the idea of group selection has re-emerged over the past two decades as a viable theoretical possibility to explain cooperative behaviour among unrelated individuals in large-scale societies. The original group selection

theory - also known as naïve group selection as put forward by Allee (1943) and Wynne-Edwards (1962) - argues that traits beneficial to the group can become fixed in a population, even if those traits negatively affect individual fitness, with selective pressures between groups out-weighing the pressures of within group competition. This idea was subsequently criticised, as although theoretically possible, it would in practice require unrealistic premises to function as an important evolutionary mechanism explaining the variation found in the natural world (Boorman & Levitt 1973; Crow & Aoki 1982). First, it requires group extinction to occur at a faster rate than individual extinction when in fact the generation times of groups are much longer than those of individuals. Second, in most organisms, phenotypic (behaviour) variation corresponds to variation of the genotype, with between group phenotypic variation being dependent on between group genotypic variation. The low levels of migration required to keep groups genetically isolated and the maintenance of between-group variation on which group selection can operate are not normally found in nature (Williams 1966; Uyenoyama & Feldman 1980). Furthermore, a selfish individual who invades an altruistic group can then out-reproduce the original altruistic members leading to the selfish trait spreading through the population (Smith 1964).

1.1.2 Cultural Group Selection

More recently, group selection theory in the guise of multi-level selection puts forward a more convincing argument in which selection operates at multiple levels, not just exclusively at the individual or the group level. It argues that selection at the group level acts on inter-group variation, while individual level selection acts on intra-group variation between individuals. Thus, selection pressures on group beneficial traits will be stronger in conditions where variation between groups is greater than variation between individuals (Wilson & Wilson 2007).

A variant of multi-level selection - cultural group selection - proposes the evolution of cultural traits based on the differential survival and reproduction of cultural groups. It posits that human behavioural variation, unlike other species, can be the result of cultural transmission processes and therefore potentially decoupled from genotypic variation, allowing behavioural variation to be maintained despite genetic mixing between groups. Three key requirements are required for selection on cultural group traits to occur: 1. behavioural group variation; 2. heritable transmission of group traits; 3. group competition (Boyd & Richerson 1985). Although all three aspects are crucial for cultural selection to operate, this thesis will predominantly focus on testing the role of group competition in the variation of cooperative behaviour, while also investigating alternative explanations based on an inclusive fitness framework and the role of

individual and ecological characteristics. These topics are discussed in further detail below.

1.1.3 Behavioural Diversity

There is extensive evidence that human groups have a wide range of behavioural diversity that is unparalleled in other species. This behavioural diversity is however not restricted to between group differences and in many cases within group differences between individuals are equally, if not more, important in explaining behavioural diversity. The issue of between and within group variation plays a key role in trying to understand the extent to which cultural norms are an adaptation to a specific environment or the result of cultural transmission processes. For a trait to be under selection at the cultural group level, the variation of this trait has to be larger between groups than within groups, as otherwise selection at the individual level will override the selective pressure at the group level.

The human behavioural variation found in the natural world is likely to be the result of gene-culture co-evolutionary processes (Cavalli-Sforza & Feldman 1973; Cavalli-Sforza & Feldman 1981; Boyd & Richerson 1985). Individuals adopt different behaviours as an adaptive response to their ecology (Diamond 1997; Harris 2001) and specific ecological constrains lead to the rise of between group cultural variation. For example, the diversity of human marriage systems can be understood through varying ecological pressures with polyandry arising in resource poor regions, like areas of Tibet where farms are too small to be split among sons (Crook & Crook 1988), and polygyny being more common in environments where resources are readily monopolisable and subsequent stratification of male resources leads to a situation described in the polygyny threshold model (Orians 1969; Betzig et al. 1988).

However, ecological variables alone are arguably insufficient to explain all behaviour variation found in humans, with similar cultural traits appearing in disparate ecological conditions and different cultural traits found in similar ecological conditions. For example, Amish and Orthodox Jewish communities often live geographically close and interact with the surrounding secular community, but nevertheless maintain striking behavioural differences. These differences could be maintained via cultural transmission processes that allow the evolution of behavioural traits based on biased social learning, in which the adoption of traits depend on their frequency, efficacy or the prestige of the trait holder (Boyd & Richerson 1985; Henrich & Boyd 1998; Henrich & Gil-White 2001). While these processes would have evolved through genetic natural selection as adaptations to reduce the costs of individual learning in

changing environments, they also facilitate cultural group selection by increasing between group variation and as result allowing potential maladaptive behaviours to arise (Boyd & Richerson 1985; Richerson & Boyd 2004).

Recent studies have attempted to quantify the amount of behavioural variation found between and within groups in order to assess the importance of cultural group selection. Most of this work has focused on cooperative behaviour - as cultural group selection appears especially well placed to help understand the evolutionary dilemma of large-scale cooperation between unrelated individuals - but any group beneficial trait could theoretically evolve through this mechanism. In a cross-cultural study using individual and group level predictors of cooperative behaviour in ultimatum, public goods and dictator games, group level traits were found to be the best predictors (cultural group and levels of market integration), while individual level predictors were not found to explain the variation in cooperative behaviour in the majority of populations studied (Henrich et al. 2005). In two similar studies investigating the cross-cultural variation of punishment and expectations of fairness across 15 populations, group level predictors were again able to explain more variance than individual predictors (Henrich et al. 2006; Henrich, Ensminger, et al. 2010).

These studies sampled and compared behaviour from multiple cultural groups and purport to demonstrate that the variation found is best explained by the cooperative cultural norms of each group. However, they crucially fail to account for the amount of variation that is found at the within group level. The initial studies that attempted to measure between group behavioural variation (Henrich et al. 2005; Henrich et al. 2006; Henrich, Ensminger, et al. 2010) assumed a homogeneous cultural group and sampled mostly from single populations (40% of cultural groups were sampled from a single population and the majority had less than 3 populations sampled (Henrich et al. 2012)), potentially confounding the within-group variation with between-group variation (Lamba & Mace 2011). Furthermore, as Nettle et al. (2011), Lamba & Mace (2011) and Holland et al. (2012) demonstrate, within-group variables - such as wealth and age - can explain variation in cooperative behaviour as significantly as between-group variables, reinforcing the idea that ecological factors can be, at least, as important as cultural factors in explaining individual variation.

To determine the role that cultural group selection has on individual behavioural traits it is imperative to quantify the relative variation that exists at different levels; individual, neighbourhood and cultural group. This thesis will focus on analysing within group variation of cooperative behaviour, but in chapter 6 I also attempt to quantify the

variation at the between group level, although this will be of limited theoretical validity due to only being able to measure variation between two different cultural groups, Catholics and Protestants.

1.1.4 Group Competition

The evolution of cooperation through cultural group selection requires that in addition to cooperative norms varying between groups, these norms also provide an advantage to the group in a situation of competition between groups. Inter-group competition is often put forward as a prominent factor in the evolution of cooperation (Boorman & Levitt 1973; Choi & Bowles 2007; Bowles 2009; Sääksvuori et al. 2011). Specifically, models of cultural group selection depend on competition between groups for traits that favour the group to evolve, in which groups compete over access to resources such as food, mates or territory (Bowles et al. 2003; Choi & Bowles 2007; García & van den Bergh 2011). Cultural group traits that provide an advantage to groups in conflict will proliferate at the expense of other cultural traits that do not, eventually leading to group extinction through conquest and assimilation (Henrich 2004). Religion, in particular, has been put forward as a cultural group trait that enhances group cohesion through doctrinal emphasis on parochial altruism (Atran & Ginges 2012) and as an intrinsic characteristic of groups is a good candidate to be under cultural group selection (Norenzayan & Shariff 2008; Norenzayan et al. 2015); this topic is further explored in chapter 5.

In these theoretical models of evolution of cooperation through inter-group conflict, biased altruism towards the in-group co-evolves alongside out-group hostility - in what is termed parochial altruism - as a way of groups maximising their payoffs (Bowles et al. 2003; Choi & Bowles 2007; García & van den Bergh 2011). In Choi & Bowles' (2007) model, groups with higher number of parochial altruists (defined as “when the members of the actor’s group benefit as a result of one’s hostile actions toward other groups” (Choi & Bowles 2007, p.636)) are more likely to initiate conflict with groups with lower numbers of parochial altruists. This asymmetry then increases the likelihood of the parochial altruist groups winning over the other group, and as a result also increases the individual payoff of the members of that group. These group benefits can then offset the individual cost of parochial altruists. In this model, the evolution of parochial altruism is not due to the indirect benefits that parochial altruists obtain from their group prevailing in a contest, but because in situations of inter-group conflict, groups with higher numbers of parochial altruists tend to win inter-group contests and the enhanced payoff is then distributed to the group members which are disproportionately parochial altruists as well. In this model, inter-group conflict

promotes the co-evolution of in-group altruism and out-group hostility, which leads to the logical inference that in situations of conflict levels of in-group altruism should be negatively associated with levels of out-group altruism (Arrow 2007; Choi & Bowles 2007). Note that even group selection models based on assortment, which do not explicitly model inter-group competition, still rely on differential group reproduction and extinction to select group advantageous trait, such as parochial altruism (Traulsen & Nowak 2006; Traulsen et al. 2008; García & van den Bergh 2011).

The findings from models pointing to an association between parochial altruism and inter-group conflict are also confirmed by empirical data. Several studies have recently shown increased in-group altruism and social cohesion in response to violent conflict in which individuals who had experienced violence were found to be more altruistic in experimental scenarios than individuals without exposure to violence (Bellows & Miguel 2009; Gilligan et al. 2011; Gneezy & Fessler 2011; Voors, Nillesen, et al. 2012; M. Bauer et al. 2014). While it should be noted that this type of cooperative behaviour is not necessarily associated with altruism *sensu stricto* (i.e. lifetime fitness costs to the actor), as described in the models of parochial altruism (Bowles et al. 2003; Choi & Bowles 2007; García & van den Bergh 2011), the findings from these studies are normally put forward as supporting empirical evidence (Bernhard et al. 2006; Voors, Nillesen, et al. 2012; Gneezy & Fessler 2011; M. Bauer et al. 2014; Puurtinen & Mappes 2009). Inter-group competition and the associated costs are not necessarily restricted to violent conflict; group proximity in situations of ethnic mixing has also been shown to be detrimental to the establishment of prosocial norms (Waring 2011; Voors, Nillesen, et al. 2012).

However, the studies that find increased levels of cooperation associated with inter-group conflict do not use real life groups with a history of conflict in their experimental set-up, instead employing abstract concepts of in-group and out-group, such as children from the same classroom as in-group and children from a different school as out-group (M. Bauer et al. 2014) or anonymous neighbours who may or may not have shared group membership (Voors, Nillesen, et al. 2012). Furthermore, with the exception of M. Bauer et al. (2014), these studies are not able to distinguish between different types of cooperative behaviour by conflating in-group cooperative behaviour with unbiased cooperation and also failing to measure out-group hostility. The accurate identification of the specific type of cooperation is crucial, as the hypotheses for the evolution of cooperation through inter-group conflict require cooperation to be biased towards the in-group, not to be indiscriminately applied (Arrow 2007; M. Bauer et al. 2014).

1.1.5 Cooperation and Inclusive Fitness

While group competition is required for cooperation to evolve through cultural group selection, models of the evolution of cooperation based on an inclusive fitness approach do not require inter-group conflict. There are several alternative mechanisms - reputation, reciprocity, coordination and indirect individual benefits - that allow cooperative behaviour to evolve through selection at the individual level. A behavioural ecology perspective emphasises that the level and type of resources available in an environment should shape the behaviour of individuals based on the associated cost and benefits (Cronk et al. 2000; Borgerhoff Mulder 1991). However, the long-term cost and benefits of cooperation are difficult to assess so it is unclear how resources and status should affect cooperative behaviour.

Indirect reciprocity theory posits that individuals will reap long term reputational benefits from helping others, even in the absence of direct reciprocal benefits, by increasing the likelihood they will be helped by others in the future (Nowak & Sigmund 1998; Nowak & Sigmund 2005). There is now good evidence that reputational image-scoring affects future interactions in the lab (Wedekind & Milinski 2000; Milinski et al. 2001) and the field (Resnick et al. 2006; Macfarlan et al. 2013; Yoeli et al. 2013), and in accordance, several studies have found that anonymity tends to reduce levels of cooperation (Haley & Fessler 2005; Bateson et al. 2006).

Indirect reciprocity requires an individual to keep reputational scoring of all potential interaction partners in a population (Nowak & Sigmund 1998; Nowak & Sigmund 2005) which demands costly cognitive processes. The concept of generalised reciprocity offers a simpler and less cognitively expensive process that allows cooperation to evolve based on the simple rule of “be nice to others, if others have been nice to you” (Pfeiffer et al. 2005; Nowak & Roch 2007). This heuristic simply requires helping others if helped in the past - independently of the identity of the partner - and provides a useful theoretical framework to understand how cooperation may breakdown in areas of low social capital and crime (Sampson et al. 1997; Laurence & Heath 2008; Schroeder et al. 2014), with evidence that is used in humans (Berkowitz & Daniels 1964; Fischbacher et al. 2001; Bartlett & DeSteno 2006) and other animals (Rutte & Taborsky 2007).

In an environment where mutual trust exists, successful interactions are facilitated, as it prevents either party from being cheated, while at the same time lowering the enforcement and vigilance costs (Coleman 1988). People living in poor

neighbourhoods may also face greater uncertainty and increased exposure to crime (Holland et al. 2012) and death (McCartney et al. 2012), leading to shorter time horizons and reduced investment in future interactions (Nettle 2010; Pepper & Nettle 2014). Finally, individuals with low resources or status could be expected to behave more selfishly in order to increase their access to resources and reduce their economic and social disadvantage.

At the same time, wealthy individuals are able to exert greater control over their lives and insulate themselves from the outside world (Kraus et al. 2009). There may also be a causal link with ruthless and competitive individuals more likely to succeed and accrue wealth, which would point to lower levels of cooperation in high status and wealthy individuals, with some evidence pointing to an association between high social status and lack of empathy (Kraus et al. 2010). However, the causality of the associations described above between selfishness and wealth, and between poverty and trust has not been well established, so it is difficult to ascertain how resources and status affect cooperation. One exception is a study using a randomised housing allocation programme of low income families into different neighbourhoods that found long term improvements for people moving into wealthier neighbourhoods in subjective well-being and physical and mental health, despite no changes in household financial situation (Ludwig et al. 2012). Another interesting study also found that simply spending some time in a deprived neighbourhood resulted in visitors reporting lower levels of social trust and higher paranoia (Nettle et al. 2014).

From an empirical perspective, results of the impact of wealth and resources have so far been mixed, but they suggest that the precise details of the ecological context mediating cooperation are important and their effect is not yet fully understood. Several studies have found an association between low levels of social capital and increased crime (Sampson et al. 1997; Laurence & Heath 2008; Schroeder et al. 2014). Mirroring this association, there is also a strong correlation at the country level between income and economic growth (Knack & Keefer 1997). In an urban context, Wilson et al. (2009) found that the quality of a neighbourhood (estimated from self-reported levels of support from family, school and neighbourhood) in Binghamton, U.S.A. positively predicted the number of dropped letters that were picked up and posted back. Nettle et al. (2011) also found that a poor area of Newcastle, UK showed fewer incidences of returning a lost letter and giving to a charity, when compared with a rich area of Newcastle – but with only two points of comparison it was not possible to ascertain which specific aspects of the varying socio-economic conditions underlined these differences. Colleagues and I expanded the lost letter experiment to

30 different neighbourhoods in London and found similar results, with low-income neighbourhoods returning significantly fewer letters than wealthy neighbourhoods (Holland et al. 2012). In contrast to these findings, Piff et al. (2012) found that wealthy individuals were less likely to behave cooperatively than less wealthy individuals in a range of naturalistic measures, mainly from a sample of students at University of California at Berkeley, USA.

The variation in the costs and benefits of a cooperative trait should determine the selection pressures under natural selection, but sexual selection is also likely to play a role in shaping cooperative behaviour by cooperation being used as a costly signal of the quality of a mate (Roberts 1998; Sylwester & Roberts 2013). Zahavi's idea that a trait can be selected not only *despite*, but also *because* there are direct costs associated with the trait can be used to partly explain the evolution of cooperation (Zahavi 1975), with the costliness of the behaviour providing an accurate indication of the fitness of an individual. The one-shot helping behaviour can be viewed as a peacock's tail.

As women tend to be the limiting factor in mating dynamics, men are more likely to invest in the mating effort, compared to a greater female investment in gestation and lactation (Trivers 1972). Based on the idea of competitive altruism, it should then be expected that when potential mates are observing, men would behave more cooperatively (Roberts 1998). Studies have shown that men tend to display seemingly altruistic behaviour when in the presence of women; in lab experiments, men were found to donate more in economic games in the presence of an attractive woman (but not attractive men) (Iredale et al. 2008) and men's charitable donations in rural Senegal increased in the presence of young women, but not men or old women (Tognetti et al. 2012). In the field, both Latané & James (1975) and Goldberg (1995) also found that men were more likely to help women than other men.

The competitive altruism hypothesis is normally applied to men, and even Darwin originally suggested that women have "*greater tenderness and less selfishness*", while men "*delight in competition*" (Darwin 1871, p.326). However, this idea is not empirically supported with a meta-analysis on cooperation studies finding no overall significant gender differences in cooperative behaviour (Balliet et al. 2011). Less explored is the idea that women can also compete for mates through cooperative displays (but see Stockley & Campbell 2013). For example, in situations where the proportion of males to females in reproductive age is low, men became the limiting gender and women could then compete for mating access. While this is observed in

non-animal species, such as langur monkeys (Sommer 1989) and birds (Liker et al. 2014), there is little evidence it is associated with cooperative behaviour or whether it occurs in humans.

1.1.6 Biased Cooperation

There is a general agreement that human beings tend to form groups and behave preferentially towards group members in exclusion of out-group members (Yamagishi et al. 1999; Bernhard et al. 2006). The requirements behind this in-group favouritism appear to be minimal, with preference for paintings of Klee over Kandinsky (Tajfel et al. 1971) or having a blue or yellow shirt (Navarrete et al. 2012) being enough to trigger preferential behaviour towards group members. Experiments with prisoner's dilemma and common pool resources also find higher levels of cooperation among members of the same minimal group than with out-group members (Kramer & Brewer 1984; Waring & Bell 2013). This tendency appears to have evolved as a useful heuristic to solve problems of coordination, reciprocity and reputation management in cooperative exchanges, ultimately leading to higher group payoffs through either parochial groups out-competing less parochial groups, or higher individual payoffs through direct benefits to the individual through successful interactions with other individuals, or indirect individual benefits derived from group competition (Efferson et al. 2008; Habyarimana et al. 2007).

The individual and group payoffs associated with in-group bias are not linear though. A purely exclusionary network, where individuals only interact with other group members, reduces the potential amount of interactions and can thus lead to reduced payoffs. Even notable parochial communities, like the Amish and the Mennonites, are involved in business transactions with out-group members (Richerson & Boyd 2004). A balance between in-group bias and number of interactions is required. Although the majority of groups' members preferentially interact with other group members, no group deals exclusively with in-group members and in fact, the majority of inter-group interactions do not lead to full blown conflict (Fearon & Laitin 1996).

Despite the general propensity for in-group bias in humans being well established, there is still a lack of clarity on the factors that mediate this process and how they vary according to different ecological and socio-economic factors, both at the individual and group level. In-group bias and associated inter-group tensions are widespread, however the occurrence of inter-group conflict (e.g. inter-ethnic violence and wars) may have been over stated in previous research (Fearon & Laitin 1996), so it is

important to understand what the external factors are that play a role in determining the level of animosity between groups.

Individuals belonging to the same group are more likely to have shared norms and behaviours than individuals from a different group. This can be the result of group members living in geographical proximity and therefore sharing similar ecological adaptive knowledge. Here, adaptive biased social transmission mechanisms operate, in which individuals are more likely to copy behaviours and norms from group members (Boyd & Richerson 1985; Henrich & Boyd 1998). As a result, in-group bias through preferential association with other group members will increase the individual pay-off in tasks requiring coordination (Efferson et al. 2008; Habyarimana et al. 2007). For example, in a business transaction between individuals, a mutual expectation of payment in 30 days is more beneficial than a transaction between an individual that expects to be paid in advance and another that expects to be paid in 30 days.

Biased treatment towards in-group members requires the identification of group membership through group markers (Barth 1969; Boyd & Richerson 1987). These markers vary in their salience and in their ease of identification and may range from skin colour, dialect to body decoration. Hechter (1990) found that success of utopian communities in late 18th Century America was directly related to common ethnic background and uniform style of dress. The inability to accurately identify group membership often results in the reduction or cessation of in-group favouritism, with in-group bias being present only in experimental scenarios when group membership is clearly defined (Hoff & Pandey 2006; Habyarimana et al. 2007).

The accurate identification of group identity in boundary areas is of particular importance, as the increased heterogeneity of these areas decreases the likelihood of encountering individuals from one's own group, which can then reduce the pay-offs of biased interactions through coordination issues and difficulties in enforcement and reputation management (McElreath et al. 2003; Habyarimana et al. 2007; Efferson et al. 2008). Turchin (2003) argues that ethnic boundaries are a catalyst for conflict and potentially a condition for increased selection pressure at the group level for in-group altruism. In contrast, due to the lack of conflict in central homogeneous areas it should be expected that in these areas a reduced ability for collective action and lower levels of in-group bias would exist. Turchin (2003) applies the concept of group boundaries to "frontiers of large empires with vigorous ideologies" (p.53), but in essence this argument can also be made for conflict between smaller groups (McElreath et al. 2003), especially groups with exclusionary membership systems like most religious

groups. The role of ethnic markers and in-group conflict in maintaining between group behavioural variation is further explored in chapter 6.

The advantages of preferentially interacting with group members go beyond coordination benefits. In situations of repeated interactions, the risk of defection increases making individuals unsure of whom they should interact with. Groups help to solve this problem by allowing the maintenance of reputation systems and contractual enforcement mechanisms. Information sharing through stronger in-group social networks allow for individuals to know the reputation of potential partners in a way that is not possible when interacting with out-group members. This reputation mechanism not only allows for potential higher payoffs in repeated interactions, but it also allows for more efficient punishment of in-group members, reducing the likelihood of defection (Mathew & Boyd 2013). The increased findability of in-group members can not only be due to salient group markers but also due to stronger social networks among co-members which result in increased availability of information about group members (Colson 1974). Social networks are stronger within the same group and consequently there is an information asymmetry in inter-group interactions. It is more difficult to identify and punish out-group members, therefore people tend to preferentially interact with in-group members and indiscriminately attack the out-group as generalised punishment (Bernhard et al. 2006). Institutional arrangements of information sharing between groups, and higher levels of in-group punishment can help to ease this problem. This factor may help explain the reduction in inter-group conflict in situations with a functioning state or ad-hoc in-group structures that are able to identify in-group members, and as a result inflict targeted in-group punishment and prevent the flaring of conflict (Fearon & Laitin 1996). This is exemplified in the reduction of Israel's collective punishment towards Palestinians with the rise of a semi-autonomous Palestinian Authority in the 1990's that was able to patrol its own community (Kleinfield 1996).

The role of institutions, such as governments and schools, in mediating group bias is multi-faceted. In the example above of Israel and Palestine, the establishment of institutions able to deliver effective in-group punishment shifts the pay-off structure of inter-group conflict. The strong social networks among group members reduces the cost of obtaining information about an in-group member in comparison with an out-group member, favouring in-group over out-group punishment as a way to reduce inter-group conflict (Fearon & Laitin 1996). In environments where group mixing is institutionalised, the information asymmetry between group members is reduced and punishment becomes effective in maintaining cooperation (Alexander & Christia 2011).

Another way institutions can affect inter-group interactions is by enabling information sharing between groups and allowing for reputation mechanisms to work across groups. An example of this is the establishment of informal coalitions of Maghribi traders in the 11th Century in the Mediterranean, which allowed the sharing of information about out-group trading partners, thus helping to prevent cheating in business transactions with out-group members (Greif 1993).

Power asymmetries are another important factor mediating in-group interactions. The existence of dominance structures where one group has control over another - based on a rationalist framework where coalitions are formed to extract material benefits or protects resources from other groups (Bates 1983; Olzak 1994; Gellner & Breuilly 2008) - can lead to increased levels of inter-group conflict. Traditionally, increased ethnic diversity is seen a predictor of increased conflict (Alesina & La Ferrara 2005; Montalvo & Reynal-Querol 2005; Habyarimana et al. 2007), however other studies have pointed to the effect of ethnic dominance by one group over others (when one group is present in higher numbers than others) as the key predictor of inter-group conflict beyond ethnic diversity per se (Collier 2001; Collier & Hoeffler 2004; Waring 2011; Waring & Bell 2013). This suggests that in situations of ethnic diversity without dominance, between group power symmetries buffer group conflict.

Most of the mechanisms described above to explain in-group biased preferences do not require specific group selection processes to evolve, as individual benefits from in-group interactions can arise from coordination, reputational and direct punishment considerations. Strong reciprocity and 3rd party punishment are often modelled as individually costly requiring group selection models to evolve (Boyd et al. 2003; Bowles & Gintis 2004; Sääksvuori et al. 2011), but these behaviours may not necessarily be costly to the individual as punishers also obtain individual reputational benefits (Raihani & Bshary 2014). Indirect individual benefits can also arise from preferentially interacting with members of one's own group. In Fu et al. (2012) model the evolution of parochial altruism occurs without the need for inter-group conflict, with individual selection operating on parochial individuals who accrue indirect benefits from belonging to a successful group of fellow parochial cooperators. In another model, investment in shared group resources are favoured as a mechanism to avoid the individual costs of intra-group competition (Barker et al. 2013).

Finally, from a theoretical perspective of inter-group competition on resource acquisition it could be expected that low status individuals discriminate more towards out-group individuals than high status individuals with less resource constrains. At the

group level, the role of status and wealth as a mediating factor in in-group bias has been explored in two studies, one of which found a relationship between high income countries and reduced levels of in-group favouritism (Van de Vliert 2010) and another that found individuals living in higher status neighbourhoods in the U.S.A. to perceive less competition from out-groups (Oliver & Wong 2003), but there appears to be a surprising absence of studies investigating the role of status and wealth on in-group bias. Despite the lack of formal evidence for a relationship between income deprivation and out-group discrimination, examples of this can be found in the rise of xenophobic political parties and economic crisis in 1930's Germany (National Socialist Party) and contemporary Greece (Golden Dawn Party). The mediating role of individual and neighbourhood S.E.S. characteristics on biased behaviour is further explored in chapter 3.

1.1.7 The External Validity of Economic Games

The vast majority of empirical work in the area of cooperation is based on economic games, but recently the validity of traditional economic games as measures of human cooperative behaviour have started to be questioned with multiple studies failing to find correlations between behaviour in experimental games and in real life measures in the field (U. Gneezy et al. 2004; S. D. Levitt & List 2007; Laury & L. O. Taylor 2008; Benz & Meier 2008; Voors et al. 2012). There are multiple reasons behind the lack of correlation between experimental games and real world measures, but these results suggest that economic games are perhaps not capturing what cooperation actually is.

First, the majority of these experiments are played with western university students who are on average a highly educated wealthy sample and are arguably not representative of the wider population (Henrich, Heine, et al. 2010; Cappelen et al. 2014). Samples of students have shown to differ from the wider population in their concerns of efficiency and equality in games' outcomes (Fehr et al. 2006) resulting in different behaviours in economic games (Cappelen et al. 2014). Furthermore, there is also evidence that prosocial players are in general more willing to take part in experiments, therefore skewing the results. For instance, List (2006) found that the individuals who initially declined to take part in an experiment were then found to be less generous in a later field experiment played without their awareness.

Second, the artificiality of the setting of these experiments may cue the subjects to play according to specific real life cooperative social norms that are not particularly relevant to the hypothesis being tested (Binmore 2010; Laury & Taylor 2006). Different internalised social norms can be invoked depending on the context of where

the game is played and as result affect the payoff structure. As described in Henrich et al. (2005), the Orma - a tribal group from Kenya - are more likely to contribute in a public good game as the game is similar to an existent social structure of social contribution (harambee); thus other groups with lower average contributions are not necessarily less cooperative; it may just be that the games invoke no real life norm for those groups. The importance of social norms in the behaviour of people in games is also highlighted by Lesorogol's (2007) study where a contextualised dictator game based on meat sharing produced significantly different results from an decontextualised dictator game; the decision in the contextualised version seemed to follow a local norm of offering a specific amount of meat to a guest, while the results from the decontextualised game showed a wider range of behaviours.

Humans have not evolved to play anonymous one-shot games, as the majority of day to day cooperative interactions are based on reciprocal and reputational concerns, and consequently behaviour in such games is likely to be based on over-generalisation of strategies that function well outside of the lab. The social heuristic hypothesis posits that people will intuitively behave based on a heuristic that is advantageous in their natural environment (Rand et al. 2014). Studies that use time-pressured and time-delayed decisions in economic games to induce intuitive or deliberative decisions, respectively, find that people consistently cooperate more in intuitive than deliberative decisions (Rand et al. 2012; Rand et al. 2014; Rand & Kraft-Todd 2014). Conversely, it should also be expected that in environments where cooperation is not the advantageous default option, intuitive decisions should produce selfish decisions but this has so far not been explicitly tested.

Third, the complexity of some of the economic games that are played is often baffling (even, as in the case with Bornstein (2003), to this researcher) and this brings into question whether the participants themselves are able to play as rational actors and understand the costs and benefits inherent to the games' processes. A recent study brought these issues to the fore and questioned the current interpretation of prosocial preferences for the results of studies on cooperation using economic games; players of public goods games who were provided with detailed information on the payoff structure and outcomes of the game decreased their contributions, unlike what the prosocial interpretation would have predicted. Furthermore, conditional co-operators in previous standard games were found to decrease their contributions the most when provided with the detailed payoff information, suggesting that previous prosocial players were possibly misunderstanding the structure of the game (Burton-Chellew & West 2013).

Natural experiments in the field have a long history in economics and are increasingly being used to find new valuable insights on human cooperative behaviour (List 2007; Levitt & List 2009). Following on these ideas, with this thesis I attempt to capture real life cooperative behaviour using the naturalistic measures of school donations, lost letters, dropped coins and lost tourist experiments, and in addition conduct a natural experiment of donations before, during and after inter-group sectarian riots.

2 Data & Methods

2.1 Study Site

Northern Ireland is part of the United Kingdom and is located in the island of Ireland, adjacent to the Republic of Ireland (**Figure 2.1**). It has a population of 1 810 000, of which 49% is Protestant and 47% is Catholic (NISRA 2012). This region has a long history of conflict between the two communities and it provides a valuable case study on the dynamics of inter-group interactions, with these two groups being predominantly endogamous with marked levels of residential and educational segregation.

Figure 2.1 Map of Northern Ireland and the Republic of Ireland (Google Earth).

In the 17th Century, English and Scottish settlers – supported by the English crown - moved to the region and confiscated the majority of productive land from Irish landowners to establish what was to become known as the plantations of Ireland. During the following centuries the British Crown ruled the island until the Easter Rising of 1916 when the Catholic majority demanded independence from the United Kingdom and a war of independence ensued between the Irish Republican Army (I.R.A.) and the British army. This conflict officially ended in 1921, but resulted in the

partition of the island into an independent southern Republic of Ireland and maintaining Northern Ireland as part of the United Kingdom (Paseta 2003; CAIN 2012). In the late 1960's, conflict flared again, in what was to be coined the Troubles, between the nationalist (predominantly Catholic) and loyalist (predominantly Protestant) communities in Northern Ireland over the political status of the region as part of the UK and over the discrimination against of the Catholic community related to housing, jobs and electoral rules (Hughes et al. 2007). The violent conflict consisted of attacks by paramilitary groups - such as the nationalist I.R.A. and the loyalist U.V.F. – on civilians, British troops, police forces, local businesses and government buildings. The response from the British Army was often brutal, notably with the attack on an unarmed civilian march in Derry in 1970 that resulted in the death of 14 civilians and non-fatal shootings of 14 more in what was to become known as the Bloody Sunday (Newdigate et al. 2010). The Troubles lasted over the next 30 years with intense inter-group violence during which over 3500 people were killed (Sutton 2012) and tens of thousands were injured (Breen-Smyth 2012).

The Good Friday agreement in 1998 established a power sharing government between nationalist and loyalist political parties. This started the process of demilitarisation of paramilitary groups, and the parallel economic development of the region has reduced the levels of violence in the past decade.

The sectarian conflict in Northern Ireland is still prevalent today, although with lower intensity and frequency than in the past. The Good Friday agreement in 1998 established a power sharing government between nationalist and loyalist political parties. This started the process of de-militarisation of the paramilitary groups that, alongside the economic development of the region, has reduced the levels of sectarian violence in the past decade (Paseta 2003; CAIN 2012). However, a low level conflict still remains present; in 2011 alone, there were 64 sectarian bombings, 60 sectarian shootings and in 2010/11, 995 sectarian related crimes were recorded, ranging from fights and church attacks to murders (Nolan 2012) (**Figure 2.2**). Riots in deprived neighbourhoods in Belfast are still frequent, especially at the Orange March Parades (Protestant community groups) during the summer months. In September 2012 riots over 3 consecutive days in north Belfast resulted in the injury of 60 police officers and the arrest of over 30 people (BBC News 2012).

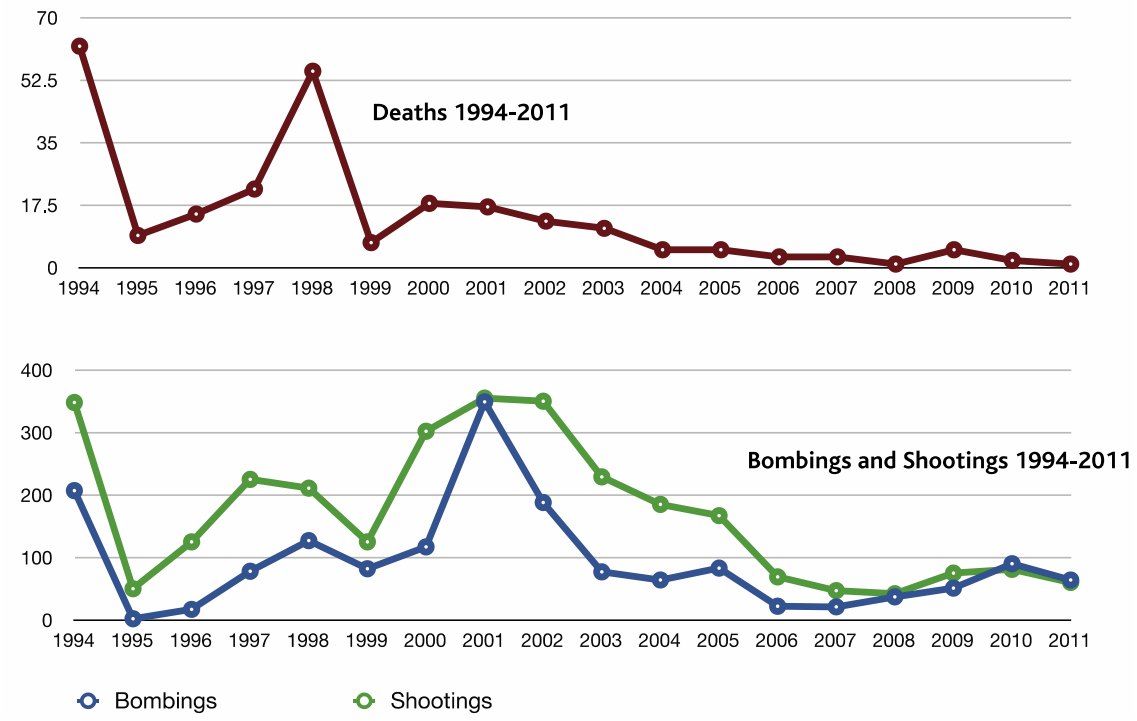

Figure 2.2 Number of sectarian related deaths, bombings and shootings in Northern Ireland between 1994 and 2011 (Nolan 2012).

The sectarian conflict in Northern Ireland has an important territorial and demographic aspect. The majority of residential areas are segregated between Catholic and Protestant communities, with over 90% of people in public housing and two thirds of the population living in areas made up of over 80% of their own religious group (Shirlow & Murtagh 2006; Byrne et al. 2006). However, the levels of segregation vary between socio-economic classes, with a recent trend of Catholic middle classes moving into previously exclusive Protestant neighbourhoods (Murtagh et al. 2008) and the few mixed urban neighbourhoods that exist being almost exclusively middle class (NISRA 2012). The separation between the two communities is most evident with the "Peace Walls" that divide Catholic and Protestant neighbourhoods (**Figure 2.3**). These separation barriers are mostly located in economically deprived areas and in Belfast extend intermittently over 21 km - sometimes reaching 12 metres high – with the latest estimate putting the total number of 88 walls in Belfast, where the majority of walls are located (**Figure 2.4**) (Community Relations Council 2008). These walls are erected to separate the two communities as a consequence of re-occurring localised inter-group violence. Despite the reduction in sectarian conflict in the past decade the construction of separation walls continues and there appears to be a strong social support for the walls to be kept, with a 2007 survey showing that only 21% of respondents believed that the walls should be removed (Vargo 2007).

Figure 2.3 Separation wall between the Catholic Clonard neighbourhood and the Protestant Shankill neighbourhood (Antonio Silva).

The segregation between these two communities in Northern Ireland extends beyond residential division and starts at an early age with a heavily segregated educational system. In 2010/11, 94% of nursery, primary and secondary schools were either predominantly Catholic (run by the Catholic Church) or Protestant (run by the state or Protestant Churches). The other 6% were integrated schools which actively promote mixed schooling, but have had limited success with little increase in the number of students enrolled in past years (Nolan 2012). People appear to support mixed schooling, with 9 out 10 surveyed being in favour of integrated education (Ipsos MORI 2011), but, in practice, most people still send their children to the school of their group. The majority of Protestant schools are managed by the state (although Protestant churches also take part in the educational board of governors) and are, in principle, not sectarian, but they are perceived as such and attended almost exclusively by children of Protestant origin (CAIN 2014a); reflecting this reality in my survey sample only 2.2% of children from Catholic parents attend a Protestant school. The high levels of residential and educational segregation are also reflected in the low rates of inter-marriage, with only 12% marriages in 2005 being of different religions (Northern Ireland Life & Times Survey 2005). This rate of intermarriage has been slowly increasing over the past decade, but for the duration of the Troubles it remained around 5% (Moxon-Browne 1991).

The levels of segregation at the educational, residential and marriage levels are likely to affect general interactions between Catholic and Protestant individuals in Northern Ireland but there is a lack of quantitative research on levels of inter-group contact. Murtagh (1998) conducted a small study in two rural villages - each predominantly Protestant and Catholic - in Northern Ireland and found that over three quarters of respondents had most or all of their friends of the same religion as themselves. Still, in this study the lack of contact did not seem to negatively affect inter-community attitudes, with over 80% of the respondents considering the relations between the two communities to be positive. However, another study among university students in Northern Ireland did find support for the idea that inter-group contact promotes positive relationships (Allport 1954; Pettigrew 1998), with higher levels of contact with out-group members being associated with positive attitudes towards the out-group (Tam et al. 2009).

Belfast is the capital and main urban area of Northern Ireland with a population of over 500.000 and approximately an equal split of Catholic and Protestant composition (**Figure 2.4**) (Equality Commission for Northern Ireland 2006). Belfast also presents a wide range of socio-economic conditions, with the richest and the poorest areas of the whole of Northern Ireland found here. At the country level, this distribution of wealth is also associated with religious affiliation, with the Catholic community being historically more deprived than the Protestant community. At the present, 26% of Catholics live in low income households, compared with only 16% of Protestants (Nolan 2012). The situation in Belfast mirrors this situation, with the majority of deprived neighbourhoods being predominantly Catholic (NISRA 2012).

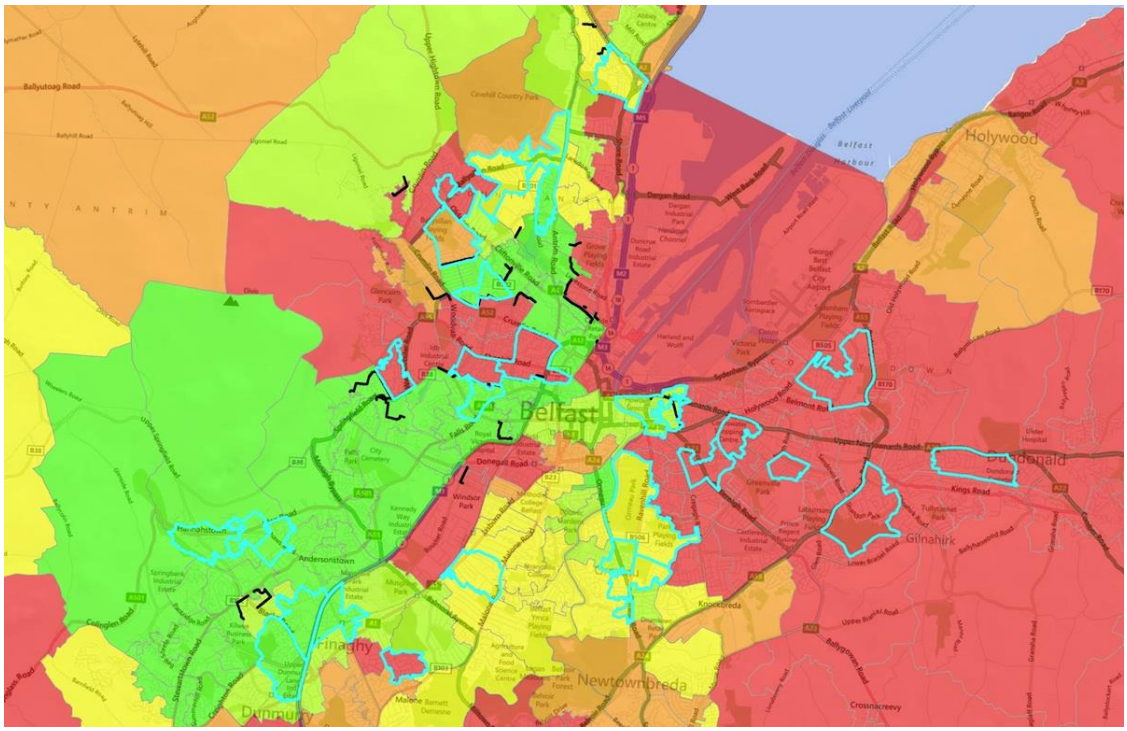

Figure 2.4 Map of Belfast with the neighbourhood religious composition and separation walls: 0%-20% Catholic (Red), 21%-40% (Orange), 41%-60% (Yellow), 61%-80% (Light Green), 81%-100% (Green). Black lines represent the separations walls. Blue highlighted areas indicate sampled neighbourhoods.

2.2 Methods

I ran several experiments to measure biased (toward the in-group or out-group) and unbiased (i.e. neutral) cooperative behaviour across different Belfast neighbourhoods representing a wide range of socio-economic characteristics. Overall, the data collection was conducted by 6 assistants and I in Belfast during the months of May and June 2012 and January, May and June 2013. I used a diverse methodology including structured questionnaires, natural field experiments and observational measures in order to capture a wide variety of behaviours (**Table 2.1**). Below I describe the data and the methodology used to collect it.

Data	Sample	Neighbourhoods	n
Survey	B	22	948
Donations	C	16	498
Donations (Riot Sample)	-	2	228
Dropped Coin	B	22	440
Lost Tourist	B	22	264
Lost Letter	A	30	1440
Ethnic markers (flags)	A	30	1665

Table 2.1 List of the primary data collected with total sample size and number of neighbourhoods where it was collected.

2.2.1 Data sampling

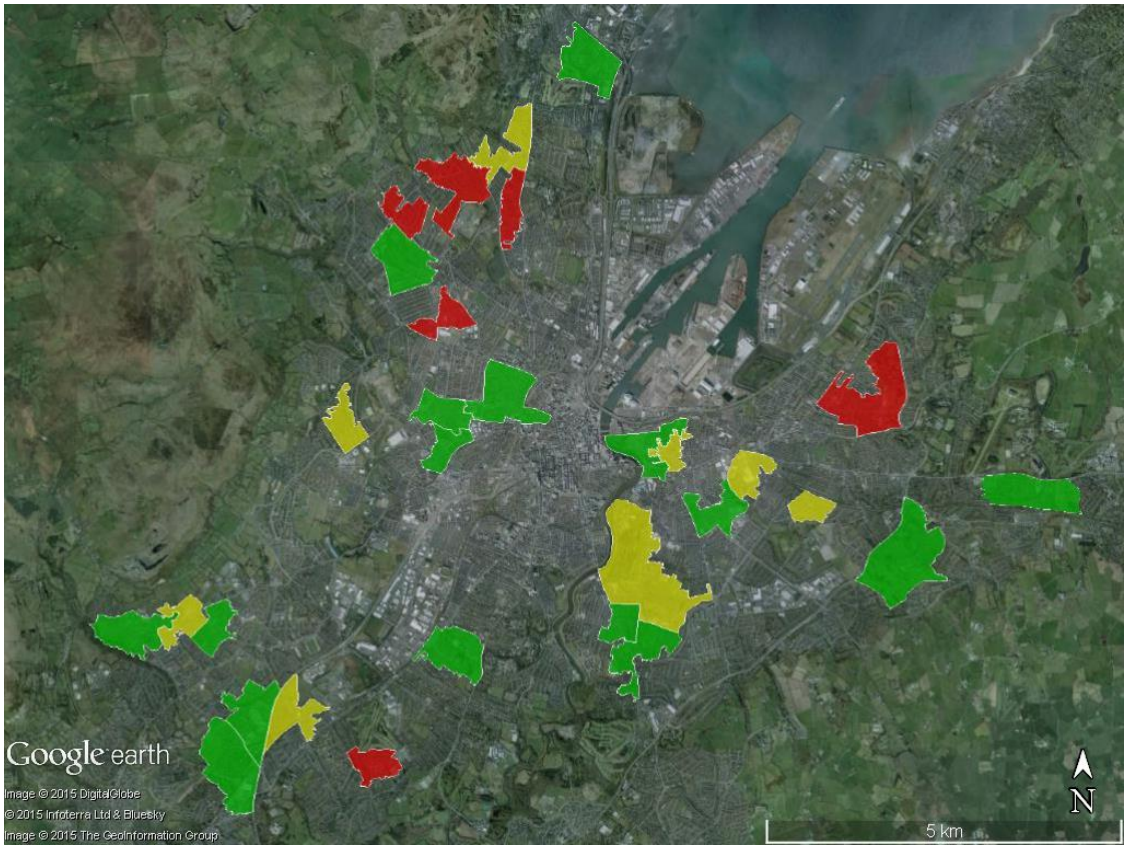

Figure 2.5 Map of Belfast with the 3 neighbourhood samples. Sample A (all colours): 30 neighbourhoods with lost letters and flags data; Sample B (green and red): 22 neighbourhoods with surveys, lost tourist and dropped coins data; Sample C (green): donations data.

The data collection was performed in 3 different samples of Belfast neighbourhoods. The lost letter experiment and the ethnic markers (i.e. flags) counting were conducted in 30 Belfast neighbourhoods (sample A); the survey, the lost tourist and the dropped coin experiments were conducted in a sub-sample of 22 neighbourhoods (sample B); the donation experiment was conducted in a sub-sample of 16 neighbourhoods (sample C). The longitudinal riot sample was conducted in two neighbourhoods of sample C, Ballymacarrett 1 and Bellevue 2. Each neighbourhood represents a lower super output area (LSOA), which is a UK standard geographic unit with an average population of 1800 (ranging from 1300 to 2800) providing the smallest area where extensive contextual socio-economic data is available (ONS 2005). There are a total of 890 LSOAs in Northern Ireland which were generated taking into account "population size, mutual proximity and social homogeneity" (ONS 2005, p.2).

The selection process of these neighbourhoods was carefully considered in order to be able to provide enough variation to test the relevant hypotheses within the time and logistic constraints available. As a result, the selection attempted to include

neighbourhoods with various conditions of sectarian conflict, socio-economic characteristics and religious composition. I acknowledge the bias inherent in this selection process, but a random sample of neighbourhoods would likely not have provided sufficient variation to test the relevant hypotheses of this thesis. The sample size obtained for each measure was also determined by time and logistic constraints.

The robustness and validity of the sample was verified by comparing the representativeness of the sample with the 2011 UK Census data on gender, religion, age, education and employment status, which shows the sample to be representative of the population at the neighbourhood, city and country level (**Table 2.2**).

