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## Where are you from? Cultural differences in public good experiments

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### ABSTRACT

We study the effect of cultural differences on contributions in a public good experiment, analysing real-time interactions between Italian and British subjects in their home countries. In the first treatment, subjects play in nationally homogeneous groups. In the second treatment, Italian and British subjects play in heterogeneous groups, knowing the nationality of the group members. In the third treatment, we control for a possible “country effect” by giving players no information on nationality. The data suggest that, in homogeneous groups, British subjects contribute significantly more to the public good; contributions are lower in heterogeneous groups; there is no country effect.

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## 1. Introduction

The hypothesis that cultural background<sup>1</sup> matters for economic interaction has frequently been tested and generally confirmed in various cross-cultural economics experiments. For instance, Roth et al. (1991), Kachelmeier and Shehata (1992), and Croson and Buchan (1999) identify the potential role of different cultural norms in influencing economic outcomes in the case of a bargaining framework. In an ultimatum game, Roth et al. (1991), Munier and Zaharia (2002), Henrich et al. (2001), and Oosterbeek and Sloof (2004) find clear differences in proposer and responder behaviour across countries. Ockenfels and Weimann (1999) run public goods and solidarity experiments, finding that in both games Eastern German subjects are more selfish than Western German subjects. Cason et al. (2002) find that the contribution levels between American and Japanese subjects are significantly different. Gaechter et al. (2003) show that strong cultural differences emerge when subjects have the possibility to punish the other members of their groups.<sup>2</sup>

Whereas these cross-cultural experiments have been fruitful in stimulating a large number of important contributions in the field, experimentalists have paid far less attention to the study of heterogeneous groups of subjects with different cultural backgrounds. In many economic interactions, the various cultural backgrounds of the players involved will be known, such as in international issues of trade, aid and the environment. Therefore, it is not only significant to compare homogeneous groups but also important to know how subjects behave when they are aware that they play in a group composed of both country

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<sup>1</sup> Culture is difficult to univocally define. Richerson and Boyd (2005) suggest that culture is “information capable of affecting individuals’ behaviour that they acquire from other members of their species through teaching, imitation, and other forms of social transmission”.

<sup>2</sup> In contrast with previous studies, Brandts et al. (2004) find minor differences in the contributions to public goods between Holland, Spain, Japan and USA. Also, in auctions and fair division games, Ivanova-Stenzel (2001) reports no differences in individual bidding behaviour between Bulgaria and Germany.

A and country B subjects. Some studies addressed this question. [Fershtman and Gneezy \(2001\)](#) study different aspects of ethnic discrimination in Israeli Jewish society towards subjects of Eastern origin using trust, dictator, and ultimatum games. [Carpenter and Cardenas \(2004\)](#) observe the occurrence of different individual extraction decisions between American and Colombian subjects in a common pool resource game. In the trust game experiments by [Willinger et al. \(2003\)](#), higher levels of investment are observed for German subjects when compared to French. [Chuah et al. \(2007\)](#) report on the cultural differences between the behaviour of Malaysian Chinese and UK subjects interacting within their own national groups, and with members of the other group in ultimatum game experiments.

This paper studies the effects of interactions between Italian and British subjects on contributions to public goods. We not only compare the behaviour of groups formed by subjects of the same nationality but also consider the behaviour of mixed groups of British and Italian subjects. Our cross-country experiment considers two Western European countries (England and Italy), which we believe to diverge with respect to some important social variables. In Section 2.1, we discuss evidence for cultural differences between these two countries.

A novel aspect of our experiments is that they are conducted in real-time in the two countries without the intervention of the experimenters. Independently of this study, [Eckel and Wilson \(2006\)](#) have carried out the only other real-time experiment. They report the results of experiments on trust games conducted over the Internet between two different laboratories both in the USA. By contrast, in the papers cited above, the interaction between subjects of different nationalities is carried out indirectly through the intervention of the experimenter. A second novelty is that we control for a possible “country effect” by letting subjects play with foreign group members also without information on their nationality. This treatment is important because a particular historical relationship or general prejudice between the chosen countries could influence the experimental evidence (see e.g. [Fershtman and Gneezy, 2001](#)).

All our treatments are based on standard linear public good games (or voluntary contribution mechanisms). In the first treatment (labelled “Native”), subjects are aware that they play in groups formed by compatriots. This represents our baseline treatment. In the second treatment (labelled “Italy–UK”), heterogeneous groups (two Italians and two Britons each) interact from labs sited in their home countries. Each subject knows the composition of the group in terms of proportion and nationality. The third treatment (labelled “Foreigner”) is the same as the Italy–UK treatment except for the information given to subjects: each player knows that one member of the group is a compatriot and that the other two are foreigners.

The design allows us to test two hypotheses: (1) British subjects cooperate less than Italians in homogeneous groups (as suggested by the results in [Burlando and Hey, 1997](#), see below) and (2) subjects playing in heterogeneous groups cooperate less than those in homogeneous groups (as suggested by [Tajfel and Turner, 1979](#); [McPherson et al., 2001](#); [Ruffle and Sosis, 2004](#)). In addition to these hypotheses, we use the comparison between the Italy–UK and Foreigner treatments as a control for a possible “country effect” due to possible attitudinal issues between Italian and British subjects.