	Sample B	**Sample C**	**Census (Sample B)**	**Census (Sample C)**	**Census (Belfast)**	**Census (NI)**
Male	46.8	46.1	47.6	47.5	48.1	49.2
Female	53.2	53.9	52.4	52.5	51.9	50.8
Catholic	50.0	53.2	51.0	54.3	48.6	44.6
Protestant	50.0	46.8	42.0	38.6	42.3	49.5
Mean Age	45.2	45.1	37.0	37.8	37.0	37.6
Education						
Primary School	23.7	27.5	N/A	N/A	N/A	N/A
GCSE	29.5	28.3	25.2	25.1	23.3	26.9
A-Level	18.9	18.5	10.8	10.5	13.4	12.1
Undergraduate	17.6	15.9	25.5	25.8	26	22.7
Graduate	10.3	9.9				
Employment						
Unemployed*	25.1	24.7	23.9	24.2	23.2	19.6
Employed FT	39.6	40.3	40.4	40.8	39.7	44.5
Employed PT	10.1	9.9	13.8	13.4	12.6	13.1
Student	5.6	4.7	6.1	6.0	7.4	6.2
Retired	19.6	20.4	12.0	11.8	11.6	12.9

Table 2.2 Percentage distribution of gender, religion, age, highest educational level achieved and employment status of the individuals in sample B (n=948), sample C (n=497), and the Census 2011 data for the same neighbourhoods in the two samples, in Belfast and in Northern Ireland. * - the unemployed data for the Census corresponds to unemployed individuals of active age, disabled or sick and their full-time carers.

2.2.2 Survey

The survey was completed in person by 3 trained assistants at the houses of the respondents during May, June and July 2012 (n=948) in 22 Belfast neighbourhoods

(sample B). The survey was conducted between 10.00 and 20.00 during weekdays and weekends (each neighbourhood had one weekend sampling visit). Each assistant was allocated a set of streets in the neighbourhood and then knocked on people's door asking if they would like to take part in the survey. The total number of attempts and responses were only recorded in a different sampling period during 14 days in May and June 2013 in Ballymacarrett 1 and Bellevue 2 and from this sample out of a total of 1267 attempts, there was no answer on 65% of the houses, 23% refused to take part and 8% filled in the questionnaire, which matched our subjective personal experience from the previous sampling periods.

The questionnaire consisted of 50 questions, required about 10 minutes to complete and was structured with multiple-choice responses that the researcher read out and for which the respondent chose the most appropriate choice. The questionnaire addressed a range of issues with a focus on questions about the respondents' socio-economic characteristics (e.g. age, sex, religion, employment status, education, income), religious beliefs (e.g. frequency of attendance of religious services and the importance of god and religious values in the daily life), exposure to sectarianism (e.g. whether they had been attacked, feelings of threat), attitudes towards the out-group (e.g. attitudes on inter-group marriage and educational segregation), levels of interaction with kin (e.g. distance and frequency of contact with kin) and inter-group contact (e.g. number of friends from different religious group) and perception of neighbourhood's social cohesion (see questionnaire in section 10.2.1)

2.2.3 Donations

The donations experiment was conducted after the completion of the questionnaire with a random sub-sample of 497 individuals taking part in the survey in 16 neighbourhoods (sample C). The random sampling consisted of not conducting the donations experiment with every other survey respondent. The participants were informed in the beginning that they would receive a £5 financial incentive for completing the questionnaire and were given the possibility at the end to donate part of that money to a local primary school (Protestant or Catholic) or charity (Save the Children). Individuals were only offered the option to donate to a single institution, which was randomly allocated, making it a between-treatment experimental design. The selection of the primary schools was conducted by choosing the nearest Catholic and Protestant school to the centroid of the neighbourhood using Google Maps (**Figure 2.6**).

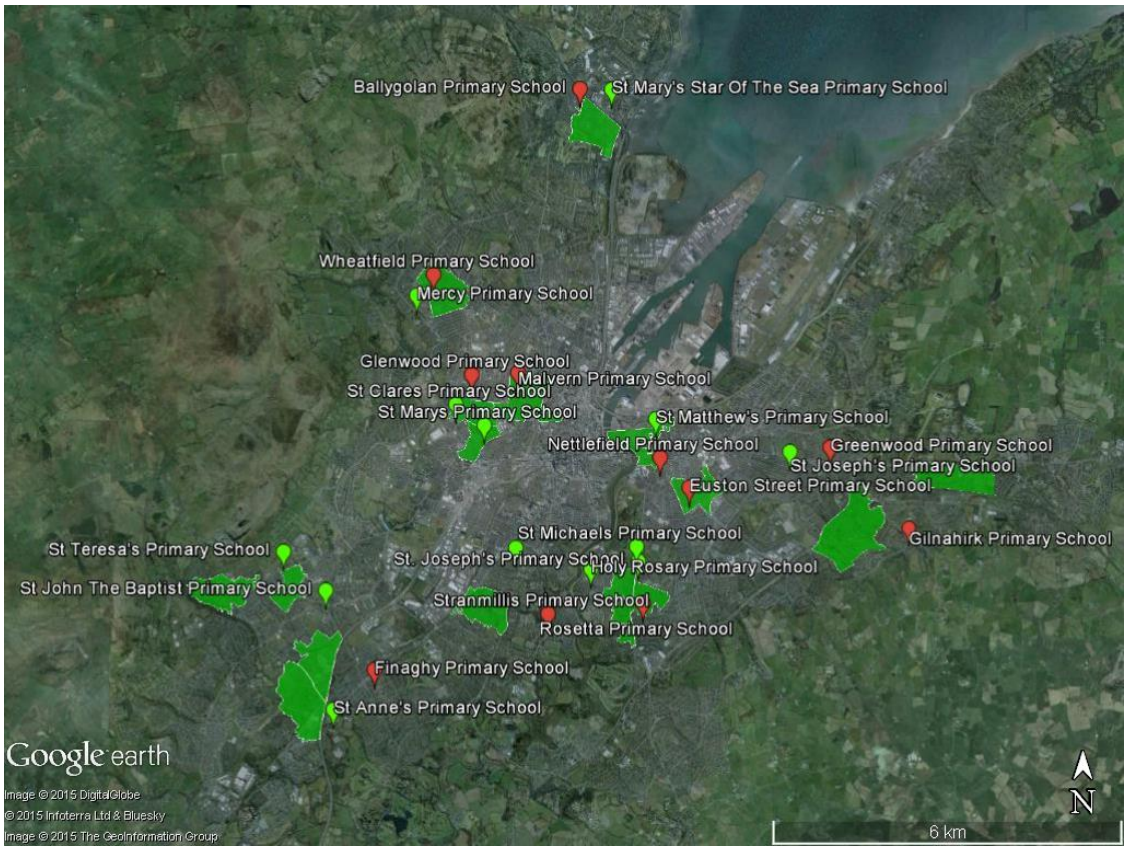

Figure 2.6 Map of Belfast with 16 neighbourhoods and 23 primary schools used in the donations experiments (sample C). 12 Catholic primary schools (green markers) and 11 Protestant primary schools (red markers).

After the completion of the questionnaire, the researcher hands the participant the financial incentive in the form of 5 pound coins, followed by informing the participant that they are welcome to keep the money or if they prefer they can donate part or all of the money to a local school or charity. At the same time, the researcher presents in view of the participant a charity box with the name of the local school or charity (**Figure 2.7**), where the participant can drop some or all of the coins (see section 10.1.2 for protocol). The amount donated to the local school treatments measures in-group (if participant is of the same religion as the school) and out-group cooperation (if participant is of different religion as the school), and the charity treatment measures unbiased cooperation. There was no significant difference between experimenters in the likelihood of receiving a donation (**Table 10.3**)

Figure 2.7 Donation boxes: Save the Children (left) and Catholic Primary school (right).

2.2.4 Donations – Riot Sample

I conducted an impromptu natural experiment when sectarian riots occurred in Belfast in January 2013 by conducting the survey and donation experiments (described above) at the time of the riots in two previously sampled neighbourhoods, Ballymacarrett 1 and Bellevue 2. I also conducted the surveys and donations experiments in aftermath of the riots in the same two neighbourhoods in May and June 2013. In this sample I used a total of 228 donations experiments, including 40 donations experiments from the pre-riot period, 77 during the riots and 102 after the riots. See chapter 4 for more details on the methods.

2.2.5 Lost Letters

I ran a lost letter experiment (Milgram et al. 1965) for which 1440 stamped letters were dropped in 30 neighbourhoods in two rounds in May and June 2012 (n=1080) and 2013 (n=360) (sample A). These stamped letters were addressed to fictional sectarian or neutral charities (*CatholicAID*, *ProtestantAID* and *CancerAID*) (**Figure 2.8**) using a hired PO Box and were dropped by me (2012) and an assistant (2013) on the pavement outside with the address facing up on rain free days. To avoid a return bias dependent on the day and time that the letters were dropped (e.g. when the postman or street cleaners come), the drops were conducted in 3 instalments in different time slots (morning, lunchtime and afternoon) on 3 different days in each neighbourhood. The letter drop points in the neighbourhood were randomly determined using ArcGIS 10 (ESRI 2013). The return rates of the letters from the three treatments (Catholic, Protestant and neutral) were used to measure the neighbourhood levels of in-group, out-group and unbiased cooperation.

Figure 2.8 Lost letters: CancerAID (top), CatholicAID (middle) and ProtestantAID (bottom).

2.2.6 Dropped Coin Experiment

A total of 440 dropped coins experiments were performed in 22 Belfast neighbourhoods (sample B) in May and July 2012. The goal of this experiment was to measure cooperation in a situation of direct personal contact with a small monetary cost (50p) associated with the cooperative act. A male and a female assistant performed the experiments by walking in front of a passer-by on the street, dropping a 50p coin and continuing walking. We recorded whether the coin was kept or returned as the measure of cooperation and also identified the number of people in the group, their gender and approximate age. See chapter 7 for more details on the methods.

2.2.7 Lost Tourist Experiment

A total of 264 lost tourist experiments were performed in 22 Belfast neighbourhoods (sample B) in May and July 2012. The goal of this experiment was to measure cooperation in a situation of direct personal contact with a small cost (time) associated with the cooperative act. A male and a female assistant performed the experiments by opening a foldout map in a main street of a neighbourhood and recording how long it

took for someone to offer to help with directions. The number of people in the helper group, their gender and approximate age were recorded. See chapter 7 for more details on the methods.

2.2.8 Ethnic Markers

The numbers of flags were recorded in 30 Belfast neighbourhoods (sample A). An assistant and I counted the amount of sectarian flags over 4 days in June 2012. The counting was done by walking every single street of the neighbourhood (according to Google Maps) and noting the number of Catholic and Protestant flags using a mechanical counter. See chapter 6 for more details on the methods.

2.3 Data

2.3.1 Neighbourhood level

The neighbourhood contextual data was obtained from measures from the 2011 UK Census (NISRA 2012) and the Northern Ireland Statistics and Research Agency (NISRA) reports on multiple deprivation indexes (NISRA 2010).

2.3.1.1 Income Deprivation

This measure is a composite index of the proportion of the population experiencing deprivation related to low income in a neighbourhood. It is based on the number of individuals in the neighbourhood in “receipt of income related benefits and tax credits” (NISRA 2010: 10) such as Jobseeker’s Allowance, Child and Working Tax Credits. This measure is expressed as the proportion of the population receiving income related benefits, ranging between 0 and 1. The mean income deprivation in the sample of 30 neighbourhoods (sample A) used is 0.35 (s.d. = 0.22), ranging between 0.06 (least deprived) and 0.76 (most deprived).

2.3.1.2 Crime and Disorder

The Crime and Disorder domain indicator is a combined measure of two sub-domains of crime and disorder. The crime sub-domain includes robberies, burglaries, vehicle theft, criminal damage and the disorder sub-domain includes fires and anti-social behaviour incidents. These two sub-domains are expressed as a normalised distribution of the rate of the at-risk population and then combined and weighed according to a 60:40 ratio for the crime and disorder measures respectively. In sample A, this score averages 33.8 (s.d. = 18.2), ranging from 5.44 (least crime) to 72.4 (most crime).

2.3.1.3 Religious Composition

The religion composition was measured by the percentage of Catholic individuals living in a neighbourhood. This measure represents the number of people that were brought up as Catholic and originates from the UK Census 2011 (NISRA 2012). This measure was added to the Northern Ireland part of the Census in 2001 due to the large percentage of people that refused to answer an alternative question in previous Census, in which respondents were asked for their individual religion instead of their community background (12% of no answer vs. 3% of no answer) (Osborne 2002). The high rate of non-answers in the original question may reflect various aspects, but is likely to be the result of the sensitive nature of religion in Northern Ireland. The mean Catholic composition in sample A is 51.5% (s.d.=34.4), ranging from 4.6% to 94.9%.

In order to simplify the analysis of the data, the neighbourhood religious composition was divided into three categories: predominantly Protestant (0% – 25% Catholic), mixed (25% - 75% Catholic) and predominantly Catholic (75% - 100% Catholic). This division has previously been used in other studies on levels of religious segregation in Northern Ireland (Shuttleworth et al. 2011; Shuttleworth & Lloyd 2009) and it appears to capture the predominant characteristics of the neighbourhood's religious composition.

2.3.1.4 Education

The educational level of people living in a neighbourhood was measured by the percentage of the population that has a graduate degree from the UK Census 2011 (NISRA 2012). The mean in sample A is 25.6% (s.d.=16.6), ranging from 7.0% to 63.9%.

2.3.1.5 Out-group proximity

Out-group proximity was measured by the interaction term of neighbourhood religious composition (in section 2.3.1.3) with the neighbourhood religious composition at a 1km radius from the neighbourhood's centroid. The religious composition at 1km attempts to determine the proximity of the out-group to individuals beyond their own neighbourhoods and is used in the analysis as an interaction term with the neighbourhood composition to quantitatively capture the neighbourhoods that are surrounded by out-group neighbourhoods. The composition at 1km is a derived variable created using the mapping software ArcGIS 10 (ESRI 2013), which estimated the wider composition based on the surrounding neighbourhoods' composition.

2.3.1.6 Population Density

This measure indicates the number of people per hectare that live in a neighbourhood and was obtained from the UK Census 2011 (NISRA 2012). This was used in the analysis of the lost letters and lost tourist experiments as a control variable, as it was hypothesised that densely populated neighbourhoods have more people passing by, and as a result are more likely to pick up the letters or help someone looking lost. In sample A there were an average of 52 individuals per hectare (s.d.=22), ranging from 14 to 105.

2.3.1.7 Number of Post Boxes

The number of post boxes in each neighbourhood were counted using Google Maps and post box location data from Somerville (2012). This variable was used as a control in the lost letter analysis as it was hypothesised that letters were more likely to be returned in neighbourhoods with higher number of post boxes. There were an average of 3 post boxes per neighbourhood (s.d.=1.5), ranging from 1 to 7 post boxes per neighbourhood.

2.3.2 Individual Level

The individual level data was obtained from the survey questionnaire responses (see section 10.1.1)

2.3.2.1 Education

Ordinal variable on the highest educational level achieved (**Table 2.3**).

2.3.2.2 Gender

Nominal variable of gender (**Table 2.3**).

2.3.2.3 Household income

Ordinal variable of the terciles of household income in pounds equivalised using the OECD modified scale to adjust for household size and composition (Hagenaars et al. 1996) (**Table 2.3**).

2.3.2.4 Religion

Binary variable of the religious background in which the individual was brought up, Catholic and Protestant. The various denominations of Protestant religion were aggregated into Protestant and individuals from other religions and with no religion were excluded from the donation analyses (**Table 2.3**).

2.3.2.5 Children

Binary variable based on how many children the individual had (**Table 2.3**).

Variable	%
Educational Level	
Primary School	23.6
GCSE	29.4
A-Level	18.9
Undergraduate	17.7
Graduate	10.5
Gender	
Female	53.3
Male	46.7
Household Income	
Low HH income	33.6
Mid HH income	35.0
High HH income	31.4
Religious Background	
Catholic	50.2
Protestant	46.8
Children	
No children	29.2
One or more	70.8

Table 2.3 Percentage distribution of individual variables used in the analyses of donations (sample C)

2.3.2.6 Sectarian Threat Index

The level of inter-group threat is measured through a polychoric factor analysis of variables related to whether the individual had been attacked or felt threatened by the other group (**Table 2.4**). The mean value in sample A is 1.8 (s.d.=0.74), ranging from 0.86 (low threat) to 4.5 (high threat).

Sectarian Threat Index (n=944)		
Uncomfortable in different neighbourhood	**Factor loading**	**Uniqueness**
Would you feel uncomfortable walking around in certain neighbourhoods because you feel people there are from a different religion to your own?	0.49	0.76
Response	**Percentage**	
Yes (2)	49.8	
No (0)	49.2	
Not sure (1)	1.1	
Community under threat	**Factor loading**	**Uniqueness**

Do you feel that your community is currently under threat from others outside of it?	0.69	0.52
Response	**Percentage**	
Yes (2)	16.4	
No (0)	81.9	
Not sure (1)	1.7	
Reduced Segregation	**Factor loading**	**Uniqueness**
Would you agree that the segregation between religious communities is less pronounced since the Good Friday agreement?	0.66	0.57
Response	**Percentage**	
Strongly agree (5)	11.0	
Agree (4)	40.7	
Neither agree nor disagree (3)	11.5	
Disagree (2)	27.9	
Strongly disagree (1)	9.0	
Sectarian Attack	**Factor loading**	**Uniqueness**
In the past year have you been attacked, threatened or insulted because of your religious/political background?	0.59	0.66
Response	**Percentage**	
No (0)	87.2	
Rarely (1)	3.7	
A few times (2)	6.8	
Many times (3)	2.4	
Neighbourhood violence	**Factor loading**	**Uniqueness**
Please indicate how much of a concern you feel sectarian violence is in your neighbourhood	0.82	0.33
Response	**Percentage**	
Not often a problem (1)	68.7	
Sometimes a problem (2)	22.2	
Often a problem (3)	5.9	
Very often a problem (4)	3.3	
Neighbourhood discrimination	**Factor loading**	**Uniqueness**
Please indicate how much of a concern you feel sectarian discrimination is in your neighbourhood	0.80	0.37
Response	**Percentage**	
Not often a problem (1)	70.5	
Sometimes a problem (2)	18.1	
Often a problem (3)	7.0	
Very often a problem (4)	4.4	

Table 2.4 List of the component variables of the factor sectarian threat index, associated questionnaire questions and percentage distribution of the responses (value in brackets). It also includes the factor loadings and unique variances of the variables in the factor.

2.3.2.7 Religiosity Index

Religiosity is measured through a polychoric factor analysis of variables related to the individual's engagement with religion (**Table 2.5**). The mean value in sample A is 2.1 (s.d.=1.4), ranging from 0 (no religiosity) to 4.4 (high religiosity).

Religiosity Index (n=944)		
Religious Influence	**Factor loading**	**Uniqueness**
Do your religious beliefs influence the way you live your life in terms of the decisions you make and the values you hold? Do you feel that:	0.84	0.30
Response	**Percentage**	
They influence me in most of what I do (5)	19.6	
They often influence me (4)	17.4	
They influence some aspects of my life (3)	24.1	
They rarely influence me (2)	7.6	
They have no influence on me (1)	21.7	
I am not religious (0)	9.6	
Personal Relationship with God	**Factor loading**	**Uniqueness**
Do you have a personal relationship with your God?	0.82	0.33
Response	**Percentage**	
Yes – We share a close personal relationship (3)	30.1	
Yes – Sometimes (2)	24.6	
Unsure (1)	3.5	
No (0)	41.8	
Religious Attendance	**Factor loading**	**Uniqueness**
How often do you attend a religious service?	0.81	0.35
Response	**Percentage**	
A few times a week (5)	5.9	
Weekly (4)	23.5	
Monthly (3)	7.1	
A few times a year (2)	15.9	
Less often than a few times a year (1)	24.7	
Never (0)	23.0	

Table 2.5 List of the component variables of the factor religiosity index, associated questionnaire questions and percentage distribution of the responses (value in brackets). It also includes the factor loadings and unique variances of the variables in the factor.

2.3.2.8 Sectarianism Index

Sectarianism is measured through a polychoric factor analysis of variables related to the individual's attitudes and behaviours towards the out-group (**Table 2.6**). The mean value in sample A is 0.3 (s.d.=0.35), ranging from 0 (low sectarianism) to 1.0 (high sectarianism).

Sectarianism Index (n=911)		
Ideal school	**Factor loading**	**Uniqueness**
If equally practical to get to, would you prefer your children to attend a maintained, controlled or integrated school?	0.74	0.46
Response (derived)	**Percentage**	
Out-group school (1)	1.0	
Mixed school (2)	54.2	
Not sure (3)	8.5	
In-group school (4)	36.3	
Marriage preference	**Factor loading**	**Uniqueness**
Would you personally prefer your children to marry a Catholic/Protestant? (same religion as yourself)	0.77	0.40
Response	**Percentage**	
Yes (1)	77.9	
No (0)	22.1	
Don't know	0.0	
Out-group friends	**Factor loading**	**Uniqueness**
Of your 5 closest friends, are any Catholic / Protestant? (same religion as yourself)	0.51	0.74
Response	**Percentage**	
Yes (1)	67.9	
No (0)	32.1	

Table 2.6 List of the component variables of the factor sectarianism index, associated questionnaire questions and percentage distribution of the responses (value in brackets). It also includes the factor loadings and unique variances of the variables in the facto

2.3.2.9 Social Capital

Social Capital is measured through a polychoric factor analysis of variables related to the individual's perceptions of his local area on issues of mutual trust, shared values, respect and cohesion. The questions are based on social capital measures used in the Community Life Survey (Cabinet Office 2012) (**Table 2.7**). The mean value in sample A is 2.2 (s.d.=0.8), ranging from 0.9 (high social capital) to 5.0 (low social capital).

Social Capital (n=948)		
Neighbours pull together	**Factor loading**	**Uniqueness**
Please indicate the extent to which you agree with the following statements? People in your area pull together to improve the neighbourhood	0.63	0.57
Response	**Percentage**	
Strongly agree (1)	23.0	
Agree (2)	41.0	
Neither agree nor disagree (3)	18.1	
Disagree (4)	13.4	

Strongly disagree (5)	4.4	
Neighbours share the same values	**Factor loading**	**Uniqueness**
Please indicate the extent to which you agree with the following statements? People in your neighbourhood share the same values	0.71	0.49
Response	**Percentage**	
Strongly agree (1)	18.5	
Agree (2)	46.7	
Neither agree nor disagree (3)	18.3	
Disagree (4)	13.3	
Strongly disagree (5)	3.3	
Neighbours respect differences	**Factor loading**	**Uniqueness**
Please indicate the extent to which you agree with the following statements? Your neighbourhood is a place where residents respect religious differences between people	0.45	0.76
Response	**Percentage**	
Strongly agree (1)	17.9	
Agree (2)	39.8	
Neither agree nor disagree (3)	17.0	
Disagree (4)	17.5	
Strongly disagree (5)	7.8	
Neighbourhood trust	**Factor loading**	**Uniqueness**
How many people in your neighbourhood do you feel can be trusted?	0.58	0.65
Response	**Percentage**	
Most (0)	59.9	
Some (1)	26.7	
Hardly any (2)	9.6	
None (3)	3.8	

Table 2.7 List of the component variables of the factor social capital, associated questionnaire questions and percentage distribution of the responses. It also includes the factor loadings and unique variances of the variables in the factor.

3 Conflict and Parochial Altruism I: Field Experiments

3.1 Summary

The idea that cohesive groups, in which individuals help each other, have a competitive advantage over groups composed of selfish individuals has been widely suggested as an explanation for the evolution of cooperation in humans. Recent theoretical models propose the co-evolution of parochial altruism and inter-group conflict, when in-group altruism and out-group hostility contribute to the group's success in these conflicts. However, the few empirical attempts to test this hypothesis do not use natural groups and conflate measures of in-group and unbiased cooperative behaviour. I conducted field experiments based on naturalistic measures of cooperation (school/charity donations and lost letters' returns) with two religious groups with an on-going history of conflict - Catholics and Protestants in Northern Ireland. Conflict was associated with reduced donations to out-group schools and the return of out-group letters, but I found no evidence that it influences in-group cooperation. Rather, socio-economic status was the major determinant of cooperative behaviour. This study presents a challenge to dominant perspectives on the origins of human cooperation and questions the idea that individuals behave altruistically in situations of inter-group conflict.

3.2 Introduction

The notion of parochial altruism chimes with our folk belief that group members pull together in times of adversity and this idea has been formalised through a series of mathematical models in which inter-group conflict plays a prominent role in the evolution of cooperation. Models of multi-level selection depend on competition between groups over access to resources (such as food, mates or territory) for cultural or genetic traits that harm the individual and favour the group, such as altruism, to be selected (Bowles et al. 2003; Choi & Bowles 2007; García & van den Bergh 2011). In situations of inter-group conflict, it is argued that the combination of in-group altruism and out-group hostility - in what is termed parochial altruism – provides a selective advantage to groups, resulting in the co-evolution of parochial altruism and inter-group conflict by group extinction through conquest and assimilation.

Studies in the lab and the field have shown an association between cooperative behaviour and inter-group conflict (Bornstein 2003; Bernhard et al. 2006; Voors, Nillesen, et al. 2012; Gneezy & Fessler 2011; M. Bauer et al. 2014; Puurtinen & Mappes 2009). A study in Burundi found that individuals who suffered the most during the conflict between Hutus and Tutsis, were more likely to donate to an anonymous member of their community in a version of a dictator game (Voors, Nillesen, et al. 2012), teenagers (but not children and adults) in Georgia and Sierra Leone were more egalitarian in a sharing game to in-group than out-group members (M. Bauer et al. 2014), and senior citizens in Israel were more likely to reject an unfair offer in an ultimatum game during the Israel-Hezbollah war, when compared to before and after the war (Gneezy & Fessler 2011).

However, these studies are hindered by methodological limitations that reduce their explanatory power of real world evolutionary dynamics. First, the majority do not distinguish between different types of cooperative behaviour, conflating in-group with unbiased cooperation (i.e. cooperation with a neutral group), and also failing to measure out-group cooperation (i.e. cooperation with a rival group) (Puurtinen & Mappes 2009; Voors, Nillesen, et al. 2012; Gneezy & Fessler 2011). Yet, the accurate identification of the specific type of cooperative behaviour is crucial in the models of the evolution of cooperation through inter-group conflict, as a group benefit is only obtained if cooperation is aimed towards the in-group and not indiscriminately applied (Arrow 2007). Second, the experimental set-up of these studies (Bornstein 2003; Bernhard et al. 2006; Voors, Nillesen, et al. 2012; Gneezy & Fessler 2011; M. Bauer et al. 2014; Puurtinen & Mappes 2009), while sometimes based in a setting of conflict, never consists of games played between individuals from both groups that are in actual conflict, instead using children from different schools (M. Bauer et al. 2014), anonymous neighbours who may or may not have shared group membership (Voors, Nillesen, et al. 2012) or senior citizens from the same ethnic group (Gneezy & Fessler 2011). Experiments using these types of abstract group categorisation may not reflect the true dynamics of inter-group competition and cue the subjects to play according to other real life cooperative social norms that are not relevant to the hypotheses being tested (Laury & Taylor 2006; Levitt & List 2007; List 2007; Binmore 2010). Finally, there is evidence of lack of consistency between different game-based measures of cooperation within the same individuals and populations (Laury & Taylor 2006), as well as concerns that players in some traditional economic games may not fully comprehend the payoff structure involved (Burton-Chellew & West 2013; House et al. 2013).

In this study I address these issues by establishing an experimental set-up based on real world institutions and cultural groups, and the use of naturalistic experimental methods, school/charity donations and lost letters. The experimental design aims to capture the context dependent nature of cooperation by measuring cooperative behaviour in a real world setting, with the lost letter experiment indicating a time commitment to find a post-box and the donation experiment associated to a monetary cost and benefit. In particular, the use of donations to primary schools in the experiments intends to reflect actual inter-group grievances between Catholics and Protestants in Northern Ireland associated with school funding (BBC News 2001). The individuals in the study are not aware that the donations or lost letters were part of an experiment, minimising the artificiality typical of most lab and field based economic games.

3.3 Data & Methods

I ran two large-scale experiments - school donations and lost letter experiments - to measure biased (toward the in-group or out-group) and unbiased cooperative behaviour across different Belfast neighbourhoods representing a wide range of socio-economic characteristics.

First, I conducted a door-to-door survey of 940 individuals in 22 neighbourhoods (**Figure 2.6**) in which people received £5 for their participation. The questionnaire included questions on individual socio-economic status (S.E.S.) and experiences of the conflict, specifically questions on whether the individual had been attacked or felt threatened by the other group. I created a sectarian threat index from a factor analysis of variables related to the individual exposure to sectarian attacks and threat, which I used as a measure of inter-group conflict (see section 2.3.2.6 for more details on this factor variable).

From this survey sample, I randomly allocated a sub-sample of 497 individuals in 16 neighbourhoods to take part in the donation experiment that was conducted immediately after the completion of the questionnaire. Individuals in this sub-sample were offered the possibility of donating part or all of the money to the local Catholic or Protestant primary school or a neutral charity unaffiliated with any religious group, *Save the Children*. Individuals were only offered the option to donate to a single institution, which was randomly allocated (see section 2.2.3 for more details on the donations experiment methodology).

Second, a lost letter experiment was conducted in the sample of 30 neighbourhoods and a total of 1440 lost letters were dropped in two rounds in May and June 2012 and 2013. The analysis of parochialism used a restricted of sample 1184 letters that included biased letters dropped only on predominantly Catholic and Protestant neighbourhoods (>75% composition), as it is not possible to interpret the parochial nature of biased letters returned in mixed neighbourhoods (i.e. if the person returning the letter was Catholic or Protestant). The analysis of sectarian threat on parochial altruism used a further restricted sample of 832 letters that only included letters dropped in the 22 neighbourhoods where the surveys were conducted. Overall, letters dropped in 2013 were less likely to be returned (63.9% in 2012; 53.9% in 2013; OR=0.66, $p<0.01$), but there was no significant year effect on the differential return of the different type of letters (see section 2.2.5 or more details on the lost letter experiment methodology).

The school donation is a natural experiment that has essentially the same payoff structure as a dictator game (Kahneman et al. 1986), albeit one that is administered surreptitiously and involves real life cooperative behaviour involving an institution. I am then able to measure the level of cooperation towards a neutral institution (donating to Save the Children), an in-group institution (e.g. Catholic individual donating to a Catholic school) and an out-group institution (e.g. Catholic individual donating to a Protestant school). The lost letter experiment provides an additional measure of cooperative behaviour; I measured unbiased cooperation by the return rate of letters addressed to CancerAID and biased cooperation by the return rate of letters addressed to CatholicAID and ProtestantAID in predominantly Protestant and Catholic neighbourhoods (>75% composition of one group), measuring in-group cooperation when the letter is addressed to an organisation representing the neighbourhood's majority group and out-group cooperation when the letter is addressed to an organisation representing the neighbourhood's minority group.

3.3.1 Analysis

I test 3 main hypotheses derived from the theoretical models of inter-group conflict and parochial altruism (Bowles et al. 2003; Choi & Bowles 2007; García & van den Bergh 2011). First, I predict that individuals will be more cooperative towards their in-group and less cooperative towards the out-group (i.e. parochial altruism). Second, I predict that increased exposure to inter-group conflict will be associated with both increased in-group cooperation and decreased out-group cooperation at both the individual and neighbourhood level. Third, I predict that inter-group conflict will better explain the variation in in-group cooperation than unbiased cooperation.

To test these hypotheses I use multi-level logistic regressions with the binary response variable of donation or no donation, and logistic regressions with the binary response variable of the return or not of a lost letter.

I ran regressions to determine the levels of parochial altruism using the explanatory variables of the type of donations or lost letter. I ran regressions to determine the mediating effect of i) religious group and ii) household income on parochial altruism with the explanatory variables of i) religious group and the interaction term with type of donations or letter, and ii) individual or neighbourhood mean household income and the interaction term with types of donations or letter.

I ran one regression for overall donations and one for lost letters' overall returns, and three separate ones by treatment type and by measure. The main explanatory variables of interest are the individual level of sectarian threat for the donation analyses and the neighbourhood mean level of individual sectarian threat for the lost letters analyses. In the donation analyses I controlled for individual age, gender, highest educational level achieved, household income, religion and having children; for the lost letter analyses I controlled for religious composition, aggregate household income, number of post-boxes, population density. The multi-level models of the donation analyses were run with two levels: individuals (level 1) nested within neighbourhoods (level 2). The multi-level structure of the analyses allow to control for the non-independence of individuals' behaviour clustered at the neighbourhood level (Snijders & Bosker 2011).

3.4 Results

The majority of people choose to donate (68.0%), with 76.6% donating to Save the Children, 76.1% to an in-group school and 51.5% to an out-group school. The majority of lost letters are also returned (61.4%), with 67.1% of CancerAID letters, 61.7% of in-group letters and 50.6% of out-group letters being returned (**Table 3.1**). I find clear evidence for the existence of parochialism, with individuals 25% more likely to donate to an in-group school than an out-group school (**Table 3.2**) and 11% more likely to return an in-group letter than an out-group letter (values refer to the predicted probabilities derived from the regression tables) (**Table 3.3**). These levels of in-group bias are not significantly mediated by religious group or income, with Catholics being as parochial as Protestants and wealthy people as parochial as poor people in both donations and lost letters (**Table 3.2**, **Table 3.3**).

	Individual					
Donation type	**Overall** (n=497)		**Protestant** (n=239)		**Catholic** (n=258)	
Overall	£0	32.0%	£0	36.8%	£0	27.5%
(n=497)	£5	62.4%	£5	56.9%	£5	67.4%
	other	5.6%	other	6.3%	other	5.0%
Protestant	£0	34.4%	£0	25.3%	£0	42.5%
(n=166)	£5	59.0%	£5	68.4%	£5	50.6%
	other	6.6%	other	6.3%	other	6.9%
Catholic	£0	38.4%	£0	55.0%	£0	22.6%
(n=164)	£5	56.1%	£5	38.8%	£5	72.6%
	other	5.5%	other	6.2%	other	4.8%
Neutral	£0	23.4%	£0	30.0%	£0	17.2%
(n=167)	£5	71.9%	£5	63.8%	£5	79.3%
	other	4.7%	other	6.2%	other	3.5%

	Neighbourhood			
Letter type	**Overall** (n=1440)	**Protestant** (n=528)	**Mixed** (n=384)	**Catholic** (n=528)
Overall (n=1440)	61.4%	58.0%	66.9%	60.8%
Protestant (n=480)	58.1%	60.2%	64.8%	51.1%
Catholic (n=480)	59.0%	50.0%	65.6%	63.1%
Neutral (n=480)	67.1%	63.6%	70.3%	68.2%

Table 3.1 Descriptive statistics of donations and lost letters. Percentage distribution of donations to schools/charity for Catholic and Protestant individuals, and number of lost letters returned by letter and neighbourhood type. Catholic neighbourhood: >75% Catholic; Protestant neighbourhood: <25% Catholic; Mixed neighbourhood: 25%< >75%. Values in green indicate in-group donations or letters and in red indicate out-group donation or letters.

Donations	Simple	Religion Interaction	Income Interaction
	OR [CI]	OR [CI]	OR [CI]
Out-group (ref. in-group)	0.30*** [0.19,0.50]	0.37** [0.19,0.73]	0.21** [0.09,0.48]
Neutral (ref. in-group)	0.99 [0.59,1.66]	1.42 [0.66,3.07]	0.65 [0.66,3.07]
Protestant (ref. Catholic)	-	0.91 [0.41,2.03]	-
Out-group X Protestant	-	0.68 [0.26,1.79]	-
Neutral X Protestant	-	0.53 [0.19,1.51]	-
Mid HH income (ref. Low HH income)	-	-	1.08 [0.47,2.50]
High HH income (ref. Low HH income)	-	-	4.87* [1.44,16.42]
Out-group X Mid HH income	-	-	2.28 [0.73,7.13]
Out-group X High HH income	-	-	1.16 [0.26,5.20]
Neutral X Mid HH income	-	-	2.85 [0.86,9.44]
Neutral X High HH income	-	-	0.70 . [0.15,3.28]
Constant	3.51*** [2.22,5.55]	3.63*** [2.00,6.58]	2.22 * [1.17,4.21]
Observations	498	497	468

Table 3.2 Donations by religious group and income. Odd ratios and 95% confidence intervals from multi-level logistic regressions used to predict donations by type of donation (neutral, in-group and out-group institutions), by religious background and the interaction with the type of donation, and by income household income and the interaction with the type of donation. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Lost Letters	Simple	Religion Interaction	Income Interaction
	OR [CI]	OR [CI]	OR [CI]
Out-group	0.64**	0.61*	0.45*
(ref. in-group)	[0.47,0.86]	[0.40,0.94]	[0.23,0.86]
Neutral	1.27	1.25	1.03
(ref. in-group)	[0.95,1.69]	[0.81,1.95]	[0.54,1.94]
Mixed Neigh.	-	1.11	-
(ref. Catholic Neigh)		[0.67,1.81]	
Protestant Neigh.	-	0.89	-
(ref. Catholic Neigh)		[0.58,1.36]	
Neutral X Protestant Neigh	-	0.92	-
		[0.50,1.71]	
Out-group X Protestant Neigh.	-	1.08	-
		[0.59,1.96]	
Mid Neigh. Deprivation	-	-	0.48*
(ref. Low Neigh. Deprivation)			[0.25,0.91]
High Neigh. Deprivation	-	-	0.21***
(ref. Low Neigh. Deprivation)			[0.11,0.38]
Neutral X Mid Neigh. Deprivation	-	-	1.04
			[0.46,2.35]
Neutral X High Neigh. Deprivation	-	-	1.30
			[0.60,2.85]
Out-group X Mid Neigh. Deprivation	-	-	1.52
			[0.65,3.56]
Out-group X High Neigh. Deprivation	-	-	1.48
			[0.66,3.32]
Constant	1.61***	1.71***	4.05***
	[1.30,1.99]	[1.26,2.32]	[2.45,6.70]
Observations	1184	1184	1184

Table 3.3 Lost letters' returns by religious group and income. Odd ratios and 95% confidence intervals from logistic regressions used to predict lost letters return by type of letter (neutral, in-group and out-group institutions), by neighbourhood religious composition and the interaction with the type of letter, and by neighbourhood income deprivation and the interaction with the type of letter. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

I find inter-group conflict associated with reduced levels of out-group cooperation; individuals who have experienced greater sectarian violence and felt the most threatened by the other group are less likely to donate money to an out-group school (**Table 3.4**, **Table 3.6**), and in neighbourhoods with higher mean sectarian threat levels a lost letter addressed to an out-group institution (relative to the majority population) is less likely to be returned (**Table 3.5**,**Table 3.7**). At the mean values for all other traits, individuals with the lowest threat levels have a 64% chance of donating to an out-group school, compared with 20% chance for individuals with the highest threat levels (**Figure 3.1**). For lost letters, there is a 70% chance of out-group letters being returned in low threat neighbourhoods, compared with only 30% in high threat neighbourhoods (**Figure 3.2**). However, I find no evidence for an association between inter-group conflict and cooperation with the in-group, with neither individual nor neighbourhood threat levels significantly predicting donations to in-group schools or returns of in-group letters, respectively (**Table 3.4**, **Table 3.5**, **Table 3.6**, **Table 3.7**;

Figure 3.1, **Figure 3.2**). I find similar patterns when conducting the analyses using the individual constituent variables of the factor sectarian threat, with most negatively predicting out-group donations (**Table 10.2**). Sectarian threat is felt most by people in low incomes and with low education, and young people and men are also more likely to feel threatened. There are no significant differences between Catholics and Protestants (**Table 3.8**).

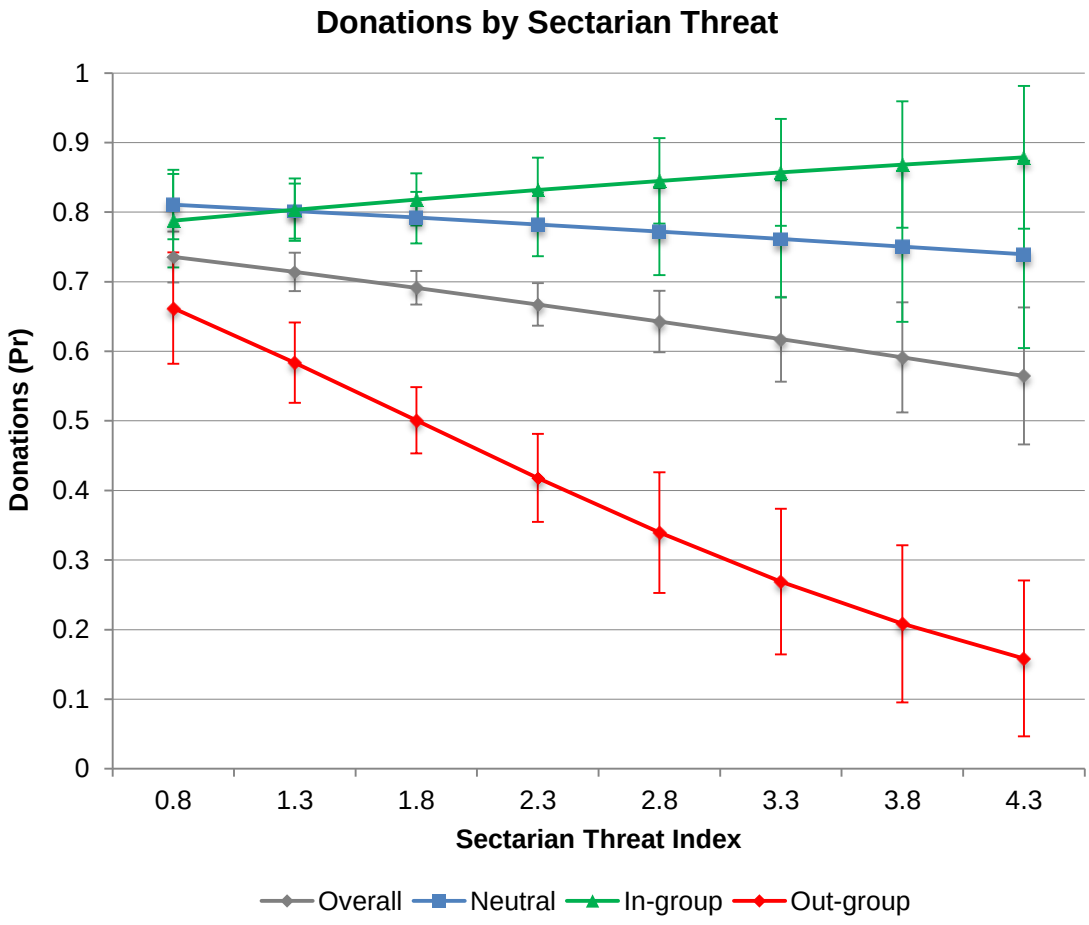

Figure 3.1 Donations by sectarian threat. Predicted probability of an individual donating to an in-group, out-group, neutral or any institution by the level of individual sectarian threat index. This measure is a continuous factor composed of the variables related to the individual exposure to sectarian attacks and threat. This effect is controlled for individual age, gender, educational level, household income, religion and having children. Plotted values refer to table 3.6 and error bars represent the standard errors.

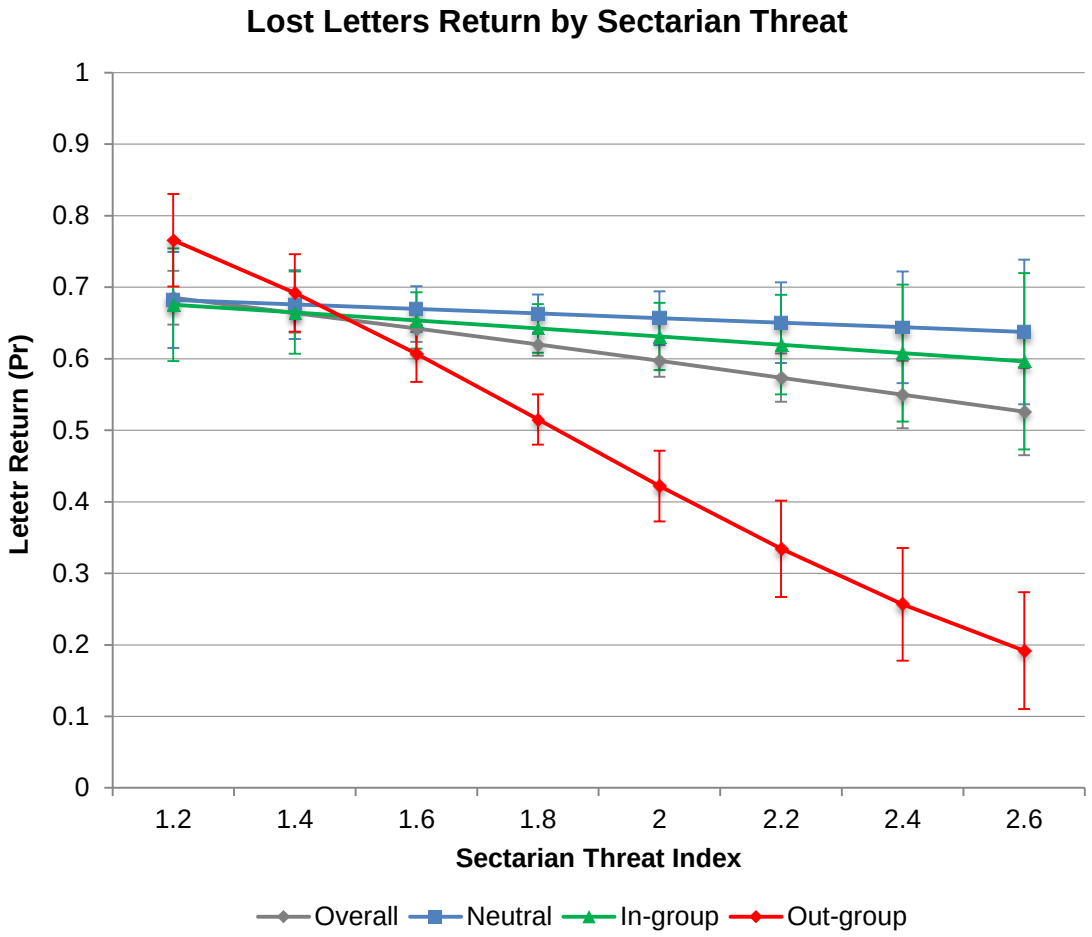

Figure 3.2 Lost letters' returns by sectarian threat. Predicted probability of return of in-group, out-group, neutral and all lost letters by the level of neighbourhood sectarian threat index. This measure is the neighbourhood aggregate of the continuous factors, which are composed of the variables related to the individual exposure to sectarian attacks and threat. This effect is controlled for neighbourhood religious composition, income deprivation, number of post-boxes and population density. Plotted values refer to table 3.7 and error bars represent the standard errors.

Donations	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Sectarian Threat	0.58***	0.61*	0.73	0.40***
	[0.44,0.75]	[0.39,0.98]	[0.45,1.17]	[0.24,0.65]
Constant	5.82***	8.30***	5.62***	5.46***
	[3.35,10.11]	[3.12,22.10]	[2.21,14.31]	[2.18,13.68]
Observations	497	167	163	167

Table 3.4 Donations by sectarian threat (unadjusted model). Odds ratios and 95% confidence intervals from unadjusted multi-level logistic regressions used to predict overall donations, and neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools). ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Lost Letters	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Sectarian Threat	0.38***	0.43**	0.36*	0.10***
	[0.27,0.55]	[0.23,0.80]	[0.13,0.99]	[0.04,0.28]
No. post-boxes	1.19***	1.19*	1.31**	1.09
	[1.09,1.30]	[1.02,1.39]	[1.08,1.58]	[0.91,1.30]
Population density	0.99*	0.99	0.99	1.01
	[0.99,1.00]	[0.98,1.00]	[0.98,1.01]	[1.00,1.03]
Constant	7.64***	8.17***	6.77**	29.19***
	[3.87,15.10]	[2.45,27.29]	[1.60,28.56]	[6.84,124.59]
Observations	1056	352	240	240

Table 3.5 Lost letters' returns by sectarian threat (unadjusted model). Odd ratios and 95% confidence intervals from simple logistic regressions used to predict the return of all lost letters, neutral, in-group and out-group lost letters (addressed to CancerAID, CatholicAID or ProtestantAID). ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Donations	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Sectarian Threat	0.80	0.89	1.21	0.51*
	[0.60,1.08]	[0.54,1.47]	[0.60,2.44]	[0.27,0.96]
Mid HH income	1.70 .	2.15	2.17	1.35
(ref. Low HH income)	[0.97,2.98]	[0.70,6.65]	[0.70,6.69]	[0.53,3.42]
High HH income	2.50*	2.22	8.78*	1.12
(ref. Low HH income)	[1.24,5.04]	[0.62,7.99]	[1.62,47.44]	[0.34,3.69]
GCSE	1.56	1.65	1.38	2.48 .
(ref. Primary School)	[0.88,2.75]	[0.54,5.04]	[0.43,4.42]	[0.86,7.15]
A-Level	2.10*	1.61	2.42	4.27*
(ref. Primary School)	[1.02,4.31]	[0.46,5.57]	[0.38,15.29]	[1.23,14.88]
Undergraduate	1.62 .	5.53	0.80	2.11
(ref. Primary School)	[0.75,3.48]	[0.84,36.59]	[0.19,3.34]	[0.53,8.46]
Graduate	2.89 .	2.24	0.90	17.33**
(ref. Primary School)	[0.95,8.86]	[0.31,16.17]	[0.08,10.03]	[2.30,130.30]
Age	1.02*	1.02	1.04*	1.01
	[1.00,1.03]	[0.99,1.05]	[1.00,1.08]	[0.98,1.03]
Male	1.05	1.23	2.03	0.62
(ref. Female)	[0.68,1.61]	[0.51,2.98]	[0.83,4.95]	[0.29,1.31]
Protestant	0.69 .	0.59	0.85	0.68
(ref. Catholic)	[0.45,1.06]	[0.26,1.35]	[0.35,2.02]	[0.32,1.43]
Children	1.84*	2.73*	3.57*	0.80
(ref. no children)	[1.10,3.10]	[1.05,7.10]	[1.17,10.84]	[0.33,1.96]
Constant	0.52	0.46	0.07 .	1.55
	[0.16,1.73]	[0.05,4.12]	[0.00,1.16]	[0.18,13.65]
Observations	466	158	153	155

Table 3.6 Donations by sectarian threat (adjusted model). Odds ratios and 95% confidence intervals from adjusted multi-level logistic regressions used to predict overall donations, and neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools). ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Lost Letters	Overall	Neutral	In-group	Out-group
Sectarian Threat	0.62	0.87	0.78	0.15**
	[0.36,1.08]	[0.32,2.33]	[0.25,2.47]	[0.05,0.50]
Mid HH income	1.67*	2.68*	2.39*	2.04
(ref. Low HH income)	[1.10,2.54]	[1.24,5.80]	[1.00,5.69]	[0.88,4.76]
High HH income	1.96*	2.50	7.82**	3.29
(ref. Low HH income)	[1.08,3.53]	[0.87,7.23]	[2.00,30.57]	[0.91,11.89]
Mixed neigh.	1.12	1.20		
(Cath. neigh)	[0.76,1.65]	[0.61,2.38]		
Protestant neigh.	1.18	1.31	1.46	1.65
(Cath. neigh)	[0.83,1.68]	[0.69,2.50]	[0.74,2.89]	[0.86,3.15]
No. post-boxes	1.15**	1.16	1.19	1.01
	[1.05,1.27]	[0.97,1.37]	[0.98,1.46]	[0.83,1.23]
Population density	1.00	1.00	1.01	1.02*
	[0.99,1.00]	[0.98,1.01]	[0.99,1.03]	[1.00,1.05]
Constant	1.87	0.90	0.39	3.85
	[0.50,7.01]	[0.08,10.07]	[0.03,5.09]	[0.33,45.08]
Observations	1056	352	240	240

Table 3.7 Lost letters' returns by sectarian threat (adjusted model). Odd ratios and 95% confidence intervals from adjusted logistic regressions used to predict the return of all lost letters, neutral, in-group and out-group lost letters (addressed to CancerAID, CatholicAID or ProtestantAID). ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Sectarian Threat	Threat
	β [CI]
Mid HH income	0.80***
(ref. Low HH income)	[0.71,0.90]
High HH income	0.74***
(ref. Low HH income)	[0.65,0.85]
GCSE	0.91
(ref. Primary School)	[0.80,1.04]
A-Level	0.76***
(ref. Primary School)	[0.64,0.89]
Undergraduate	0.73***
(ref. Primary School)	[0.61,0.86]
Graduate	0.71***
(ref. Primary School)	[0.58,0.86]
Age	0.99***
	[0.98,0.99]
Male	1.12*
(ref. Female)	[1.02,1.23]
Protestant	0.99
(ref. Catholic)	[0.90,1.08]
Children	1.10
(ref. no children)	[0.98,1.24]
Constant	12.58***
	[10.33,15.31]
Observations	863

Table 3.8 Sectarian threat. Coefficients and 95% confidence intervals from linear regressions used to predict individual sectarian threat. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

In contrast, I find that S.E.S. best explains the variation in overall cooperative behaviour. At the mean values for all other traits, individuals in the highest income group are 25% more likely to donate than individuals in the lowest income group (**Table 3.6**) and letters dropped in least deprived neighbourhoods have a 72% probability of being returned compared to 48% in the most deprived neighbourhoods (**Table 3.7**). In relation to education, individuals with a university degree have an 80% probability of donating compared to 60% for individuals with only primary schooling (**Table 3.6**). When looking at the specific types of cooperative behaviour I find wealthy people and wealthy neighbourhoods associated with more help to the in-group and higher educated people more likely to donate to the out-group and to Save the Children (**Table 3.6**,**Table 3.7**). I also find that people with children are more likely to donate, but specifically to in-group, not out-group schools (**Table 3.6**).

3.5 Discussion

These results indicate that in a situation of inter-group conflict, whilst individuals are more likely to reduce cooperation with out-group members, this will have no effect or reduce cooperative behaviour towards the in-group. Current theoretical models of parochial altruism build on the assumption that increased pro-sociality or in-group altruism results in a group advantage in a situation of inter-group conflict by setting the cost accrued by the in-group altruist to always be lower than the benefit accrued to the group (or another individual in the group) (Bowles et al. 2003; Choi & Bowles 2007; García & van den Bergh 2011). Lab based empirical results supporting these models are also based on a game payoff structure in which altruistic groups always out-compete selfish groups in a situation of group conflict (Bornstein 2003; Puurtinen & Mappes 2009). Here, I question whether this assumption is realistic and argue that it is not generalisable to all situations where groups are in competition or conflict. In the case of Catholics and Protestants in Northern Ireland, recent conflict between the two groups has mostly been over issues related to schools, housing and symbolic displays (Nolan 2012); it is possible that in these situations increased group cohesion does not provide a group advantage, or that the individual cost of helping the group out-weighs the potential group advantage.

In other situations of inter-group conflict where within-group cooperation may provide a group advantage, the individual bearing the costs for the group may not be acting out of altruistic concerns, but instead the behaviour may be the result of reputation considerations (Nowak & Sigmund 1998), enforcement by other group members or the prospect of personal material gain (Mathew & Boyd 2011), or may represent hierarchical dominance structures (e.g. conscription) in larger societies, which may operate for the benefit of powerful individuals (Guala 2012).

These results point to the importance of S.E.S. in explaining the variation in cooperative behaviour as found in previous studies (Wilson et al. 2009; Holland et al. 2012) and this aspect is further explored in chapter 7, but they put in question the findings of previous studies on inter-group conflict and cooperation that fail to take into account the variation of individual S.E.S. (Bornstein 2003; Bernhard et al. 2006; Gneezy & Fessler 2011; M. Bauer et al. 2014; Puurtinen & Mappes 2009).

Another possibility, proposed by Gavrilets & Fortunato (2014), is that within-group inequality is driving the differential investment in the between-group conflict, with the different individual costs and benefits of inter-group conflict resulting in higher in-

group contributions by high status individuals. In other words, in a situation of inter-group conflict high status individuals have more to gain or lose, and as result are more likely to invest in the in-group. According to this model, the behaviour of high status individuals is seemingly altruistic at the within-group level, however these individuals' behaviour is not motivated by altruism, but rather by competition with their high ranking peers in other groups. My results provide some empirical support for this model, as I find that both wealthy individuals and neighbourhoods are more likely to contribute to the in-group, possibly indicating that wealthy Catholics and Protestant are more willing to invest in inter-group competition.

The fact that individuals with children were more likely to donate to an in-group, but not an out-group school, led me initially to assume that people wanted to benefit their own children's school. However, when re-analysing the data using instead the binary variable of children currently living at home (more likely to reflect children attending the nearby in-group school, than offspring who may have left the household) no significant effect was found (**Table 10.4**). This suggests that shared kinship is not the mediating mechanism for increased donations. People with children are also more likely to donate to the neutral charity *Save the Children*, but this might be related to a priming effect of people with children being more inclined to donate to a charity invoking children.

There are some potential limitations to this study. It is possible that the neutral institutions were, in fact, perceived as biased toward one or other religious group, but neither religious background or threat levels significantly explain the variation in neutral donations or letters return. This suggests that neutral institutions are not particularly affiliated with either group. The donation experiment induces a possible priming effect on the participants, as it was conducted after the questionnaire. I decided against conducting the experiment first, as this might have raised suspicion from the participants that they were participating in an experiment. I would expect a prime to amplify the effects of conflict on parochial altruism (i.e. increase in-group altruism and reduce out-group altruism), so the reduction in out-group cooperation might be less striking without priming. However, the prime should also enhance in-group cooperation if parochial altruism is operating, and as exposure to conflict in the primed experiment did not predict variation in in-group cooperation, the effect is not likely to be present without the prime either.

The experimental design also does not allow to resolve endogeneity issues, as the levels of exposure to violence may not be exogenous to individual cooperative

behaviour; for example younger, poorer and less educated individuals may be more likely to be involved in sectarian conflict and as result feel more threatened. In order to attenuate these endogeneity issues, I control in the analysis for the contextual variables significantly correlated with inter-group conflict. Furthermore, it is important to be aware of the selection bias inherent to studies involving active participation, such as the donations experiment, as people willing to participate in the survey could be more cooperative than the wider population (i.e. participating in the study in itself may be a cooperative act) (Levitt & List 2007). Nevertheless, I find this sample to be representative of the population at the neighbourhood, city and country level when comparing it with the 2011 UK Census data on of gender, religion, age, education and employment status (see section 2.2.1)

Finally, the lost letter experiment - which does not suffer from selection bias - largely replicates the donations' results, with both pointing to the importance of S.E.S and how conflict negatively affects cooperative behaviour towards the out-group. These results highlight the importance of empirically testing theoretical models by measuring large-scale cooperation in a real world setting, and demonstrate how adversity, either from conflict or deprivation, leads to the breakdown of all types of cooperation.

4 Conflict and Parochial Altruism II: Longitudinal Field Experiments

4.1 Summary

The idea that cooperative groups out-compete less cooperative groups has been proposed as theoretical possibility for the evolution of cooperation through cultural group selection. Previous studies have found an association between increased cooperation and exposure to inter-group violence, but they are mostly based on correlational data making it difficult to establish causality. Here I test the hypothesis that inter-group conflict predicts parochial altruism by using longitudinal data on a real-world measure of cooperation – charity and school donations - sampled before, during and after violent sectarian riots in two neighbourhoods with different exposures to conflict in Belfast, Northern Ireland. I find that conflict reduces all types of cooperation with in-group donations being particularly affected by inter-group violence. In this context I find no evidence that inter-group conflict promotes greater levels of cooperation of any type.

4.2 Introduction

On the 3rd December 2012, the Belfast City Council passed a motion with 29 votes for and 21 against to restrict the flying of the Union flag to 18 designated days in the Belfast City Hall (Belfast City Council 2012). The flag had previously been flown all year round and this change sparked protests from the Protestant community who mostly feels an affinity with the United Kingdom, leading to an escalation of violence through the region, which resulted in violent riots over the next few months. During this period, numerous clashes between Protestants, Catholics and the police led to 560 people being charged (BBC News 2013a), 157 police men and women injured and an estimated £70 million costs in material damages, reduced business revenues and increased policing (BBC News 2014; BBC News 2013e).

Figure 4.1 The aftermath of the riots in Ballymacarrett in January 2013 (Antonio Silva).

The violent clashes in Belfast continued through January and at this time I decided to go back to Belfast to repeat the survey and donations experiment I had previously conducted in May 2012 during a more peaceful time. I then went back again in May 2013 to investigate the aftermath of the riots. This allowed me to have a longitudinal dataset of cooperative behaviour and attitudes at the neighbourhood level that now enables me to assess the causal role of inter-group conflict on cooperation.

As described in sections 1.1 and 3.2 there are important theoretical implications for the evolution of cooperation if inter-group conflict is associated with parochial altruism. Several studies in the lab and field have found an association between cooperation and exposure with conflict (Bornstein 2003; Bernhard et al. 2006; Voors, Nillesen, et al. 2012; M. Bauer et al. 2014; Puurtinen & Mappes 2009), but Gneezy & Fessler (2011) is the only study that has looked into this relationship using longitudinal data. They conducted ultimatum (UG) and trust games (TG) between Israeli senior citizens before, during and after the 2006 Israel–Hezbollah war and found that during the war

participants were more likely to reject low offers in the UG and transfer back more money if the initial offer was high in TG. There were no significant differences for the initial amounts offered in either game. These results were interpreted as evidence that in wartime people are more likely to incur a cost to reward cooperative behaviour and punish uncooperative behaviour.

The study in Israel provides an interesting, but partial, insight into how cooperation is affected by inter-group conflict. First, the lack of significant differences in the initial amounts offered suggest that cooperative tendencies may have remained unchanged through the conflict; although the interpretation of these behaviours is complicated as selfish strategic considerations in UGs and TGs can also result in increased offers (Dawes et al. 2007; Brañas-Garza et al. 2014). Second, the games were conducted at the same time as the Lebanon and Israel war, but only between Israeli senior citizens of the same ethnic group living in a housing facility in Tel Aviv. No salient group affiliation is used, so it is not possible to establish how conflict affects cooperation differently towards the in-group or out-group. In this new study, I use a naturalistic donation experiment to assess how a sharp increase in violence between Catholics and Protestants in Northern Ireland affects cooperation towards the in-group, out-group and unbiased institutions.

4.3 Data & Methods

I chose two previously sampled neighbourhoods from the original data collection in 2012 – Ballymacarrett 1 and Bellevue 2 - that were experiencing different levels of exposure to the sectarian riots to test the effect of inter-group conflict on biased and unbiased cooperative behaviour (**Figure 4.2**). The focal point of the riots was in the Short Strand area in east Belfast, where Ballymacarrett is located (BBC News 2013b; BBC News 2013d). The riots were initially contained in specific areas, with the rest of the city remaining relatively unaffected. Bellevue was chosen as the control neighbourhood as no incidents had been reported in the area and it had similar religious composition and socio-economic characteristics to the riot neighbourhood Ballymacarrett (see **Table 10.1**).

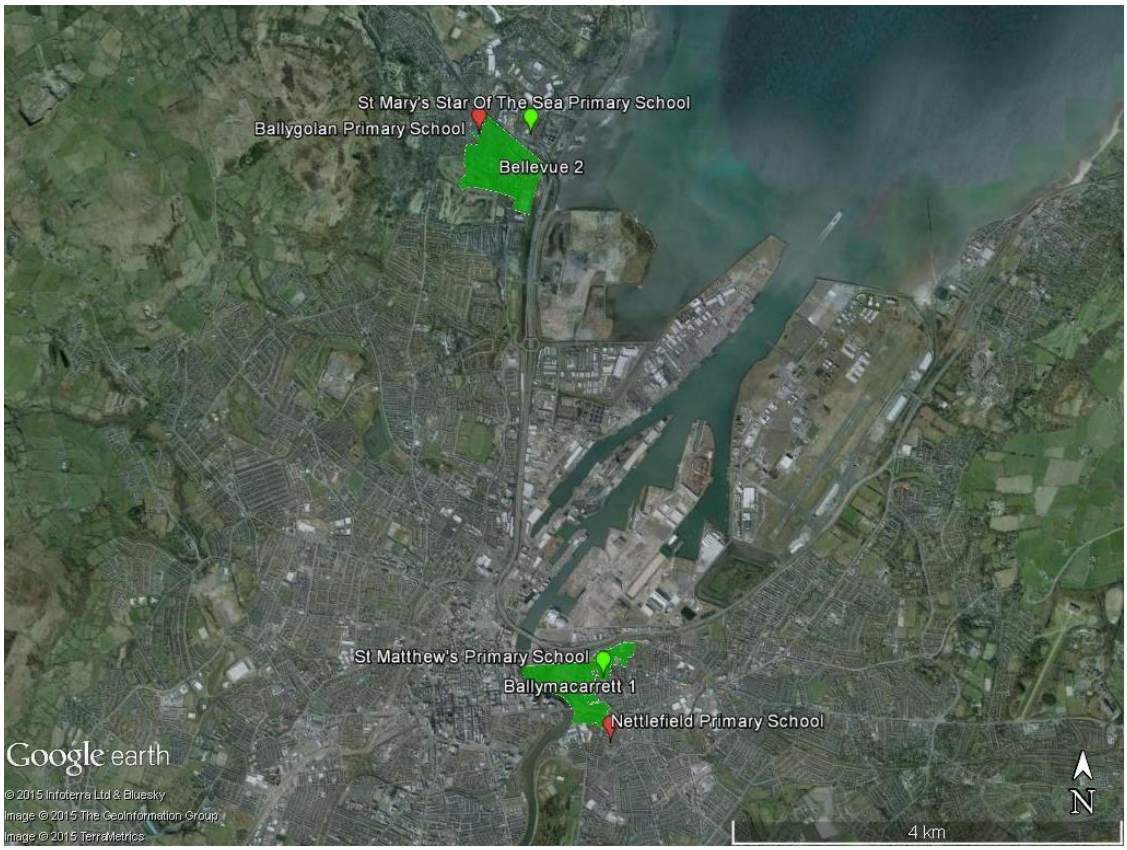

Figure 4.2 Map of Belfast with the neighbourhoods Ballymacarrett 1 and Bellevue 2 in green and the 4 primary schools used in the donations experiments before, during and after the sectarian riots. Catholic primary schools (green markers) and Protestant primary schools (red markers).

The surveys and donation experiments were conducted across 3 different time periods in 2012 and 2013 by 6 experimenters. The pre-riots sampling period was 3 days on 25th May, 20th June and 17th July 2012 with Emily, Leo and Ram. The mid-riots sampling period was 5 consecutive days between 11th and 15th January 2013 with Caroline, Adam and myself. The post-riots sampling period was 14 days between 15th May and 5th June 2013 with Adam and myself.

We conducted a total of 228 donations experiments, 112 in the riot neighbourhood (henceforth Ballymacarrett) and 116 in the calm neighbourhood (henceforth Bellevue). In the pre-riots period we conducted a total of 40 donation experiments: 17 neutral, 15 in-group and 17 out-group. In the mid-riots period we conducted a total of 77 experiments: 19 neutral, 30 in-group and 28 out-group. In the post-riots period we conducted a total of 102 experiments: 25 neutral, 38 in-group and 39 out-group.

The hypothesis that conflict promotes parochial altruism – increased in-group cooperation and reduced out-group cooperation – is tested in two ways. First, I test whether parochial altruism increases during the riots in comparison to before and after

the riots. Second, I test whether this effect is more pronounced in the neighbourhood with greater exposure to sectarian violence compared to the neighbourhood with less exposure to violence. I also perform a manipulation check to determine if the riots caused a different shift in people's perception of sectarian threat in the riot and calm neighbourhood.

4.3.1 Analysis

I ran unadjusted and adjusted linear regressions to predict the overall and specific amount donated to the unbiased charity (Save the Children), the in-group and the out-group primary schools. These linear regressions were performed per neighbourhood and with both neighbourhoods' data combined. The outcome continuous variable was the amount donated. I use the continuous instead of the derived binary variable used in chapter 3, because in the mid and post-riot time periods a substantial amount of people chose to donate only part of the £5 given (pre-riots: 2% of participants chose £1-£4; mid-riots: 31.2%; post-riots: 37.3%). The reasons behind this are unclear but are possibly related to an experimenter effect. The explanatory variables used in the adjusted models were the same as in the analyses described in chapter 3: household income, highest educational level achieved (due to low cell numbers of *graduate*, it was re-coded as *undergraduate*), age, gender, religious background and sectarian threat index (in the sectarian threat analyses). The manipulation checks were performed using similar linear regressions but with the factor sectarian threat as the outcome variable (see sections 2.3.2 and 3.3 for more details on the variables used).

4.4 Results

People living in the riot neighbourhood - Ballymacarrett – experienced a significant increase in the feelings of sectarian threat during the riots, compared to before and after the riots. In contrast, people living in the calm neighbourhood – Bellevue – reported no significant differences over time (**Table 4.2**). When looking at the individual variables of the factor sectarian threat, I find significant changes for most of the variables in the Ballymacarrett and no significant change in any of the variables in Bellevue (**Table 10.10, Table 10.11**). During the riots, people in the riot neighbourhood reported more sectarian violence in the neighbourhood and feeling that their community was under threat, which confirms the successful identification of control and treatment neighbourhoods (**Table 10.10**)

	Pre-Riot		**Mid-Riot**		**Post-Riot**	
Donations	**Ballym.**	**Bellevue**	**Ballym.**	**Bellevue**	**Ballym.**	**Bellevue**
	$\bar{x}$ (δ)	$\bar{x}$ (δ)	$\bar{x}$ (δ)	$\bar{x}$ (δ)	$\bar{x}$ (δ)	$\bar{x}$ (δ)

Overall	3.2 (2.4)	3.8 (2.2)	3.2 (2.1)	2.2 (2.1)	2.9 (2.0)	2.8 (2.1)
Neutral	4.4 (1.8)	4.4 (1.7)	4.1 (1.9)	3.6 (2.2)	3.3 (1.8)	1.9 (1.9)
In-group	3.8 (2.3)	2.9 (2.7)	3.7 (1.8)	1.4 (1.9)	3.3 (1.9)	3.7 (1.8)
Out-group	1.5 (2.3)	3.9 (2.2)	2.0 (2.2)	2.1 (2.1)	2.3 (2.1)	2.5 (2.2)
Observations	24	25	38	39	50	52

Table 4.1 Descriptive statistics of donations over time. Means ($\bar{x}$) and standard deviations (δ) of donations to the neutral charity (Save the Children), in-group, out-group primary school over time in Ballymacarrett and Bellevue.

Sectarian Threat	**Both Neighs.**	**Ballymacarrett (riot neigh.)**	**Bellevue (calm neigh.)**
	β [CI]	β [CI]	β [CI]
Mid-Riots	0.30 .	0.58**	-0.04
(ref. Pre-Riots)	[-0.03,0.63]	[0.16,1.01]	[-0.41,0.33]
Post-Riots	0.03	0.08	-0.02
(ref. Pre-Riots)	[-0.30,0.35]	[-0.35,0.50]	[-0.39,0.34]
Mid HH Income	0.07	0.11	0.08
(ref. Low HH income)	[-0.23,0.37]	[-0.28,0.49]	[-0.26,0.41]
High HH Income	-0.01	0.04	-0.05
(ref. Low HH income)	[-0.32,0.30]	[-0.37,0.45]	[-0.40,0.29]
GCSE	-0.07	0.20	-0.05
(ref. Primary School)	[-0.40,0.27]	[-0.22,0.63]	[-0.44,0.33]
A-Level	-0.20	-0.22	-0.01
(ref. Primary School)	[-0.62,0.22]	[-0.74,0.30]	[-0.51,0.50]
Undergraduate	0.13	0.34	0.14
(ref. Primary School)	[-0.38,0.63]	[-0.32,1.01]	[-0.40,0.69]
Age	-0.01**	-0.01*	-0.00
	[-0.02,-0.00]	[-0.02,-0.00]	[-0.01,0.01]
Male	-0.15	-0.24	0.11
(ref. Female)	[-0.39,0.10]	[-0.57,0.08]	[-0.16,0.38]
Protestant	-0.22 .	-0.38*	0.03
(ref. Catholic)	[-0.47,0.02]	[-0.71,-0.06]	[-0.23,0.30]
Constant	2.59***	3.00***	1.37***
	[1.96,3.22]	[2.24,3.76]	[0.59,2.16]
Observations	214	108	106

Table 4.2 Sectarian threat over time in Ballymacarrett and Bellevue. Coefficients and 95% confidence intervals from adjusted linear regressions used to predict the levels of individual sectarian threat over time (before, during and after the riots) in Ballymacarrett (riot neighbourhood) and Bellevue (calm neighbourhood) and both together. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Overall, there was a reduction in donations during and after the riots, compared to before, but this effect was only significant in Bellevue, the calm neighbourhood (**Table 4.3**). When looking at the different types of donations, I find that in-group donations suffered the most during the riots, with an average of £1.30 less being given to in-group primary schools during the riots compared to before the riots. Neutral donations

were the highest before and significantly decreased with time, with £1.80 less being donated after compared to before the riots. Out-group donations also reduced over time but this decline did not reach significance (**Table 4.4**). Again, these effects were only significant in Bellevue (**Table 4.5**, **Table 4.6**). Household income significantly predicted increased levels of cooperation, with high income individuals donating on average 80p more than low income individuals (**Table 4.3**). Threat only negatively affected out-group donations, having no impact on in-group or neutral donations (**Table 4.7**), as found in the cross-sectional study across the 16 neighbourhoods (chapter 3).

The unadjusted models without any control variables showed similar trends as the adjusted models, although significance in the case of the sectarian threat increase in Ballymacarrett and in-group donations reduction in Bellevue during the riots was not reached (**Table 10.5**, **Table 10.6**, **Table 10.7**, **Table 10.8**,**Table 10.9**)

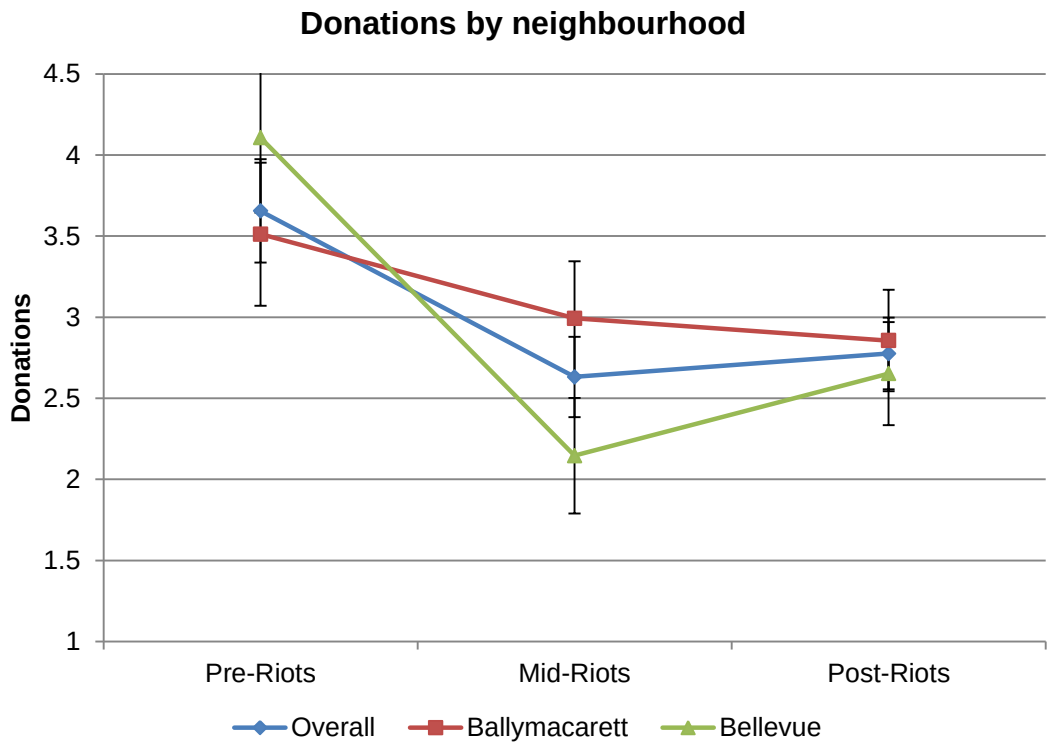

Figure 4.3 Donations by neighbourhood over time. Predicted value of an individual donating to the neutral charity *Save the Children*, an in-group primary school, an out-group primary school and all combined donations over time (before, during and after the riots) in Ballymacarrett (riot neighbourhood) and Bellevue (calm neighbourhood). These predicted values are controlled for individual household income, educational level, age, gender and religion. Error bars represent the standard errors.

Donations	Both Neighs.	Ballymacarrett (riot neigh.)	Bellevue (calm neigh.)
	β [CI]	β [CI]	β [CI]
Mid-Riots	-1.02*	-0.52	-1.96**
(ref. Pre-Riots)	[-1.82,-0.23]	[-1.63,0.60]	[-3.14,-0.79]
Post-Riots	-0.88*	-0.66	-1.46*
(ref. Pre-Riots)	[-1.67,-0.09]	[-1.77,0.46]	[-2.60,-0.31]
Mid HH Income	0.59	0.73	0.64
(ref. Low HH income)	[-0.13,1.31]	[-0.26,1.71]	[-0.43,1.71]
High HH Income	0.80*	1.58**	0.15
(ref. Low HH income)	[0.06,1.55]	[0.51,2.66]	[-0.93,1.24]
GCSE	-0.32	-0.52	0.12
(ref. Primary School)	[-1.13,0.48]	[-1.64,0.59]	[-1.08,1.32]
A-Level	0.11	-0.26	0.95
(ref. Primary School)	[-0.90,1.11]	[-1.61,1.09]	[-0.60,2.49]
Undergraduate	-0.01	-0.67	0.93
(ref. Primary School)	[-1.19,1.16]	[-2.41,1.08]	[-0.73,2.58]
Age	0.00	0.01	-0.00
	[-0.01,0.02]	[-0.01,0.04]	[-0.03,0.02]
Male	0.26	0.70	-0.23
(ref. Female)	[-0.32,0.84]	[-0.14,1.54]	[-1.07,0.62]
Protestant	-0.28	-0.15	-0.43
(ref. Catholic)	[-0.86,0.30]	[-1.00,0.69]	[-1.26,0.40]
Constant	2.96***	1.76 .	4.28***
	[1.44,4.48]	[-0.22,3.74]	[1.79,6.77]
Observations	224	110	114

Table 4.3 Donations over time in Ballymacarrett and Bellevue. Coefficients and 95% confidence intervals from adjusted linear regressions used to predict the individual amount given in donations over time (before, during and after the riots) to all schools and charities in Ballymacarrett (riot neighbourhood) and Bellevue (calm neighbourhood) and both together. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

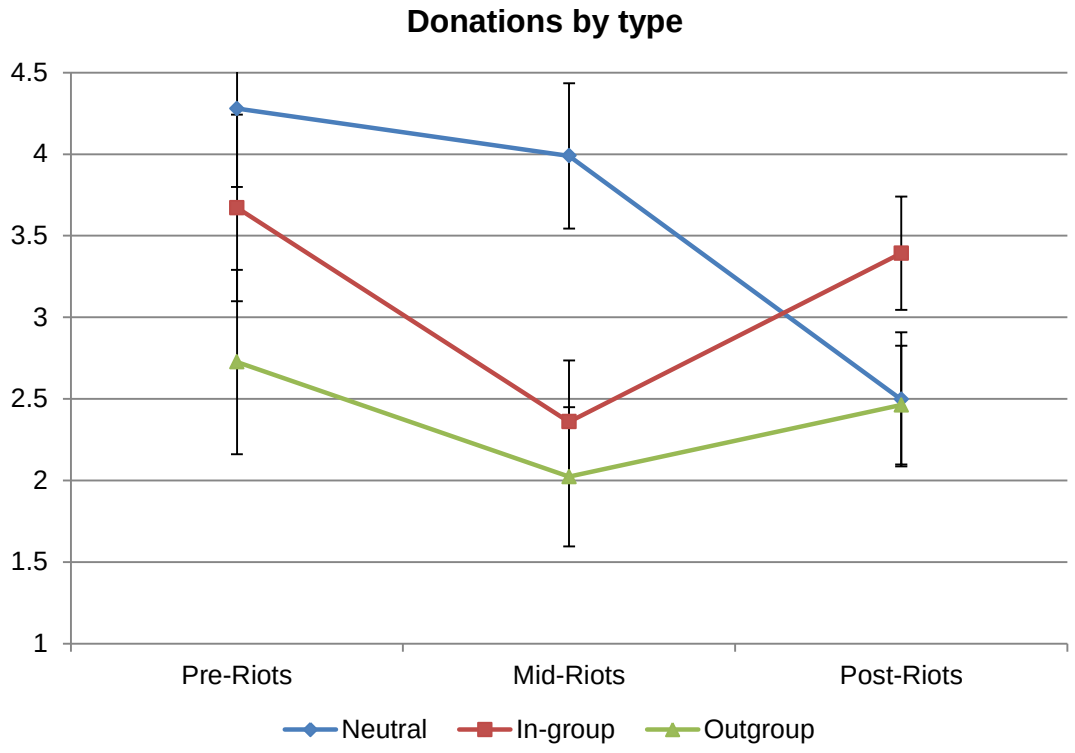

Figure 4.4 Donations by type over time. Predicted value of an individual donating to the neutral charity *Save the Children*, an in-group primary school, an out-group primary school and all combined donations over time (before, during and after the riots). These predicted values are controlled for individual household income, educational level, age, gender and religion. Error bars represent the standard errors.

Donations	Neutral	In-group	Out-group
	β [CI]	β [CI]	β [CI]
Mid-Riots	-0.29	-1.31.	-0.70
(ref. Pre-Riots)	[-1.61,1.04]	[-2.68,0.05]	[-2.13,0.72]
Post-Riots	-1.78**	-0.28	-0.26
(ref. Pre-Riots)	[-3.09,-0.47]	[-1.69,1.13]	[-1.64,1.11]
Mid HH Income	0.91	1.02	-0.04
(ref. Low HH income)	[-0.36,2.18]	[-0.43,2.47]	[-1.28,1.19]
High HH Income	0.19	1.26*	0.72
(ref. Low HH income)	[-1.29,1.66]	[0.06,2.46]	[-0.60,2.04]
GCSE	0.61	-0.99	-0.29
(ref. Primary School)	[-0.80,2.02]	[-2.30,0.32]	[-1.92,1.34]
A-Level	-0.20	0.31	0.49
(ref. Primary School)	[-2.06,1.66]	[-1.28,1.89]	[-1.49,2.47]
Undergraduate	2.06	-0.64	-0.04
(ref. Primary School)	[-0.61,4.73]	[-2.34,1.06]	[-2.19,2.12]
Age	0.00	0.01	0.00
	[-0.03,0.04]	[-0.02,0.04]	[-0.03,0.04]
Male	-0.21	0.27	0.92 .
(ref. Female)	[-1.37,0.96]	[-0.67,1.20]	[-0.12,1.95]
Protestant	-0.98 .	-0.38	0.38
(ref. Catholic)	[-2.05,0.08]	[-1.31,0.55]	[-0.67,1.43]
Constant	4.22**	2.85*	0.87
	[1.16,7.28]	[0.42,5.28]	[-2.07,3.81]
Observations	59	81	84

Table 4.4 Donations by type over time. Coefficients and 95% confidence intervals from adjusted linear regressions used to predict the individual amount given in donations over time (before, during and after the riots) to the neutral charity *Save the Children*, in-group and out-group primary schools. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

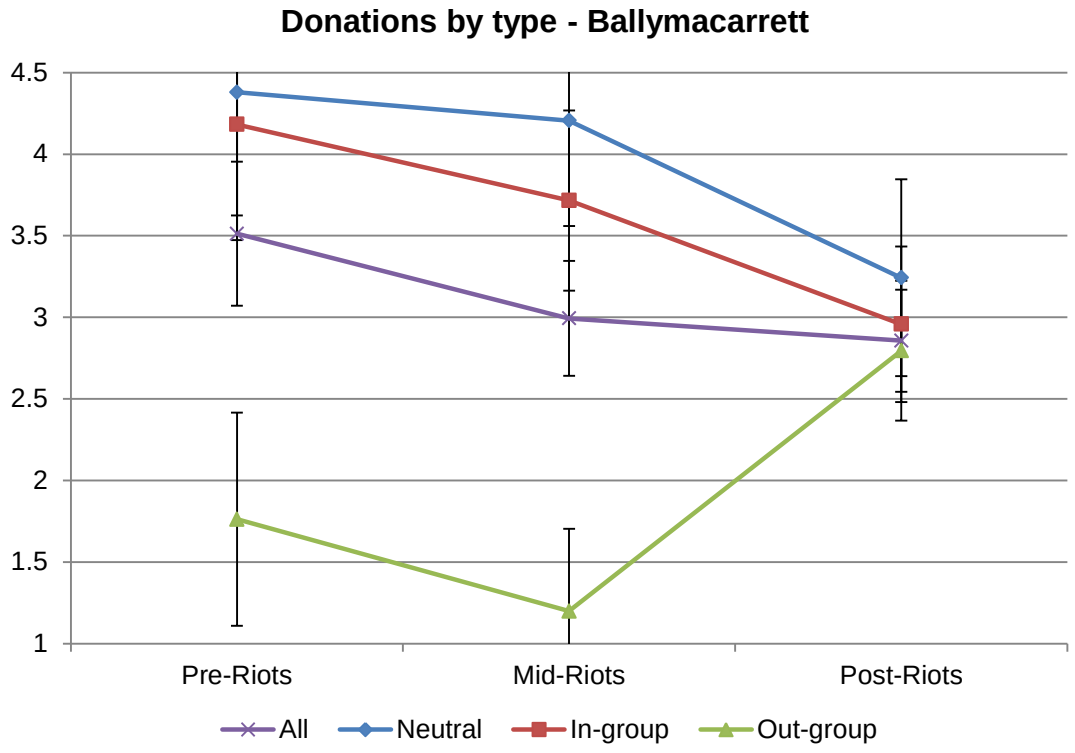

Figure 4.5 Donations by type over time (Ballymacarrett). Predicted value of an individual donating to the neutral charity *Save the Children*, an in-group primary school, an out-group primary school and all combined donations over time (before, during and after the riots) in Ballymacarrett (riot neighbourhood). These predicted values are controlled for individual household income, educational level, age, gender and religion. Error bars represent the standard errors.

Donations	Neutral (Riot Neigh.)	In-group (Riot Neigh.)	Out-group (Riot Neigh.)
	β [CI]	β [CI]	β [CI]
Mid-Riots	-0.17	-0.47	-0.56
(ref. Pre-Riots)	[-2.29,1.94]	[-2.31,1.38]	[-2.27,1.15]
Post-Riots	-1.14	-1.22	1.03
(ref. Pre-Riots)	[-3.26,0.99]	[-3.07,0.62]	[-0.62,2.68]
Mid HH Income	0.34	1.45	-0.91
(ref. Low HH income)	[-1.47,2.15]	[-0.61,3.50]	[-2.37,0.55]
High HH Income	0.67	1.41	2.67**
(ref. Low HH income)	[-1.91,3.26]	[-0.35,3.16]	[1.11,4.23]
GCSE	1.15	-0.90	-0.40
(ref. Primary School)	[-0.82,3.11]	[-2.73,0.92]	[-2.26,1.46]
A-Level	-0.07	0.04	0.03
(ref. Primary School)	[-2.68,2.53]	[-2.34,2.42]	[-2.17,2.23]
Undergraduate	2.73	-0.25	-3.21*
(ref. Primary School)	[-2.57,8.03]	[-2.86,2.35]	[-5.85,-0.57]
Age	0.01	0.01	0.04 .
	[-0.04,0.05]	[-0.04,0.05]	[-0.00,0.07]
Male	-0.29	0.86	1.03
(ref. Female)	[-2.32,1.73]	[-0.55,2.26]	[-0.26,2.31]
Protestant	-1.04	-0.70	1.46*
(ref. Catholic)	[-2.77,0.69]	[-2.17,0.78]	[0.13,2.79]
Constant	4.21*	2.73	-1.83
	[0.17,8.24]	[-0.83,6.29]	[-5.00,1.34]
Observations	30	39	41

Table 4.5 Donations by type over time (Ballymacarrett). Coefficients and 95% confidence intervals from adjusted linear regressions used to predict the individual amount given in donations over time (before, during and after the riots) to the neutral charity *Save the Children*, in-group and out-group primary schools in Ballymacarrett (riot neighbourhood). ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

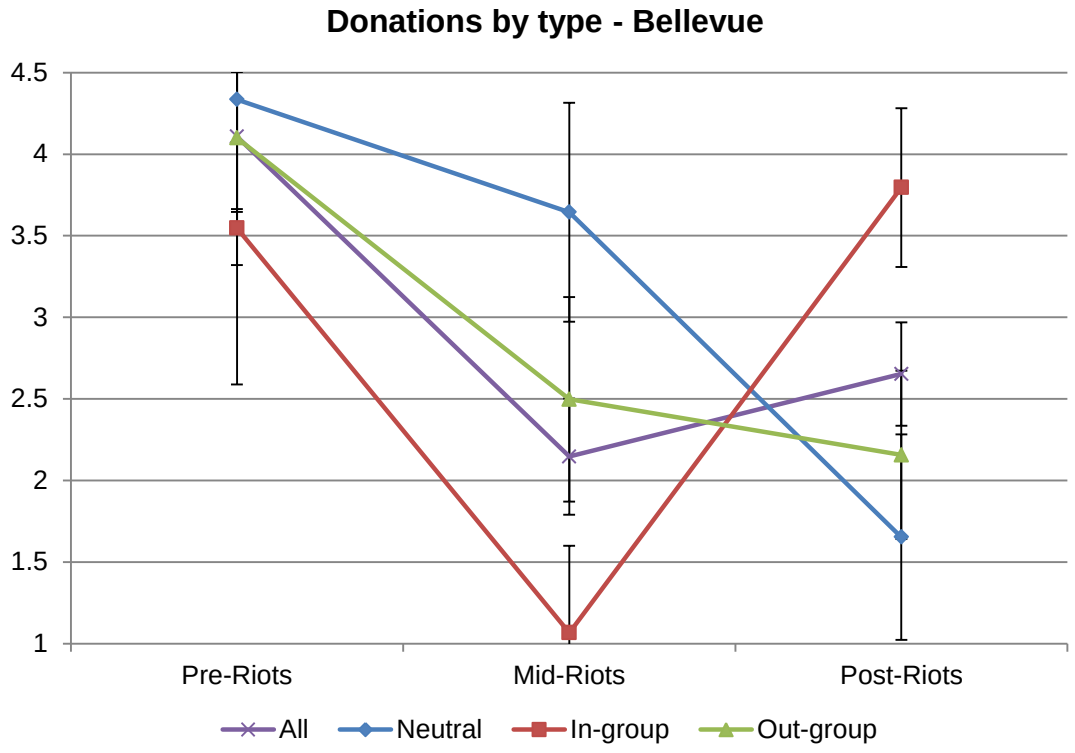

Figure 4.6 Donations by type over time (Bellevue). Predicted value of an individual donating to the neutral charity *Save the Children*, an in-group primary school, an out-group primary school and all combined donations over time (before, during and after the riots) in Bellevue (calm neighbourhood). These predicted values are controlled for individual household income, educational level, age, gender and religion. Error bars represent the standard errors.

Donations	Neutral (Calm Neigh.)	In-group (Calm Neigh.)	Out-group (Calm Neigh.)
	β [CI]	β [CI]	β [CI]
Mid-Riots	-0.69	-2.48*	-1.60
(ref. Pre-Riots)	[-2.68,1.30]	[-4.85,-0.11]	[-3.69,0.48]
Post-Riots	-2.68*	0.25	-1.94 .
(ref. Pre-Riots)	[-4.71,-0.65]	[-2.07,2.57]	[-3.89,0.00]
Mid HH Income	1.79	1.18	0.15
(ref. Low HH income)	[-0.59,4.17]	[-1.03,3.39]	[-2.07,2.36]
High HH Income	0.03	0.92	-0.22
(ref. Low HH income)	[-2.12,2.17]	[-0.80,2.63]	[-2.74,2.30]
GCSE	0.07	-0.68	-0.48
(ref. Primary School)	[-2.89,3.03]	[-2.62,1.25]	[-3.22,2.26]
A-Level	-1.40	0.93	0.78
(ref. Primary School)	[-4.97,2.18]	[-1.53,3.39]	[-2.79,4.35]
Undergraduate	1.58	-0.40	1.83
(ref. Primary School)	[-2.32,5.47]	[-3.09,2.29]	[-1.58,5.24]
Age	-0.03	0.04 .	-0.03
	[-0.10,0.04]	[-0.00,0.09]	[-0.09,0.03]
Male	-1.09	0.37	0.15
(ref. Female)	[-2.99,0.81]	[-1.00,1.74]	[-1.51,1.82]
Protestant	-0.68	0.51	-0.29
(ref. Catholic)	[-2.37,1.00]	[-0.94,1.95]	[-1.96,1.38]
Constant	7.06*	0.36	5.26 .
	[0.12,14.00]	[-3.31,4.04]	[-0.09,10.61]
Observations	29	42	43

Table 4.6 Donations by type over time (Bellevue). Coefficients and 95% confidence intervals from adjusted linear regressions used to predict the individual amount given in donations over time (before, during and after the riots) to the neutral charity *Save the Children*, in-group and out-group primary schools in Bellevue (calm neighbourhood). ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Donations	Overall	Neutral	In-group	Out-group
	β [CI]	β [CI]	β [CI]	β [CI]
Sectarian Threat	-0.25	0.35	0.08	-0.71*
	[-0.59,0.08]	[-0.32,1.03]	[-0.46,0.62]	[-1.28,-0.14]
Mid HH Income	0.50	1.17	1.13	-0.09
(ref. Low HH income)	[-0.24,1.23]	[-0.20,2.54]	[-0.31,2.56]	[-1.28,1.11]
High HH Income	0.86*	0.07	1.49*	0.64
(ref. Low HH income)	[0.10,1.62]	[-1.51,1.66]	[0.26,2.71]	[-0.64,1.92]
GCSE	-0.71	0.28	-1.00	-0.66
(ref. Primary School)	[-1.50,0.08]	[-1.30,1.86]	[-2.25,0.25]	[-2.20,0.88]
A-Level	-0.52	-1.72	-0.08	0.08
(ref. Primary School)	[-1.52,0.48]	[-3.83,0.39]	[-1.59,1.43]	[-1.80,1.97]
Undergraduate	-0.30	1.22	-0.29	-0.25
(ref. Primary School)	[-1.50,0.89]	[-1.63,4.07]	[-2.10,1.52]	[-2.24,1.75]
Age	-0.01	0.00	0.00	-0.01
	[-0.03,0.01]	[-0.04,0.04]	[-0.03,0.04]	[-0.05,0.02]
Male	0.18	0.36	0.05	0.89
(ref. Female)	[-0.42,0.78]	[-0.97,1.70]	[-0.94,1.04]	[-0.13,1.91]
Protestant	-0.24	-1.01	-0.24	0.31
(ref. Catholic)	[-0.84,0.35]	[-2.18,0.16]	[-1.25,0.76]	[-0.72,1.34]
Constant	3.70***	2.39	2.66	2.95
	[1.92,5.48]	[-1.63,6.41]	[-0.08,5.40]	[-0.28,6.19]
Observations	214	56	77	81

Table 4.7 Donations by type and sectarian threat. Coefficients and 95% confidence intervals from adjusted linear regressions used to predict the individual amount given in donations to the neutral charity Save the Children, in-group and out-group primary schools, by individuals levels of sectarian threat. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

4.5 Discussion

Overall, there was a significant trend toward a reduction in cooperative behaviour during and after the riots, which suggests that inter-group conflict does not promote cooperation. The different levels of sectarian violence in Ballymacarrett and Bellevue during the riots were reflected in the different reported levels of sectarian threat by people living in those neighbourhoods. However, the reduction in donations during and after the riots was mainly driven by changes in Bellevue, the neighbourhood with the least exposure to the riots.

The majority of incidents happened in the Short Strand area where the Ballymacarrett neighbourhood was located. I experienced this first hand, when Protestants youths started to throw rocks and other projectiles to where my assistants and I were conducting the door to door surveys and donation experiments, eventually forcing us to stop. Violent clashes with police continued throughout the day, with water cannons being deployed and cars being set alight. Nevertheless, to some extent the riots

ended up spreading throughout the city, and although there were no reported incidents inside Bellevue, the surrounding areas saw buses being set alight, cars being hijacked and skirmishes between the police and loyalists involving rocks and petrol bombs (BBC News 2013c). In addition, the riots were extensively reported in local and national local media, which increased the overall levels of exposure to the conflict. As a result, it is possible that the treatment and control neighbourhood may have not functioned as planned and the increased exposure of inter-group violence affected the whole region, leading to a shift in behaviours and attitudes related to group dynamics. I am also not able to determine the endogeneity of the riots as it is possible that riots erupted in Ballymacarrett due to intrinsic characteristics of the neighbourhood which could affect the variation in cooperative behaviour. It is also possible that there is other secular trends reducing donations throughout the city over time due to some factor that is not identified in this experiment.

In any case, there appears to be a marked decline in all types of cooperation in both neighbourhoods due to increased inter-group conflict. Specifically, the decline in in-group cooperation is most substantial during the riots with an average of £1.30 less donations to an in-group primary school than before the riots. The levels of cooperation remained lower in the aftermath of the riots compared to before, but the levels appear to be returning back to the original levels. This suggests that the impact of conflict may not be long lasting and cooperation can return to normal levels after a few months. This may be especially true in the context of Northern Ireland where people might be somewhat desensitised to sectarian violence with inter-group tension always present and low level conflict between the two groups being a relatively frequent occurrence.

In contrast with previous studies, the results from this study do not support the hypothesis that conflict promotes cooperation. In relation to Gneezy's & Fessler's (2011) results, the differences may be related to the fact that they use UGs and TGs to measure punishment and trusting behaviour, while this study focus on cooperative behaviour. The behaviour in UGs and TGs is difficult to interpret as it can stem from various psychological mechanisms other than altruistic preferences, such as status seeking, spite or fairness (Dawes et al. 2007; Brañas-Garza et al. 2014). The concepts of cooperation and punishment are often assumed to be linked (Boyd et al. 2003; Bernhard et al. 2006; Hauert et al. 2007) but recent evidence points to a lack of association between propensity of cooperation and punishment within individuals (Yamagishi et al. 2012; Brañas-Garza et al. 2014; Peysakhovich et al. 2014). It is possible that conflict increases the propensity to punish, although it is not clear

whether this would be directed towards the in-group or the out-group (Bernhard et al. 2006; Mathew & Boyd 2011) and no out-group members were included in their study. This study is the first to test the causal effect of conflict on cooperation using real-world measures and groups, so it is also possible that previous results are artefacts from the unusual contexts where the experiments took place (see section 1.1.7 for more on this issue).

These results show that the effects of conflict may be multi-faceted. The levels of sectarian threat as measured by the survey questions appear to mostly affect cooperation towards the out-group, which is also confirmed by the results from the cross-sectional data described in chapter 3. However, the effects of conflict may not be entirely captured by these questions as the riots lead to a reduction of all types of cooperation and not just towards the out-group. These results do not support the models of inter-group conflict and parochial altruism (Bowles et al. 2003; Choi & Bowles 2007; García & van den Bergh 2011) and strengthen the findings from the cross-sectional data. Overall, it appears that inter-group conflict has a pernicious effect on all types of cooperative behaviour.

5 Religion and Parochial Altruism

5.1 Summary

The widespread existence of religious beliefs in human societies suggests a functional explanation for the evolution of religion. Models of cultural group selection have been put forward to explain the rise of religion as a group adaptation to increase group cohesion in situations of inter-group conflict, and empirical studies have suggested that religious individuals are more cooperative than non-religious individuals. However, existing studies conflate measures of in-group and unbiased altruism, and the evolution of religion as a group beneficial adaptation requires altruism to be directed towards in-group members and not be indiscriminately applied. Here I present results from field experiments based on naturalistic measures of biased and unbiased cooperation (school/charity donations and lost letters' returns) in two religious groups with an on-going history of inter-group conflict - Catholics and Protestants in Belfast, Northern Ireland. While I find a positive association between individual levels of religiosity and overall cooperative behaviour, I find no evidence that this behaviour is specifically aimed towards the in-group. Furthermore, the association between religiosity and cooperative behaviour is not significant when controlling for individual socio-economic variables. The findings from this study question the validity of current theoretical models for the evolution of religion and point to the importance of environmental constraints in explaining the variation in human cooperative behaviour.

5.2 Introduction

"*You must not let anything that breathes remain alive. You shall annihilate them—the Hittites and the Amorites, the Canaanites and the Perizzites, the Hivites and the Jebusites—just as Yahweh your God has commanded!*" (Deuteronomy 20:16-18)

"*Love your enemies, do good to those who hate you, bless those who curse you, pray for those who mistreat you. If someone slaps you on one cheek, turn to them the other also."* (Luke 6:27-29)

Moralising religions are likely to have emerged around the Axial age between 800-200 BCE when societies started to adopt beliefs in all-powerful morally concerned gods who dispense supernatural justice to enforce specific norms and behaviours (Baumard & Boyer 2013; Norenzayan et al. 2015). Modern religions share several

moral aspects – e.g. the rule of *treat others as one would like others to treat oneself* - but they also tend to provide a wide range of doctrinal flexibility, illustrated by the two quotes above. Abrahamic religions, such as Islam and Judaism, are doctrinally based on exclusionary principles, with clear distinctions between in-group and out-group membership. At the same time, religious texts of all major religions instruct to love and be righteous towards one's enemies (Luke 6:27-29; Mumtahanah 60:7) and tend to encourage pro-social behaviour. Still, the pro-sociality is mostly aimed towards fellow groups members as in the case of the Zakat - one of the main pillars of Islam - which obliges every Muslim to systematically donate 2.5% of one's wealth to the poor, but crucially not to the other group's poor (Ibn Qudama 2.1774).

From an evolutionary perspective, religion has been proposed as a proximate mechanism that promotes cooperation within the group, in which individuals act in benefit of other group members at a cost to themselves. Specifically, models of multi-level selection depend on competition between groups over access to resources (such as food, mates or territory) for cultural or genetic traits that favour the group to be selected (Bowles et al. 2003; Choi & Bowles 2007; García & van den Bergh 2011). Religion has been put forward as a cultural group trait that enhances group cohesion through doctrinal emphasis on parochial altruism – the combination of in-group altruism and out-group hostility (Wilson 2010; Atran & Henrich 2010; Atran & Ginges 2012; Norenzayan 2014; Norenzayan et al. 2015). In situations of inter-group conflict, it is argued that parochial altruism provides a selective advantage to groups, resulting in the co-evolution of parochial altruism and inter-group conflict by group extinction through conquest and assimilation.

The operation of cultural group selection requires reduced within-group variability and between group competition, and religion presents a set of characteristics that could potentially facilitate the selection of group beneficial traits, such as altruism. Religious levelling institutions and norms - monogamy (i.e. mates redistribution) and charity (i.e. wealth redistribution) - can reduce within-group variability, attenuating individual selection pressures against in-group altruism by promoting higher group fitness (Bowles et al. 2003). Costly religious rituals - such as bare knee walking to pilgrimage sites in Catholicism and bodily mutilation in Hinduism - provide a reliable signalling mechanism of in-group devotion, possibly signalling future commitment to the group (Sosis & Bressler 2003); in accordance to this idea, the intensity of warfare in societies is associated with the existence of costly religious rituals (Sosis et al. 2007). Religious beliefs may also allow the externalisation of costs of punishment required for norm enforcement due to the fear of supernatural punishment, which would detract

god fearing individuals from free-riding in cooperative situations, reducing the need for costly punishment in the maintenance of in-group cooperation (Johnson 2005; Norenzayan 2014). In a situation of inter-group conflict, groups with more god fearing members could then out-compete less religious groups, as the prosocial norms of religious groups would provide an advantage on which cultural group selection could operate (Atran & Henrich 2010). However, it is important to note that invoking supernatural punishment as a way of solving the third party punishment dilemma (Johnson 2005; Norenzayan 2014) is problematic, as mutant atheists in a population would not fear God's punishment and would then be able to free-ride by not incurring the costs of inflicting punishment. Earthly costly punishment would then be required to punish the atheist free-riders, neutralising any benefits of the belief in supernatural punishment.

One of the first behavioural experiments investigating how religion affects cooperation was Orbell et al. (1992), which found that high church attendance for Mormons was a good predictor of cooperation with an anonymous stranger in a prisoner's dilemma game. The experiment used Mormons in Utah and Oregon, but the association between church attendance and cooperation was only found in Utah. This was suggested to be associated with the fact that Utah has a larger population of Mormons, which would increase the probability of the stranger in the game being an in-group member, although this was not experimentally established.

Several more studies have now suggested that religious individuals are more cooperative than non-religious individuals (Sosis & Ruffle 2004; Tan & Vogel 2008; Soler 2012 but see Ahmed & Salas 2009; Paciotti et al. 2011), that priming religious concepts increases cooperation to strangers (Shariff & Norenzayan 2007; Mazar & Ariely 2006) and that levels of religiosity are positively associated with cooperation (see review in Galen 2012). These studies use either self-reported measures of cooperation or lab based economic games with anonymous players. Large-scale surveys have also shown correlations between religious individuals and self-reported charitable donations (Brooks 2003; Schwadel 2005), but more pernicious effects - especially towards the out-group - have also been reported with racist and xenophobic attitudes being associated with religious beliefs (Guiso et al. 2003; Greer et al. 2005). In general, behavioural studies using economic games tend to find religiosity associated with increased levels of cooperation, although the results are somewhat mixed and the majority of studies are not able to distinguish the target of the cooperative behaviour (Galen 2012).

Religion can function as a marker of identity, but in order to determine whether religion possesses specific characteristics that distinguish it from other secular groups it is necessary to compare behaviour towards religious and other secular groups. Only one study has explicitly compared the parochialism of members of a religious institution with members of a secular institution, and in this study individuals played a game between members of a religious or secular kibbutz and people living in cities to measure levels of cooperation towards in-group and out-group individuals (Sosis & Ruffle 2004). This game was conducted in pairs, with an envelope containing 100 shekels from which each person could choose to remove an amount; if the sum of the amount both chose exceeded 100, no one received anything; if the sum was less than 100, each player got to keep their respective amount and the leftover was multiplied by 1.5 and divided equally. They found that, on average, kibbutz members took less money from the envelope than city residents, and also took less money when paired with fellow kibbutz members than with city residents. In addition, members of religious kibbutzim took less money than members of secular kibbutzim. This was interpreted and is widely cited as evidence that religion promotes altruism specifically towards the in-group. However, the player's motivation in this envelope game is not clear, as the "altruistic" behaviour can equally be interpreted through a perspective of self-interest. Removing less money may show trust in the other player, but not necessarily altruism as it is also in the self-interest of the player to remove less if there is the possibility of the other player removing too much money. The behaviour measured is mostly about different reciprocal expectations which, although possibly associated with within-group cooperative dynamics (Yamagishi & Kiyonari 2000), is not per se evidence of altruism. Furthermore, the study lacked a control group of city people playing with city people making it difficult to ascertain whether religious people are more cooperative than secular people. Nonetheless, differences between city and kibbutz individuals were driven by the most religiously fervent male members of the religious kibbutzim, which points to the importance of religiosity in cooperation and provides some evidence that religion may play a role in maintaining group beneficial norms.

The concept of religiosity is multi-dimensional and it is likely that belonging to a religious group produces different outcomes depending on which dimension of religiosity is the most marked. Allport's distinction between extrinsic and intrinsic religiosity proposes that intrinsic relates to the personal and private aspect of religion (e.g. closeness to good, praying), while extrinsic is based on the utilitarian benefits of belonging to a group (e.g. attendance to religious services) (Allport & Ross 1967). Studies that investigated this distinction generally found that intrinsic religiosity tends to result in greater cooperation, while extrinsic religiosity is sometimes associated with

reduction in cooperative behaviour (Galen 2012). Batson et al. (1999) found that participants who scored higher on intrinsic religiosity were more likely to help gay people, than participants that scored higher in extrinsic religiosity, but it is not clear that gay people fulfil the concept of an out-group. Ginges et al. (2009) found that in Palestine attendance to religious services, but not devotion, predicted support for suicide attacks and martyrdom, which can be understood as extreme versions of parochial altruism. Still, there are no studies that have been able to determine how these different components of religiosity affect actual cooperative behaviour towards biased and unbiased targets.

Similarly, the majority of other studies on religion and cooperation do not accurately identify the target of the cooperative behaviour as in-group, out-group or unbiased. This is crucial for the understanding of the role of religion in the evolution of cooperation, as if religion simply results in higher levels of unbiased cooperation - with religious individuals being equally altruistic to in-group or out-group members - then it cannot function as a cultural group selection mechanism promoting greater group cohesion. The lack of unbiased targets is another important limitation, as it does not allow us to distinguish between cooperation towards religious or secular institutions. The unique importance of religious, versus secular, groups in creating in-group cohesion is yet to be established, as secular and religious groups appear to share many of the same characteristics – costly rituals, levelling institutions and demarcation. Finally, these studies tend to rely on either self-reported measures or economic games limiting the explanatory power of real world behaviour; self-reporting is problematic as it does not necessarily correlate with actual behaviour (Burt & Popple 1998; Bekkers & Wiepking 2011) and the artificiality of economic games may not reflect behaviour in the real world (see section 1.1.7 for more on the external validity of economic games).

These issues are key to determine the role, if any, religion played in the evolution of cooperation and this study aims to address some of the limitations of previous studies. It uses naturalistic measures of biased and unbiased cooperation to determine if levels of religiosity are associated with parochial altruism at the individual and neighbourhood level. It tests how different components of religiosity – intrinsic and extrinsic religiosity – affect cooperative behaviour. It also investigates how religiosity is associated with exposure to inter-group conflict, attitudes towards the out-group and level of contact between groups.

5.3 Data & Methods

The donation and lost letters data are the same as the ones used in chapter 3 and are described in detail in sections 2.2 and 3.3. The main hypothesis tested is whether religiosity at the individual and neighbourhood level predicts parochial altruism – increase in in-group cooperative behaviour and reduction in out-group cooperative behaviour.

The secondary hypothesis is that intrinsic and extrinsic religiosity have different effects on cooperative behaviour, with intrinsic predicting an overall increase in cooperation and extrinsic a reduction in out-group cooperation. In the data, intrinsic religiosity is represented by the closeness to god and influence of religion, while extrinsic is represented by attendance to religious services.

Religiosity is measured through a factor analysis of variables related to the individual's engagement with religion obtained from the 3 survey questions on the frequency of attendance of religious services, influence of god on daily life and closeness to god (see section 2.3.2.7 for more details on the factor variable religiosity). Sectarianism is measured through a factor analysis of variables related to the individual's attitudes and behaviours towards the out-group from three survey questions on preference for marriage partner and school for their children, and number of out-group close friends (see section 2.3.2.8 for more details on the factor variable sectarianism). Sectarian threat is measured through a factor analysis of variables relating to whether the individual had been attacked or felt threatened by the other group from 6 survey questions that asked if individuals had been victims of sectarian attacks, felt uncomfortable walking in an out-group neighbourhood, felt there is more segregation in general and in their neighbourhood, had been exposed to sectarian violence in their neighbourhood, and felt that their community was under threat (see section 2.3.2.6 for more details on the factor variable sectarian threat). Cooperative behaviour is measured through donations to local Catholic and Protestant primary schools and Save the Children (**Table 3.1**).

5.3.1 Analysis

To test these hypotheses I use multi-level logistic regressions with the binary response variables of overall, in-group, out-group and unbiased donation. I also ran logistic regressions with the binary response variables of the return of overall, in-group, out-group and unbiased lost letters. The main explanatory variables of interest are the individual level of religiosity for the donation analyses and the neighbourhood

mean level of religiosity for the lost letters analyses. In the donation analyses I control for individual age, gender, educational level, household income and religion; for the lost letter analyses I control for religious composition, income deprivation, number of post-boxes, population density at the neighbourhood level (see section 2.3 for more details on these variables). The multi-level models of the donation analyses were run with two levels: individuals (level 1) nested within neighbourhoods (level 2). The multi-level structure of the analyses allow to control for the non-independence of individuals' behaviour clustered at the neighbourhood level (Snijders & Bosker 2011).

5.4 Results

Overall, the more religious people are, the more likely they are to donate. Specifically, the individuals' levels of religiosity positively (but marginally) predict the likelihood of donating to an out-group primary school and to the neutral *Save the Children*. However, there is no association between religiosity and donations to in-group schools (**Table 5.1**,**Table 5.2**). Furthermore, these associations are not significant when taking into account socio-economic status (S.E.S.) and other individual characteristics in the adjusted models (**Figure 5.1**)

Donations	**Overall**	**Neutral**	**In-group**	**Out-group**
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Religiosity	1.24**	1.29 .	1.14	1.27 .
	[1.07,1.44]	[0.97,1.71]	[0.86,1.52]	[1.00,1.63]
Constant	1.40	2.09	2.37*	0.65
	[0.92,2.15]	[0.96,4.53]	[1.17,4.81]	[0.34,1.22]
Observations	497	168	163	166

Table 5.1 Donations by religiosity (unadjusted models). Odds ratios and 95% confidence intervals from multi-level logistic regressions used to predict overall donations, neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools) by individual levels of religiosity. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Donations	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Religiosity	1.17 .	1.17	1.00	1.28
	[0.98,1.40]	[0.85,1.62]	[0.68,1.48]	[0.95,1.73]
Mid HH income	1.88*	2.42	1.93	1.70
(ref. Low HH income)	[1.09,3.23]	[0.79,7.39]	[0.65,5.78]	[0.70,4.15]
High HH income	2.66**	2.34	7.15*	1.40
(ref. Low HH income)	[1.33,5.29]	[0.67,8.18]	[1.38,37.01]	[0.44,4.49]
GCSE	1.59	1.63	1.21	2.84 .
(ref. Primary School)	[0.90,2.81]	[0.54,4.93]	[0.39,3.72]	[0.98,8.22]
A-Level	1.99 .	1.48	1.72	4.66*
(ref. Primary School)	[0.99,4.00]	[0.45,4.85]	[0.29,10.07]	[1.34,16.27]
Undergraduate	1.44	3.75	0.58	2.84
(ref. Primary School)	[0.68,3.02]	[0.63,22.40]	[0.15,2.28]	[0.71,11.39]
Graduate	2.95 .	1.76	0.76	21.29**
(ref. Primary School)	[0.99,8.77]	[0.27,11.48]	[0.09,6.54]	[2.89,156.74]
Age	1.02**	1.02 .	1.05**	1.00
	[1.01,1.04]	[1.00,1.05]	[1.02,1.09]	[0.98,1.03]
Male	1.01	1.07	1.97	0.59
(ref. Female)	[0.66,1.54]	[0.47,2.46]	[0.83,4.67]	[0.28,1.23]
Protestant	0.72	0.56	0.92	0.70
(ref. Catholic)	[0.47,1.10]	[0.24,1.26]	[0.39,2.17]	[0.33,1.46]
Constant	0.32*	0.46	0.17 .	0.22 .
	[0.13,0.80]	[0.08,2.54]	[0.03,1.15]	[0.04,1.15]
Observations	465	158	153	154

Table 5.2 Donations by religiosity (adjusted models). Odds ratios and 95% confidence intervals from multi-level logistic regressions used to predict overall donations, neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools) by individual levels of religiosity. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

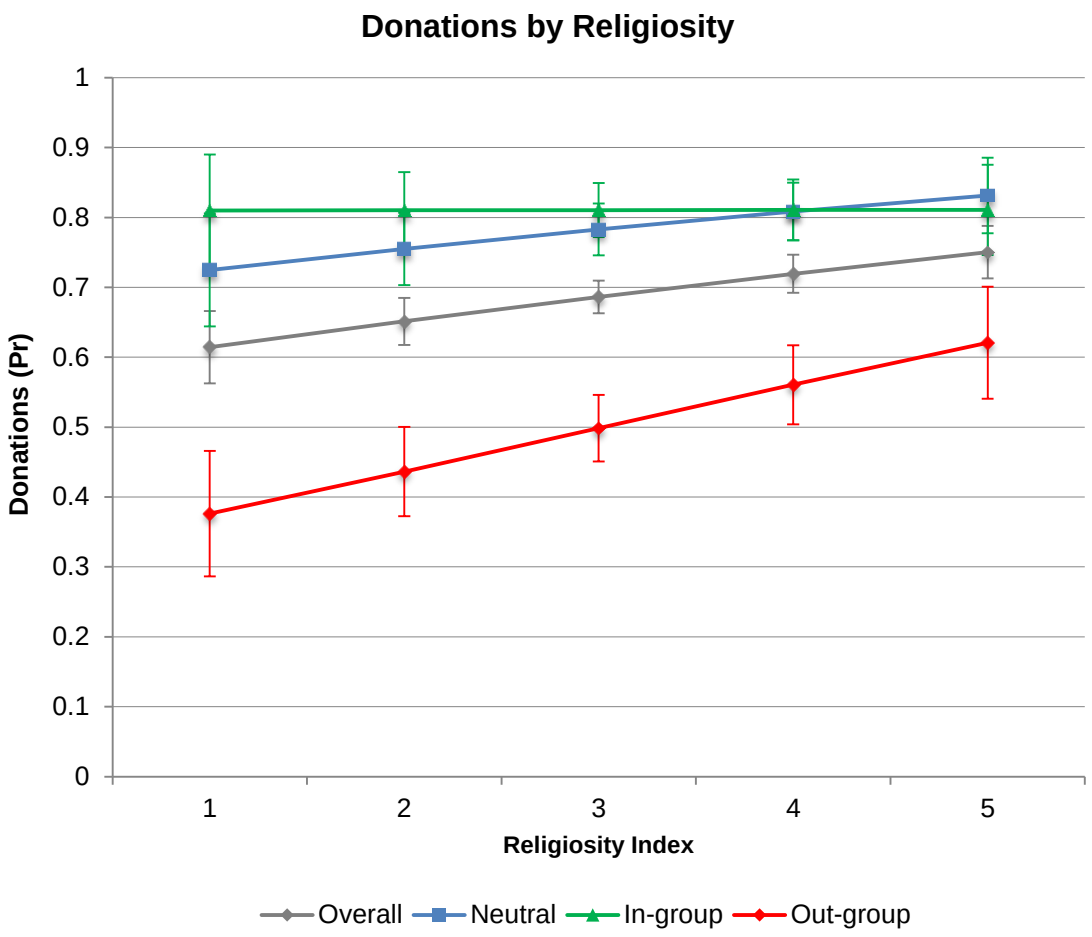

Figure 5.1 Donations by religiosity. Predicted probability of an individual donating to an in-group, out-group, neutral or any institution by the level of individual religiosity. This measure is a continuous factor composed of the variables related to the individual engagement with religion. This effect is controlled for individual age, gender, educational level, household income and religion. Plotted values refer to table 5.2 and error bars represent the standard errors.

The analyses using the separate variables of the religiosity factor indicate that the frequency of attendance to religious services and the levels of religious influence affect cooperative behaviour differently. People that attend church services more often are significantly more likely to donate to an out-group - but not an in-group - primary school (**Table 5.3**), and people who are influenced by religion are more likely to donate to Save the Children (**Table 5.4**). Proximity to god increases overall donations, does not significantly predict any specific type of donations (**Table 5.5**). The adjusted model of the individual components of religiosity effect on donations take into account individual characteristics that show similar trends (**Table 10.12**, **Table 10.13**, **Table 10.14**).

Donations	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Religious Attendance	1.18**	1.16	1.12	1.32**
	[1.04,1.33]	[0.91,1.47]	[0.89,1.42]	[1.07,1.61]
Constant	1.60*	2.69**	2.52**	0.60
	[1.10,2.31]	[1.35,5.34]	[1.42,4.46]	[0.34,1.05]
Observations	498	168	163	167

Table 5.3 Donations by religious attendance (unadjusted models). Odds ratios and 95% confidence intervals from multi-level logistic regressions used to predict overall donations, and neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools) by frequency of church attendance. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Donations	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Religious Influence	1.18**	1.32*	1.06	1.14
	[1.04,1.33]	[1.04,1.68]	[0.84,1.32]	[0.93,1.38]
Constant	1.41	1.69	2.71**	0.76
	[0.91,2.20]	[0.76,3.77]	[1.27,5.77]	[0.39,1.45]
Observations	498	168	163	167

Table 5.4 Donations by religious influence (unadjusted models). Odds ratios and 95% confidence intervals from multi-level logistic regressions used to predict overall donations, neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools) by individual level of religious influence on daily life. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Donations	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Closeness to God	1.18*	1.14	1.14	1.17
	[1.01,1.37]	[0.84,1.53]	[0.87,1.50]	[0.92,1.50]
Constant	1.76**	2.97**	2.62***	0.86
	[1.22,2.54]	[1.49,5.94]	[1.54,4.44]	[0.52,1.44]
Observations	465	158	153	154

Table 5.5 Donations by closeness to god (unadjusted models). Odds ratios and 95% confidence intervals from multi-level logistic regressions used to predict overall donations, neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools) by individual level of closeness to god. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Results also show that religiosity increases with age and education, women are more religious than men, and Catholics are more religious than Protestants. There is no association with income (**Table 5.6**). In relation to the relationship between religiosity and exposure to threat and sectarianism, there is a strong positive association between exposure to threat and sectarianism (β [CI]=0.16 [0.12;0.21]; p<0.001), but

while the more religious people are also more sectarian, they actually feel less threatened than less religious people (**Table 5.6**).

Religiosity	
	β [CI]
Threat Index	-0.10 .
	[-0.22,0.02]
Sectarian Index	0.57***
	[0.41,0.74]
Mid HH income	-0.05
(ref. Low HH income)	[-0.25,0.16]
High HH income	-0.21
(ref. Low HH income)	[-0.45,0.03]
GCSE	0.07
(ref. Primary School)	[-0.16,0.29]
A-Level	0.21
(ref. Primary School)	[-0.06,0.48]
Undergraduate	0.51***
(ref. Primary School)	[0.22,0.80]
Graduate	0.24
(ref. Primary School)	[-0.10,0.59]
Age	0.03***
	[0.03,0.04]
Male	-0.42***
(ref. Female)	[-0.58,-0.26]
Protestant	-0.46***
(ref. Catholic)	[-0.62,-0.30]
Constant	0.54*
	[0.07,1.01]
Observations	844

Table 5.6 Religiosity by threat and sectarianism. Coefficients and 95% confidence intervals from adjusted linear regressions used to predict individual religiosity. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

The neighbourhood level analysis using the lost letters data shows that neighbourhood religiosity has no predictive power to explain the return of lost letters in either the simple or adjusted models, but lost letters are more likely to be returned in Catholic neighbourhoods, especially in the case of out-group letters (**Table 5.7**, **Table 5.8**).

Lost Letters	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Religiosity	1.40	1.17	1.96	1.67
	[0.92,2.12]	[0.56,2.43]	[0.84,4.57]	[0.74,3.77]
No. post-boxes	1.25***	1.24**	1.30**	1.05
	[1.14,1.37]	[1.06,1.45]	[1.07,1.57]	[0.89,1.24]
Population density	0.99***	0.99**	0.99	0.99
	[0.98,0.99]	[0.98,1.00]	[0.97,1.00]	[0.98,1.00]
Constant	0.78	1.50	0.37	0.50
	[0.27,2.28]	[0.23,9.89]	[0.04,3.60]	[0.05,4.62]
Observations	1056	352	240	240

Table 5.7 Lost letters' returns by religiosity (unadjusted models). Odd ratios and 95% confidence intervals from logistic regressions used to predict the return of all lost letters, neutral, in-group and out-group lost letters (addressed to CancerAID, CatholicAID or ProtestantAID) by neighbourhood level of religiosity. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

Lost Letters	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Religiosity	1.64	1.18	2.28	3.01
	[0.81,3.31]	[0.35,4.06]	[0.32,16.06]	[0.51,17.63]
Mid HH income	2.20***	2.92**	2.69*	3.69***
(ref. Low HH income)	[1.54,3.15]	[1.53,5.57]	[1.24,5.85]	[1.70,8.03]
High HH income	2.69***	2.74**	6.54**	4.85*
(ref. Low HH income)	[1.80,4.02]	[1.36,5.56]	[1.58,27.06]	[1.26,18.60]
Mixed neigh.	0.86	0.89		
(Prot. neigh)	[0.62,1.21]	[0.49,1.61]		
Catholic neigh.	0.61.	0.68	0.44	0.31*
(Prot. neigh)	[0.37,1.02]	[0.28,1.68]	[0.13,1.48]	[0.11,0.93]
No. post-boxes	1.17**	1.16	1.21	0.98
	[1.06,1.29]	[0.97,1.38]	[0.99,1.47]	[0.81,1.18]
Population density	1.00	1.00	1.01	1.02*
	[0.99,1.01]	[0.98,1.01]	[0.99,1.03]	[1.00,1.04]
Constant	0.26	0.60	0.06	0.03 .
	[0.04,1.53]	[0.03,12.82]	[0.00,5.69]	[0.00,1.68]
Observations	1056	352	240	240

Table 5.8 Lost letters' returns by religiosity (unadjusted models). Odd ratios and 95% confidence intervals from logistic regressions used to predict the return of all lost letters, neutral, in-group and out-group lost letters (addressed to CancerAID, CatholicAID or ProtestantAID) by neighbourhood level of religiosity. ***p<0.001; **p<0.01; *p<.0.05; .p<0.1

5.5 Discussion

I broadly replicate the results of previous studies looking at the relationship between religiosity and cooperation, with more religious people being more cooperative.

However, a more thorough analysis taking into account S.E.S. and other individual characteristics find the effect of religion on cooperation strongly attenuated. The fact that the significance disappears once controlling for other individual factors indicates that religiosity may not be the driving force in increased cooperation, and other individual characteristics such as income and education play a more important role.

As previously shown in chapter 3, individual S.E.S. characteristics are the main predictors of cooperative behaviour with wealthy individuals more likely to donate to in-group primary schools and educated individuals more likely to donate to out-group schools. I discuss that in more detail in chapter 3, but it is interesting that there is no relationship between income and levels of religiosity, and more educated people are more religious, unlike other samples where religiosity is associated with lower income and education (Pew Forum on Religion & Public Life 2010; Crabtree 2010). This may reflect the high overall levels of religiosity in Northern Ireland that may cause a ceiling effect, with the majority of people going to church at least a few times a year and reporting to have a personal relationship with god.

Interestingly, religiosity only seems to play a small role in the variation of out-group cooperation, as the more religious individuals - especially the ones more likely to attend church services – are the ones who are most cooperative towards the out-group. This is a surprising finding considering the theoretical predictions of the religion and parochial altruism models that predict religiosity should increase levels of out-group hostility (Wilson 2010; Ginges et al. 2009; Atran & Ginges 2012). In the context of Christianity in Northern Ireland religious beliefs appear to encourage increased cooperation towards the out-group and it is difficult to reconcile this finding with a cultural group selection account of the evolution of religion and cooperation (Wilson 2010; Atran & Henrich 2010; Atran & Ginges 2012; Norenzayan 2014; Norenzayan et al. 2015), but it does suggest that the doctrinal command of *turning the other cheek and love your enemies* (Luke 6:27-31) is actually followed.

The discussion of the relationship between religion and cooperation too often sees religion as a monolithic concept, when in fact there are important doctrinal differences between religions, which likely affect the behaviour of the believers. The relationship between Protestantism and the advent of Capitalism in Europe, for example, has long been discussed, starting with Weber (1930) who put forward the idea that the Reformation's rejection of the sale of indulgences to grant salvation and the Protestant work ethic with its duty to work as a sign of grace, facilitated the emergence of capitalism. Contemporary survey data supports this idea, with

Protestants more likely to report willingness to monitor and punish wrong-doing and Catholics more likely to care about the family and small group relationships (Arruñada 2004). At the behavioural level the importance of religious denomination in cooperation is less clear. I do not find major differences between Catholics and Protestants cooperative behaviour, although Catholic neighbourhoods are more likely to return lost letters, especially out-group ones. Fehr et al. (2003) shows that Catholics in Germany are more trusting in a trust game than Protestants, but on the other hand Anderson & Mellor (2009) find that Protestants in the U.S.A. donate more in public goods game and are less likely to reduce their donations in repeated games than Catholics and non-religions people.

The parochial altruism theoretical approach is based on the assumption that groups that are hostile to other groups are more likely to out-compete groups that are less hostile. However, there are costs associated with exclusionary networks, as if individuals only interact with other group members the potential amount of interactions is reduced, possibly leading to reduced payoffs. Even notable parochial communities, like the Amish and the Mennonites, are involved in business transactions with out-group members (Richerson & Boyd 2004), and god primes have shown to increase help for an out-group member in an hypothetical scenario (Preston & Ritter 2013). A balance between in-group bias and number of interactions is required to maximise individual pay-offs and in certain situations, religion may facilitate this.

In the Northern Irish context, the relationship between religiosity and cooperation appears to be mostly driven by church attendance, similar in a way to the findings from the Israel kibbutzim where increased cooperation was driven by the men who frequented religious services most often (Sosis & Ruffle 2004; Ruffle & Sosis 2006). However, while the target of increased cooperation in the kibbutzim was the in-group, I find the inverse effect with cooperation increasing towards the out-group. Survey data from the USA shows that increased church attendance increases generalised trust for some denominations, which could result in increased cooperation with the out-group (Welch et al. 2004). These results indicate that church attendance plays a key role in inter-group dynamics and religion, but that these dynamics are context dependant. How the context varies is unclear, but it is at least not modulated by social networks mixing as this is unrelated to either religiosity or church attendance.

These results highlight the importance of the identification of the specific target of cooperation, with previous studies often not able to distinguish between in-group, out-group and unbiased cooperation. The correct identification of the target of cooperation

is crucial to determine if religion can operate as group-beneficial trait, as if religious individuals are cooperative towards the out-group or are simply indiscriminately cooperative it would not bring a benefit to the group. The results show that cooperation towards in-group and neutral institutions have similar levels and patterns, but neither type is affected by religiosity.

There is also an interesting relationship between religiosity, exposure to threat and sectarianism. I find a strong positive association between exposure to threat and sectarianism, but while more religious people are also more sectarian, they actually feel less threatened than less religious people. This seems to suggest that despite religiosity being associated with feelings of sectarianism, it buffers how threatened people feel. This is confirmed by studies that show how rituals have soothing effects in unpredictable situations (Legare & Souza 2012) and how in general, riskier environments tend to promote intensification of religious beliefs (Norenzayan & Hansen 2006; Kay et al. 2010).

Religion plays an important role in the creation of group identity and the facilitation of in-group bias, and this is supported by my data in Northern Ireland with clear differentiation between in-group and out-group cooperative behaviour. However, it is unlikely that these processes are exclusive to religious groups. Other types of secular groups such as political organisations, fraternities and football clubs, share most of properties found in religious groups such as costly rituals (e.g. initiation ceremonies), group demarcation (e.g. nationality) and levelling institutions and norms (e.g. food sharing and progressive taxation). For example, in relation to inter-group marriage, race can be a more relevant exclusionary grouping than religion, with 95% of blacks in the U.S.A. marrying within group (Sweet & Bumpass 1987) compared to 84% of Protestants and 62% of Catholics (Glenn 1982). In fact, I would argue that with the exception of supernatural punishment (but see criticism of this in section 5.2), all other characteristics attributed to religious groups can equally apply to secular groups. Despite the evidence that people in general appear to be more cooperative towards members of the same religious community, a significant association between the degree of involvement in religious practice or doctrine and cooperative towards the in-group was not found. These results do not support the idea of religion as a group beneficial adaptation in a contemporary environment (Atran & Ginges 2012) and instead suggest that religion may simply operate as a marker of group identity, arguably similar to race, nationality or fans of Paul Klee (Tajfel et al. 1971).

6 The Distribution of Ethnic Markers and Cultural Diversity

6.1 Summary

There is extensive evidence that people tend to preferentially interact and cooperate with members of their own group. The evolution of this in-group bias requires the accurate identification of group membership in order to avoid the breakdown of cooperation by free-riders who may reap the benefits of biased cooperation towards the in-group by faking group membership. The ethnic marker hypothesis proposes that in-group cooperation can evolve if group markers are associated with behaviours, reducing the pay-offs of free-riders by requiring coordination for a successful interaction. This hypothesis assumes the existence of behavioural differences between groups and predicts that marker differences should be greater at boundary regions. In this study, I test these two aspects of the ethnic markers hypothesis by i) quantifying cultural differences between Catholics and Protestants in Northern Ireland, and ii) testing the association between the number of sectarian flags in 30 Belfast neighbourhoods and their proximity to the out-group. I find substantial cultural differences between Catholics and Protestants in some traits, even after taking into account individual characteristics, but find inconsistent results for an increased number of markers in boundary regions. These findings indicate that cultural differences between Catholics and Protestants may be large enough for in-group bias to arise due to coordination benefits, but that in this context ethnic markers may not be associated with coordination mechanisms.

6.2 Introduction

Human populations are often divided into groups with specific behavioural characteristics that themselves and others identify by sets of distinctive markers that can include dress style, dialect and rituals (Barth 1969). The salience of group membership through these markers is a crucial requirement for the evolution and maintenance of in-group cooperation through tag-based models of cooperation (Cohen & Haun 2013). In these models, often known as green-beard models, an altruistic gene can be selected if it is associated with a recognisable trait that elicits preferential treatment from others with the same gene (Hamilton 1964a; Hamilton 1964b; Dawkins 1976). In its original formulation the theory was applied to cooperative alleles, but it has since expanded to include cultural traits, with cultural

group markers functioning as a tag that allow the evolution of cooperation through the identification of in-group cooperators and selectively directing altruistic behaviour towards group members (Nettle & Dunbar 1997; Van Den Berghe 1981). In these models of repeated interaction, the association between behaviour and marker is assumed resulting in individuals preferentially interacting with other individuals with the same group markers indicating the past cooperative behaviour, which functions as a cue of current and future behaviour.

The problem with linking cooperation with group markers is that the relationship breaks down with the invasion of cheaters who have the group marker but can behave in a selfish manner towards other group members. Then, biased imitation favours the spread of the individuals that decouple marker and behaviour - a strategy that leads to a higher payoff for cheaters – resulting in the breakdown of cooperation (Cohen 2012). Nettle & Dunbar (1997) models attempt to address this issue by allowing defectors to mimic the marker, in this case dialects, and in scenarios when the rate of change of dialects is fast enough the spread of mimics is hindered. In the real world though, dialects do not change as fast as the time it takes for an outsider to learn them and fake the group membership. As Groucho Marx apocryphally put it "*the secret of success is honesty and fair dealing. If you can fake those, you've got it made*".

Following on from this, the advantage of preferentially interacting with group members who share a marker must evolve by imposing costly constraints on cheaters in order to remove the benefit from the decoupling of the marker and behaviour. As described in section 1.1.6, successful cooperative interactions require a coordination strategy in order for individuals to mutually benefit from this interaction. If group markers and behaviour are coupled, preferentially interacting with similarly marked individuals would increase the respective payoffs in a cooperative dilemma scenario. The evolution of group markers as a solution to a cooperation dilemma results in markers being honest signals of behaviour, as there is no gain for a cheater to pretend to be a member of a group if their payoff is going to be reduced due to lack of coordination with in-group cooperators (Boyd & Richerson 1987; Axtell et al. 2001; McElreath et al. 2003).

One of the most pertinent corollaries of the ethnic markers hypothesis for this study is that both group markers and behaviours will be more distinctive at the geographical boundaries between groups than at the group centre (McElreath et al. 2003; Turchin 2003). The necessity to identify group members arises mostly in a scenario where the

population is heterogeneous, such as in boundary regions where different groups are in close proximity. In a homogeneous central region the need for group markers is reduced, as the likelihood of individuals belonging to the same group and consequently also more likely to share the same behaviour is higher (McElreath et al. 2003; Turchin 2003).

A key assumption of the ethnic marker hypothesis is that cultural differences between groups will be large enough to produce coordination benefits by preferentially interacting with in-group members with shared norms and behaviours, instead of out-group individuals with different norms. There is evidence of cross-cultural differences in attitudes (Richerson et al. 2015) and behaviours (Henrich et al. 2005; Henrich et al. 2006; Henrich, Ensminger, et al. 2010), but it's not clear whether these represent genuine differences in norms between groups, or are instead capturing individual variation, possibly explained by ecological and demographic characteristics (Lamba & Mace 2011; Lamba & Mace 2012) (see section 1.1.3 for more on this issue). Catholics and Protestants use group markers distinguishing themselves and their territory from out-group members, but it is unclear whether these two groups have substantial cultural differences. Historically, the two communities have lived segregated existences with little inter-cultural mixing that would have facilitated the evolution of different cultural norms, namely different fertility rates (NILS 2012; Coward 1980). However, in a contemporary scenario these differences may have been eroded with, for example, similar fertility rates for Catholics and Protestants (NILS 2012) and increased levels of integration with mixed marriages now up to 12% from 5% decades ago (Northern Ireland Life & Times Survey 2005). Furthermore, in this context seemingly different cultural norms may instead reflect important socio-economic differences between the two groups, with Catholics having suffered from historic discrimination over access to jobs, housing and political power (Paseta 2003; CAIN 2012). It is possible that once individual characteristics are taken into account, few differences remain between the two groups. In this case, flags may facilitate interactions within the group by accurately identifying group membership, but perhaps their main role is territorial and unrelated to any coordination interactions.

From an empirical perspective there is little research testing the predictions derived from the models described above (Boyd & Richerson 1987; Axtell et al. 2001; McElreath et al. 2003). One recent exception is Jensen et al (2015) who empirically test the hypothesis that cooperation will be directed toward individuals who share the same accent in Denmark. They find that people expect higher success in an imagined interaction where coordination is required with someone who shares their accent, but

find no cooperative preference for people with similar accents in imagined dictator and trust games. Specifically in reference to the prediction that ethnic markers will be more prevalent in boundary regions, there is an indication that ethnic differences may be more marked at group boundary regions on the Lake Baringo region of Kenya (Hodder 1977), but no quantitative studies exist.

In Northern Ireland, sectarian flags are widespread, identifying public and private spaces as Protestant and Catholic, although they are predominantly found in Protestant neighbourhood. The use of flags is a highly contentious issue in the region, often triggering sectarian violence between Catholics and Protestants, and a recent Belfast City council decision to fly only the British flag on certain days led to months of violent riots between the two groups and the police (further described in chapter 4) (BBC News 2014). These flags are predominantly used in Protestant areas and are put up by both paramilitary groups and individuals, and appear to serve two main purposes, marking group territory and as a display of individual group membership (Jarman 2005). Although the flags tend of remain in place most of the year, they are normally put up at the time of important Protestants parades and marches. These marches are a traditional feature for the Protestant community, celebrating historical events of the region and often related to battles with Catholics (**Figure 6.1**). They appear to fulfil a social, religious and political role and have become a highly contentious issue as they are now a recurring flash point for sectarian conflict between the two groups (Anderson & Shuttleworth 1998; Bell et al. 2010; CAIN 2014b).

Figure 6.1 Orange order march on the 12th July celebrating the Battle of Boyne in 1690 when the Protestant King William defeated the Catholic army of King James II (Antonio Silva).

In the models of ethnic markers (Boyd & Richerson 1987; Axtell et al. 2001; McElreath et al. 2003), marker differences co-evolve with behavioural differences as a mechanism allowing individuals to preferentially interact with others that share similar social norms. It is not clear whether flags in Northern Ireland fulfil this function; if the existence of group bias in these groups were the result of behavioural differences and associated coordination issues, then one would expect group markers to function as an identifier of different cultural norms. Alternatively, if the differences in cultural norms between the groups are weak, then group markers could simply function as territorial identification in a situation of group competition over resources and political power.

Belfast provides a suitable setting to empirically test keys aspects of the ethnic marker hypothesis: i) are group markers are more pronounced in boundary areas between Catholic and Protestants?; ii) is cooperative behaviour at the individual level associated with the flying of flags?; iii) is there substantial cultural differentiation between Catholics and Protestants, beyond individual socio-economic differences?

6.3 Data & Methods

6.3.1 Flags

The number of sectarian flags was recorded in 30 Belfast neighbourhoods by an assistant and I over 4 days in June 2012. The counting was performed by walking every single street of the neighbourhood (according to Google Maps) and noting the number of Catholic and Protestant flags using a mechanical counter. The counting consistency had been previously verified by both experimenters recording flags in the same neighbourhood and cross-checking results, but little discrepancy was found (101 vs. 104 flags). A total 1565 flags were counted; of which 1441 were Protestants (92.1%) and 124 were Catholic (7.9%).

We identified the different sectarian flags (**Figure 6.2**, **Figure 6.3**) based on archival data (CAIN 2014c) and informal conversations with local people. The flags were also identified as private (e.g. windows, flag pole) or public (e.g. lamp posts), as they may represent different aspects of group identification; public flags arguably indicate group level enforcement of group markers while private flags indicate individual group membership. Due to the low numbers of Catholic flags, I decided not to perform a separate analysis for private and public Catholic flags.

Figure 6.2 Protestant/Loyalist flags: St. George's, Ulster, United Kingdom, St. Andrew's Cross, St. Patrick's Cross, Orange Order, Ulster Volunteer Force, Ulster Defence League (from left to right)

Figure 6.3 Catholic/Nationalist flag: Tricolour flag.

The variable of the number of flags in a neighbourhood used in the analysis is the ratio of Protestant and Catholic flags by the number of 1000 people of each group living in the neighbourhood (NISRA 2012).

Out-group proximity was measured by the interaction term of neighbourhood religious composition with the neighbourhood religious composition at a 1km radius from the neighbourhood's centroid (see section 2.3.1 for more details on these variables). The religious composition at 1km attempts to determine the proximity of the out-group to individuals beyond their own neighbourhoods and is used in the analysis as an interaction term with the neighbourhood composition to quantitatively capture the neighbourhoods that are surrounded by out-group neighbourhoods. The composition at 1km is a derived variable created using the mapping software ArcGIS 10 (ESRI 2013), which estimated the wider composition based on the surrounding neighbourhoods' composition. Other radiuses were estimated, but the 1km radius was the best variable in the interaction term to explain the variation in the number of Protestant and Catholic flags (**Table 6.2**) and was the one used in the analyses.

The donations data used is the binary variable of whether a donation was made or not to an in-group primary school (see sections 2.2.3 and 3.3 for details on this variable). The self-reported attitudes towards flying the flags were obtained from the survey data (see Q45 in section 10.2.1S) (**Table 6.1**).

Attitudes towards flags	**Protestants**	**Catholics**
	%	%
Should be taken down	28.2	58.5
Should be taken down in public property	18.7	18.9
Should be allowed, but personally don't fly it	31.7	19.6
I often fly it	21.5	3.0
Observations	461	465

Table 6.1 Response distribution to attitudes towards flying the flags. Responses to survey question "*This question is about whether people should display their affiliation with religious/political flags. Which statement applies best to how you feel?*" by religious group.

Models	Protestant Flags	Catholic Flags
	AIC	AIC
Neigh. Composition	200.3	91.0
Neigh. Composition X 0.5 km radius	198.7	78.5
Neigh. Composition X 1 km radius	195.4	60.1
Neigh. Composition X 2 km radius	198.3	59.5
Neigh. Composition X 3 km radius	198.8	60.8
Observations	20	19

Table 6.2 Model selection of the out-group proximity variable. List of models of negative binomial regressions to determine the best model explaining variation in the ratio of Catholic and Protestant flags per 1000 individuals using neighbourhood religion composition and its interaction with the neighbourhood composition at 0.5 km, 1 km, 2km and 3km radius. Lowest AIC value (± 2) indicate best model (underlined). See **Table 10.15 Table 10.16** for regression tables.

6.3.1.1 Analysis

The data analysis is based on negative binomial regressions, which are ideal for over-dispersed count outcome variables (UCLA Statistical Consulting Group), such as number of flags in this sample (mean<variance). The likelihood ratio tests comparing the negative binomial models to Poisson models were significant for all models used, indicating the suitability of negative binomial regressions. I use linear regression to test the associations between neighbourhood mean in-group donations and number of flags ratio, and I used a chi-square goodness of fit test to test the individual donations and self-reported attitudes towards flags, and religious background and attitudes towards flags. The outcome variables used are the ratios of the number of Protestant and Catholic flags by the number of 1000 Protestant and Catholics in the neighbourhood, respectively.

The main explanatory term of interest is the measure of out-group proximity, the interaction between the neighbourhood composition and the neighbourhood composition at 1 km radius. The models also include neighbourhood income deprivation as a control variable (see section 2.3.1.1 for more details on the variables). The measure of in-group cooperative behaviour is the neighbourhood mean of donations of an individual Protestant to a Protestant school and an individual Catholic to a Catholic school.

I ran different negative binomial regression models testing whether out-group proximity predicts the number of Protestant flags, using the overall number, as well as the number of private and public flags. I also ran the same models including neighbourhood income deprivation.

6.3.2 Cultural differences

The cultural characteristics of Catholics and Protestants were obtained from the secondary dataset Understanding Society (Understanding Society 2013). The Understanding Society survey is a UK-wide longitudinal dataset that includes over 3000 individuals living in Northern Ireland and contains extensive information on individual SES, behavioural and attitudinal characteristics, employment and health history, religious beliefs, personality traits and political opinions. The questions used were chosen based on potential traits that could affect the success of individual interactions due to different expectations and beliefs, and included questions on financial risk-taking, gender roles, leisure, social support, professional life and beliefs. The data analysed was from Wave 4 from 2013 (see **Table 10.17** for the questions used)

6.3.2.1 Analysis

The relative level of variation at the between and within group level was determined based on a modified version of the Price equation (Price 1970; Bell et al. 2009; Richerson et al. 2015):

$$\frac{Group\ Benefit}{Individual\ Cost} > \frac{1 - Fst}{Fst}$$

The Price equation was originally proposed to determine the levels of variation of genetic traits using allele frequencies, but has since also been used to quantify differences in cultural traits (Bell et al. 2009; Richerson et al. 2015). The F_{st} represents the fraction of the trait variance that lies between groups and is the key value of interest in this analysis. F_{st} values of 0 indicate a trait is distributed equally between groups and conversely a value of 1 indicates a trait that only exists in one group. F_{st} is calculated by $F_{st}=(H_t-H_s)/H_t$, in which H_t is the total trait heterogeneity and H_s is the average trait heterogeneity across groups (Hawks 2011). This F_{st} analysis was performed for discrete traits in the Understanding Society survey.

I also used multivariate linear and multinomial logistic regressions to determine the importance of religious affiliation in explaining the variation of continuous and categorical trait, controlling for individual characteristics: household income, highest level of education achieved, age and gender (see 2.3.2 for details on these variables).

6.4 Results

6.4.1 Flags

In relation to the first hypothesis I find that there are more flags in Protestant neighbourhoods that are close to predominantly Catholic neighbourhoods. However, this association disappears once neighbourhood income deprivation is taken into account with deprived neighbourhoods having more flags of either group than wealthier ones. These results are similar for the number of Protestant private and public flags, with both being positively predicted by proximity to the out-group in the simple models and neighbourhood deprivation in the combined models (**Table 6.3**). In contrast, I find the number of Catholic flags in neighbourhoods surrounded by Protestant neighbourhoods lower than in Catholic neighbourhoods that are surrounded by Catholic neighbourhoods (**Table 6.4**). This effect in relation to the Catholic flags remains when controlling for income deprivation, which positively predicts the number of both Protestant and Catholic flags (**Table 6.3**, **Table 6.4**)

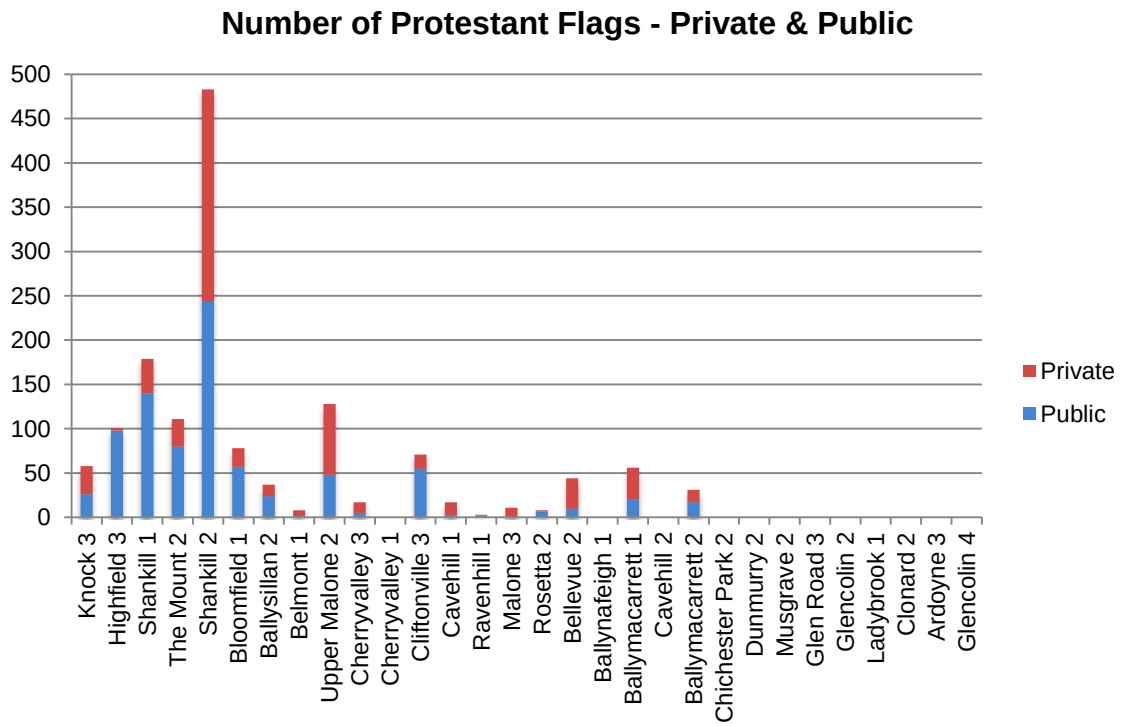

Figure 6.4. Number of public and private Protestant flags in the 30 Belfast neighbourhoods (sample A). Sorted from left to right by neigh. religious composition (perc. of Catholics).

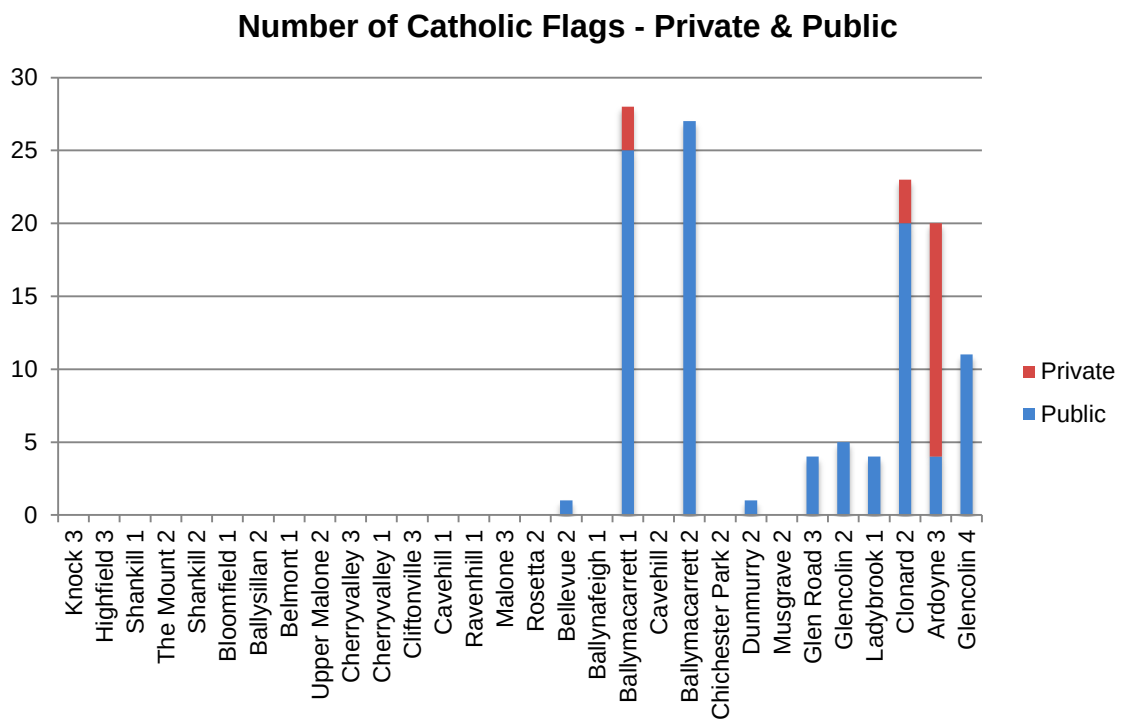

Figure 6.5 Number of public and private Catholics flags in the 30 Belfast neighbourhoods (sample A). Sorted from left to right by neigh. religious composition (perc. of Catholics).

In relation to the second hypothesis, I find no association between neighbourhood mean donations to in-group primary schools and number of flags ratio for either Protestant (β [95CI] = -0.00 [-0.01;0.00]; p>0.05) or Catholic flags (β [95CI] = 0.00 [-0.07;0.09]; p>0.05). The analysis of the survey data also finds no association between Protestant in-group donations and self-reported attitudes towards flying the flags (X^2=2.94; p>0.05), including no association between people flying the flag themselves and donating to the in-group (X^2=0.27; p>0.05).

	Prot. Flags	Priv. Prot. Flags	Pub. Prot. Flags	Prot. Flags (Inc. Dep.)	Priv. Prot. Flags (Inc. Dep.)	Pub. Prot. Flags (Inc. Dep.)
	β [CI]	β [CI]	β [CI]	β [CI]	β [CI]	β [CI]
Neigh. Composition	0.11 [-0.00,0.22]	0.08 [-0.02,0.19]	0.11 [0.00,0.23]	0.04 [-0.06,0.13]	-0.02 [-0.09,0.05]	0.07 [-0.05,0.19]
Neigh. Composition (1 km radius)	0.05** [0.02,0.09]	0.06* [0.01,0.10]	0.05** [0.01,0.09]	0.01 [-0.03,0.06]	-0.01 [-0.04,0.03]	0.03 [-0.03,0.08]
Neigh. Composition X Neigh. Composition (1 km radius)	-0.00* [-0.01,-0.00]	-0.00* [-0.01,-0.00]	-0.00* [-0.01,-0.00]	-0.00 [-0.00,0.00]	0.00 [-0.00,0.00]	-0.00 [-0.00,0.00]
Income Deprivation	-	-	-	4.06** [1.41,6.70]	6.77*** [4.21,9.34]	2.38 [-0.94,5.70]
Constant	2.67*** [1.50,3.84]	2.22*** [0.89,3.56]	1.72** [0.47,2.97]	2.05*** [1.05,3.04]	1.05* [0.15,1.94]	1.46** [0.24,2.69]
Observations	20	20	20	20	20	20

Table 6.3 Protestant flag ratios by out-group proximity. Coefficients and 95% confidence intervals from negative binomial regression used to predict the number of Protestant flags ratio per 1000 Protestants in a neighbourhood by out-group proximity (measured by the interaction term between neighbourhood religious composition and composition in 1 Km radius)
***p<.001; **p<.01; *p<..05; .p<.1

	Cath. Flags	Cath. Flags (Inc. Dep.)
	β [CI]	β [CI]
Neigh. Composition	-0.26*** [-0.37,-0.15]	-0.25*** [-0.33,-0.16]
Neigh. Composition (1 km radius)	-0.82*** [-1.12,-0.52]	-0.63*** [-0.87,-0.40]
Neigh. Composition X Neigh. Composition (1 km radius)	0.01*** [0.01,0.01]	0.01*** [0.00,0.01]
Income Deprivation	-	4.09** [1.06,7.13]
Constant	28.20*** [18.34,38.05]	22.86*** [15.07,30.66]
Observations	19	19

Table 6.4 Catholic flag ratios by out-group proximity. Coefficients and 95% confidence intervals from negative binomial regression used to predict the number of Catholic flags ratio per 1000 Catholics in a neighbourhood in a neighbourhood by out-group proximity (measured by the interaction term between neighbourhood religious composition and composition in 1 Km radius). ***p<.001; **p<.01; *p<..05; .p<.1

From the sample of the main survey, I find significant differences between Catholics' and Protestants' attitudes towards the flags (X^2=126.87; p<0.001), with only 3% of Catholics frequently flying the flag compared with 22% of Protestants and a majority of Catholics feeling that all the flags should be taken down, compared to only 28% of Protestants who share this opinion (**Table 6.5**).

Response	Protestants	Catholics
	%	%
Take down	28.2%	58.5%
Not in public	18.7%	18.9%
Ok with flags	31.7%	19.6%
Often fly flags	3.0%	21.5%
Observations	461	465

Table 6.5 Responses to survey question on opinions about flying sectarian flags by religious group. See survey question 45 in section 10.1.1.

6.4.2 Cultural Differences

The analyses of cultural differences between Catholic and Protestants across a series self-reported attitudes and behaviours finds significant variation between the two groups for some traits. The F_{st} analysis shows some variation between Catholics and Protestants for a few traits, namely between-group variation accounting for between 10 and 13% of the overall variation in trade union membership, owing shares, having savings, credit cards and religious activity (**Table 6.6**). There are significant differences between Catholics and Protestants for 12 out of 34 traits, with group identity remaining significant in the adjusted models controlling for individual characteristics (**Table 6.7**). Education is the only trait that becomes significantly different in the adjusted model, with Protestants more likely to have degrees. A more in-depth analysis of this relationship shows that older Protestants are more likely to be educated, with the inverse happening for younger generations with Catholics now being more likely to have a university degree (see section 10.2.4 for unadjusted and adjusted regression tables)

Question	n	F_{st}	Catholics (%)	Protestants (%)
Start Business	1360	0.00	10.6	10.4
Invest Shares	2660	0.11	10.0	17.0
Savings	2713	0.10	31.6	41.1
Credit cards	2724	0.10	36.0	45.8
Give to charity	2727	0.01	27.4	25.43
Unionised	580	0.13	75.9	65.5
Religious Active	2732	0.11	66.3	55.9

Table 6.6 F_{st} values from responses to the Understanding Society survey by Catholics and Protestants. Sample size, F_{st} values and percentage distribution of *Yes* responses to surveys questions **(Table 10.17**) by each religious group.

Question	n	Simple Models	Adjusted Models
Life Stages			
Age wanting to get married	216	No sign. difference	No sign. difference
Age starting a family	209	No sign. difference	No sign. difference
Age leaving home	234	No sign. difference	No sign. difference
Beliefs			
Importance of education for sense of self	247	No sign. difference	No sign. difference
Importance of political beliefs for sense of self	193	No sign. difference	No sign. difference
Importance of family for sense of self	250	No sign. difference	No sign. difference
Importance of occupation for sense of self	201	No sign. difference	No sign. difference
Importance of ethnic background for sense of self	221	Prot. consider ethnicity less important	Prot. consider ethnicity less important
How religious active	2732	Prot. are less religious active	Prot. are less religious active
Work			
No. of overtime hours per week	1163	No sign. difference	No sign. difference
Job satisfaction	1362	No sign. difference	No sign. difference
Member of workplace union	580	Prot. less likely to be unionised	Prot. less likely to be unionised
Current economic activity	2732	Prot. less likely to be disabled/sick and student	Prot. less likely to be disabled/sick and student
Financial Risk			
Would like to start own business	1360	No sign. difference	No sign. difference
Total HH debt	567	No sign. difference	No sign. difference
Have credit cards	2724	Prot. more likely to have credit card	Prot. more likely to have credit card
Investment in shares	2660	Prot. more likely to have shares	Prot. more likely to have shares
Savings	2713	Prot. more likely to have savings	Prot. more likely to have savings
Long/Short term savings	1007	No sign. difference	No sign. difference

Cooperation			
Donations to charities	2727	No sign. difference	No sign. difference
Gender Roles			
Who does the grocery shopping	1556	No sign. difference	No sign. difference
Who does the cooking	1562	No sign. difference	No sign. difference
Who does the cleaning	1505	No sign. difference	No sign. difference
Who does the laundry	1535	No sign. difference	No sign. difference
Who does the financial decisions	1565	No sign. difference	No sign. difference
Who is responsible for childcare	618	Prot. more likely to share childcare	Prot. more likely to share childcare
General			
Income	2732	No sign. difference	No sign. difference
Education	2696	No sign. difference	Prots. more likely to have degrees
Life satisfaction	2304	No sign. difference	No sign. difference
Income satisfaction	2302	No sign. difference	No sign. difference
Capable of making decisions	2306	No sign. difference	No sign. difference
Hours doing housework per week	2726	Prot. spend less time on housework	Prot. spend less time on housework
How many alc. drinks in past month	210	No sign. difference	No sign. difference
Feel supported by family	242	No sign. difference	No sign. difference

Table 6.7 Questions from the Understanding Society survey and statistical significant differences in simple and adjusted models (include household income, education, age and gender). See section 10.2.4 for the regression tables.

6.5 Discussion

I find weak support for a key corollary of the ethnic marker hypothesis - "*ethnic differences should be stronger at boundary regions than deep within ethnic territories*" (McElreath et al. 2003, p.129). There are more Protestant flags in Protestant neighbourhoods that are in close proximity to Catholic areas, but there is the opposite effect for Catholic flags, with more flags in Catholic neighbourhoods not in close proximity to Protestant areas. In relation to Catholic flags this effect remains when taking into account the income deprivation of the neighbourhood, but disappears for Protestant flags. In both cases, poor neighbourhoods have more flags than wealthy neighbourhoods.

It is important to be aware that Catholic flags are substantially less common than Protestant flags, so it is possible that they fulfil different roles in the Northern Irish context. Notably, Protestant flags have a symbolic importance that does not seem to apply to Catholic flags, with issues around the presence of Protestant flags having become a recurring conflict flashpoint between the two groups (Anderson & Shuttleworth 1998; Bell et al. 2010). This is confirmed by my survey data that finds Catholics significantly more opposed to the flags than Protestants. The distribution of Protestant flags is better explained by income deprivation than proximity to Catholic areas, which may indicate that the importance of group identification varies between individuals living in wealthy and deprived areas. It is possible that interactions between the two groups have higher coordination costs for low S.E.S. individuals, but the data on cultural differences does not support this interpretation as individual S.E.S. characteristics have little impact on the amount of variation that is explained by religious group. Furthermore in chapter 3 I found low S.E.S individuals to not be any more parochial than high S.E.S. in either donations or lost letters' returns.

There is extensive evidence that people tend to preferentially cooperate with their own group (Yamagishi et al. 1999; Bernhard et al. 2006), but this may not necessarily be related to coordination issues, as expectations of future reciprocity with in-groups (Yamagishi & Kiyonari 2000; Yamagishi & Mifune 2008) and reputation management (Habyarimana et al. 2007) can also explain this bias. Findings from empirical work demonstrate that in-group favouritism can exist in marked groups in the absence of shared preferences, as increased findability of marked group members allows better reputation management and sanctioning mechanisms to operate (Habyarimana et al. 2007).

Theoretically the existence of markers could either be a response to a lack of cooperation, or lack of cooperation could be caused by the lack of markers, so finding no association between markers and level of in-group donations is perhaps not surprising. The ethnic marker hypothesis is only relevant for cooperative interactions that require coordination, so one should only expect higher levels of cooperation towards individuals with shared markers when coordination is required (Efferson et al. 2008).

The analysis of behavioural and attitudinal diversity between the two groups indicated that some interactions with out-group individuals may lead to coordination issues. Despite the fact that the majority of traits analysed did not significantly differ between

Catholics and Protestants, there were some important traits that did. Notably, the most consistent differences were related to financial behaviour, with Protestants more likely to have credit cards, invest in shares and have more savings. Protestants appear to be more financial savvy than Catholics, despite no significant differences in income between the two groups. There were also some differences in education, with Protestants more likely to have degrees, but losing the educational advantage in the younger generation, with young Catholics being more likely to have a degree than young Protestants. This seems to reflect the changing socio-economic reality of the region with Catholics taking advantage of greater access to jobs and education, which had historically been curtailed, and this is a good example of how changes in institutional structures can have an impact on inter-group status dynamics. When it comes to gender norms - important to the key coordination interaction that is marriage - there are no differences in specific behaviours and attitudes, but Protestants tend to share childcare by both parents more, while Catholics tend to rely more on the mother.

In addition to provide another way to explore the level of cultural differences between the two groups, the F_{st} data is also relevant to determine the potential strength of selection operating at the group level. Based on the Price equation, a trait will be selected if it provides group benefits and is not costly to the individual, but individually costly traits can still be selected if either the group benefits are large enough or their variation lies mostly between groups. From a theoretical perspective, an individually costly trait with a large F_{st} value (i.e. most of the variation for the trait is between groups) can be selected (Price 1970; Bell et al. 2009). Due to the geometric relationship between costs/benefits ratio and F_{st} values, traits with F_{st} above 0.01 are substantially more likely to be under cultural group selection (Richerson et al. 2015). Some of the traits analysed fulfil this criteria and speculatively, cultural group selection could operate by groups with norms of financial risk taking (e.g. Protestants) out-competing more risk-averse groups (e.g. Catholics). However, these analyses measure variation only between two groups, which is arguably insufficient to accurately assess and generalise the role of between-group variation in shaping selection. Furthermore, without being able to establish the associated cost and benefits of the trait for the individual and the group it is not possible to test the relevance of cultural group selection in this context.

Overall, these cultural differences may negatively impact the costs of interaction between Catholic and Protestant individuals, partially explaining the existence of in-group bias and the need for ethnic markers. However, the available data used in this study does not allow for conclusive inferences to be made. First, it has not been

possible to establish that sectarian flags in Belfast function as coordination signals, as expressed in the ethnic markers hypothesis (Boyd & Richerson 1987; Axtell et al. 2001; McElreath et al. 2003); the distribution of Protestant flags follows the corollary of the hypothesis, with boundary areas more likely to have flags, but this prediction could equally arise from increased territorial disputes in these areas. Second, it is not clear whether people prefer to interact with members of their own group due to coordination advantages, or whether flags are associated with shared norms. Despite the limitations of the study, the analyses of the behavioural and attitudinal differences still provide an interesting snapshot of the two groups living in Northern Ireland and further inform the debate on the role of multi-level selection.

7 Naturalist measures of variation in cooperative behaviour

7.1 Summary

The variation in cooperative behaviour across human populations is likely to be partly explained by variation in the ecological context of the populations. Studies measuring this variation tend to assume that cooperation is a stable phenotypic trait across domains although this yet to be empirically confirmed. In this study I investigate whether the area level ecological context determines the variation in cooperative behaviour using four naturalistic measures – lost tourist, dropped coin, lost letters and donations – and apply these methods across 22 neighbourhoods with a wide range of socio-economic characteristics in Belfast, UK. I also hypothesise that cooperation is not a discrete trait and it will vary across domains, depending on specific cost and benefits associated with each behaviour. The results demonstrate that cooperation is negatively affected by neighbourhood income deprivation across all measures and varies by gender, age and group size. People are more likely to help someone of the opposite gender, older people are more likely help and groups are less likely to help than individuals on their own. These findings confirm the importance of socio-economic characteristics in explaining variation of cooperative behaviour and are found across all measures indicating that cooperation may be stable across domains.

7.2 Introduction

Humans display a variety of cooperative behaviour across multiple domains, from helping strangers on the street (Goldberg 1995), paying taxes (Dhami & al-Nowaihi 2007), to giving money to charity (Raihani 2014). These types of cooperation are likely to depend on future opportunities for reciprocation, increased mating opportunities or reputation enhancement (Nowak 2006). The level of cooperation observed in a population is likely to vary according to its ecological context and its associated cost and benefits; for example those with stable lifestyles may have longer time horizons and thus weight future benefits against immediate ones (Nettle 2010; Pepper & Nettle 2014), those in poverty may prefer quick rewards even if there is a risk of incurring punishment or loss (Lynam et al. 2000), and those with more close kin in the population around them may be more cooperative (Betzig & Turke 1986).

From a behavioural ecology perspective, the level and type of resources available should shape the behaviour of individuals living a specific environment (Cronk et al. 2000; Borgerhoff Mulder 1991). However, the theoretical framework on how wealth and resources should affect cooperative behaviour is somewhat undeveloped. The concept of generalised reciprocity provides a useful framework to understand how harsh environments can result in a negative feedback loop of reducing social cohesion and trust. Based on this idea, if an individual's past experience has been negative, he or she is more likely to then not cooperate in subsequent interactions (Pfeiffer et al. 2005; Nowak & Roch 2007). These issues are expanded on section 1.1.5, but empirically the impact of status and income deprivation on cooperation has not been established, with conflicting results on whether wealth increases or reduces levels of cooperation (Paul K Piff et al. 2012; Holland et al. 2012; R. Bauer et al. 2014; Charities Aid Foundation 2006; Wilson et al. 2009; Nettle et al. 2011; Cardenas 2003). In addition, it is also unclear what is the relative importance of individual and contextual characteristics on cooperation (Sampson et al. 2002).

Wilson et al (2009) demonstrated how the level of neighbourhood social support (subjective measure of neighbourhood safety and helpful neighbours) in Binghamton, U.S.A. positively affected individual cooperative behaviour, indicating how contextual cues at the neighbourhood level can help explain individual behaviour. Other studies have also suggested how the level of neighbourhood income deprivation negatively affects altruistic behaviour in Newcastle and London, UK (Nettle et al. 2011; Holland et al. 2012). Notably, a study found the variation in cooperative behaviour to be better predicted by contextual factors - childhood exposure to crime and family conflict – than individual socio-economic status (S.E.S.) characteristics (McCullough et al. 2012).

Studies investigating the relationship between resources and status on cooperation tend to pick one proxy for what is a multi-faceted factor that encompasses other relevant issues, such as mental and physical health (Ludwig et al. 2012), education (Sampson et al. 1997) and area-level crime rates (Holland et al. 2012). For example, not having money does not simply affect one's ability to eat or pay the rent, but it can also lead to cognitive constraints that impair decision-making abilities and produce sub-optimal behaviour (Mullainathan & Shariff 2013).

The different theories of the evolution of cooperation are empirically tested - using economic games and real-life measures - with the assumption that cooperative behaviour is a discrete trait that reflects a general tendency to cooperate or not

(Peysakhovich et al. 2014). However, cooperation is likely to be a multi-dimensional behaviour conditional on the varying costs and benefits associated to a specific act, and several studies have found cross-situational inconsistency of cooperative behaviour in the lab and field (U. Gneezy et al. 2004; S. D. Levitt & List 2007; Laury & L. O. Taylor 2008; Benz & Meier 2008; Voors et al. 2012). As a result, in this study I will use four measures of cooperative behaviour to determine how cooperation varies across domains in a real-word setting. The donations and dropped coin experiment have a an associated monetary cost and benefit, while the lost letter and lost tourist experiments only represent a time commitment to find a post-box or give directions to someone. In addition, the lost letter experiment is completely anonymous and ultimately has no identifiable direct or indirect benefits. Based on the characteristics of each behaviour, such as levels of anonymity and associated monetary cost I make a series of hypotheses: i) cooperative behaviour will vary across domains ii) measures involving money will be determined mainly by income deprivation; iii) lower levels of cooperation in anonymous measures without personal interactions.

The main aim of this chapter is to test how different contextual neighbourhood characteristics affect individual cooperation. Specifically, which aspect of deprivation is principally responsible for the variation in cooperative behaviour, as income deprivation, crime and social capital are all inter-related concepts, but it is unclear which characteristic is the driving force in influencing whether people choose to cooperate or not. I also test how individual level characteristics affect cooperative behaviour, specifically looking at how the gender, age and group size predict the likelihood of helping behaviour. Finally, for the donations experiment I am able to determine the relative importance of individual and area-level variables in explaining the variation in cooperation.

7.3 Data & Methods

7.3.1 Lost tourist experiment

A total of 264 lost tourist experiments were performed in 22 Belfast neighbourhoods (sample B). The goal of this experiment was to measure cooperation in a situation of direct personal contact with a small cost (time) associated with the cooperative act. A male (Leo) and a female (Emily) experimenter in their early 20s performed the experiments by opening a foldout map of Belfast in a main street of a neighbourhood and recording how long it took for someone to offer them help with directions. The experimenters and I chose a busy, central location in the neighbourhood, based on

our personal experience of the neighbourhoods where we had previously spent considerable amount of time conducting the surveys. The number of people in the helper group, their gender and approximate age were recorded.

Each experimenter conducted 132 rounds of the experiment between 12.00 and 14.00 during May, June and July 2012. Each round lasted 5 minutes and if no one volunteered help during that time, it was recorded as *no help*. If someone approached the experimenter and asked if they needed help during that time it was recorded as *help*. The experimenter recorded the characteristics of the helpers.

The number, gender and age of helpers was determined by the experimenter through visual observation. Age was recorded as child, 15-25, 25-35, 35-45, 45-55 and over 55. The type of group was derived from the number and gender of helpers and was coded as *Single Male*, *Single Female*, *Female Group*, *Male Group* and *Couple* (groups of two people composed of a man and a woman). The specific person in a group offering help was also recorded.

7.3.2 Dropped Coin Experiment

A total of 440 dropped coins experiments were performed in 22 Belfast neighbourhoods (sample B). The goal of this experiment was to measure cooperation in a situation of direct personal contact with a small monetary cost (50p) associated with the cooperative act. A male (Leo) and a female (Emily) experimenter performed the experiments by walking in front of a passer-by on the street, dropping a 50p coin and continuing to walk for 30 seconds. The experimenter stood in a corner at an intersection of the main street of the neighbourhood with a side street (near the spot chosen for the lost tourist experiment), waited for a pedestrian to start crossing the side street and started to walk in front at an approximate distance of 3 meters. The experimenter then waited for 5 seconds, dropped the coin from his or her pocket and kept on walking. After 30 seconds, we recorded whether the coin was kept or returned as the measure of cooperation, and also identified the number of people in the group, their gender and approximate age. A total of 111 people ignored the coin and these data points were not used in the analyses due to uncertainty in interpreting this behaviour, leaving a total of 329 experiments.

Leo conducted 222 experiments and Emily 222 between 12.00 and 14.00 during May and July 2012. While one experimenter was conducting the experiment, the other experimenter was recording the characteristics of the passers-by in a notebook.

The number, gender and age of the participants was determined by the observer. Age was recorded as child, 15-25, 25-35, 35-45, 45-55 and over 55. The type of group was derived from the number and gender of the participants and was coded as *Single Male*, *Single Female*, *Female Group*, *Male Group, Mixed Group (*groups are composed of two or more people) and *Couple* (groups of two people composed of a man and a woman). The specific person in a group returning the coin was also recorded.

7.3.3 Lost Letters

A total of 480 lost letters addressed to a fictitious unbiased charity *CancerAid* were dropped by me in 30 Belfast neighbourhoods (sample A) in two rounds in May and June 2012 and 2013. This data-set adds 128 letters from 8 neighbourhoods to the original data-set used in chapter 3, as sectarian threat variables are not used in the analysis. The experimental methodology is described in more detail in section 2.2.5.

7.3.4 Donations

A total of 168 donation experiments to the unbiased charity *Save the Children* were performed in 16 Belfast neighbourhoods (sample C) in May, June and July 2012. The experimental methodology is described in more detail in section 2.2.3.

7.3.5 Analysis

I used a model selection approach (Akaike 1974; Burnham & Anderson 1998) with a series of univariate logistic regressions to determine the relative importance of income deprivation, crime and social capital in explaining the variation in cooperation for each measure (the lost letter analysis was also controlled for population density and number of post-boxes, and the lost tourist analysis was controlled for population density).

I also used a model selection approach with a series of multi-level logistic regressions to compare the relative importance of neighbourhood and individual level variables of income (neighbourhood income deprivation and household income) and education (proportion of graduates and highest educational level achieved) in explaining the variation in donations (see section 2.3 for more details on the variables used in the analyses).

The binary response variables used in the analyses were whether someone offered to help in the lost tourist experiment, returned the coin in the dropped coin experiment,

returned the letter in the lost letter experiment and donated money to *Save the Children* in the donations experiment.

I ran a series of multivariate logistic regressions to determine the role of group composition, experimenter and the interaction of these two terms in the variation of helping behaviour. In the dropped coin experiment the explanatory variables were the type of group, the experimenter and the interaction of these two terms. In the donations experiments the explanatory variables were the gender of the participant, the experimenter and the interaction of these two terms. In the lost tourist experiment there was only information available for the type of the group that helped and no direct information on the type of passers-by that did not help. As a result, I used a chi-square test to compare the characteristics of the helpers with the characteristics of people passing by in the dropped coin experiment, as they were recorded in the same neighbourhoods at the same time of the day as the lost tourist experiments were conducted, and consequently could be considered as accurate estimates of the characteristics of passers-by.

7.4 Results

Overall, 67% of people in the sample provided help across the different measures, with people most likely to cooperate in the donations experiment and least likely in the lost tourist experiment (**Table 7.1**).

	Maps	Coins	Lost Letters	Donations	Total
No Help	107 (40.5%)	109 (33.1%)	158 (32.9%)	40 (23.8%)	414 (33%)
Help	157 (59.5%)	220 (66.9%)	322 (67.1%)	128 (76.2%)	827 (67%)

Table 7.1. Frequency and percentage of help provided in the lost tourist, dropped coin, lost letter and donations experiments.

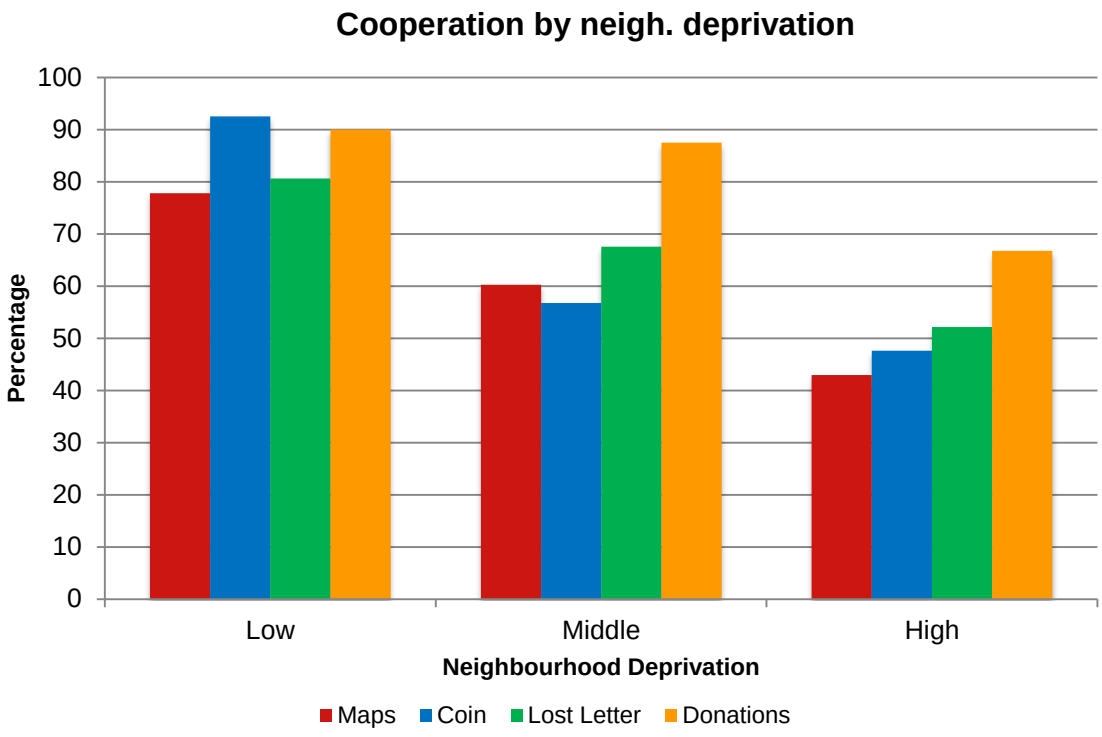

Figure 7.1 Cooperation by neighbourhood deprivation. Percentage of times helping behaviour occurred in the lost tourist, dropped coin, lost letter and donations experiment by neighbourhood income deprivation. Helping behaviour: lost tourist – asking if the experimenter needed help under 5 minutes; dropped coin – returning a dropped coin to the experiment; lost letter – posting back a stamped lost letter dropped in the pavement; donation – donating money to *Save the Children*.

The main determinant of cooperative behaviour across the four measures is income deprivation. In poorer neighbourhoods people are less likely to help others and this applies to all measures, including helping people that look lost, return a dropped coin or a lost letter, and donating to Save the Children (**Table 7.3**; **Figure 7.1**). The differences in helping behaviour between rich and poor neighbourhoods are striking, with for example 92.5% of people returning the coin in rich neighbourhoods, compared to 47.6% in poor neighbourhoods (**Figure 7.1**). Neighbourhood level crime rates are the best predictor for donations data, but deprivation negatively affects all types of cooperative behaviour (**Table 7.2**).

Model	**Maps**	**Coins**	**Lost Letters**	**Donations**
	AIC	AIC	AIC	AIC
Income Deprivation	331.7	362.6	441.7	175.6
Crime	348.9	407.7	444.0	172.4
Social Capital Index	350.4	385.3	447.4	182.8
Observations	264	329	352	168

Table 7.2 Model selection for the 4 measures by neighbourhood level predictors. List of models of univariate logistic regressions to determine the best model explaining variation in

cooperative behaviour. Lowest AIC value (± 2) indicate best model (underlined). See **Table 10.35** for the models' regressions.

	Maps	**Coins**	**Lost Letters**	**Donations**
	OR [95CI]	OR [95CI]	OR [95CI]	OR [95CI]
Mid Neigh. Deprivation	0.44*	0.11***	0.54*	0.64
(ref. Low Neigh. Deprivation)	[0.22,0.89]	[0.05,0.23]	[0.32,0.92]	[0.20,2.00]
High Neigh. Deprivation	0.23***	0.07***	0.34***	0.26*
(ref. Low Neigh. Deprivation)	[0.11,0.49]	[0.03,0.16]	[0.19,0.60]	[0.09,0.76]
Pop. Density	1.00	-	1.00	-
	[0.98,1.01]		[0.99,1.01]	
Number of Post-boxes	-	-	1.10	-
			[0.96,1.27]	
Constant	3.85***	12.33***	3.57***	7.00***
	[1.82,8.15]	[6.25,24.33]	[1.72,7.40]	[2.74,17.87]
Observations	264	329	480	168

Table 7.3 Cooperation by income deprivation. Odd ratios and 95% confidence intervals from logistic regressions used to predict to odds of being helped when lost, returning a dropped coin, returning a lost letter and donating to a neutral charity, by neighbourhood income deprivation. ***p<.001; **p<.01; *p<..05; .p<.1

The donations data includes individual and neighbourhood level data and as a result I can assess the relative importance of individual and area level S.E.S. The model comparison shows that neighbourhood level income deprivation and education better explain the variation of donations, with individual level variables not adding any explanatory power (**Table 7.4**).

Models	**Donations**
	AIC
Individual Education	186.5
Neighbourhood Education	178.9
Ind. and Neigh. Education	186.0
Individual Income	182.5
Neighbourhood Income	174.0
Ind. and Neigh. Income	175.0
Neigh. Education and Income	175.1
Ind. Education and Income	187.6
Ind. and Neigh. Education and Income	183.3
Observations	159

Table 7.4 Model selection for donations by individual and neighbourhood-level income and education. List of models of logistic regressions to determine the best model explaining variation in cooperative behaviour using individual and neighbourhood level variables of income (household income and neigh. income deprivation) and education (highest educational level achieved and neigh. percentage of graduates). Lowest AIC value (± 2) indicate best model (underlined). See **Table 10.36** for the models' regressions.

There is also variation on the types of people that are likely to provide help. While there is no significant difference between men's and women's behaviour on their own or in a group, groups of men or women are significantly less likely to help than individuals on their own in both the dropped coin and lost tourist experiments. In the dropped coin experiment, couples (i.e. one woman and one man together) return the coin 92% of the times, compared to for example, male and female groups returning the coin 42% and 46% of the times, respectively (**Table 7.5**; **Figure 7.2**).

In relation to the lost tourist experiment, no data was recorded on the passers-by but assuming similar distributions of group types as the ones recorded for the dropped coin experiment (conducted in the same neighbourhoods at the same time of the day), the same trend is observed with single men and single women disproportionately helping the lost experimenter and groups of men and groups of women disproportionately not helping (X^2=39.95; df=5; p<0.001) (**Table 7.6**; **Figure 7.3**). When looking at who initiates the helping behaviour in couples, men are substantially more likely to do so with 80.8% of the time in the map experiment and 93.0% of the time in the dropped coin experiment.

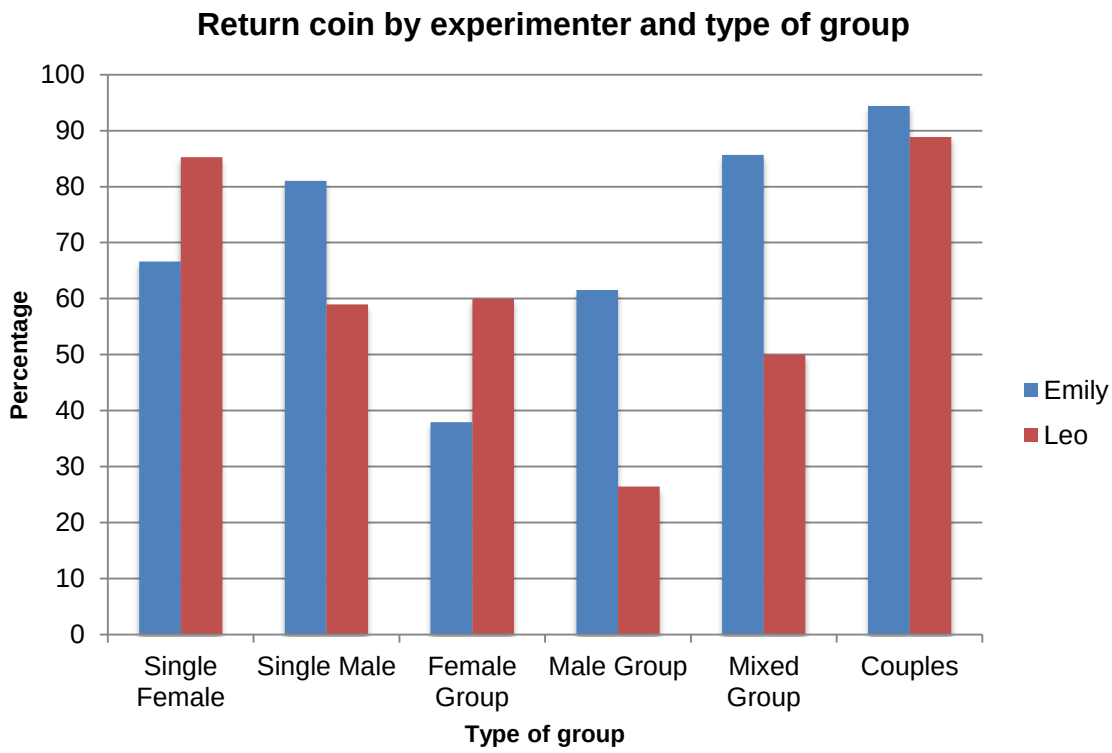

Figure 7.2 Percentage of time a coin was returned by experimenter and type of group.

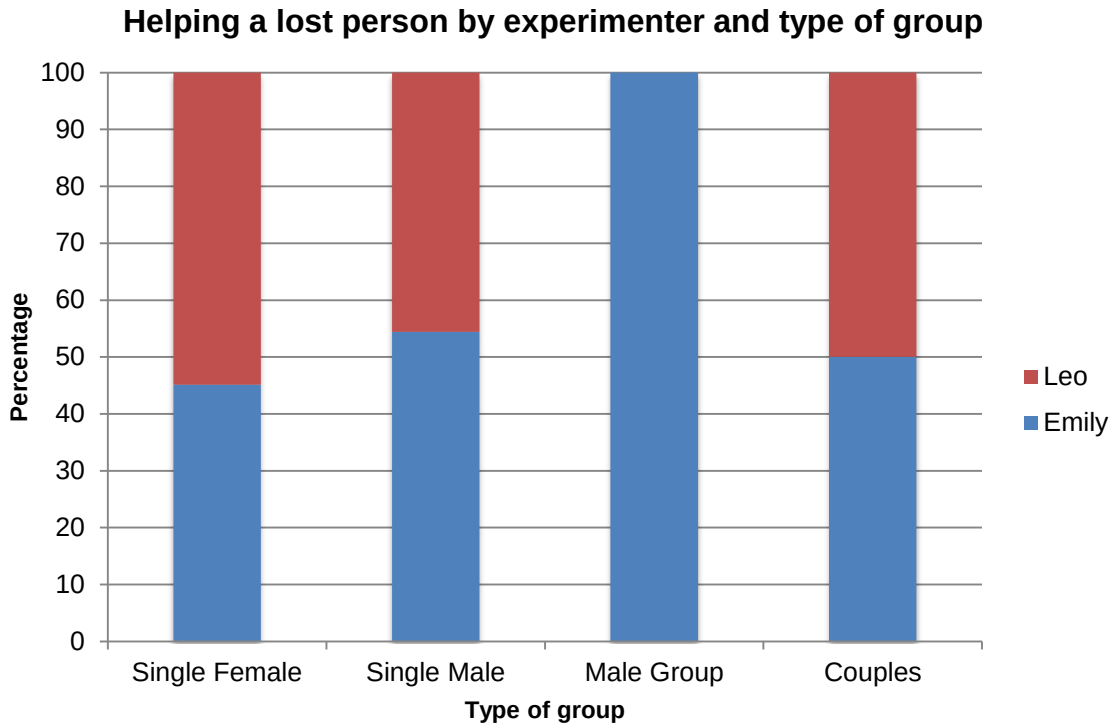

Figure 7.3 Percentage of time the experimenter was helped in the lost tourist experiment by experimenter and type of group.

The variation in cooperation is also significantly explained by gender effects with Emily, the female experimenter, and Leo, the male experimenter, being more likely to be helped by their opposite gender. When Emily drops a coin, she is 21% more likely to be helped by a man than by a woman, while Leo is 44% less likely to be helped by a man than by a woman (**Table 7.5**; **Figure 7.2**).

Similarly, when Emily is looking lost she has a 10% higher probability that a man will come to help her than a woman, and the inverse is true for Leo, although neither differences are statistically significant. The helping behaviour of groups of men and women are particularly gender biased, with no groups of men helping Leo when he is looking lost compared with Emily being helped 12 times (**Figure 7.3**), and group of men only returning a coin 26% of the time to Leo compared to 62% to Emily. These effects are not significantly mediated by income deprivation, as no significant interaction effects between the experimenter, type of group and income deprivation were found for any of the three measures (**Table 10.37**).

In relation to the donations experiment, there is no gender effect on donations with no significant difference between men and women in donations. Leo, the male

experimenter, receives significantly more than Emily, a female experimenter, but men and women donate equally to all experimenters (**Table 7.7**).

	Coins	**Coins (Experimenter)**
	OR [95CI]	OR [95CI]
Leo	-	2.90
(ref. Emily)		[0.90,9.39]
Single Male	0.74	2.14
(ref. Single Female)	[0.35,1.54]	[0.73,6.28]
Female Group	0.28**	0.31*
(ref. Single Female)	[0.13,0.62]	[0.11,0.85]
Male Group	0.23***	0.80
(ref. Single Female)	[0.11,0.48]	[0.28,2.29]
Mixed Group	0.86	3.00
(ref. Single Female)	[0.20,3.59]	[0.32,27.83]
Couple	3.70*	8.50**
(ref. Single Female)	[1.28,10.79]	[1.74,41.50]
Leo X Single Male	-	0.12**
		[0.02,0.56]
Leo X Female Group	-	0.85
		[0.16,4.44]
Leo X Male Group	-	0.08**
		[0.02,0.39]
Leo X Mixed Group	-	0.06
		[0.00,1.30]
Leo X Couple	-	0.16
		[0.02,1.47]
Constant	3.12***	2.00*
	[1.81,5.38]	[1.00,4.00]
Observations	329	329

Table 7.5 Coins' returns by experimenter and group-type. Odd ratios and 95% confidence intervals from logistic regression used to predict to odds of a dropped coin being returned by type of group and by experimenter. ***p<.001; **p<.01; *p<..05; .p<.1

Type of Group	**Expected**	**Observed**
Single Female	21.4%	32.5%
Single Male	26.8%	43.3%
Female Group	16.1%	0.0%
Male Group	16.4%	7.6%
Mixed Group	3.2%	0%
Couple	16.1%	16.6%

Table 7.6 Expected and observed values of passers-by that helped in the lost tourist experiment. Expected values are obtained from the random sampling of the dropped coin experiments and observed values are the percentage of each group that helped the experimenter looking lost. ***p<.001; **p<.01; *p<..05; .p<.1

	Donations	Donations (Experimenter)
	OR [95CI]	OR [95CI]
Leo	-	3.50*
(ref. Emily)		[1.10,11.09]
Ram	-	3.50
(ref. Emily)		[0.68,17.96]
Male	1.02	1.53
(ref. Female)	[0.50,2.08]	[0.54,4.37]
Leo X Male	-	0.46
		[0.08,2.54]
Ram X Female	-	1.00
		[1.00,1.00]
Ram X Male	-	0.34
		[0.04,2.66]
Constant	3.14	1.71
	[1.92,5.14]	[0.89,3.31]
Observations	167	167

Table 7.7 Donations by experimenter and respondent's gender. Odd ratios and 95% confidence intervals from logistic regression used to predict the odds of donating to the neutral charity *Save the Children* by gender and by experimenter. ***p<.001; **p<.01; *p<..05; .p<.1

Age is a reliable predictor of helping behaviour, with older people being significantly more likely to return a dropped coin, donating to Save the Children (**Table 7.8**) and helping a lost person (**Table 7.9**). People over 55 are twice as likely to return a dropped coin and 64% more likely to donate than people under 26; in the lost tourist experiment, people over 55 return the coin 62% more often than expected by their prevalence in the street, while people under 26 help less than half than what expected (X^2=31.31; df=5; p<0.001). Having a child present has no significant impact on the likelihood of a coin being returned (OR [CI] =0.73 [0.37;1.54]; p>0.05).

	Coins (1st Person)	Coin (2nd Person)	(Donations)
	OR [95CI]	OR [95CI]	OR [95CI]
25-35	2.00*	4.03***	2.30**
(ref. 15-25)	[1.08,3.71]	[1.78,9.08]	[1.22,4.32]
35-45	2.63**	6.76***	2.87**
(ref. 15-25)	[1.40,4.92]	[2.68,17.04]	[1.49,5.53]
45-55	7.30***	6.56**	3.35***
(ref. 15-25)	[2.81,18.97]	[1.63,26.46]	[1.71,6.56]
>55	27.38**	-	3.35***
(ref. 15-25)	[3.55,211.01]		[1.71,6.56]
Child	-	1.43	-
(ref. 15-25)		[0.34,5.98]	
Constant	0.91	0.56*	0.83
	[0.60,1.39]	[0.32,0.98]	[0.51,1.35]
Observations	327	171	498

Table 7.8 Coins' returns by age. Odd ratios and 95% confidence intervals from the logistic regressions used to predict to odds of a dropped coin being returned by age for the first person and second person in a group, and the odds of a donating to a charity by age. ***p<.001; **p<.01; *p<..05; .p<.1

Age	Expected	Observed
Child	7.2%	2.6%
15-25	23.2%	10.1%
25-35	23.5%	16.4%
35-45	21.3%	25.4%
45-55	14.7%	29.1%
>55	10.1%	16.4%

Table 7.9 Expected and observed ages of passers-by that helped in the lost tourist experiment. Expected values are obtained from the random sampling of the dropped coin experiments and observed values are the percentage of each group that helped the experimenter looking lost. The expected and observed values are significantly different from each other (X^2=31.31; df=5; p<0.001).

7.5 Discussion

In this study the likelihood of helping someone at no obvious benefit to an individual is strongly predicted by the level of income deprivation in the local area across the four cooperative measures. This suggests that those living in poor neighbourhoods are less inclined to help their neighbours, either because of the individual characteristics of poor people or due to the area level characteristics of poor neighbourhoods that affect individual behaviour.

Most of the measures used determine only the role of area level characteristics on cooperation, but I am able to disentangle the individual and area level relative impact with the donations data. This shows that contextual characteristics, namely income

deprivation, proportion of graduates and crime better explain the variation in cooperative behaviour than individual level characteristics (household income and education), which in the case of donations are not significant predictors. These results confirm the importance of contextual factors, such as low levels of social cohesion and high crime rates, found in poor neighbourhoods here and elsewhere (Sampson et al. 1997; Laurence & Heath 2008; Schroeder et al. 2014) that are likely to affect how individuals behave, irrespective of their individual characteristics, by creating feelings of distrust and leading to less cooperative behaviour towards neighbours. Notably, the fact that individuals living in deprived neighbourhoods in this sample are less likely to trust people in their neighbourhood lends support to this proximate explanation ($r=0.20$; $p<0.001$). It is not possible though to establish the causality of the effects, as the low levels of social trust in the deprived neighbourhoods may be causing the low levels of cooperation found in these neighbourhoods, or alternatively the uncooperative behaviour of people living in a neighbourhood is leading to reduced levels of social trust.

The fact that individuals in deprived neighbourhoods are less likely to donate money or return a dropped coin can be explained by the relative cost of cooperation being higher for poor individuals than for wealthy ones, as £5 or 50p represent a larger relative benefit for a poor person than for a wealthy person. Still, this explanation does not account for the similar results found in the cooperative acts without an associated monetary cost in the lost letter and lost tourist experiments. Here the harsh environment and possible shorter-time horizons of individuals experiencing income deprivation (Nettle 2010; Pepper & Nettle 2014) may minimise the potential for long-term reciprocity leading to a general reduction in cooperative behaviour (Coleman 1988; Pfeiffer et al. 2005). At a more proximate level, studies have shown how feelings of financial scarcity can impair cognitive ability and promote tunnel vision making people "less insightful, less forward-thinking " (Mullainathan & Shariff 2013, p.13). Low-income individuals may be too preoccupied with meeting individual needs to spend effort (even if rather trivial) on improving an outcome for an unknown person.

The overall results in this study stand in sharp contrast to the results of Piff et al (2012) who found wealthy individuals more prone to cheat and take valued good from others. There is the possibility that Piff et al's (2012) results may not be accurate, due to a lack of statistical power of the experiments, which could indicate publication bias or spurious results (Francis 2012 but see P. K. Piff et al. 2012), and the fact that the S.E.S. measures used are either symbolic (e.g. receive more money in Monopoly) or difficult judge (e.g. how expensive a car looks). However, if the effects detected are

true, the contradictory results may be highlighting some domain specific differences of cooperative behaviour between rich and poor people; for example anti-social behaviours involving competition (such as aggressive driving or cheating in an economic game as in Piff et al (2012)) may be more common amongst the wealthy, whereas in a non-competitive task (such as returning a lost letter or donate to a school) wealthy individuals are more cooperative than poor individuals. Strategic considerations may also mediate how status and resources affect cooperative behaviour, with a study using dictator and ultimatum games with millionaires in Holland finding them to be more generous in a non-strategic dictator game than in a strategic ultimatum game (R. Bauer et al. 2014).

Social class affects one's perception of what is moral and people tend to judge the typical behaviour of people from different groups to be more unethical than typical behaviour from people from their own group (Dunning et al. 2004; Pronin 2008; Trautmann et al. 2013). Trautmann et al. (2013) suggest that different social classes have different moral and ethical frameworks dependent on specific normative behaviours. They find that, for example, high status individuals tend be against income redistributive measures, but at the same time they are more likely to volunteer than low status individuals, despite the greater opportunity costs of high class individuals. Indeed, high status individuals are, for example, more likely to tolerate tax avoidance behaviours (Murray 2012). This is also matched at the country level with a strong correlation between countries with low levels of individual charitable giving associated with countries with high levels of taxation and a strong welfare system (e.g. French people give 0.14% of their GDP to charities compared 1.7% in the U.S.A.) (Charities Aid Foundation 2006). Taken together, these findings suggest that the idea of what constitutes prosocial or cooperative behaviour may not be universal and depend on contextual and normative variables.

In any case, people in my sample display high levels of cooperation with the majority choosing to cooperate across the four measures. The donations experiment - in essence a dictator game – has 73% of people donating to Save the Children, which compares with an average of only 28% in lab-based dictator games (Engel 2011). Other studies also point to the fact that participants in lab-based games – normally graduate students - tend to be less generous than the population at large (Fehr et al. 2006; Cappelen et al. 2014), with a representative sample of Norwegians giving 52% more in a dictator game than a student sample (Cappelen et al. 2014), which highlights the importance of using naturalistic measures in the field to assess cooperative behaviour.

The characteristics of the passers-by provided one the main causes of the variation in cooperative behaviour found in this study. Out of all compositions recorded, couples (i.e. two people together of opposite sex) were by far the most cooperative in both the dropped coin and the lost tourist experiments. Men were also disproportionally more likely to be the ones initiating contact when returning the coin or asking if the experimenter needed help when lost, providing strong support for the hypothesis that cooperation is being driven as a mating strategy (Roberts 1998). Despite the fact that overall there was no difference between men and women in helping behaviour, the different target of this help - in the lost tourist and dropped experiments - was clear, with men more likely to help Emily and women more likely to help Leo, on their own or in groups. This gender differential in helping behaviour in the presence of women has been found in other studies (Latané & James 1975; Goldberg 1995; Tognetti et al. 2012) and is traditionally explained through the idea of competitive altruism in which males compete for females by displaying costly behaviours (Roberts 1998). Goldberg (1995) found that women were consistently less likely to donate money to homeless women than homeless men, while men were only less likely to give money to homeless women when accompanied by another woman, which in the study is proposed as a way of preventing jealousy by males and an adaptive response to female competition by females. The fact that women are also more likely to help the male experimenter in my study is less often observed, but it is possible that in this context women are also competing for mates (Stockley & Campbell 2013).

These results have some important limitations though, the fact that the sample is made out of only two experimenters means other factors beyond gender could explain the differences found. Another important caveat is the fact that Leo following his participation in the study went on to work at Abercrombie & Fitch, a company known to exclusively hire attractive staff (AFP 2013); it is conceivable that this skewed the results, as both men and women tend to display greater generosity towards attractive members of the opposite gender (Iredale et al. 2008; Van Vugt & Iredale 2013; Farrelly et al. 2007).

People on their own were significantly more likely to help than people in groups, which refutes the hypothesis that reputation in groups would drive the increased levels of cooperation. This is an interesting result, found in both the dropped coin and the lost tourist experiments confirming it is not a spurious finding. One possibility is that people in groups experience a sense of diffused responsibility, in that individuals expect others in the group to help and so withhold assistance (Latané & Darley 1969).

In a similar experiment, people in groups were also less likely to provide help when items were dropped than individuals on their own (Latané & James 1975). This may explain the behaviour in the lost tourist experiment, but it does not apply to the dropped coin experiment where the coin is picked up and an active decision is made to keep or return it (when in groups, subjects were observed discussing what to do after picking up the coin). Speculatively, I would propose that cooperative behaviour may not bring reputational benefits in this context and may instead signal weakness to others as there are no direct benefits in returning the coin. In some contexts helping others can also be seen as showing off, as it makes peers look less cooperative in relative terms and has been found to promote anti-social punishment of cooperators (Herrmann et al. 2008; Parks & Stone 2010; Irwin & Horne 2013). The prevalence of anti-social punishment in the real-world has yet to be established, but there is evidence that people sometimes hide their helping behaviour from others, specifically in choosing to be anonymous when donating large amounts in online fundraising websites (Raihani 2014; Peacey & Sanders 2014), and perhaps similar dynamics are at play here.

One of the most interesting finding from these experiments is how similar the results were across measures, rejecting the original hypothesis that cooperative behaviour would vary depending on domain-specific cost and benefits. All measures were negatively affected by income deprivation and most showed similar gender, group type and age effects. Whether there was a monetary gain at stake, personal involvement or possible reputational benefits made little difference on how people behaved, and on the whole, people behaved surprisingly well (**Table 7.1**; **Figure 7.1**). Peysakhovich et al. (2014) also found consistent individual behaviour across multiple online economic games and self-reported measures of cooperation, and propose the existence of a stable human cooperative phenotype. The current study expands on those findings by showing the stability of cooperation - at the area-level - across real-world measures, but indicates that while a domain-general cooperative phenotype may exist, this phenotype is plastic and dependent on the ecological context.

8 Conclusion

The main aim of this thesis was to investigate the impact of conflict on cooperation and empirically test the prediction from cultural group selection theories that the evolution of cooperation can occur through inter-group conflict. The findings from both cross-sectional and longitudinal data in chapters 3 and 4 do not support the idea that conflict between groups promotes parochial altruism. Instead, I find that individual and contextual characteristics of wealth, education, religion and gender play a more important role in explaining the variation in cooperative behaviour.

These results put into question the theoretical idea that cooperation could have evolved through increased group pay-offs via inter-group conflict. Here I propose that individuals may not necessarily behave altruistically in situations of conflict. My findings on parochial altruism are based on two measures only - and others have indeed found some association between conflict and cooperation - but perhaps there are more evolutionarily parsimonious explanations for the behaviour of individuals during conflict, such as reputation concerns and enforcement mechanisms.

For example, evidence from large-scale conflicts with high casualty numbers and where good recruitment data is available does indicate the importance of enforcement in conflict. In World War II, 61% of all US servicemen were forced to fight in the war as draftees (Beevor 2013); in the UK, almost every man between 18 and 41 years old was also forced to enlist (Scott 2006). In Vietnam, despite only 25% of soldiers being draftees, a disproportionate 35% of the casualties were drafted soldiers (American War Library 1997). In this case, the volunteers (non-drafted soldiers) were not necessarily ready and willing to fight for their country, but by volunteering they were able to choose their assignment, avoiding the most dangerous sections such as the infantry, which was then mostly composed of draftees (Karnow 1997). A recent review of inter-group warfare in small scale societies also found that individual benefits - mostly related to reputation and status – better explain the intensity of conflict than group-level benefits (Glowacki & Wrangham 2013), again demonstrating how altruism may not be an important motivation in conflict.

These examples are not conclusive evidence for whether altruism plays a key role in conflict or not, but they suggest that perhaps we are too quick to attribute altruistic tendencies to individuals in situations of war. Group benefits may arise from out-competing other groups, but they may also benefit the individual, so the issue is

whether group selection needs to be invoked to explain large-scale human cooperation.

In chapter 5 I explored the role of religion in promoting in-group cooperation, as predicted by cultural group selection models (Wilson 2010; Atran & Henrich 2010; Atran & Ginges 2012; Norenzayan 2014; Norenzayan et al. 2015). Overall, religious individuals donated more than less religious individuals, but this relationship was weak and was not maintained when taking into account other individual characteristics, such as S.E.S. and age. Crucially, the most robust positive effect of religiosity on cooperative behaviour was towards the out-group. This throws into question the idea of religion as a group functional mechanism of increased group cohesion, as put forward in cultural group selection theories of the co-evolution of large-scale cooperation and religion. While current theories emphasise the parochial aspect of religions, the benefits of interactions with other groups are sometimes overlooked. Positive interactions with the out-group can bring group-level benefits by reducing conflict and promoting trade, and the doctrinal flexibility of modern religions may facilitate these interactions by allowing believers to modulate their behaviour in different contexts. Religions may still function as a group beneficial trait that could be selected through cultural group selection, but the precise details of what role religion plays remain unclear.

Nonetheless, religion does appear to function as a powerful group identifier and I found consistent evidence that people prefer to cooperate with their religious group in both donations and lost letters. In chapter 6 I investigated the possibility that cultural differences and associated coordination costs between Catholics and Protestants could be driving the in-group preference, but found mixed evidence for that hypothesis with only a few traits significantly differing between the two groups.

The main finding of this thesis is that income is most significant predictor of overall and biased cooperation (chapters 3, 4 and 7). This finding is robust and is found across all four measures of cooperative behaviour used. The theoretical and empirical data on how resources affect cooperative behaviour is still unclear, as studies in Europe have tended to find an association between high S.E.S. and higher levels of cooperation (Nettle et al. 2011; Holland et al. 2012; R. Bauer et al. 2014), while in contrast studies in U.S.A and elsewhere have found the opposite trend (Paul K Piff et al. 2012; Martinsson et al. 2015). This suggests that the effects of status and income on cooperation may be mediated by the cultural context. The high levels of income inequality in the U.S.A. (World Bank 2015) could affect the attitudes and behaviours

towards others; for example 30% of people in the USA believe that social status is mostly dependent on luck, whereas in Europe 54% believe to be so. Even more striking, 60% of people in the U.S.A. think that the poor are lazy compared to only 26% in Europe (Alesina et al. 2001). These attitudes may affect how the wealthy in America behave, although these differences could also potentially be explained by different norms of what cooperative behaviour actually is, as exemplified by the contrasting attitudes between Americans and Europeans towards wealth redistribution when performed by the state through taxation (European preference) or by individuals through charity giving (American preference) (Murray 2012; Trautmann et al. 2013). What constitutes cooperative behaviour may vary across cultural contexts, but the results from the lost tourist and dropped coin experiments, in which groups of people were less likely to help, than people on their own, also suggests the possibility that the reputational benefits of cooperation may not be universal.

It is important to stress that the findings from this thesis may be the result of the particular context of Northern Ireland and potentially not generalisable to other contexts. The inter-group dynamics in the past may have enabled the selective pressures required for the evolution of altruistic behaviours through inter-group conflict (Bowles 2009), and the lack of association found between conflict and in-group cooperation may not be representative of our evolutionary past. The role of religion, in particular, may have changed in a contemporary environment. Moralising religions arose at a time when the costs and benefits of interaction within and between groups may have been different from today's globalised world, so religion may no longer fulfil the function it was originally selected for. Modern secular institutions, such as governments and the justice system, may crowd out the role of religion, leaving religious ideas as a relic from our evolutionary past (Norenzayan et al. 2015).

These studies are however one of the first attempts at exploring the role of conflict in cooperation using naturalistic measures of cooperative behaviour with endogamous and demarcated groups with a long and on-going history of conflict. The idea of cooperation originating from conflict is perversely attractive. Yet, the empirical question of whether inter-group conflicts are, in fact, won because group members are more willing to sacrifice themselves for the group has not been satisfactorily answered. Mathematical models neatly draw out the battle-lines for alternative accounts on the evolution of unique cooperative tendencies. But it is only through continued empirical work - ideally using real world groups and naturalistic measures of cooperation - that we can settle on a shared conclusion.

9 Bibliography

AFP, 2013. Abercrombie & Fitch accused of only hiring good-looking staff. *The Daily Telegraph*. Available at: http://www.telegraph.co.uk/news/worldnews/europe/france/10200892/Abercrombie-and-Fitch-accused-of-only-hiring-good-looking-staff.html [Accessed February 25, 2015].

Ahmed, A.M. & Salas, O., 2009. Is the hand of God involved in human cooperation? *International Journal of Social Economics*, 36(1/2), pp.70–80.

Akaike, H., 1974. A new look at the statistical model identification. *IEEE Transactions on Automatic Control*, 19, pp.716–723.

Alesina, A. & La Ferrara, E., 2005. Ethnic Diversity and Economic Performance. *Journal of Economic Literature*, 43(3), pp.762–800.

Alesina, A., Glaeser, E.L. & Sacerdote, B., 2001. Why Doesn't the United States Have a European-Style Welfare State? *Brookings Papers on Economic Activity*, 2001(2), pp.187–277.

Alexander, M. & Christia, F., 2011. Context modularity of human altruism. *Science*, 334(6061), pp.1392–1394.

Allee, W., 1943. Where angels fear to tread: a contribution from general sociology to human ethics. *Science*, 97(2528), p.517.

Allport, G.W., 1954. *The Nature of Prejudice*, Reading, MA: Addison Wesley.

Allport, G.W. & Ross, J.M., 1967. Personal Religious Orientation and Prejudice. *Journal of Personality and Social Psychology*, 5(4), pp.432–443.

American War Library, 1997. Vietnam War Deaths, By Volunteer or Drafted, Enlisted. *American War Library*. Available at: http://www.americanwarlibrary.com/vietnam/vwc8.htm [Accessed March 27, 2015].

Anderson, J. & Shuttleworth, I.G., 1998. Sectarian demography, territoriality and political development in Northern Ireland. *Political Geography*, 17(2), pp.187–208.

Anderson, L.R. & Mellor, J.M., 2009. Religion and cooperation in a public goods experiment. *Economics Letters*, 105(1), pp.58–60.

Anon, Mumtahanah. In *Qur'an*. p. 60:7.

Arrow, H., 2007. The sharp end of altruism. *Science*, 318(5850), pp.581–2.

Arruñada, B., 2004. The Economic Effects of Christian Moralities. *Working Paper*.

Atran, S. & Ginges, J., 2012. Religious and sacred imperatives in human conflict. *Science*, 336(6083), pp.855–7.

Atran, S. & Henrich, J., 2010. The evolution of religion: How cognitive by-products, adaptive learning heuristics, ritual displays, and group competition generate deep commitments to prosocial religions. *Biological Theory*, 5(1), pp.18–30.

Axelrod, R., 1981. The Emergence of Cooperation among Egoists. *The American Political Science Review*, 75(2), pp.306–318.

Axtell, R.L., Epstein, J.M. & Young, H.P., 2001. The Emergence of Classes in a Multi Agent Bargaining Model. In S. N. Durlauf & H. P. Young, eds. *Social Dynamics*. Brookings Institute, pp. 191–213.

Balliet, D. et al., 2011. Sex differences in cooperation: A meta-analytic review of social dilemmas. *Psychological Bulletin*, 137(6), pp.881–909.

Barker, J.L., Barclay, P. & Reeve, H.K., 2013. Competition over Personal Resources Favors Contribution to Shared Resources in Human Groups. *PLoS ONE*, 8(3), p.e58826.

Barth, F., 1969. *Ethnic groups and boundaries*, Boston: Little Brown & Co.

Bartlett, M.Y. & DeSteno, D., 2006. Gratitude and prosocial behavior: helping when it costs you. *Psychological Science*, 17(4), pp.319–25.

Bates, R., 1983. Modernization, ethnic competition, and the rationality of politics in contemporary Africa. In D. Rothchild & V. A. Olorunsola, eds. *State Versus Ethnic Claims: African Policy Dilemmas*. Boulder: Westview Press, p. 171.

Bateson, M., Nettle, D. & Roberts, G., 2006. Cues of being watched enhance cooperation in a real-world setting. *Biology Letters*, 2(3), pp.412–4.

Batson, C. et al., 1999. “And Who Is My Neighbor?:” Intrinsic Religion as a Source of Universal Compassion. *Journal for the Scientific Study of Religion*, 38(4), pp.445–457.

Bauer, M. et al., 2014. War’s Enduring Effects on the Development of Egalitarian Motivations and In-Group Biases. *Psychological Science*, 21(1), pp.47–57.

Bauer, R., Gneezy, U. & Diego, S., 2014. Donation and Strategic Behavior of Millionaires. *Working Paper*, pp.1–23.

Baumard, N. & Boyer, P., 2013. Explaining moral religions. *Trends in Cognitive Sciences*, 17, pp.272–280.

BBC News, 2013a. BBC News - PSNI say 560 charged or reported over flag protests. *BBC News*. Available at: http://www.bbc.co.uk/news/uk-northern-ireland-24986841 [Accessed March 12, 2015].

BBC News, 2014. BBC News - Q&A: Northern Ireland flag protests. *BBC News*. Available at: http://www.bbc.co.uk/news/uk-northern-ireland-20651163 [Accessed February 24, 2015].

BBC News, 2013b. BBC News - Union flag dispute: Riot breaks out in east Belfast. *BBC News*. Available at: http://www.bbc.co.uk/news/uk-northern-ireland-21020296 [Accessed March 12, 2015].

BBC News, 2013c. BBC News - Union flag protests: Police attacked and traffic disrupted. *BBC News*. Available at: http://www.bbc.co.uk/news/uk-northern-ireland-20985521 [Accessed March 12, 2015].

BBC News, 2013d. BBC News - Union flag protests: Twenty-nine officers hurt in Belfast. *BBC News*. Available at: http://www.bbc.co.uk/news/uk-northern-ireland-20998867 [Accessed April 16, 2013].

BBC News, 2001. Dispute school extra cash criticised. *BBC News*. Available at: http://news.bbc.co.uk/1/hi/northern_ireland/1601116.stm.

BBC News, 2012. Man is charged over riots in Denmark Street, Belfast. *BBC News*. Available at: http://www.bbc.co.uk/news/uk-northern-ireland-20137680 [Accessed November 28, 2012].

BBC News, 2013e. Union flag protests: PSNI says policing cost is £20m. *BBC News*. Available at: http://www.bbc.co.uk/news/uk-northern-ireland-21706714.

Beevor, A., 2013. *The Second World War*, Phoenix.

Bekkers, R. & Wiepking, P., 2011. Accuracy of self-reports on donations to charitable organizations. *Quality and Quantity*, 45(6), pp.1369–1383.

Belfast City Council, 2012. Agenda for Council on Monday, 3rd December, 2012, 6.00 pm.

Bell, A. V, Richerson, P.J. & McElreath, R., 2009. Culture rather than genes provides greater scope for the evolution of large-scale human prosociality. *Proceedings of the National Academy of Sciences*, 106(42), pp.17671–17674.

Bell, J., Jarman, N. & Harvey, B., 2010. Beyond Belfast - Contested Spaces in Urban, Rural and Cross-Border Settings. *Community Relations Council*.

Bellows, J. & Miguel, E., 2009. War and local collective action in Sierra Leone. *Journal of Public Economics*, 93(11-12), pp.1144–1157.

Benz, M. & Meier, S., 2008. Do people behave in experiments as in the field?—evidence from donations. *Experimental Economics*, 11(3), pp.268–281.

Van Den Berghe, P.L., 1981. *The Ethnic Phenomenon*, Westport: Praeger Publishers.

Berkowitz, L. & Daniels, L.R., 1964. Affecting the Salience of the Social Responsibility Norm: Effects of Past Help on the Response To Dependency Relationships. *Journal of Abnormal Psychology*, 68(3), pp.275–281.

Bernhard, H., Fischbacher, U. & Fehr, E., 2006. Parochial altruism in humans. *Nature*, 442(7105), pp.912–5.

Betzig, L.L., Mulder, M.B. & Turke, P., 1988. *Human reproductive behaviour: A Darwinian perspective* L. L. Betzig, M. B. Mulder, & P. Turke, eds., CUP Archive.

Betzig, L.L. & Turke, P.W., 1986. Food sharing on Ifaluk. *Current Anthropology*, 27(4), pp.397–400.

Binmore, K., 2010. Social norms or social preferences? *Mind & Society*, 9(2), pp.139–157.

Boorman, S.A. & Levitt, P.R., 1973. Group selection on the boundary of a stable population. *Theoretical population biology*, 4(1), pp.85–128.

Borgerhoff Mulder, M., 1991. Human behavioural ecology. In J. R. Krebs & N. B. Davies, eds. *Behavioural ecology: an evolutionary approach*. Oxford, UK: Blackwell Publishing.

Bornstein, G., 2003. Intergroup conflict: individual, group, and collective interests. *Personality and Social Psychology Review*, 7(2), pp.129–45.

Bowles, S., 2009. Did warfare among ancestral hunter-gatherers affect the evolution of human social behaviors? *Science*, 324(5932), pp.1293–8.

Bowles, S., Choi, J.-K. & Hopfensitz, A., 2003. The co-evolution of individual behaviors and social institutions. *Journal of Theoretical Biology*, 223(2), pp.135–147.

Bowles, S. & Gintis, H., 2004. The evolution of strong reciprocity: cooperation in heterogeneous populations. *Theoretical Population Biology*, 65(1), pp.17–28.

Boyd, R. et al., 2003. The evolution of altruistic punishment. *Proceedings of the National Academy of Sciences*, 100(6), pp.3531–5.

Boyd, R. & Richerson, P.J., 1982. Cultural transmission and the evolution of cooperative behavior. *Human Ecology*, 10(3), pp.325–351.

Boyd, R. & Richerson, P.J., 1985. *Culture and the evolutionary process*, Chicago: University of Chicago Press.

Boyd, R. & Richerson, P.J., 1987. The Evolution of Ethnic Markers. *Cultural Anthropology*, 2(1), pp.65–79.

Brañas-Garza, P. et al., 2014. Fair and unfair punishers coexist in the Ultimatum Game. *Scientific Reports*, 4(6025), pp.1–4.

Breen-Smyth, M., 2012. Injured in the Troubles: the needs of individuals and their families. *WAVE Trauma Centre*, (May).

Brooks, A.C., 2003. *Religious Faith and Charitable Giving*, Heritage Foundation.

Burnham, K.P. & Anderson, D.R., 1998. *Model Selection and inference: a practical information-theoretic approach*, New York, USA: Springer-Verlag.

Burt, C.D.B. & Popple, J.S., 1998. Memorial Distortions in Donation Data. *The Journal of Social Psychology*, 138(6), pp.724–733.

Burton-Chellew, M.N. & West, S.A., 2013. Prosocial preferences do not explain human cooperation in public-goods games. *Proceedings of the National Academy of Sciences*, 110(1), pp.216–21.

Byrne, J., Hansson, U. & Bell, J., 2006. Mixed residential communities in Northern Ireland. *Institute for Conflict Research*.

Cabinet Office, 2012. Community Life Survey. Available at: https://www.gov.uk/government/collections/community-life-survey [Accessed March 25, 2015].

CAIN, 2012. Background on the Northern Ireland Conflict. *Conflict Archive on the Internet*. Available at: http://cain.ulst.ac.uk/othelem/index.html.

CAIN, 2014a. CAIN: Background Information on Northern Ireland Society - Education. *Conflict Archive on the Internet*. Available at: http://cain.ulst.ac.uk/ni/educ.htm [Accessed March 25, 2015].

CAIN, 2014b. CAIN: Key Issue - Parades and Marches in Northern Ireland. *Conflict Archive on the Internet*. Available at: http://cain.ulst.ac.uk/issues/parade/ [Accessed March 22, 2015].

CAIN, 2014c. Symbols in Northern Ireland - Flags Used in the Region. *Conflict Archive on the Internet*. Available at: http://cain.ulst.ac.uk/images/symbols/flags.htm [Accessed March 22, 2015].

Camerer, C.F., 2003. *Behavioral game theory: Experiments in strategic interaction*, Princeton: Princeton University Press.

Cappelen, A.W. et al., 2014. Social Preferences in the Lab: A Comparison of Students and a Representative Population. *CESifo Working Paper Series*.

Cardenas, J.C., 2003. Real wealth and experimental cooperation: experiments in the field lab. *Journal of Development Economics*, 70(2), pp.263–289.

Cavalli-Sforza, L.L. & Feldman, M.W., 1981. *Cultural Transmission and Evolution: A Quantitative Approach*, Princeton: Princeton University Press.

Cavalli-Sforza, L.L. & Feldman, M.W., 1973. Models for cultural inheritance. I. Group mean and within group variation. *Journal of Theoretical Biology*, 55, pp.42–55.

Charities Aid Foundation, 2006. International comparisons of charitable giving. *Charities Aid Foundation briefing paper*, (November), pp.1–24.

Choi, J.-K. & Bowles, S., 2007. The coevolution of parochial altruism and war. *Science*, 318(5850), pp.636–40.

Churchill, W., 1949. *Their Finest Hour*, London, UK: Houghton Mifflin.

Cohen, E., 2012. The Evolution of Tag-Based Cooperation in Humans. *Current Anthropology*, 53(5), pp.588–616.

Cohen, E. & Haun, D., 2013. The development of tag-based cooperation via a socially acquired trait. *Evolution and Human Behavior*, 34(3), pp.230–235.

Coleman, J.S., 1988. Social Capital in the Creation of Human Capital. *American Journal of Sociology*, 94, pp.S95–S120.

Collier, P., 2001. Implications of ethnic diversity. *Economic policy*, 16(32), pp.127–166.

Collier, P. & Hoeffler, A., 2004. Greed and grievance in civil war. *Oxford Economic Papers*, 56(4), pp.563–595.

Colson, E., 1974. *Tradition and Contract*, Chicago: Aldine.

Community Relations Council, 2008. Towards Sustainable Security Interface - Barriers and the Legacy of Segregation in Belfast. *Community Relations Council*, pp.1–44.

Coward, J., 1980. Recent Characteristics of Roman Catholic Fertility in Northern and Southern Ireland. *Population Studies*, 34(1), pp.31–44.

Crabtree, S., 2010. Religiosity Highest in World's Poorest Nations. *Gallup Survey*. Available at: http://www.gallup.com/poll/142727/religiosity-highest-world-poorest-nations.aspx.

Cronk, L., Chagnon, N.A. & Irons, W., 2000. *Adaptation and human behavior: an anthropological perspective*, New York, USA: Aldine de Gruyter.

Crook, J.H. & Crook, S.J., 1988. Tibetan polyandry: Problems of adaptation and fitness. In L. Betzig, M. Borgerhoff-Mulder, & P. Turke, eds. *Human reproductive*

behavior: A Darwinian perspective. Cambridge: Cambridge University Press, pp. 97–114.

Crow, J.F. & Aoki, K., 1982. Group selection for a polygenic behavioral trait: a differential proliferation model. *Proceedings of the National Academy of Sciences*, 79(8), pp.2628–31.

Darwin, C., 1871. *The descent of man, and selection in relation to sex*, London, UK: John Murray.

Dawes, C.T. et al., 2007. Egalitarian motives in humans. *Nature*, 446(7137), pp.794–796.

Dawkins, R., 1976. *The Selfish Gene*, Oxford, UK: Oxford Paperbacks.

Deuteronomy, The Book of Deuteronomy. In *The Book of Deuteronomy*. pp. 20:16–18.

Dhami, S. & al-Nowaihi, A., 2007. Why do people pay taxes? Prospect theory versus expected utility theory. *Journal of Economic Behavior and Organization*, 64, pp.171–192.

Diamond, J., 1997. *Guns, germs, and steel: the fates of human societies*, New York, USA: W. W. Norton.

Dunning, D. et al., 2004. Flawed Self-Assessment - Implications for Health, Education, and the Workplace. *Psychological Science*, 5(3), pp.69–106.

Efferson, C., Lalive, R. & Fehr, E., 2008. The Coevolution of Cultural Groups and Ingroup Favoritism. *Science*, 321(5897), pp.1844–1849.

Engel, C., 2011. Dictator Games : A Meta Study. *Experimental Economics*, 14(4).

Equality Commission for Northern Ireland, 2006. Community background in Northern Ireland. *Equality Commission for Northern Ireland*.

ESRI, 2013. ArcGIS Desktop 10.2.

Farrelly, D., Lazarus, J. & Roberts, G., 2007. Altruists attract. *Evolutionary Psychology*, 5, pp.313–329.

Fearon, J.D. & Laitin, D.D., 1996. Explaining Interethnic Cooperation. *The American Political Science Review*, 90(4), pp.715–735.

Fehr, E., Fischbacher, U. & Rosenbladt, B. Von, 2003. A nation-wide laboratory: Examining trust and trustworthiness by integrating behavioral experiments into representative surveys. *Working Paper - Schmollers Jahrbuch*, 122(866), pp.519–542.

Fehr, E., Naef, M. & Schmidt, K.M., 2006. Preferences in and Maximin Aversion , Efficiency , Inequality Simple Distribution Experiments: Comment. *American Economic Review*, 96(5), pp.1912–1917.

Fischbacher, U., Gächter, S. & Fehr, E., 2001. Are people conditionally cooperative? Evidence from a public goods experiment. *Economics Letters*, 71, pp.397–404.

Francis, G., 2012. Evidence that publication bias contaminated studies relating social class and unethical behavior. *Proceedings of the National Academy of Sciences*, 109(25), pp.E1587–E1587.

Fu, F. et al., 2012. Evolution of in-group favoritism. *Scientific Reports*, 2, p.460.

Galen, L.W., 2012. Does religious belief promote prosociality? A critical examination. *Psychological Bulletin*, 138(5), pp.876–906.

García, J. & van den Bergh, J.C.J.M., 2011. Evolution of parochial altruism by multilevel selection. *Evolution and Human Behavior*, 32(4), pp.277–287.

Gavrilets, S. & Fortunato, L., 2014. A solution to the collective action problem in between-group conflict with within-group inequality. *Nature Communications*, 5, pp.1–11.

Gellner, E. & Breuilly, J., 2008. *Nations and Nationalism*, Ithaca: Cornell University Press.

Gilligan, M., Pasquale, B. & Samii, C., 2011. *Civil War and Social Capital: Behavioral-Game Evidence from Nepal*,

Ginges, J., Hansen, I. & Norenzayan, A., 2009. Religion and support for suicide attacks. *Psychological Science*, 20(2), pp.224–30.

Glenn, N., 1982. Interreligious Marriage in the United States: Patterns and Recent Trends. *Journal of Marriage and the Family*, 44(3), pp.555–566.

Glowacki, L. & Wrangham, R.W., 2013. The role of rewards in motivating participation in simple warfare. *Human Nature*, 24(4), pp.444–60.

Gneezy, A. & Fessler, D.M.T., 2011. Conflict, sticks and carrots: war increases prosocial punishments and rewards. *Proceedings of the Royal Society B: Biological Sciences*, 279(1727), pp.219–23.

Gneezy, U., Haruvy, E. & Yafe, H., 2004. The inefficiency of splitting the bill*. *The Economic Journal*, 114(495), pp.265–280.

Goldberg, T.L., 1995. Altruism towards panhandlers: Who gives? *Human Nature*, 6, pp.79–89.

Greer, T. et al., 2005. We Are a Religious People; We Are a Vengeful People. *Journal for the Scientific Study of Religion*, 44(1), pp.45–57.

Greif, A., 1993. Contract enforceability and economic institutions in early trade: The Maghribi traders' coalition. *The American Economic Review*, 83(3), pp.525–548.

Guala, F., 2012. Reciprocity: weak or strong? What punishment experiments do (and do not) demonstrate. *Behavioral and Brain Sciences*, 35(1), pp.1–15.

Guiso, L., Sapienza, P. & Zingales, L., 2003. People's opium? Religion and economic attitudes. *Journal of Monetary Economics*, 50, pp.225–282.

Habyarimana, J. et al., 2007. Why does ethnic diversity undermine public goods provision? *American Political Science Review*, 101(4), p.709.

Hagenaars, A.J.M., De Vos, K. & Zaidi, M.A., 1996. *Poverty statistics in the late 1980s: Research based on micro-data*, Office for Official Publications of the European Communities.

Haley, K.J. & Fessler, D.M.T., 2005. Nobody's watching? Subtle cues affect generosity an anonymous economic game. *Evolution and Human Behavior*, 26, pp.245–256.

Hamilton, W.D., 1964a. The genetical evolution of social behaviour. I. *Journal of Theoretical Biology*, 7(1), pp.1–16.

Hamilton, W.D., 1964b. The genetical evolution of social behaviour. II. *Journal of Theoretical Biology*, 7(1), pp.17–52.

Harris, M., 2001. *Cultural Materialism: The Struggle for a Science of Culture*, AltaMira Press.

Hauert, C. et al., 2007. Via freedom to coercion: the emergence of costly punishment. *Science*, 316(5833), pp.1905–1907.

Hawks, J., 2011. Measuring population subdivision. Available at: http://johnhawks.net/explainer/laboratory/measuring-fst/ [Accessed March 10, 2015].

Hechter, M., 1990. The Attainment of Solidarity in Intentional Communities. *Rationality and Society*, 2(2), pp.142–155.

Henrich, J. et al., 2006. Costly Punishment Across Human Societies. *Science*, 312(5781), pp.1767–1770.

Henrich, J., 2004. Cultural group selection, coevolutionary processes and large-scale cooperation. *Journal of Economic Behavior & Organization*, 53(1), pp.3–35.

Henrich, J. et al., 2012. Culture does account for variation in game behavior. *Proceedings of the National Academy of Sciences*, 109(2), pp.E32–3; author reply E34.

Henrich, J. et al., 2005. “Economic man” in cross-cultural perspective: behavioral experiments in 15 small-scale societies. *Behavioral and Brain Sciences*, 28(6), pp.795–815; discussion 815–55.

Henrich, J., Ensminger, J., et al., 2010. Markets, Religion, Community Size, and the Evolution of Fairness and Punishment. *Science*, 327(5972), pp.1480–1484.

Henrich, J. & Boyd, R., 1998. The Evolution of Conformist Transmission and the Emergence of Between-Group Differences. *Evolution and Human Behavior*, 19(4), pp.215–241.

Henrich, J. & Gil-White, F.J., 2001. The evolution of prestige: Freely conferred deference as a mechanism for enhancing the benefits of cultural transmission. *Evolution and Human Behavior*, 22(3), pp.165–196.

Henrich, J., Heine, S.J. & Norenzayan, A., 2010. The weirdest people in the world? *Behavioral and Brain Sciences*, 33(2-3), pp.61–83.

Herrmann, B., Thöni, C. & Gächter, S., 2008. Antisocial punishment across societies. *Science*, 319(5868), pp.1362–7.

Hodder, I., 1977. The distribution of material culture items in the Baringo district , western Kenya. *Man*, 12(2), pp.239–269.

Hoff, K. & Pandey, P., 2006. Discrimination, Social Identity, and Durable Inequalities. *American Economic Review*, 96(2), pp.206–211.

Holland, J., Silva, A.S. & Mace, R., 2012. Lost Letter Measure of Variation in Altruistic Behaviour in 20 Neighbourhoods. *PloS one*, 7(8), p.e43294.

House, B.R. et al., 2013. Ontogeny of prosocial behavior across diverse societies. *Proceedings of the National Academy of Sciences*, 110(36), pp.14586–14591.

Hughes, J. et al., 2007. Segregation in Northern Ireland. *Policy Studies*, 28(1), pp.33–53.

Ipsos MORI, 2011. Attitudinal Survey on Integrated Education. *Ipsos MORI*, (March).

Iredale, W., Vugt, M. Van & Dunbar, R., 2008. Showing off in humans: Male generosity as a mating signal. *Evolutionary Psychology*, 6(3), pp.386–392.

Irwin, K. & Horne, C., 2013. A normative explanation of antisocial punishment. *Social Science Research*, 42(2), pp.562–70.

Jarman, N., 2005. No longer a problem? Sectarian violence in Northern Ireland. *Institute for Conflict Research*, (March), pp.1–64.

Johnson, D., 2005. God's punishment and public goods. *Human Nature*, 16(4), pp.410–446.

Kahneman, D., Knetsch, J. & Thaler, R.H., 1986. Fairness and the Assumptions of Economics. *Journal of Business*, 59(4).

Karnow, S., 1997. *Vietnam: A History*, London, UK: Penguin.

Kay, A.C., Moscovitch, D. a & Laurin, K., 2010. Randomness, attributions of arousal, and belief in god. *Psychological Science*, 21, pp.216–218.

Kleinfield, N.R., 1996. Netanyahu Promotes Views on Peace and Investments. *New York Times*.

Knack, S. & Keefer, P., 1997. Does social capital have an economic payoff? A cross-country investigation. *The Quarterly Journal of Economics*, 112(4), p.1251.

Kramer, R.M. & Brewer, M.B., 1984. Effects of group identity on resource use in a simulated commons dilemma. *Journal of Personality and Social Psychology*, 46(5), pp.1044–57.

Kraus, M.W., Côté, S. & Keltner, D., 2010. Social class, contextualism, and empathic accuracy. *Psychological Science*, 21, pp.1716–1723.

Kraus, M.W., Piff, P.K. & Keltner, D., 2009. Social class, sense of control, and social explanation. *Journal of Personality and Social Psychology*, 97(6), pp.992–1004.

Lamba, S. & Mace, R., 2011. Demography and ecology drive variation in cooperation across human populations. *Proceedings of the National Academy of Sciences*, 108(35), pp.14426–14430.

Lamba, S. & Mace, R., 2012. Reply to Henrich et al.: Behavioral variation needs to be quantified at multiple levels. *Proceedings of the National Academy of Sciences*, 109(2), pp.E34–E34.

Latané, B. & Darley, J.M., 1969. Bystanders “apathy”. *American Scientist*, 57, pp.244–268.

Latané, B. & James, D.J., 1975. Sex, Group Size and Helping in Three Cities. *Sociometry*, 38(2), pp.180–194.

Laurence, J. & Heath, A., 2008. Predictors of community cohesion: multi-level modelling of the 2005 Citizenship Survey. *Department for Communities and Local Government*.

Laury, S.K. & Taylor, L.O., 2006. Altruism spillovers: Are behaviors in context-free experiments predictive of altruism toward a naturally occurring public good? *Journal of Economic Behavior & Organization*, 65(1), pp.9–29.

Legare, C.H. & Souza, A.L., 2012. Evaluating ritual efficacy: evidence from the supernatural. *Cognition*, 124(1), pp.1–15.

Lesorogol, C., 2007. Bringing Norms In - The Role of Context in Experimental Dictator Games. *Current Anthropology*, 48(6), pp.920–926.

Levitt, S.D. & List, J.A., 2009. Field experiments in economics: The past, the present, and the future. *European Economic Review*, 53(1), pp.1–18.

Levitt, S.D. & List, J.A., 2007. What do laboratory experiments measuring social preferences reveal about the real world? *The Journal of Economic Perspectives*, 21(2), pp.153–174.

Liker, A., Freckleton, R.P. & Székely, T., 2014. Divorce and infidelity are associated with skewed adult sex ratios in birds. *Current Biology*, 24(8), pp.880–884.

List, J.A., 2006. Field experiments: A bridge between lab and naturally occurring data. *Advances in Economic Analysis and Policy*, 6(2).

List, J.A., 2007. On the interpretation of giving in dictator games. *Journal of Political Economy*, 115(3), pp.482–493.

Ludwig, J. et al., 2012. Neighborhood Effects on the Long-Term Well-Being of Low-Income Adults. *Science*, 337(6101), pp.1505–1510.

Luke, Gospel of Luke. , pp.6:27–29.

Lynam, D.R. et al., 2000. The interaction between impulsivity and neighborhood context on offending: The effects of impulsivity are stronger in poorer neighborhoods. *Journal of Abnormal Psychology*, 109(4), p.563.

Macfarlan, S.J., Quinlan, R. & Remiker, M., 2013. Cooperative behaviour and prosocial reputation dynamics in a Dominican village. *Proceedings of the Royal Society B: Biological Sciences*, 280.

Martinsson, P., Villegas-Palacio, C. & Wollbrant, C., 2015. Cooperation and social classes: evidence from Colombia. *Social Choice and Welfare*.

Mathew, S. & Boyd, R., 2011. Punishment sustains large-scale cooperation in prestate warfare. *Proceedings of the National Academy of Sciences*, 108(28), pp.11375–80.

Mathew, S. & Boyd, R., 2013. The cost of cowardice: punitive sentiments towards free riders in Turkana raids. *Evolution and Human Behavior*, 35(1), pp.58–64.

Mazar, N. & Ariely, D., 2006. Dishonesty in Everyday Life and Its Policy Implications. *Journal of Public Policy & Marketing*, 25(1), pp.117–126.

McCartney, G. et al., 2012. Why do males in Scotland die younger than those in England? evidence from three prospective cohort studies. *PLoS ONE*, 7(7).

McCullough, M.E. et al., 2012. Harsh childhood environmental characteristics predict exploitation and retaliation in humans. *Proceedings of the Royal Society B: Biological Sciences*.

McElreath, R., Boyd, R. & Richerson, P.J., 2003. Shared norms and the evolution of ethnic markers. *Current Anthropology*, 44(1), pp.122–129.

Milgram, S., Mann, L. & Harter, S., 1965. The lost-letter technique: a tool of social research. *Public Opinion Quarterly*, 29(3), p.437.

Milinski, M. et al., 2001. Cooperation through indirect reciprocity: image scoring or standing strategy? *Proceedings of the Royal Society B: Biological Sciences*, 268(1484), pp.2495–2501.

Montalvo, J.G. & Reynal-Querol, M., 2005. Ethnic diversity and economic development. *Journal of Development Economics*, 76(2), pp.293–323.

Moxon-Browne, E., 1991. National Identity in Northern Ireland. In P. Stringer & G. Robinson, eds. *Social Attitudes in Northern Ireland: The First Report*.

Mullainathan, S. & Shariff, E., 2013. *Scarcity*, Allen Lane.

Murray, C., 2012. *Coming Apart: The State of White America, 1960-2010*, New York, USA: Crown Forum.

Murtagh, B., 1998. Community, conflict and rural planning in Northern Ireland. *Journal of Rural Studies*, 14(2), pp.221–231.

Murtagh, B., Graham, B. & Shirlow, P., 2008. Authenticity and stakeholder planning in the segregated city. *Progress in Planning*, 69(2), pp.41–92.

Navarrete, C.D. et al., 2012. Fear is readily associated with an out-group face in a minimal group context. *Evolution and Human Behavior*, 33(5), pp.590–593.

Nettle, D. et al., 2014. Being there: a brief visit to a neighbourhood induces the social attitudes of that neighbourhood. *PeerJ*, 2, p.e236.

Nettle, D., 2010. Dying young and living fast: variation in life history across English neighborhoods. *Behavioral Ecology*, 21(2), pp.387–395.

Nettle, D., Colléony, A. & Cockerill, M., 2011. Variation in cooperative behaviour within a single city. *PloS one*, 6(10), p.e26922.

Nettle, D. & Dunbar, R.I.M., 1997. Social markers and the evolution of reciprocal exchange. *Current Anthropology*, 38(1).

Newdigate, L.S., Hoyt, W. & Toohey, J., 2010. Bloody Sunday Inquiry Report. *The National Archives*.

NILS, 2012. Fertility in Contemporary Northern Ireland. *Northern Ireland Longitudinal Study*, (March).

NISRA, 2012. Census 2011 - Population and Household Estimates for Northern Ireland. *Northern Ireland Statistics and Research Agency*.

NISRA, 2010. Northern Ireland Multiple Deprivation Measure 2010. *Northern Ireland Statistics and Research Agency*, (May).

Nolan, P., 2012. Northern Ireland Peace Monitoring Report. *Community Relations Council*, (February).

Norenzayan, A., 2014. Big questions about Big Gods : response and discussion. *Religion, Brain & Behavior*, (February 2015), pp.62–77.

Norenzayan, A. et al., 2015. The Cultural evolution of Prosocial Religions. *Behavioral and Brain Sciences*, pp.1–86.

Norenzayan, A. & Hansen, I.G., 2006. Belief in supernatural agents in the face of death. *Personality & Social Psychology Bulletin*, 32(2), pp.174–87.

Norenzayan, A. & Shariff, A.F., 2008. The origin and evolution of religious prosociality. *Science*, 322(5898), pp.58–62.

Northern Ireland Life & Times Survey, 2005. *Marriage Partner - Religion*

Nowak, M. a & Roch, S., 2007. Upstream reciprocity and the evolution of gratitude. *Proceedings of the Royal Society B: Biological Sciences*, 274(December 2006), pp.605–609.

Nowak, M.A., 2006. Five rules for the evolution of cooperation. *Science*, 314(5805), pp.1560–3.

Nowak, M.A. & Sigmund, K., 2005. Evolution of indirect reciprocity. *Nature*, 437(7063), pp.1291–8.

Nowak, M.A. & Sigmund, K., 1998. The dynamics of indirect reciprocity. *Journal of Theoretical Biology*, 194(4), pp.561–74.

Nowak, M.A. & Sigmund, K., 1992. Tit for tat in heterogeneous populations. *Nature*, 355, pp.250–252.

Oliver, J.E. & Wong, J., 2003. Intergroup Prejudice in Multiethnic Settings. *American Journal of Political Science*, 47(4), p.567.

Olzak, S., 1994. *The dynamics of ethnic competition and conflict*, Stanford: Stanford University Press.

ONS, 2005. *Super Output Areas (SOAs)*, Office for National Statistics

Orbell, J. et al., 1992. Religion, Context, and Constraint toward Strangers. *Rationality and Society*, 4(3), pp.291–307.

Orians, G.H., 1969. On the evolution of mating systems in birds and mammals. *American Naturalist*, 103(934), pp.589–603.

Osborne, B., 2002. Fascination of religion head count. *BBC News*. Available at: http://news.bbc.co.uk/1/hi/northern_ireland/2590023.stm [Accessed December 12, 2013].

Paciotti, B. et al., 2011. Are Religious Individuals More Generous, Trusting, and Cooperative? An Experimental Test of the Effect of Religion on Prosociality. *The Economics of Religion: Anthropological Approaches Research in Economic Anthropology*, 31, pp.267 – 305.

Parks, C.D. & Stone, A.B., 2010. The desire to expel unselfish members from the group. *Journal of Personality and Social Psychology*, 99(2), pp.303–10.

Paseta, S., 2003. *Modern Ireland: A Very Short Introduction*, Oxford, UK: Oxford Paperbacks.

Peacey, M.W. & Sanders, M., 2014. Masked Heroes: endogenous anonymity in charitable giving. *Working Paper*, pp.1–41.

Pepper, G. V & Nettle, D., 2014. Out of control mortality matters: the effect of perceived uncontrollable mortality risk on a health-related decision. *PeerJ*, 2, pp.1–24.

Pettigrew, T.F., 1998. Intergroup contact theory. *Annual Review of Psychology*, 49, pp.65–85.

Pew Forum on Religion & Public Life, 2010. *U.S. Religious Knowledge Survey*,

Peysakhovich, A., Nowak, M. a & Rand, D.G., 2014. Humans display a “cooperative phenotype” that is domain general and temporally stable. *Nature communications*, 5, p.4939.

Pfeiffer, T. et al., 2005. Evolution of cooperation by generalized reciprocity. *Proceedings of the Royal Society B: Biological Sciences*, 272(June), pp.1115–1120.

Piff, P.K. et al., 2012. Higher social class predicts increased unethical behavior. *Proceedings of the National Academy of Sciences*, pp.1–6.

Piff, P.K. et al., 2012. Reply to Francis: Cumulative power calculations are faulty when based on observed power and a small sample of studies. *Proceedings of the National Academy of Sciences*, 109(25), pp.E1588–E1588.

Preston, J.L. & Ritter, R.S., 2013. Different effects of religion and God on prosociality with the ingroup and outgroup. *Personality & Social Psychology Bulletin*, 39(11), pp.1471–83.

Price, G., 1970. Selection and covariance. *Nature*.

Pronin, E., 2008. How we see ourselves and how we see others. *Science*, 320(5880), pp.1177–1180.

Puurtinen, M. & Mappes, T., 2009. Between-group competition and human cooperation. *Proceedings of the Royal Society B: Biological Sciences*, 276(1655), pp.355–60.

Qudama, I., *al-Mughni*, 2.1774

Raihani, N.J., 2014. Hidden altruism in a real-world setting. *Biology Letters*, 10(1), p.20130884.

Raihani, N.J. & Bshary, R., 2014. The reputation of punishers. *Trends in Ecology & Evolution*, 30(2), pp.98–103.

Rand, D., Greene, J. & Nowak, M., 2012. Spontaneous giving and calculated greed. *Nature*, 489.

Rand, D. & Kraft-Todd, G., 2014. Reflection does not undermine self-interested prosociality. *Frontiers in Behavioral Neuroscience*, 8, pp.1–22.

Rand, D.G. et al., 2014. Social heuristics shape intuitive cooperation. *Nature communications*, 5, p.3677.

Resnick, P. et al., 2006. The value of reputation on eBay: A controlled experiment. *Experimental Economics*, 9(2), pp.79–101.

Richerson, P. et al., 2015. Cultural Group Selection Plays an Essential Role in Explaining Human Cooperation: A Sketch of the Evidence. *Behavioral and Brain Sciences*.

Richerson, P.J. & Boyd, R., 2004. *Not by genes alone: How culture transformed human evolution*, Chicago: University Of Chicago Press.

Roberts, G., 1998. Competitive altruism: from reciprocity to the handicap principle. *Proceedings of the Royal Society B: Biological Sciences*, 265, pp.427–431.

Ruffle, B.J. & Sosis, R., 2006. Cooperation and the in-group-out-group bias: A field test on Israeli kibbutz members and city residents. *Journal of Economic Behavior & Organization*, 60(2), pp.147–163.

Rutte, C. & Taborsky, M., 2007. Generalized reciprocity in rats. *PLoS Biology*, 5(7), p.e196.

Sääksvuori, L., Mappes, T. & Puurtinen, M., 2011. Costly punishment prevails in intergroup conflict. *Proceedings of the Royal Society B: Biological Sciences*, 278(1723), pp.3428–3436.

Sampson, R.J., Morenoff, J.D. & Gannon-Rowley, T., 2002. Assessing “Neighborhood Effects”: Social processes and new directions in research. *Annual Review of Sociology*, 28(1), pp.443–478.

Sampson, R.J., Raudenbush, S.W. & Earls, F., 1997. Neighborhoods and violent crime: a multilevel study of collective efficacy. *Science*, 277(5328), pp.918–924.

Schroeder, K.B., Pepper, G. V. & Nettle, D., 2014. Local norms of cheating and the cultural evolution of crime and punishment: a study of two urban neighborhoods. *PeerJ*, 2, p.e450.

Schwadel, P., 2005. Individual, congregational, and denominational effects on church members’ civic participation. *Journal for the Scientific Study of Religion*, 44(2), pp.159–171.

Scott, L.V., 2006. *Conscription and the Attlee Governments: The Politics and Policy of National Service, 1945-1951*, Oxford, UK: Oxford University Press.

Shariff, A.F. & Norenzayan, A., 2007. God is watching you: priming God concepts increases prosocial behavior in an anonymous economic game. *Psychological Science*, 18(9), pp.803–9.

Shirlow, P. & Murtagh, B., 2006. *Belfast: Segregation, violence and the city*, London: Pluto Press.

Shuttleworth, I.G. & Lloyd, C.D., 2009. Are Northern Ireland’s communities dividing? Evidence from geographically consistent Census of Population data, 1971–2001. *Environment and Planning A*, 41(1), pp.213–229.

Shuttleworth, I.G., Lloyd, C.D. & Martin, D., 2011. Exploring the implications of changing census output geographies for the measurement of residential segregation: the example of Northern Ireland 1991–2001. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 174(1), pp.1–16.

Smith, J.M., 1964. Group Selection and Kin Selection. *Nature*, 201(4924), pp.1145–1147.

Snijders, T.A.B. & Bosker, R.J., 2011. *Multilevel analysis: An introduction to basic and advanced multilevel modeling* 2nd Editio., London: Sage Publications.

Soler, M., 2012. Costly signaling, ritual and cooperation: evidence from Candomblé, an Afro-Brazilian religion. *Evolution and Human Behavior*, 33(4), pp.346–356.

Soltis, J., Boyd, R. & Richerson, P.J., 1995. Can group-functional behaviors evolve by cultural group selection?: An empirical test. *Current Anthropology*, 36(3), pp.473–494.

Somerville, M., 2012. Find you nearest postbox. Available at: http://dracos.co.uk/made/locating-postboxes/.

Sommer, V., 1989. Sexual harassment in langur monkeys (Presbytis entellus). Competition for ova, sperm, and nurture? *Ethology*, 80, pp.205–217.

Sosis, R. & Bressler, E.R., 2003. Cross-Cultural Cooperation and Commune Longevity : A Test of the Costly Signaling Theory of Religion. *Cross-Cultural Research*, 37(2), pp.211–239.

Sosis, R., Kress, H. & Boster, J., 2007. Scars for war: evaluating alternative signaling explanations for cross-cultural variance in ritual costs. *Evolution and Human Behavior*, 28(4), pp.234–247.

Sosis, R. & Ruffle, B.J., 2004. Ideology, religion, and the evolution of cooperation: Field experiments on Israeli Kibbutzim. *Research in Economic Anthropology*, 23(04), pp.89–117.

Stockley, P. & Campbell, A., 2013. Female competition and aggression: interdisciplinary perspectives. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 368, p.20130073.

Sutton, M., 2012. Sutton Index of Deaths. *Sutton Index of Deaths*. Available at: http://cain.ulst.ac.uk/sutton/ [Accessed November 28, 2012].

Sweet, J. & Bumpass, L., 1987. *American Families and Households*, New York, USA: Russell Sage.

Sylwester, K. & Roberts, G., 2013. Reputation-based partner choice is an effective alternative to indirect reciprocity in solving social dilemmas. *Evolution and Human Behavior*, 34(3), pp.201–206.

Tajfel, H. et al., 1971. Social categorization and intergroup behaviour. *European Journal of Social Psychology*, 1(2), pp.149–178.

Tam, T. et al., 2009. Intergroup trust in Northern Ireland. *Personality & Social Psychology Bulletin*, 35(1), pp.45–59.

Tan, J.H.W. & Vogel, C., 2008. Religion and trust: An experimental study. *Journal of Economic Psychology*, 29(6), pp.832–848.

Thomson, J., 2011. *Dunkirk: Retreat to Victory*, New York, USA: Arcade.

Tognetti, A. et al., 2012. Sexual Selection of Human Cooperative Behaviour: An Experimental Study in Rural Senegal. *PLoS ONE*, 7(9).

Traulsen, A. & Nowak, M., 2006. Evolution of cooperation by multilevel selection. *Proceedings of the National Academy of Sciences*, 103(29), pp.10952–10955.

Traulsen, A., Shoresh, N. & Nowak, M. a., 2008. Analytical results for individual and group selection of any intensity. *Bulletin of Mathematical Biology*, 70(5), pp.1410–1424.

Trautmann, S.T., van de Kuilen, G. & Zeckhauser, R.J., 2013. Social Class and (Un)Ethical Behavior: A Framework, With Evidence From a Large Population Sample. *Psychological Science*, 8(5), pp.487–497.

Trivers, R., 1972. Parental investment and sexual selection. In B. Campbell, ed. *Sexual selection and the descent of man, 1871-1971*. Chicago: Aldine, pp. 136–179.

Trivers, R., 1971. The evolution of reciprocal altruism. *The Quarterly Review of Biology*, 46, pp.34–57.

Turchin, P., 2003. *Historical dynamics: Why States Rise and Fall*, Princeton: Princeton University Press.

UCLA Statistical Consulting Group, Stata Data Analysis Examples - Negative Binomial Regression. Available at: http://www.ats.ucla.edu/stat/stata/dae/nbreg.htm [Accessed January 1, 2015].

Understanding Society, 2013. Understanding Society survey - Wave 4.

Uyenoyama, M. & Feldman, M.W., 1980. Theories of kin and group selection: a population genetics perspective. *Theoretical population biology*, 414, pp.380–414.

Vargo, T., 2007. Survey: Belfast Residents Asked If Peace Lines Should Come Down. *US-Ireland Alliance*.

Van de Vliert, E., 2010. Climato-Economic Origins of Variation in Ingroup Favoritism. *Journal of Cross-Cultural Psychology*, 42(3), pp.494–515.

Voors, M., Turley, T., et al., 2012. Exploring whether behavior in context-free experiments is predictive of behavior in the field: Evidence from lab and field experiments in rural Sierra Leone. *Economics Letters*, 114(3), pp.308–311.

Voors, M., Nillesen, E., et al., 2012. Violent conflict and behavior: a field experiment in Burundi. *American Economic Review*, 102(2), pp.941–964.

Van Vugt, M. & Iredale, W., 2013. Men behaving nicely: Public goods as peacock tails. *British Journal of Psychology*, 104, pp.3–13.

Waring, T.M., 2011. Ethnic Forces in Collective Action: Diversity, Dominance, and Irrigation in Tamil Nadu. *Ecology and Society*, 16(4).

Waring, T.M. & Bell, A. V., 2013. Ethnic dominance damages cooperation more than ethnic diversity: results from multi-ethnic field experiments in India. *Evolution and Human Behavior*, 34(6), pp.398–404.

Weber, M., 1930. *The Protestant Ethic and the Spirit of Capitalism*, Penguin Classics.

Wedekind, C. & Milinski, M., 2000. Cooperation through image scoring in humans. *Science*, 288(5467), pp.850–852.

Welch, M. et al., 2004. Trust in God and Trust in Man : The Ambivalent Role of Religion in Shaping Dimensions of Social Trust Author. *Journal for the Scientific Study of Religion*, 43(3), pp.317–343.

Williams, G., 1966. *Adaption and Natural Selection: A Critique of Some Current Evolutionary Theory*, Princeton: Princeton University Press.

Wilson, D.S., 2010. *Darwin's cathedral: Evolution, religion, and the nature of society*, University of Chicago Press.

Wilson, D.S., O'Brien, D.T. & Sesma, A., 2009. Human prosociality from an evolutionary perspective: variation and correlations at a city-wide scale. *Evolution and Human Behavior*, 30(3), pp.190–200.

Wilson, D.S. & Wilson, E.O., 2007. Rethinking the Theoretical Foundation of Sociobiology. *The Quarterly Review of Biology*, 82(4), pp.327–348.

World Bank, 2015. GINI index (World Bank estimate). Available at: http://data.worldbank.org/indicator/SI.POV.GINI/ [Accessed March 27, 2015].

Wynne-Edwards, V., 1962. *Animal dispersion in relation to social behaviour*, Edinburgh: Oliver and Boyd.

Yamagishi, T. et al., 2012. Rejection of unfair offers in the ultimatum game is no evidence of strong reciprocity. *Proceedings of the National Academy of Sciences*, 109(50), pp.20364–8.

Yamagishi, T., Jin, N. & Kiyonari, T., 1999. Bounded generalized reciprocity: in-group boasting and in-group favoritism. *Advances in Group Processes*, 16, pp.161–197.

Yamagishi, T. & Kiyonari, T., 2000. The group as the container of generalized reciprocity. *Social Psychology Quarterly*, 63(2), pp.116–132.

Yamagishi, T. & Mifune, N., 2008. Does Shared Group Membership Promote Altruism?: Fear, Greed, and Reputation. *Rationality and Society*, 20(1), pp.5–30.

Yoeli, E. et al., 2013. Powering up with indirect reciprocity in a large-scale field experiment. *Proceedings of the National Academy of Sciences*, pp.10424–9.

Zahavi, A., 1975. Mate selection - A selection for a handicap. *Journal of Theoretical Biology*, 53(1), pp.205–14.

10 Supplementary Information

10.1 Methods

10.1.1 Questionnaire

1. **Gender:** ☐ Male ☐ Female
2. **What is your date of birth?** _____
3. **What is your postcode?** _____
4. **How long have you lived in the neighbourhood?** _____
5. **What is your country of birth?**
   - ☐ Northern Ireland
   - ☐ Republic of Ireland
   - ☐ Scotland
   - ☐ England
   - ☐ Wales
   - ☐ Other _____
6. **What is your current employment status?**
   - ☐ Unemployed
   - ☐ Employed full-time
   - ☐ Employed part-time
   - ☐ Student full-time
   - ☐ Student part-time
   - ☐ Retired
7. **What is the highest educational level you have completed?**
   - ☐ Primary school
   - ☐ GCSE / O-Level / NVQ Level 1-2 / BTEC Level 1-2 / Equivalent
   - ☐ A-Level / NVQ Level 3 / BTEC Level 3 / Equivalent
   - ☐ Undergraduate / Equivalent
   - ☐ Graduate / Post-graduate / Equivalent
   - ☐ Other: _____
   - ☐ None
8. **Which of these types of living arrangement best describes your situation?** (prompt)
   - ☐ Living alone
   - ☐ Living with partner only
   - ☐ Living with children only
   - ☐ Living with partner and children
   - ☐ Living with parents
   - ☐ Living with parents and with partner or children
   - ☐ Shared accommodation
   - ☐ Other: _____
9. **How many adults live in your household (including yourself)?** _____
10. **How many children of your own do you have?** _____
11. **How many live with you at the moment?** _____
12. **What's your relationship status?**
    - ☐ Married
    - ☐ Co-habiting
    - ☐ Never married
    - ☐ Previously divorced or separated
    - ☐ Widowed / Widower

13. **What is your rough household annual income (you and your partner's** (if you have one) **before tax)?** (show them sheet, don't ask out aloud)

- ☐ No Income
- ☐ £0 - £5.000
- ☐ £5.001 - £10.000
- ☐ £10.001 - £15.000
- ☐ £15.001 - £20.000
- ☐ £20.001 - £25.000
- ☐ £25.001 - £30.000
- ☐ £30.001 - £40.000
- ☐ £40.001 - £50.000
- ☐ £50.001 - £75.000
- ☐ £75.001 - £100.000
- ☐ £100.001 - £200.000
- ☐ More than £200.000

14. **What is your religion?**

- ☐ Catholic
- ☐ Church of Ireland
- ☐ Presbyterian
- ☐ Methodist
- ☐ Other Protestant religion _____
- ☐ Other religion _____
- ☐ No religion

15. **What's your partner's religion? (if divorced/separated, previous partner)**

- ☐ Catholic
- ☐ Church of Ireland
- ☐ Presbyterian
- ☐ Methodist
- ☐ Other Protestant religion _____
- ☐ Other religion _____
- ☐ No religion

16. **What religion were you brought up in?**

- ☐ Catholic
- ☐ Church of Ireland
- ☐ Presbyterian
- ☐ Methodist
- ☐ Other Protestant religion _____
- ☐ Other religion _____
- ☐ No religion

17. **How religious would you say your parents/guardians were as you were growing up?**

- ☐ Very religious
- ☐ Moderately religious
- ☐ Not very religious
- ☐ Not religious at all

18. **How often do you attend a religious service?**

- ☐ A few times a week
- ☐ Weekly
- ☐ Monthly
- ☐ A few times a year
- ☐ Less often than a few times a year
- ☐ Never

19. **Do your religious beliefs influence the way you live your life in terms of the decisions you make and the values you hold? Do you feel that:** (prompt if unsure)

- ☐ They influence me in most of what I do
- ☐ They often influence me
- ☐ They influence some aspects of my life
- ☐ They rarely influence me
- ☐ They have no influence on me
- ☐ I am not religious

20. **Do you have a personal relationship with your God?** (prompt)

- ☐ Yes - We share a close personal relationship
- ☐ Yes - Sometimes
- ☐ Unsure
- ☐ No

21. **Of your 5 <u>closest</u> friends, are any Catholic / Protestant?** (different religion as yourself)

- ☐ Yes
- ☐ No (skip to 22)

22. (if yes to above) **how many out of those 5?**

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5

23. Do you think your family would <u>prefer</u> you to marry a Protestant / Catholic? (the same religion as yourself)

- ☐ Yes
- ☐ No (Skip to Q24)
- ☐ Don't know

24. Why do you think they would prefer this? (prompt after answer)

- ☐ They might feel my partner would not share the same values/background
- ☐ Worry what others would think
- ☐ They would want my children to be brought up within the religion
- ☐ Social Norm
- ☐ Other_____

25. Would you personally prefer your children to marry a Catholic/Protestant? (same religion as yourself)

- ☐ Yes
- ☐ No (Skip to Q26)
- ☐ Don't know

26. **If yes, why would that be?** (prompt after answer)

- ☐ I feel their partner would not share the same values/background
- ☐ Worry what others would think
- ☐ I would want my grandchildren to be brought up within the religion
- ☐ Social Norm
- ☐ Other_____

27. (Skip to Q28 if no children) **Do or did your children attend a Maintained (Catholic), Controlled (Protestant) or an Integrated school?**

- ☐ Integrated school
- ☐ Maintained (Catholic school)
- ☐ Controlled (Protestant school)
- ☐ Irish language school
- ☐ Children under school age

28. We are trying to understand the reasoning behind parents' choice of schools for their children. Why did you choose that school over others? (don't prompt unless unsure)

- ☐ Close-by / Practical
- ☐ Quality of Education
- ☐ Other family members have attended
- ☐ Wanted them raised in a religious fashion
- ☐ Didn't want them raised in a religious fashion
- ☐ Other _____

29. (If no children: "If you had children…") **If equally practical to get to, would you prefer your children to attend a maintained, controlled or integrated school?**

- ☐ Maintained (Catholic school)
- ☐ Integrated
- ☐ Controlled (Protestant school)
- ☐ Not sure

30. Would you/did you feel comfortable to confide in your parents/guardians about personal issues? (prompt)

- ☐ Very much so
- ☐ Sometimes
- ☐ Not much
- ☐ Not at all

31. How far does/did your mother live from you?

- ☐ Living together
- ☐ Within 2 miles
- ☐ In Belfast
- ☐ In Northern Ireland
- ☐ Other: _____
- ☐ Deceased

32. How far does/did your father live from you?

- ☐ Living together
- ☐ Within 2 miles
- ☐ In Belfast
- ☐ In Northern Ireland
- ☐ Other: _____
- ☐ Deceased

33. How often do/did you speak to your mother?

- ☐ Daily
- ☐ Weekly
- ☐ Monthly
- ☐ A few times a year
- ☐ Never
- ☐ Deceased

34. How often do/did you speak to your father?

- ☐ Daily
- ☐ Weekly
- ☐ Monthly
- ☐ A few times a year
- ☐ Never
- ☐ Deceased

35. **Do you have many people you would count as friends in your neighbourhood?** (prompt)

- ☐ Yes, the majority of my friends are local
- ☐ Yes, a few
- ☐ No, hardly any
- ☐ No, none

36. **How safe do you feel in your neighbourhood?** (prompt)

- ☐ Very safe
- ☐ Fairly safe
- ☐ Mildly unsafe
- ☐ Very unsafe

37. **What is the religious composition of your neighbourhood? What proportion do you think are Catholic / Protestant?** (prompt)

- ☐ Mostly Catholic
- ☐ Mostly Protestant
- ☐ More than half Protestant
- ☐ More than half Catholic
- ☐ about 50:50 (mixed)

38. For what party did you vote in the last Northern Ireland Assembly Election?

- ☐ Democratic Unionist Part
- ☐ Ulster Unionist Party
- ☐ Alliance Party
- ☐ Green
- ☐ Didn't vote
- ☐ Sinn Fein
- ☐ SDLP
- ☐ Traditional Unionist Voice
- ☐ Other_____
- ☐ Rather not say

39. In the past year have you been attacked, threatened or insulted because of your religious/political background? (prompt)

- ☐ Yes, many times
- ☐ Yes, but very rarely
- ☐ Yes, a few times
- ☐ No

40. Do you feel that your community is currently under threat from others outside of it?

- ☐ Yes
- ☐ No
- ☐ Not sure

41. Would you agree that the segregation between religious communities is less pronounced since the Good Friday agreement? (prompt)

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

42. Would you feel uncomfortable walking around in certain neighbourhoods because you feel people there are from a different religion to your own?

- ☐ Yes
- ☐ No
- ☐ Not sure

43. Who would you support if Northern Ireland were playing The Republic of Ireland in football?

- ☐ I don't care about football
- ☐ I would support Northern Ireland
- ☐ I would support the Republic of Ireland

44. Which of the following statements do you feel best describes your personal stance on religion?

- ☐ I have given the issue a great deal of thought
- ☐ I have thought about it somewhat
- ☐ I haven't given it much/any personal thought

45. This question is about whether people should display their affiliation with religious/political flags. Which statement applies best to how you feel? (tick as appropriate)

- ☐ I often adorn my house in flags
- ☐ I don't personally adorn my house in flags, but I feel people should be allowed to freely express their affiliation on both private and public property
- ☐ I don't have a problem with people putting flags on their personal property, but I dislike them being displayed on public property
- ☐ I feel people should take down their flags, as they serve to alienate communities and promote sectarianism

46. In what ways are you involved with your local community? Please tick all that apply:

- ☐ I work/volunteer in a community organisation
- ☐ I attend residents and/or council meetings
- ☐ I am active in local community groups (such as sports team, charity and church groups, etc.)
- ☐ I go to church locally
- ☐ I go to my local community centre/pub
- ☐ I keep up to date with community news via my local paper
- ☐ My children go to the local school
- ☐ Other _____
- ☐ Not at all

47. Please indicate the extent to which you agree with the following statements:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
People in your area pull together to improve the neighbourhood	☐	☐	☐	☐	☐
People in your neighbourhood share the same values	☐	☐	☐	☐	☐
Your neighbourhood is a place where residents respect religious differences between people	☐	☐	☐	☐	☐

48. Please indicate how much of a concern you feel the following issues are in your neighbourhood:

	Not often a problem	Sometimes a problem	Often a problem	Very often a problem
Vandalism	☐	☐	☐	☐
Drug crime	☐	☐	☐	☐
Sectarian violence	☐	☐	☐	☐
Sectarian discrimination	☐	☐	☐	☐
Street theft/burglary	☐	☐	☐	☐

49. How many people in your neighbourhood do you feel can be trusted?

☐ Most
☐ Some
☐ Hardly any
☐ None

50. In general would you say your health is:

☐ Excellent
☐ Good
☐ Fair
☐ Poor
☐ Very Poor

10.1.2 Donations Protocol

Knock twice on the front door and wait for 20 seconds. If no one opens the door proceed to the next house. If someone opens the door say:

Hi, I am doing a student project on neighbourhood well-being in Belfast and it's questionnaire that should take no more than 10 minutes and for your time we are giving out £5 for answering it.

Wait for reply and if positive add:

At the end you can give some of the money to a local school/charity, but it's up to you and you can decide that in the end.

Start the questionnaire and in the end say:

Ok, that's it. All done. There's just a consent form in the end for you to sign if you consent for this to be used in research and where it also explains that all the data collected is anonymous. Thank you very much and here's the money

Hand them the 5 pound coins, bring the donation box forward and say:

Today we are collecting money for SCHOOL NAME / SAVE THE CHILDREN. Would you like to donate some money? It's completely up to you.

10.1.3 Neighbourhood Characteristics

Neighbourhood	Sectarian Threat	Sectarianism	Religiosity	Social Capital	Income Deprivation	Crime & Disorder	Perc. Catholics	Pop. Density	Perc. Graduates
Ardoyne 3	2.40	0.32	2.25	2.27	0.76	55.19	93.93	81.12	7.23
Ballymac. 1	2.59	0.29	2.13	2.26	0.55	29.5	62.24	48.12	13.57
Ballymac. 2					0.61	21.95	78.32	98.96	7.47
Ballynafeigh 1	1.41	0.13	2.13	2.02	0.21	64.51	66.57	78.44	47.23
Ballysillan 2	2.13	0.22	1.69	2.35	0.27	20.01	9.27	64.74	11.98
Bellevue 2	1.90	0.25	1.91	2.36	0.39	44.77	62.31	33.81	14.88
Belmont 1	1.43	0.25	2.73	2.15	0.06	15.53	8.09	24.61	46.25
Bloomfield 1					0.4	47.37	15.62	64.88	21.96
Cavehill 1	1.67	0.18	1.74	2.23	0.08	30.95	50.4	29.58	34.83
Cavehill 2					0.08	32.24	79.4	39.67	46.52
Cherryvalley 1	1.30	0.21	2.40	1.75	0.06	6.91	14.75	19.95	47.14
Cherryvalley 3	1.40	0.43	2.08	2.36	0.24	9.03	12.36	33.21	29.62
Chichest. Pk. 2	1.83	0.22	1.96	2.30	0.29	52.55	81.62	71.63	32.51
Cliftonville 3	2.25	0.35	2.18	2.38	0.45	59.57	44.48	32.25	11.73
Clonard 2	2.25	0.47	2.32	2.24	0.61	55.83	89.6	102.06	15.19
Glen Road 3	1.69	0.33	2.35	2.09	0.41	16.41	94.86	58.55	13.07
Glencolin 2	1.54	0.44	2.50	2.14	0.5	27.83	94.42	34.28	10.77
Glencolin 4					0.56	36.11	90.68	59.97	11.58
Highfield 3					0.51	33.26	8.25	63.21	7.26
Knock 3					0.11	5.44	4.62	78.57	22.02
Ladybrook 1	1.47	0.34	2.64	2.07	0.22	14.19	94.52	43.55	26.76
Malone 3	1.29	0.17	1.85	1.95	0.08	29.66	53.18	41.7	63.9
Musgrave 2					0.15	29.84	94.65	41.21	34.33

Ravenhill 1					0.11	37.69	51.39	16.11	56.24
Rosetta 2	1.39	0.21	1.87	1.87	0.26	35.37	55.53	42.64	48.4
Shankill 1	2.18	0.41	1.67	2.49	0.63	41.97	7.07	54.24	6.96
Shankill 2	2.19	0.56	1.97	2.32	0.73	72.42	8.49	34.5	8.52
The Mount 2	1.62	0.36	1.87	2.60	0.51	56.23	16.91	78.05	18.45
Upper Malone 2	1.59	0.29	1.91	2.07	0.45	9.61	10.1	59.23	13.87
Dunmurry 2	1.44	0.35	2.77	1.73	0.08	22.89	91.88	30.21	37.08
Mean	1.77	0.31	2.13	2.18	0.35	33.83	51.52	51.97	25.58
S.D.	0.40	0.11	0.33	0.22	0.22	18.18	34.95	22.69	16.87

Table 10.1 Descriptive statistics of the neighbourhoods' characteristics on the mean levels of sectarian threat, sectarianism, religiosity, social capital, and income deprivation, crime & disorder score, religious composition as perc. of Catholics, population density and perc. of graduates.

10.2 Analyses

10.2.1 Donations (Chapter 3)

Donations	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Sectarian attack	0.65**	0.66	1.01	0.26**
	[0.49,0.86]	[0.41,1.05]	[0.56,1.83]	[0.11,0.64]
Constant	2.45***	4.08***	3.17***	1.32
	[1.84,3.27]	[2.37,7.04]	[2.17,4.64]	[0.93,1.86]
Comm. under threat	0.87	1.07	1.00	0.55*
	[0.66,1.15]	[0.61,1.89]	[0.61,1.64]	[0.34,0.90]
Constant	2.31***	3.59***	3.18***	1.26
	[1.71,3.13]	[2.05,6.29]	[2.15,4.70]	[0.88,1.79]
Segregation	0.79**	0.81	1.09	0.62***
	[0.67,0.93]	[0.58,1.13]	[0.80,1.48]	[0.48,0.82]
Constant	4.38***	6.46***	2.50	4.34**
	[2.51,7.63]	[2.24,18.58]	[1.00,6.29]	[1.80,10.47]
Threat in out-group neigh.	0.77**	0.84	0.71	0.75
	[0.63,0.94]	[0.57,1.24]	[0.49,1.03]	[0.55,1.04]
Constant	2.95***	4.39***	4.66***	1.45
	[2.03,4.30]	[2.17,8.87]	[2.61,8.33]	[0.88,2.39]
Neigh. sectarian violence	0.61***	0.58*	0.63*	0.59*
	[0.47,0.80]	[0.37,0.91]	[0.41,0.98]	[0.35,0.97]
Constant	4.43***	7.83***	6.13***	2.27*
	[2.78,7.04]	[3.42,17.94]	[2.90,12.99]	[1.04,4.95]
Neigh. sectarian discrimination	0.76*	0.71	0.71	0.74
	[0.59,0.98]	[0.46,1.09]	[0.48,1.06]	[0.46,1.20]
Constant	3.24***	5.80***	5.29***	1.60
	[2.08,5.03]	[2.66,12.61]	[2.60,10.73]	[0.76,3.37]
Observations	498	168	163	167

Table 10.2 Donations by sectarian threat (individual variables). Odds ratios and 95% confidence intervals from simple multi-level logistic regressions used to predict overall donations, and neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools) using the constituent variables of the factor sectarian threat index. ***p<.001; **p<.01; *p<..05; .p<.1

Donations	Overall
	OR [CI]
Emily	0.96
(ref. Leo)	[0.62,1.48]
Ram	0.78
(ref. Leo)	[0.47,1.29]
Constant	2.28 ***
	[1.65,3.14]
Observations	498

Table 10.3 Donations by experimenter. Odds ratio and 95% confidence intervals from a logistic regression used to predict overall donations by experimenter, Leo (n=177), Emily (n=210) and Ram (n=111). ***p<.001; **p<.01; *p<..05; .p<.1

Donations	Overall	Neutral	In-group	Out-group
Sectarian Threat	0.81	0.91	1.23	0.51*
	[0.60,1.10]	[0.55,1.50]	[0.62,2.44]	[0.27,0.95]
Mid HH income	1.70	2.25	2.02	1.32
(ref. Low HH income)	[0.97,2.98]	[0.74,6.90]	[0.67,6.12]	[0.52,3.36]
High HH income	2.46*	2.20	7.06*	1.13
(ref. Low HH income)	[1.23,4.94]	[0.62,7.88]	[1.38,36.25]	[0.34,3.76]
GCSE	1.52	1.75	1.28	2.39
(ref. Primary School)	[0.86,2.69]	[0.58,5.24]	[0.40,4.07]	[0.82,6.93]
A-Level	1.91	1.46	1.83	4.23*
(ref. Primary School)	[0.94,3.88]	[0.44,4.87]	[0.31,10.74]	[1.22,14.73]
Undergraduate	1.38	4.57	0.65	2.25
(ref. Primary School)	[0.65,2.91]	[0.72,29.09]	[0.16,2.62]	[0.58,8.75]
Graduate	2.64	1.91	0.89	16.90**
(ref. Primary School)	[0.87,8.02]	[0.28,13.10]	[0.09,8.62]	[2.25,126.90]
Age	1.02**	1.03*	1.06**	1.00
	[1.01,1.04]	[1.00,1.06]	[1.02,1.09]	[0.98,1.03]
Male	1.00	1.15	1.93	0.66
(ref. Female)	[0.65,1.53]	[0.48,2.76]	[0.81,4.60]	[0.31,1.41]
Protestant	0.70	0.59	0.92	0.68
(ref. Catholic)	[0.46,1.07]	[0.26,1.34]	[0.39,2.16]	[0.32,1.43]
HH Children	1.21	1.92	1.09	1.17
(ref. no HH children)	[0.79,1.86]	[0.79,4.71]	[0.47,2.55]	[0.55,2.47]
Constant	0.59	0.43	0.09	1.38
	[0.18,1.95]	[0.05,4.01]	[0.01,1.46]	[0.16,11.99]
Observations	466	158	153	155

Table 10.4 Donations by sectarian threat (HH children). Odds ratios and 95% confidence intervals from adjusted multi-level logistic regressions used to predict overall donations, and neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools) using the no. of children in the household as a control variable. ***p<.001; **p<.01; *p<..05; .p<.1

10.2.2 Donations - Riots (Chapter 4)

Sectarian Threat	Overall	Riot Neigh. (Ballymacarrett)	Calm Neigh. (Bellevue)
Mid-Riots	0.21	0.41 .	-0.06
(ref. Pre-Riots)	[-0.11,0.53]	[-0.02,0.83]	[-0.39,0.27]
Post-Riots	0.03	0.07	-0.04
(ref. Pre-Riots)	[-0.28,0.33]	[-0.33,0.48]	[-0.35,0.27]
Constant	1.76***	2.13***	1.40***
	[1.51,2.00]	[1.80,2.47]	[1.15,1.65]
Observations	218	110	108

Table 10.5 Sectarian threat over time (unadjusted models). Coefficients and 95% confidence intervals from simple linear regressions used to predict the levels of individual sectarian threat over time (before, during and after the riots) to all schools and charities in Ballymacarrett (riot neighbourhood) and Bellevue (calm neighbourhood) and both together. ***p<.001; **p<.01; *p<..05; .p<.1

Donations	Overall	Riot Neigh. (Ballymacarrett)	Calm Neigh. (Bellevue)
Mid-Riots	-0.85*	-0.02	-1.65**
(ref. Pre-Riots)	[-1.62,-0.08]	[-1.12,1.08]	[-2.73,-0.57]
Post-Riots	-0.63	-0.27	-0.97
(ref. Pre-Riots)	[-1.36,0.11]	[-1.32,0.78]	[-2.00,0.05]
Constant	3.51***	3.21***	3.80***
	[2.91,4.11]	[2.35,4.07]	[2.96,4.64]
Observations	228	112	116

Table 10.6 Donations over time (unadjusted models). Coefficients and 95% confidence intervals from adjusted linear regressions used to predict the individual amount given in donations over time (before, during and after the riots) to all schools and charities in Ballymacarrett (riot neighbourhood) and Bellevue (calm neighbourhood) and both together. ***p<.001; **p<.01; *p<..05; .p<.1

Donations	Overall	Neutral	In-group	Out-group
Mid-Riots	-0.85*	-0.57	-0.87	-0.69
(ref. Pre-Riots)	[-1.62,-0.08]	[-1.84,0.70]	[-2.17,0.44]	[-2.03,0.65]
Post-Riots	-0.63	-1.81**	0.22	-0.35
(ref. Pre-Riots)	[-1.36,0.11]	[-3.01,-0.61]	[-1.04,1.48]	[-1.62,0.91]
Constant	3.51***	4.41***	3.33***	2.76***
	[2.91,4.11]	[3.49,5.34]	[2.27,4.40]	[1.71,3.82]
Observations	228	61	83	84

Table 10.7 Donations over time by type (unadjusted models). Coefficients and 95% confidence intervals from simple linear regressions used to predict the individual amount given in donations over time (before, during and after the riots) to the neutral charity *Save the Children*, in-group and out-group primary schools. ***p<.001; **p<.01; *p<..05; .p<.1

Donations	Neutral (Riot Neigh.)	In-group (Riot Neigh.)	Out-group (Riot Neigh.)
Mid-Riots	-0.28	-0.04	0.50
(ref. Pre-Riots)	[-2.07,1.52]	[-1.80,1.73]	[-1.43,2.43]
Post-Riots	-1.04	-0.43	0.82
(ref. Pre-Riots)	[-2.77,0.68]	[-2.11,1.24]	[-1.02,2.65]
Constant	4.38***	3.75***	1.50
	[3.04,5.71]	[2.34,5.16]	[-0.04,3.04]
Observations	30	41	41

Table 10.8 Donations over time by type (unadjusted models) (Ballymacarrett). Coefficients and 95% confidence intervals from simple linear regressions used to predict the individual amount given in donations over time (before, during and after the riots) to the neutral charity *Save the Children*, in-group and out-group primary schools in Ballymacarrett (riot neighbourhood). ***p<.001; **p<.01; *p<..05; .p<.1

Donations	Neutral (Calm Neigh.)	In-group (Calm Neigh.)	Out-group (Calm Neigh.)
Mid-Riots	-0.89	-1.48	-1.75
(ref. Pre-Riots)	[-2.76,0.98]	[-3.29,0.33]	[-3.62,0.12]
Post-Riots	-2.52**	0.93	-1.39
(ref. Pre-Riots)	[-4.24,-0.80]	[-0.83,2.70]	[-3.15,0.37]
Constant	4.44***	2.86***	3.89***
	[3.12,5.77]	[1.35,4.37]	[2.43,5.35]
Observations	31	42	43

Table 10.9 Donations over time by type (unadjusted models) (Bellevue). Coefficients and 95% confidence intervals from simple linear regressions used to predict the individual amount given in donations over time (before, during and after the riots) to the neutral charity *Save the Children*, in-group and out-group primary schools in Bellevue (calm neighbourhood). ***p<.001; **p<.01; *p<..05; .p<.1

	Comm. threat	Threat in diff. neigh.	Sectarian attacks	Segregation	Sectarian violence	Sectarian discrimination
	OR [CI]	OR [CI]	β [CI]	β [CI]	β [CI]	β [CI]
Mid-Riots	6.60*	0.31	0.18	0.33	0.70*	0.82**
(ref. Pre-Riots)	[1.56,27.87]	[0.08,1.22]	[-0.35,0.71]	[-0.19,0.85]	[0.17,1.23]	[0.26,1.37]
Post-Riots	1.74	0.24*	0.08	-0.13	0.10	0.30
(ref. Pre-Riots)	[0.48,6.38]	[0.06,0.94]	[-0.45,0.61]	[-0.65,0.39]	[-0.43,0.63]	[-0.26,0.85]
Mid HH Income	1.00	1.00*	-0.00	0.00	0.00	-0.00
(ref. Low HH income)	[1.00,1.00]	[1.00,1.00]	[-0.00,0.00]	[-0.00,0.00]	[-0.00,0.00]	[-0.00,0.00]
High HH Income	1.66	0.63	0.04	0.19	0.21	0.25
(ref. Low HH income)	[0.46,6.03]	[0.18,2.25]	[-0.50,0.57]	[-0.34,0.71]	[-0.33,0.75]	[-0.31,0.81]
GCSE	3.10	0.65	-0.54	-0.35	-0.24	-0.10
(ref. Primary School)	[0.54,17.71]	[0.14,3.11]	[-1.19,0.11]	[-0.99,0.29]	[-0.89,0.41]	[-0.78,0.58]
A-Level	2.55	0.85	0.29	0.04	0.47	0.72
(ref. Primary School)	[0.34,19.35]	[0.12,5.94]	[-0.55,1.13]	[-0.78,0.87]	[-0.37,1.32]	[-0.17,1.61]
Undergraduate	1.00	1.00	-0.01*	-0.01	-0.02**	-0.01*
(ref. Primary School)	[0.97,1.02]	[0.98,1.03]	[-0.03,-0.00]	[-0.02,0.00]	[-0.03,-0.00]	[-0.03,-0.00]
Age	0.32*	1.13	-0.09	-0.33	-0.06	-0.36
	[0.11,0.93]	[0.44,2.88]	[-0.50,0.32]	[-0.73,0.08]	[-0.47,0.36]	[-0.79,0.07]
Male	0.17***	0.21**	-0.14	0.07	-0.31	-0.28
(ref. Female)	[0.06,0.48]	[0.08,0.56]	[-0.54,0.27]	[-0.34,0.47]	[-0.72,0.10]	[-0.71,0.14]
Constant	14.85*	20.97**	1.46**	3.71***	3.21***	3.07***
	[1.52,144.60]	[2.08,211.47]	[0.54,2.38]	[2.80,4.61]	[2.29,4.13]	[2.11,4.03]
Observations	110	110	109	109	110	110

Table 10.10 Sectarian threat over time (individual variables) (Ballymacarrett). Odd ratios, coefficients and 95% confidence intervals from adjusted logistic and linear regressions used to predict the component variables of the factor sectarian threat over time (before, during and after the riots) in Ballymacarrett (riot neighbourhood). See section 2.3.2.6 for details on the variables. ***p<.001; **p<.01; *p<..05; .p<.1

	Comm. threat	Threat in diff. neigh.	Sectarian attacks	Segregation	Sectarian violence	Sectarian discrimination
	OR [CI]	OR [CI]	β [CI]	β [CI]	β [CI]	β [CI]
Mid-Riots	2.08	0.59	-0.03	-0.25	0.03	-0.17
(ref. Pre-Riots)	[0.40,10.83]	[0.19,1.86]	[-0.40,0.34]	[-0.76,0.25]	[-0.40,0.45]	[-0.59,0.25]
Post-Riots	1.05	0.88	0.08	-0.41	0.09	-0.03
(ref. Pre-Riots)	[0.19,5.78]	[0.29,2.68]	[-0.29,0.45]	[-0.90,0.08]	[-0.32,0.50]	[-0.43,0.37]
Mid HH Income	1.00	1.00	-0.00	0.00	-0.00	-0.00
(ref. Low HH income)	[1.00,1.00]	[1.00,1.00]	[-0.00,0.00]	[-0.00,0.00]	[-0.00,0.00]	[-0.00,0.00]
High HH Income	0.55	1.54	-0.10	-0.12	-0.10	0.09
(ref. Low HH income)	[0.11,2.85]	[0.48,4.92]	[-0.49,0.29]	[-0.64,0.39]	[-0.53,0.33]	[-0.33,0.52]
GCSE	1.97	1.66	-0.22	-0.61	-0.01	0.13
(ref. Primary School)	[0.25,15.71]	[0.37,7.41]	[-0.73,0.29]	[-1.28,0.05]	[-0.57,0.54]	[-0.42,0.68]
A-Level	1.09	1.35	-0.09	0.43	0.22	0.43
(ref. Primary School)	[0.12,10.27]	[0.26,7.19]	[-0.66,0.48]	[-0.31,1.17]	[-0.40,0.84]	[-0.18,1.03]
Undergraduate	1.02	0.99	-0.01	-0.01	-0.00	-0.01
(ref. Primary School)	[0.98,1.06]	[0.96,1.01]	[-0.02,0.00]	[-0.02,0.00]	[-0.01,0.01]	[-0.01,0.00]
Age	1.93	1.04	0.26	0.02	0.09	0.09
	[0.55,6.74]	[0.46,2.37]	[-0.01,0.53]	[-0.34,0.39]	[-0.22,0.40]	[-0.21,0.39]
Male	2.98	0.38*	0.18	-0.14	-0.04	0.17
(ref. Female)	[0.84,10.61]	[0.17,0.87]	[-0.09,0.45]	[-0.50,0.22]	[-0.34,0.26]	[-0.13,0.47]
Constant	0.01*	2.83	0.13	3.30***	1.61***	1.61***
	[0.00,0.73]	[0.25,32.14]	[-0.66,0.91]	[2.24,4.37]	[0.70,2.51]	[0.72,2.49]
Observations	111	113	109	112	113	113

Table 10.11 Sectarian threat over time (individual variables) (Bellevue). Odd ratios, coefficients and 95% confidence intervals from adjusted logistic and linear regressions used to predict the component variables of the factor sectarian threat over time (before, during and after the riots) in Bellevue (calm neighbourhood). See section 2.3.2.6 for details on the variables. ***p<.001; **p<.01; *p<..05; .p<.1

10.2.3 Donations - Religiosity (Chapter 5)

Donations	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Religious Attendance	1.10	1.04	0.97	1.31*
	[0.95,1.26]	[0.80,1.35]	[0.70,1.33]	[1.02,1.68]
Mid HH income	1.91*	2.39	1.88	1.71
(ref. Low HH income)	[1.11,3.28]	[0.79,7.25]	[0.62,5.71]	[0.70,4.18]
High HH income	2.69**	2.27	6.91*	1.49
(ref. Low HH income)	[1.35,5.36]	[0.65,7.96]	[1.32,36.11]	[0.47,4.80]
GCSE	1.55	1.67	1.21	2.74 .
(ref. Primary School)	[0.88,2.74]	[0.55,5.05]	[0.39,3.73]	[0.94,7.97]
A-Level	1.93 .	1.46	1.79	4.49*
(ref. Primary School)	[0.96,3.89]	[0.45,4.81]	[0.30,10.84]	[1.27,15.88]
Undergraduate	1.37	3.95	0.61	2.33
(ref. Primary School)	[0.65,2.89]	[0.65,23.96]	[0.15,2.52]	[0.58,9.32]
Graduate	2.83 .	1.75	0.78	20.05**
(ref. Primary School)	[0.95,8.45]	[0.27,11.44]	[0.09,6.87]	[2.68,149.98]
Age	1.02**	1.03*	1.05**	1.00
	[1.01,1.04]	[1.00,1.05]	[1.02,1.09]	[0.98,1.03]
Male	0.99	1.00	1.94	0.61
(ref. Female)	[0.65,1.50]	[0.44,2.27]	[0.82,4.60]	[0.29,1.28]
Protestant	0.72	0.52	0.90	0.76
(ref. Catholic)	[0.47,1.11]	[0.23,1.19]	[0.37,2.14]	[0.36,1.63]
Constant	0.36*	0.57	0.17 .	0.21 .
	[0.15,0.87]	[0.11,2.92]	[0.03,1.12]	[0.04,1.10]
Observations	466	158	153	155

Table 10.12 Donations by religious attendance (adjusted). Odds ratios and 95% confidence intervals from multi-level logistic regressions used to predict overall donations, and neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools) by frequency of church attendance. ***p<.001; **p<.01; *p<..05; .p<.1

Donations	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Religious Influence	1.14 .	1.25 .	0.97	1.14
	[1.00,1.31]	[0.96,1.63]	[0.73,1.30]	[0.90,1.44]
Mid HH income	1.89*	2.42	1.93	1.80
(ref. Low HH income)	[1.10,3.24]	[0.79,7.42]	[0.65,5.69]	[0.74,4.36]
High HH income	2.66**	2.27	7.10*	1.48
(ref. Low HH income)	[1.34,5.28]	[0.65,7.96]	[1.39,36.30]	[0.47,4.68]
GCSE	1.63 .	1.72	1.19	2.75 .
(ref. Primary School)	[0.92,2.88]	[0.57,5.19]	[0.39,3.68]	[0.96,7.88]
A-Level	2.08*	1.68	1.70	4.63*
(ref. Primary School)	[1.03,4.18]	[0.51,5.57]	[0.29,9.97]	[1.35,15.89]
Undergraduate	1.44	4.08	0.59	2.52
(ref. Primary School)	[0.69,2.99]	[0.68,24.36]	[0.15,2.25]	[0.65,9.84]
Graduate	2.98*	1.87	0.76	20.42**
(ref. Primary School)	[1.00,8.88]	[0.29,12.22]	[0.09,6.49]	[2.78,149.71]
Age	1.02**	1.02 .	1.05**	1.01
	[1.01,1.04]	[1.00,1.05]	[1.02,1.09]	[0.98,1.03]
Male	0.99	1.09	1.96	0.57
(ref. Female)	[0.65,1.50]	[0.48,2.51]	[0.83,4.61]	[0.28,1.17]
Protestant	0.70 .	0.54	0.91	0.67
(ref. Catholic)	[0.46,1.07]	[0.24,1.22]	[0.39,2.13]	[0.32,1.39]
Constant	0.30**	0.34	0.18 .	0.23 .
	[0.12,0.75]	[0.06,1.97]	[0.03,1.23]	[0.04,1.16]
Observations	466	158	153	155

Table 10.13 Donations by religious influence (adjusted). Odds ratios and 95% confidence intervals from multi-level logistic regressions used to predict overall donations, neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools) by individual level of religious influence on daily life. ***p<.001; **p<.01; *p<..05; .p<.1

Donations	Overall	Neutral	In-group	Out-group
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Closeness to God	1.11	1.04	1.10	1.18
	[0.94,1.32]	[0.75,1.44]	[0.77,1.57]	[0.87,1.60]
Mid HH income	1.86*	2.41	2.00	1.69
(ref. Low HH income)	[1.08,3.20]	[0.79,7.31]	[0.67,6.00]	[0.69,4.13]
High HH income	2.62**	2.28	7.59*	1.41
(ref. Low HH income)	[1.31,5.22]	[0.65,8.02]	[1.46,39.51]	[0.44,4.50]
GCSE	1.60	1.68	1.25	2.76 .
(ref. Primary School)	[0.91,2.83]	[0.55,5.06]	[0.40,3.91]	[0.96,7.90]
A-Level	2.00 .	1.45	1.64	4.78*
(ref. Primary School)	[0.99,4.01]	[0.44,4.81]	[0.28,9.59]	[1.38,16.58]
Undergraduate	1.51	3.99	0.55	2.99
(ref. Primary School)	[0.72,3.16]	[0.66,24.22]	[0.14,2.12]	[0.75,11.94]
Graduate	3.03*	1.77	0.78	21.57**
(ref. Primary School)	[1.01,9.04]	[0.27,11.60]	[0.09,6.88]	[2.91,159.72]
Age	1.02**	1.03*	1.05**	1.01
	[1.01,1.04]	[1.00,1.05]	[1.02,1.08]	[0.98,1.03]
Male	0.99	1.01	2.05	0.59
(ref. Female)	[0.65,1.52]	[0.44,2.34]	[0.86,4.90]	[0.28,1.23]
Protestant	0.70	0.53	0.96	0.66
(ref. Catholic)	[0.46,1.08]	[0.23,1.22]	[0.40,2.27]	[0.32,1.38]
Constant	0.35*	0.55	0.16 .	0.26
	[0.14,0.87]	[0.10,2.95]	[0.02,1.06]	[0.05,1.32]
Observations	465	158	153	154

Table 10.14 Donations by closeness to god (adjusted). Odds ratios and 95% confidence intervals from multi-level logistic regressions used to predict overall donations, neutral, in-group and out-group donations (Save the Children, Catholic or Protestant primary schools) by individual level of closeness to god. ***p<.001; **p<.01; *p<..05; .p<.1

10.2.4 Ethnic Markers & Cultural Differences (Chapter 6)

10.2.4.1 Flags

Protestant Flags	Neigh. composition	Half Km interaction	1Km interaction	2Km interaction	3Km interaction
Neigh. Composition	-0.01 [-0.03,0.01]	0.17 [-0.02,0.36]	0.11 [-0.00,0.22]	0.07 [-0.01,0.15]	0.06 [-0.01,0.13]
0..5 Km Neigh. Comp.	-	0.06* [0.01,0.12]	-	-	-
Neigh. Comp. X 0..5 Km Comp.	-	-0.00* [-0.01,-0.00]	-	-	-
1 Km Neigh. Comp.	-	-	0.05** [0.02,0.09]	-	-
Neigh. Comp. X 1 Km Comp.	-	-	-0.00* [-0.01,-0.00]	-	-
2 Km Neigh. Comp.	-	-	-	0.05* [0.01,0.09]	-
Neigh. Comp. X 2 Km Comp.	-	-	-	-0.00* [-0.00,-0.00]	-
3 Km Neigh. Comp.	-	-	-	-	0.06* [0.01,0.11]
Neigh. Comp. X 3 Km Comp.	-	-	-	-	-0.00* [-0.00,-0.00]
Constant	4.30*** [3.46,5.13]	2.65*** [1.32,3.99]	2.67*** [1.50,3.84]	2.68*** [1.34,4.02]	2.38** [0.82,3.94]
Observations	20	20	20	20	20

Table 10.15 Negative binomial regressions from the out-group proximity model selection (Protestant flags). Coefficients and 95% confidence intervals from negative binomial regressions used to explain the variation in Catholic flags in mixed and Protestant neighbourhoods by neighbourhood composition (% Catholics) and its interaction with the composition in the surrounding radius of 0.5 Km, 1 Km, 2 Km and 3 Km. ***p<.001; **p<.01; *p<..05; .p<.1

Catholic Flags	Neigh. composition	Half Km interaction	1Km interaction	2Km interaction	3Km interaction
Neigh. Composition	0.04 [-0.03,0.10]	-0.22 [-0.50,0.07]	-0.26*** [-0.37,-0.15] [-0.37,-0.15]	-0.33*** [-0.45,-0.22]	-0.44*** [-0.57,-0.31]
0..5 Km Neigh. Comp.	-	-0.98** [-1.64,-0.32]	-	-	-
Neigh. Comp. X 0..5 Km Comp.	-	0.01** [0.00,0.02]	-	-	-
1 Km Neigh. Comp.	-	-	-0.82*** [-1.12,-0.52]	-	-
Neigh. Comp. X 1 Km Comp.	-	-	0.01*** [0.01,0.01]	-	-
2 Km Neigh. Comp.	-	-	-	-1.10*** [-1.47,-0.74]	-
Neigh. Comp. X 2 Km Comp.	-	-	-	0.01*** [0.01,0.01]	-
3 Km Neigh. Comp.	-	-	-	-	-1.52*** [-1.97,-1.08]
Neigh. Comp. X 3 Km Comp.	-	-	-	-	0.02*** [0.01,0.02]
Constant	-1.52 [-6.41,3.38]	34.80* [6.34,63.27]	28.20*** [18.34,38.05]	35.02*** [24.45,45.60]	45.54*** [33.05,58.02]
Observations	19	19	19	19	19

Table 10.16 Negative binomial regressions from the out-group proximity model selection (Catholic flags). Coefficients and 95% confidence intervals from negative binomial regressions used to explain the variation in Catholic flags in mixed and Catholic neighbourhoods by neighbourhood composition (% Catholics) and its interaction with the composition in the surrounding radius of 0.5 Km, 1 Km, 2 Km and 3 Km. ***p<.001; **p<.01; *p<..05; .p<.1

10.2.4.2 Cultural Differences

Variable	Question
Life Stages	
Age wanting to get married	*At what age do you want to get married?*
Age starting a family	*At what age do you want to start a family?*
Age leaving home	*At what age would you like to leave home?*
Beliefs	
Importance of education for sense of self	*How important is your level of education to your sense of who you are?*
Importance of political beliefs for sense of self	*How important are your political beliefs to your sense of who you are?*
Importance of family for sense of self	*How important is your family to your sense of who you are?*
Importance of occupation for sense of self	*How important is your occupantion to your sense of who you are?*
Importance of ethnic background for sense of self	*How important is your ethnic or racial background to your sense of who you are?*
How religious active	*Do you consider that you are actively practising your religion?*
Work	
No. of overtime hours per week	*How many hours overtime do you usually work in a normal week?*
Job satisfaction	*How dissatisfied or satisfied are you with your present job overall?*
Member of workplace union	*Are you a member of this trade union or association?*
Current economic activity	*Please look at this card and tell me what best describes your current employment situation?*
Financial Risk	

Would like to start own business	*Would you like to start up your own business/start up a new business?*
Total HH debt	*About how much in total is owed?*
Have credit cards	*Do you have any store cards or credit cards such as Visa, or Mastercard in your sole name?*
Investment in shares	*Do you have company stocks or shares, uk or foreign (excluding isas/peps)*
Savings	*Do you save any amount of your income, for example by putting something away now and then in a bank, building society, or Post Office account, other than to meet regular bills? Please include share purchase schemes and ISA's.*
Long/Short term savings	*Would you say your savings are mainly long term savings for the future or mainly short term savings for things you need now and for unexpected events?*
Cooperation	
Donations to charities	*In the last 12 months, have you donated any money to charities or other organisations?*
Gender Roles	
Who does the grocery shopping	*Could you please say who mostly does grocery shopping here?*
Who does the cooking	*Could you please say who mostly does cooking here?*
Who does the cleaning	*Could you please say who mostly does cleaning here?*
Who does the laundry	*Could you please say who mostly does laundry here?*
Who does the ironing	*Could you please say who mostly does ironing here?*
Who does the financial decisions	*In your household, who has the*

	final say in big financial decisions?
Who is responsible for childcare	*Who is mainly responsible for looking after the children?*
General	
Income	
Education	
Life satisfaction	*How satisfied are you with your life?*
Income satisfaction	*How satisfied are you the income of your household?*
Capable of making decisions	*Have you recently felt capable of making decisions about things?*
Hours doing housework per week	*How many hours per week have you spent on housework?*
How many alc. drinks in past month	*How many times in the last four weeks have you had an alcoholic drink?*
Feel supported by family	*Do you feel supported by your family, that is the people who live with you?*

Table 10.17 Questions from the Understanding Society survey. Wave 4 (2013)

	(1) Active Religious	(2) Active Religious (adj.)	(3) Unionised	(4) Unionised (adj.)
Protestant	0.65***	0.51***	0.60**	0.59**
	[0.55,0.76]	[0.43,0.61]	[0.41,0.88]	[0.40,0.87]
Mid HH Inc.		1.46***		2.13*
		[1.19,1.79]		[1.19,3.82]
High HH Inc.		1.80***		2.44**
		[1.45,2.24]		[1.37,4.35]
Other qual.		0.93		1.11
		[0.68,1.28]		[0.39,3.11]
GCSE		0.90		1.46
		[0.70,1.17]		[0.63,3.40]
A-level		1.08		1.00
		[0.82,1.41]		[0.43,2.32]
Other Degree		1.13		1.21
		[0.80,1.60]		[0.50,2.93]
Uni. Degree		1.55**		1.04
		[1.15,2.09]		[0.46,2.36]
Age		1.04***		1.03**
		[1.03,1.04]		[1.01,1.05]
Female		1.48***		1.08
		[1.25,1.75]		[0.74,1.57]
Constant	1.97***	0.23***	3.15***	0.39
	[1.74,2.22]	[0.16,0.33]	[2.32,4.28]	[0.11,1.32]
Observations	2732	2696	580	575

Table 10.18 Cultural differences between Catholics and Protestants – religious active and trade union membership. Odd ratios and 95% confidence intervals from logistic regressions used to explain the variation whether someone is religious active and whether someone is unionised by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Start business	(2) Start business (adj.)	(3) Credit card	(4) Credit card (adj.)
Protestant	0.98	1.01	1.50***	1.37***
	[0.69,1.39]	[0.70,1.45]	[1.29,1.76]	[1.14,1.63]
Mid HH Inc.		1.64		1.86***
		[0.96,2.81]		[1.49,2.31]
High HH Inc.		1.42		2.99***
		[0.82,2.47]		[2.39,3.74]
Other qual.		1.91		3.78***
		[0.70,5.23]		[2.71,5.26]
GCSE		1.60		4.18***
		[0.68,3.78]		[3.13,5.59]
A-level		1.53		4.54***
		[0.64,3.65]		[3.37,6.12]
Other Degree		1.51		6.47***
		[0.58,3.98]		[4.53,9.24]
Uni. Degree		1.48		13.62***
		[0.62,3.55]		[9.80,18.94]
Age		0.96***		1.03***
		[0.95,0.98]		[1.02,1.03]
Female		0.53***		1.36***
		[0.37,0.77]		[1.14,1.62]
Constant	0.12***	0.35	0.56***	0.02***
	[0.09,0.16]	[0.12,1.05]	[0.50,0.63]	[0.01,0.03]
Observations	1360	1341	2724	2688

Table 10.19 Cultural differences between Catholics and Protestants – want to start a business and credit cards. Odd ratios and 95% confidence intervals from logistic regressions used to explain the variation whether someone would like to start a business and whether someone has a credit card by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Has shares	(2) Has shares (adj.)	(3) Has savings	(4) Has savings(adj.)
Protestant	1.85***	1.70***	1.51***	1.47***
	[1.46,2.34]	[1.32,2.17]	[1.28,1.77]	[1.24,1.74]
Mid HH Inc.		2.58***		1.89***
		[1.83,3.64]		[1.52,2.33]
High HH Inc.		2.72***		2.65***
		[1.93,3.84]		[2.13,3.30]
Other qual.		1.94*		1.38
		[1.15,3.28]		[1.00,1.91]
GCSE		2.58***		1.54**
		[1.67,4.00]		[1.18,2.02]
A-level		3.41***		1.87***
		[2.22,5.25]		[1.42,2.47]
Other Degree		4.49***		2.13***
		[2.79,7.23]		[1.53,2.97]
Uni. Degree		5.34***		3.39***
		[3.46,8.25]		[2.53,4.54]
Age		1.02***		1.01**
		[1.01,1.02]		[1.00,1.01]
Female		0.72**		1.13
		[0.57,0.90]		[0.96,1.34]
Constant	0.11***	0.01***	0.46***	0.11***
	[0.09,0.13]	[0.01,0.02]	[0.41,0.52]	[0.07,0.16]
Observations	2660	2624	2713	2677

Table 10.20 Cultural differences between Catholics and Protestants – shareholding and savings. Odd ratios and 95% confidence intervals from logistic regressions used to explain the variation whether someone has shares and whether someone has savings by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Given to charity	(2) Given to charity (adj.)	(3) Family support	(4) Family support (adj.)
Protestant	1.11	0.91	1.16	1.22
	[0.93,1.31]	[0.75,1.09]	[0.60,2.24]	[0.61,2.43]
Mid HH Inc.		1.79***		0.78
		[1.44,2.22]		[0.36,1.68]
High HH Inc.		2.42***		0.87
		[1.90,3.09]		[0.33,2.28]
Other qual.		1.40		1.00
		[1.00,1.97]		[1.00,1.00]
GCSE		1.98***		1.77
		[1.50,2.62]		[0.62,5.02]
A-level		2.10***		2.15
		[1.57,2.81]		[0.65,7.13]
Other Degree		2.52***		2.87
		[1.67,3.81]		[0.21,38.43]
Uni. Degree		3.43***		2.93
		[2.41,4.88]		[0.20,43.05]
Age		1.03***		0.86
		[1.03,1.04]		[0.66,1.12]
Female		1.59***		1.87
		[1.32,1.91]		[0.92,3.81]
Constant	2.65***	0.17***	0.21***	1.47
	[2.33,3.02]	[0.12,0.26]	[0.13,0.34]	[0.02,138.14]
Observations	2727	2691	239	226

Table 10.21 Cultural differences between Catholics and Protestants – charity giving and family support. Odd ratios and 95% confidence intervals from logistic regressions used to explain the variation whether someone has given to charity and whether someone feels supported by their family by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Age to get married	(2) Age to get married (adj.)	(3) Age start family	(4) Age start family (adj.)
Protestant	-0.45	-0.44	0.24	0.20
	[-1.23,0.33]	[-1.25,0.37]	[-0.59,1.06]	[-0.65,1.05]
Mid HH Inc.		-0.37		0.39
		[-1.28,0.55]		[-0.57,1.36]
High HH Inc.		-0.42		0.38
		[-1.54,0.70]		[-0.83,1.59]
Other qual.		0.14		1.10
		[-2.14,2.42]		[-1.36,3.55]
GCSE		0.48		1.09
		[-0.82,1.78]		[-0.28,2.46]
A-level		0.39		1.08
		[-1.09,1.88]		[-0.50,2.66]
Other Degree		-0.31		-0.10
		[-3.51,2.89]		[-3.47,3.26]
Uni. Degree		0.48		1.39
		[-3.21,4.17]		[-2.09,4.86]
Age		0.30*		0.09
		[0.00,0.59]		[-0.24,0.41]
Female		-0.92*		-1.08*
		[-1.73,-0.12]		[-1.96,-0.21]
Constant	28.10***	23.09***	29.31***	27.14***
	[27.53,28.67]	[18.07,28.11]	[28.71,29.92]	[21.63,32.66]
Observations	216	211	209	204

Table 10.22 Cultural differences between Catholics and Protestants – age to marry and start a family. Coefficients and 95% confidence intervals from linear regressions used to explain the variation in ideal age to get married and start a family by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Age to leave home	(2) Age to leave home (adj.)	(3) Hours of overtime	(4) Hours of overtime (adj.)
Protestant	-0.18	-0.35	-0.17	-0.14
	[-0.94,0.57]	[-1.09,0.39]	[-0.66,0.32]	[-0.63,0.34]
Mid HH Inc.		0.57		0.57
		[-0.27,1.40]		[-0.13,1.27]
High HH Inc.		0.25		1.45***
		[-0.78,1.29]		[0.74,2.16]
Other qual.		1.33		0.52
		[-0.82,3.48]		[-0.74,1.79]
GCSE		0.64		-0.18
		[-0.46,1.74]		[-1.19,0.83]
A-level		0.48		-0.19
		[-0.75,1.71]		[-1.22,0.84]
Other Degree		3.65*		0.51
		[0.69,6.62]		[-0.63,1.64]
Uni. Degree		-0.30		0.48
		[-3.73,3.12]		[-0.55,1.51]
Age		0.56***		-0.01
		[0.30,0.83]		[-0.03,0.01]
Female		-0.27		-1.29***
		[-1.01,0.47]		[-1.77,-0.80]
Constant	22.80***	11.95***	2.03***	2.12**
	[22.26,23.35]	[7.36,16.54]	[1.65,2.40]	[0.71,3.52]
Observations	234	229	1163	1149

Table 10.23 Cultural differences between Catholics and Protestants – age to leave home and hours of overtime worked. Coefficients and 95% confidence intervals from linear regressions used to explain the variation in ideal age to leave home and number of hours worked overtime last week by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Importance of educ.	(2) Importance of educ. (adj.)	(3) Importance of pol. id.	(4) Importance of pol. id. (adj.)
Protestant	-0.04	0.02	0.08	0.09
	[-0.25,0.16]	[-0.20,0.23]	[-0.20,0.36]	[-0.20,0.39]
Mid HH Inc.		-0.16		0.12
		[-0.39,0.08]		[-0.21,0.45]
High HH Inc.		0.12		0.30
		[-0.18,0.43]		[-0.12,0.71]
Other qual.		0.21		0.37
		[-0.39,0.81]		[-0.41,1.16]
GCSE		0.12		0.07
		[-0.20,0.43]		[-0.35,0.48]
A-level		-0.09		-0.04
		[-0.45,0.26]		[-0.52,0.44]
Other Degree		-0.55		-0.50
		[-1.34,0.24]		[-1.94,0.94]
Uni. Degree		0.03		-0.21
		[-0.79,0.84]		[-1.31,0.90]
Age		0.05		-0.00
		[-0.03,0.12]		[-0.10,0.10]
Female		-0.16		0.42**
		[-0.37,0.05]		[0.13,0.71]
Constant	1.72***	0.90	3.01***	2.71**
	[1.56,1.87]	[-0.38,2.19]	[2.81,3.22]	[0.97,4.46]
Observations	247	242	193	188

Table 10.24 Cultural differences between Catholics and Protestants – importance of education and political identity to sense of self. Coefficients and 95% confidence intervals from linear regressions used to explain the variation in the importance of education and political identity to a sense of self by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Importance of fam.	(2) Importance of fam. (adj.)	(3) Importance of occ.	(4) Importance of occ. (adj.)
Protestant	0.02	0.06	0.07	0.17
	[-0.14,0.17]	[-0.10,0.22]	[-0.15,0.29]	[-0.06,0.39]
Low HH Inc.		0.00		0.00
		[0.00,0.00]		[0.00,0.00]
Mid HH Inc.		-0.08		-0.22
		[-0.26,0.09]		[-0.48,0.03]
High HH Inc.		-0.09		0.19
		[-0.32,0.14]		[-0.13,0.50]
Other qual.		0.24		0.17
		[-0.22,0.69]		[-0.42,0.76]
GCSE		0.06		0.21
		[-0.18,0.29]		[-0.13,0.56]
A-level		0.16		0.26
		[-0.11,0.42]		[-0.11,0.63]
Other Degree		-0.17		-0.35
		[-0.77,0.42]		[-1.19,0.50]
Uni. Degree		-0.04		0.42
		[-0.66,0.58]		[-0.38,1.22]
Age		0.02		-0.05
		[-0.04,0.07]		[-0.13,0.02]
Female		-0.25**		0.00
		[-0.41,-0.09]		[-0.22,0.23]
Constant	1.36***	1.10*	1.79***	2.57***
	[1.25,1.47]	[0.14,2.06]	[1.64,1.95]	[1.19,3.95]
Observations	250	245	201	197

Table 10.25 Cultural differences between Catholics and Protestants – importance of family and occupation to sense of self. Coefficients and 95% confidence intervals from linear regressions used to explain the variation in the importance of family and occupation to a sense of self by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Importance of ethn.	(2) Importance of ethn. (adj.)	(3) Job satisfaction	(4) Job satisfaction (adj.)
Protestant	0.27*	0.34*	-0.01	-0.01
	[0.00,0.55]	[0.05,0.63]	[-0.15,0.13]	[-0.15,0.13]
Mid HH Inc.		-0.08		-0.08
		[-0.40,0.24]		[-0.28,0.12]
High HH Inc.		-0.05		0.01
		[-0.46,0.35]		[-0.19,0.21]
Other qual.		-0.03		-0.39*
		[-0.79,0.74]		[-0.73,-0.04]
GCSE		-0.09		-0.35*
		[-0.51,0.32]		[-0.62,-0.07]
A-level		0.23		-0.33*
		[-0.24,0.70]		[-0.61,-0.05]
Other Degree		-0.32		-0.35*
		[-1.43,0.78]		[-0.67,-0.03]
Uni. Degree		-0.14		-0.40**
		[-1.19,0.90]		[-0.69,-0.12]
Age		0.01		0.01**
		[-0.09,0.11]		[0.00,0.01]
Female		-0.15		0.16*
		[-0.44,0.13]		[0.02,0.30]
Constant	2.27***	2.20*	5.42***	5.32***
	[2.08,2.47]	[0.47,3.94]	[5.32,5.53]	[4.92,5.71]
Observations	221	216	1362	1343

Table 10.26 Cultural differences between Catholics and Protestants - importance of ethnic identity to sense of self and job satisfaction. Coefficients and 95% confidence intervals from linear regressions used to explain the variation in the importance of ethnic background to a sense of self and levels of job satisfaction by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Life satisfaction	(2) Life satisfaction (adj.)	(3) Amount of debt	(4) Amount of debt (adj.)
Protestant	0.01	-0.01	-1523.64	-990.58
	[-0.11,0.13]	[-0.13,0.11]	[-7765.96,4718.67]	[-7469.62,5488.46]
Mid HH Inc.		0.04		4199.85
		[-0.11,0.18]		[-4156.04,12555.75]
High HH Inc.		0.16*		10647.46*
		[0.01,0.32]		[1853.78,19441.14]
Other qual.		0.02		8292.10
		[-0.21,0.25]		[-6670.02,23254.22]
GCSE		-0.05		-8706.92
		[-0.24,0.13]		[-20255.88,2842.04]
A-level		0.21*		-7029.47
		[0.01,0.40]		[-19249.80,5190.86]
Other Degree		-0.01		-11313.03
		[-0.25,0.24]		[-25228.54,2602.48]
Uni. Degree		0.32**		-6231.61
		[0.12,0.53]		[-18350.49,5887.28]
Age		0.00		-53.34
		[-0.00,0.00]		[-311.70,205.02]
Female		0.11		-5997.09
		[-0.01,0.23]		[-12586.39,592.20]
Constant	5.26***	5.01***	9772.11***	15510.42
	[5.17,5.35]	[4.76,5.27]	[5385.46,14158.76]	[-1347.15,32367.99]
Observations	2304	2272	567	555

Table 10.27 Cultural differences between Catholics and Protestants – life satisfaction and amount of debt. Coefficients and 95% confidence intervals from linear regressions used to explain the variation in the levels of life satisfaction and amount of debt owed by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Income satisfaction	(2) Income satisfaction (adj.)	(3) Able to decide	(4) Able to decide (adj.)
Protestant	0.12	0.09	0.02	0.01
	[-0.02,0.26]	[-0.05,0.23]	[-0.02,0.06]	[-0.03,0.04]
Mid HH Inc.		0.29***		0.01
		[0.12,0.47]		[-0.04,0.05]
High HH Inc.		0.57***		-0.04
		[0.39,0.75]		[-0.09,0.00]
Other qual.		-0.12		0.03
		[-0.39,0.16]		[-0.04,0.10]
GCSE		-0.05		0.01
		[-0.27,0.17]		[-0.05,0.07]
A-level		0.13		-0.02
		[-0.09,0.36]		[-0.08,0.04]
Other Degree		0.20		-0.06
		[-0.09,0.48]		[-0.14,0.01]
Uni. Degree		0.30*		0.00
		[0.05,0.54]		[-0.06,0.07]
Age		0.00*		0.00***
		[0.00,0.01]		[0.00,0.00]
Female		-0.04		0.03
		[-0.18,0.10]		[-0.00,0.07]
Constant	4.51***	3.95***	2.01***	1.88***
	[4.40,4.61]	[3.65,4.25]	[1.99,2.04]	[1.80,1.96]
Observations	2302	2270	2306	2274

Table 10.28 Cultural differences between Catholics and Protestants – income satisfaction and ability to make decision. Coefficients and 95% confidence intervals from linear regressions used to explain the variation in the levels of income satisfaction and on ability to make decisions by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Hours of housework	(2) Hours of housework (adj.)	(3) How many alc. drinks	(4) How many alc. drinks (adj.)
Protestant	-0.78*	-1.23***	-0.13	-0.16
	[-1.52,-0.04]	[-1.91,-0.56]	[-0.43,0.18]	[-0.48,0.16]
Mid HH Inc.		-0.23		-0.04
		[-1.05,0.58]		[-0.39,0.32]
High HH Inc.		-0.67		0.02
		[-1.53,0.19]		[-0.45,0.49]
Other qual.		2.23***		-0.53
		[0.97,3.48]		[-1.49,0.43]
GCSE		2.17***		-0.20
		[1.14,3.20]		[-0.69,0.30]
A-level		0.88		-0.43
		[-0.19,1.95]		[-0.95,0.10]
Other Degree		2.58***		-0.67
		[1.22,3.94]		[-1.77,0.44]
Uni. Degree		0.92		-0.09
		[-0.25,2.09]		[-1.34,1.16]
Age		0.08***		0.02
		[0.06,0.10]		[-0.09,0.12]
Female		8.49***		0.15
		[7.83,9.16]		[-0.17,0.48]
Constant	11.03***	1.53*	3.29***	3.25**
	[10.46,11.60]	[0.09,2.97]	[3.07,3.51]	[1.31,5.19]
Observations	2726	2690	210	205

Table 10.29 Cultural differences between Catholics and Protestants – hours spent doing housework and consumption of alcoholic drinks. Coefficients and 95% confidence intervals from linear regressions used to explain the variation in amount of hours spent doing housework in the past week and the frequency of alcoholic drinks in the past month by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Grocery shop	(2) Grocery shop (adj.)	(3) Cooking	(4) Cooking (adj.)
Mostly spouse/partner				
Protestant	1.05	1.06	1.09	1.10
	[0.77,1.42]	[0.77,1.45]	[0.81,1.47]	[0.81,1.48]
Female	0.03***	0.02***	0.03***	0.03***
	[0.02,0.04]	[0.02,0.03]	[0.02,0.04]	[0.02,0.04]
Mid HH Inc.		1.33		1.00
		[0.89,2.01]		[0.68,1.48]
High HH Inc.		1.24		1.04
		[0.82,1.88]		[0.70,1.54]
Other qual.		0.54		0.60
		[0.29,1.01]		[0.33,1.09]
GCSE		0.60*		0.86
		[0.36,0.99]		[0.53,1.40]
A-level		0.60		0.81
		[0.36,1.00]		[0.49,1.32]
Other Degree		0.78		0.84
		[0.42,1.43]		[0.47,1.49]
Uni. Degree		0.48**		0.73
		[0.28,0.83]		[0.44,1.22]
Age		1.00		1.00
		[0.99,1.01]		[0.99,1.01]
Constant	4.44***	5.79***	4.56***	5.17***
	[3.29,5.99]	[2.53,13.25]	[3.40,6.11]	[2.34,11.44]
Shared				
Protestant	1.01	1.02	0.82	0.81
	[0.78,1.32]	[0.78,1.34]	[0.62,1.07]	[0.61,1.07]
Female	0.16***	0.16***	0.16***	0.15***
	[0.12,0.21]	[0.12,0.21]	[0.12,0.21]	[0.11,0.21]
Mid HH Inc.		1.33		1.47*
		[0.94,1.89]		[1.01,2.13]
High HH Inc.		1.19		1.33
		[0.83,1.69]		[0.91,1.93]
Other qual.		0.95		0.88
		[0.57,1.58]		[0.51,1.53]
GCSE		0.72		1.24
		[0.47,1.12]		[0.79,1.95]
A-level		0.77		1.10
		[0.48,1.22]		[0.68,1.78]
Other Degree		1.17		1.12
		[0.71,1.91]		[0.66,1.89]
Uni. Degree		0.64		0.95
		[0.40,1.03]		[0.58,1.54]
Age		1.00		1.00
		[0.99,1.01]		[0.99,1.01]
Constant	2.58***	2.21*	2.43***	2.06
	[1.92,3.46]	[1.06,4.63]	[1.80,3.28]	[0.96,4.46]
Observations	1556	1533	1562	1539

Table 10.30 Cultural differences between Catholics and Protestants – Gender Roles I. Odd ratios and 95% confidence intervals from multinomial logistic regressions (ref. response is *mostly self*) is used to explain the variation in who does most of the grocery shopping and most of the cooking by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Cleaning	(2) Cleaning (adj.)	(3) Ironing	(4) Ironing (adj.)
Mostly spouse/partner				
Protestant	0.95	0.93	1.11	1.10
	[0.68,1.32]	[0.66,1.30]	[0.75,1.64]	[0.74,1.65]
Female	0.02***	0.01***	0.00***	0.00***
	[0.01,0.02]	[0.01,0.02]	[0.00,0.00]	[0.00,0.00]
Mid HH Inc.		1.01		1.12
		[0.65,1.55]		[0.66,1.89]
High HH Inc.		0.82		1.24
		[0.53,1.27]		[0.73,2.13]
Other qual.		0.57		0.36*
		[0.29,1.11]		[0.16,0.81]
GCSE		0.86		0.51*
		[0.50,1.47]		[0.26,0.99]
A-level		0.70		0.54
		[0.40,1.23]		[0.27,1.06]
Other Degree		0.83		0.35**
		[0.43,1.59]		[0.16,0.77]
Uni. Degree		0.93		0.44*
		[0.52,1.66]		[0.22,0.88]
Age		1.02*		1.00
		[1.00,1.03]		[0.99,1.02]
Constant	6.37***	3.97**	12.50***	18.48***
	[4.55,8.91]	[1.62,9.73]	[8.32,18.77]	[6.12,55.81]
Shared				
Protestant	0.92	1.00	0.87	0.92
	[0.70,1.21]	[0.75,1.32]	[0.62,1.21]	[0.66,1.29]
Female	0.10***	0.10***	0.04***	0.04***
	[0.08,0.14]	[0.07,0.14]	[0.03,0.07]	[0.03,0.06]
Mid HH Inc.		1.15		1.37
		[0.80,1.66]		[0.86,2.18]
High HH Inc.		1.02		1.50
		[0.70,1.49]		[0.94,2.41]
Other qual.		0.94		0.77
		[0.55,1.61]		[0.38,1.57]
GCSE		0.67		0.74
		[0.42,1.07]		[0.42,1.33]
A-level		0.75		0.94
		[0.46,1.23]		[0.51,1.71]
Other Degree		1.24		0.96
		[0.74,2.08]		[0.50,1.83]
Uni. Degree		1.14		0.89
		[0.70,1.85]		[0.49,1.63]
Age		0.99		0.98**
		[0.98,1.00]		[0.97,0.99]
Constant	3.88***	5.68***	4.29***	10.71***
	[2.80,5.38]	[2.62,12.34]	[2.86,6.45]	[4.00,28.69]
Observations	1505	1483	1535	1512

Table 10.31 Cultural differences between Catholics and Protestants – Gender Roles II. Odd ratios and 95% confidence intervals from multinomial logistic regressions (ref. response is *mostly self*) is used to explain the variation in who does most of the house cleaning and most of the ironing by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Fin. decisions	(2) Fin. decisions (adj.)	(3) Childcare	(4) Childcare (adj.)
Mostly spouse/partner				
Protestant	1.11	1.14	2.18*	2.26*
	[0.75,1.63]	[0.77,1.69]	[1.17,4.04]	[1.18,4.35]
Female	2.56***	2.36***	0.00***	0.00***
	[1.74,3.76]	[1.59,3.49]	[0.00,0.01]	[0.00,0.01]
Mid HH Inc.		0.90		0.81
		[0.55,1.46]		[0.36,1.82]
High HH Inc.		1.28		0.59
		[0.78,2.10]		[0.25,1.40]
Other qual.		0.51		0.90
		[0.24,1.12]		[0.17,4.63]
GCSE		0.73		4.02*
		[0.40,1.34]		[1.16,13.90]
A-level		0.86		3.25
		[0.44,1.67]		[0.89,11.86]
Other Degree		1.07		9.98**
		[0.52,2.21]		[2.06,48.48]
Uni. Degree		0.65		6.59**
		[0.33,1.28]		[1.83,23.73]
Age		0.99		1.02
		[0.98,1.01]		[0.97,1.06]
Constant	0.55**	0.88	7.31***	1.50
	[0.37,0.81]	[0.32,2.42]	[3.45,15.47]	[0.18,12.70]
Shared				
Protestant	0.84	0.82	1.96**	2.23***
	[0.62,1.13]	[0.61,1.12]	[1.29,2.96]	[1.43,3.48]
Female	1.31	1.32	0.05***	0.04***
	[0.98,1.75]	[0.98,1.78]	[0.02,0.10]	[0.02,0.08]
Mid HH Inc.		1.32		1.41
		[0.91,1.91]		[0.80,2.49]
High HH Inc.		1.64*		2.02*
		[1.11,2.42]		[1.13,3.62]
Other qual.		0.81		1.21
		[0.46,1.42]		[0.38,3.86]
GCSE		0.78		1.83
		[0.48,1.25]		[0.74,4.51]
A-level		1.15		1.94
		[0.69,1.91]		[0.76,4.96]
Other Degree		0.88		5.11**
		[0.49,1.59]		[1.78,14.68]
Uni. Degree		0.94		3.87**
		[0.56,1.58]		[1.53,9.74]
Age		1.01		1.01
		[1.00,1.02]		[0.98,1.04]
Constant	4.84***	2.76*	13.19***	3.35
	[3.68,6.36]	[1.27,6.00]	[6.58,26.44]	[0.72,15.57]
Observations	1565	1542	618	612

Table 10.32 Cultural differences between Catholics and Protestants – Gender Roles III. Odd ratios and 95% confidence intervals from multinomial logistic regressions (ref. response is *mostly self*) is used to explain the variation in who makes most of the financial decisions and who does most of the childcare by religious background (ref. category is Catholic). Adjusted models include household income (ref. category is low HH income), highest educational level achieved (ref. category is no qualification), age and gender (ref. category is male).

	(1) Econ. activity	(2) Econ. activity (adj.)
Self Employed		
Protestant	0.82	0.78
	[0.60,1.12]	[0.57,1.08]
Age		1.03***
		[1.02,1.05]
Female		0.29***
		[0.21,0.41]
Constant	0.18***	0.07***
	[0.15,0.23]	[0.04,0.13]
Unemployed		
Protestant	0.71	0.71
	[0.49,1.02]	[0.49,1.04]
Age		0.96***
		[0.95,0.98]
Female		0.36***
		[0.24,0.53]
Constant	0.14***	1.02
	[0.11,0.18]	[0.54,1.93]
Retired		
Protestant	1.39**	0.84
	[1.14,1.69]	[0.59,1.20]
Age		1.35***
		[1.31,1.38]
Female		1.49*
		[1.04,2.12]
Constant	0.52***	0.00***
	[0.44,0.60]	[0.00,0.00]
Maternity leave		
Protestant	0.54	0.62
	[0.20,1.47]	[0.23,1.69]
Age		0.91***
		[0.86,0.96]
Female		3.39e+06
		[0.00,.]
Constant	0.02***	0.00
	[0.01,0.04]	[0.00,.]
Family care or home		
Protestant	0.77	0.74
	[0.56,1.05]	[0.54,1.03]
Age		1.03***
		[1.02,1.04]
Female		26.62***
		[10.84,65.34]
Constant	0.19***	0.00***
	[0.15,0.24]	[0.00,0.01]
FT student		
Protestant	0.64**	0.61*
	[0.48,0.87]	[0.38,0.98]
Age		0.61***
		[0.57,0.66]
Female		1.79*
		[1.10,2.91]
Constant	0.23***	23756.45***
	[0.19,0.29]	[4969.57,113564.98]
Sick or disabled		
Protestant	0.57***	0.52***
	[0.41,0.79]	[0.37,0.72]
Age		1.07***
		[1.06,1.09]

Female		0.96
		[0.69,1.34]
Constant	0.21***	0.01***
	[0.17,0.26]	[0.00,0.02]
Govt. training scheme		
Protestant	2.44	2.45
	[0.50,11.79]	[0.50,12.00]
Age		0.86***
		[0.78,0.94]
Female		0.41
		[0.10,1.68]
Constant	0.00***	0.91
	[0.00,0.02]	[0.06,12.97]
Doing something else		
Protestant	0.70	0.68
	[0.24,2.00]	[0.24,1.95]
Age		1.02
		[0.98,1.06]
Female		0.73
		[0.26,2.11]
Constant	0.02***	0.01***
	[0.01,0.03]	[0.00,0.07]
Observations	2732	2732

Table 10.33 Cultural differences between Catholics and Protestants – economic activity. Odd ratios and 95% confidence intervals from multinomial logistic regressions (ref. response is *full time employment*) is used to explain the variation in the economic activity by religious background (ref. category is Catholic). Adjusted models include age and gender (ref. category is male).

	(1) Long/Short term savings	(2) Long/Short term savings (adj.)
Mainly long term		
Protestant	1.09	1.23
	[0.79,1.49]	[0.88,1.71]
Mid HH Inc.		1.19
		[0.74,1.91]
High HH Inc.		1.77*
		[1.12,2.81]
Other qual.		1.21
		[0.58,2.53]
GCSE		1.01
		[0.56,1.83]
A-level		1.45
		[0.81,2.60]
Other Degree		2.39**
		[1.24,4.59]
Uni. Degree		1.37
		[0.77,2.41]
Age		0.99**
		[0.98,1.00]
Female		1.13
		[0.82,1.55]
Constant	0.58***	0.49
	[0.45,0.75]	[0.21,1.16]
Mainly short term		
Protestant	0.87	0.93
	[0.64,1.18]	[0.68,1.28]
Mid HH Inc.		1.02
		[0.67,1.54]
High HH Inc.		1.11
		[0.73,1.68]
Other qual.		1.37
		[0.75,2.52]
GCSE		0.89
		[0.53,1.48]
A-level		0.76
		[0.44,1.29]
Other Degree		1.14
		[0.61,2.14]
Uni. Degree		0.62
		[0.36,1.06]
Age		0.99**
		[0.98,1.00]
Female		1.28
		[0.94,1.74]
Constant	0.71**	1.21
	[0.56,0.90]	[0.56,2.64]
Observations	1002	993

Table 10.34 Cultural differences between Catholics and Protestants – long/short term savings. Odd ratios and 95% confidence intervals from multinomial logistic regressions (ref. response is *both types of saving*) is used to explain the variation in whether savings are planned for the long or short term by religious background (ref. category is Catholic). Adjusted models include age and gender (ref. category is male).

10.2.5 Naturalistic Measures (Chapter 7)

	Coins	Maps	Lost Letters	Donations
	OR [CI]	OR [CI]	OR [CI]	OR [CI]
Income Deprivation	0.04***	0.01***	0.19**	0.03***
	[0.01,0.13]	[0.00,0.04]	[0.05,0.65]	[0.00,0.24]
Constant	4.90***	11.94***	3.22**	13.08***
	[2.84,8.45]	[6.62,21.56]	[1.49,6.98]	[5.00,34.24]
Crime & Disorder	0.98***	0.98***	0.98*	0.96***
	[0.97,0.99]	[0.97,0.99]	[0.97,1.00]	[0.94,0.98]
Constant	3.23***	4.57***	2.18*	15.58***
	[1.89,5.53]	[2.76,7.59]	[1.08,4.43]	[5.93,40.95]
Social Capital	0.15**	0.02***	0.54	0.63*
	[0.04,0.50]	[0.01,0.09]	[0.18,1.63]	[0.43,0.92]
Constant	93.41***	7363.25***	7.62	9.09***
	[6.48,1347.02]	[373.01,145351.30]	[0.71,82.02]	[3.45,23.91]
Observations	264	329	352	168

Table 10.35 Logistic regressions from the model selection for the 4 measures. Odd ratios and 95% confidence intervals from logistic regressions used to predict cooperative behaviour by the neighbourhood-level variables: income deprivation, crime and disorder rates and social capital index. Lost letters regressions were also controlled for pop. density and no. of post-boxes. ***p<.001; **p<.01; *p<..05; .p<.1

Donations	Ind. Education	Neigh. Education	Neigh. & Ind. Education
	OR [CI]	OR [CI]	OR [CI]
GCSE	0.95	-	1.02
	[0.35,2.56]		[0.38,2.72]
A-Level	1.12	-	0.97
	[0.39,3.24]		[0.33,2.81]
Undergraduate	2.47	-	1.90
	[0.54,11.29]		[0.41,8.72]
Graduate	1.79	-	1.10
	[0.30,10.68]		[0.17,7.10]
Perc. Graduates	-	1.03*	1.03
		[1.00,1.06]	[0.99,1.06]
Constant	2.74*	1.64	1.62
	[1.21,6.22]	[0.76,3.52]	[0.62,4.23]
	Ind. Income	**Neigh. Income**	**Neigh. & Ind. Income**
HH Income	1.00	-	1.00
	[1.00,1.00]		[1.00,1.00]
Income Deprivation	-	0.04**	0.03**
		[0.01,0.30]	[0.00,0.24]
Constant	3.55***	11.27***	15.52***
	[1.85,6.79]	[4.31,29.42]	[4.88,49.36]
	Neigh. Educ. & Inc.	**Ind. Educ. & Inc.**	**Neigh. & Ind. Educ. & Inc**
Perc. Graduates	0.98	-	-0.02
	[0.93,1.02]		[-0.07,0.03]
Income Deprivation	0.01*	-	-4.76*
	[0.00,0.38]		[-8.72,-0.81]
GCSE	-	-0.07	-0.20
		[-1.06,0.93]	[-1.19,0.79]
A-Level	-	0.19	-0.17
		[-0.89,1.26]	[-1.26,0.91]
Undergraduate	-	1.08	0.46
		[-0.49,2.66]	[-1.14,2.06]
Graduate	-	1.03	0.41
		[-1.08,3.15]	[-1.79,2.61]
HH Income	-	-0.00	-0.00
		[-0.00,0.00]	[-0.00,0.00]
Constant	36.25**	1.13*	3.82**
	[2.69,488.08]	[0.27,2.00]	[0.92,6.72]

Table 10.36 Logistic regressions from the model selection for donations. Odd ratios and 95% confidence intervals from multi-level logistic regressions used to predict cooperative behaviour by individual (household income and highest educational status reached) and

neighbourhood-level variables (income deprivation and perc. of graduates). n=159. ***p<.001; **p<.01; *p<..05; .p<.1

	Donations
	OR [CI]
Leo	1.00
	[0.06,16.89]
Ram	3.93
	[0.02,677.49]
Male	1.16
	[0.06,23.21]
Leo X Male	1.37
	[0.02,116.83]
Ram X Male	0.33
	[0.00,159.57]
Income Deprivation	0.02*
	[0.00,0.76]
Leo X Income Deprivation	15.75
	[0.03,7099.23]
Ram X Income Deprivation	1.19
	[0.00,11681.73]
Male X Income Deprivation	1.79
	[0.00,862.49]
Leo X Male X Income Deprivation	0.06
	[0.00,979.90]
Ram X Male X Income Deprivation	0.71
	[0.00,73587.51]
Constant	9.87*
	[1.51,64.73]
Observations	167

Table 10.37 Donations by experimenter, participant's gender and income deprivation. Odd ratios and 95% confidence intervals from a logistic regression used to predict donations by the experimenter, the gender of the participant, the neighbourhood income deprivation and the interaction of the 3 terms. ***p<.001; **p<.01; *p<..05; .p<.1