Our data reject the hypothesis that British subjects contribute less to the public good than Italians when playing in homogeneous groups. To the contrary, Britons contribute 9% more when groups are made of compatriots. This was also the case in the Foreigner treatment, whereas in the Italy–UK treatments it turns out that the contributions of British and Italian subjects are very close (39.96% in the Foreigner treatment and 37.04% in the Italy–UK treatment). The second hypothesis is confirmed by the data. Subjects lower their contributions to the public good in both Italy–UK, by 18%, and Foreigner, by 15%, treatments compared with the Native treatment. Finally, we do not find any evidence of a country effect when comparing the contribution levels reached in Italy–UK and Foreigner treatments.

The only previous experimental study testing for cultural differences between Italy and England is by the abovementioned [Burlando and Hey \(1997\)](#), henceforth BH. BH do not analyse heterogeneous groups but their cross-country comparison suggests that British players free-ride significantly more than Italians in a public bad game. While this supports the hypothesis of different social norms in different social and cultural contexts, it contradicts our results. Although our experiment differs from BH in many respects,<sup>3</sup> we believe that only one of these differences is likely to explain why we obtain the opposite result. In our Native treatment, subjects know they are playing with compatriots only; it is not clear if the same was the case in BH. In Section 3.2 we will discuss evidence for the effects of group heterogeneity on subjects’ interactions.

## 2. Methodology

### 2.1. Country selection

The choice of Italy and UK is supported by empirical studies analysing the role of cultural traits on the political and economic performance of different countries.<sup>4</sup> For example, [Guiso et al. \(2004\)](#) report the results of a recent survey conducted on 1016 managers from the five major EU countries. Each was asked to rank colleagues from the five countries in terms of

<sup>3</sup> First, while we implement a linear public good game, BH opt for a public bad game. Second, BH allow for the price of the public bad to vary from round to round to motivate subjects to consider their decisions wisely; our marginal per capita return from the contribution to the public good is constant throughout the experiment. Third, each BH session involves two sub-sessions in order to check for a restart effect; our design does not have the same feature. Fourth, BH warn against potential differences in the purchasing power of the sums earned by British and Italian subjects; we resolved this problem by applying the Big Mac index to equalize the profits.

<sup>4</sup> The role of cultural factors as casual variables affecting the economic growth and development is also investigated from a theoretical point of view ([Becker, 1998](#); [Altman, 2001](#)).

their trustworthiness.<sup>5</sup> While British managers ranked fellow citizens as the most trustworthy and Italians the least, Italian managers ranked fellow citizens fourth in trustworthiness and British managers third. Therefore, that the expectations of agents correspond to the objective characteristics of the country seems to be upheld.

Inglehart (2000) allocates 65 countries into distinct cultural zones according to different dimensions. A first classification is done following two cultural dimensions that reflect “cross-national polarization between traditional versus secular-rational orientations toward authority and survival versus self-expression values” (p. 82).<sup>6</sup> Italy and Britain score the same value of the first cultural dimension but strongly diverge on the value of the second cultural dimension. In particular, Britain shows a much higher level of values of self-expression than Italy. Inglehart (2000) also analyses the coherence of the cultural clusters, examining the relationship between interpersonal trust<sup>7</sup> and per capita GNP. Whereas Italy and Britain show very similar values of GNP per capita, there is a clear difference in those regarding interpersonal trust. Britain scores significantly higher than Italy in this cultural dimension, confirming a difference in social norms between these two countries.

Along the same line, Hofstede (1996) studies how national differences relate to organizational practices. He uses data from a survey of IBM employees in 50 countries and three regions, constructing six groups on the basis of similarity along two dimensions. The first dimension is the power distance, defined as “the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally” (p. 28). The second dimension measures the degree of individualism in a society, where individualism “pertains to societies in which the ties between individuals are loose: everyone is expected to look after himself or herself and his or her immediate family” (p. 51). According to this analysis, Italy and Britain belong to two different groups. In particular, Italy shows a higher power distance index and a lower individualism index than Britain. Therefore, we believe that the different levels of the social dimensions described above may affect the choices of the subjects taking part in a cross-cultural experiment.

## 2.2. Design issues

Roth et al. (1991) and Camerer (2003) list the methodological problems that may arise when running cross-country experiments, such as the experimenter effect, the language effect, and the currency effect.<sup>8</sup> The first problem to solve is the presence of different experimenters in different locations, which may cause uncontrolled procedural or personal differences among the experimenters. To take care of this feature, all of our experimenters agreed upon the same experimental procedures and then ran initial sessions jointly (in Italy). We could thus be sure that all the experimenters followed the same procedures in the two labs.

The second problem is given by the fact that the instructions had to be in two languages. To control for errors in translation (and given that the native language of the author is the Italian), we checked the accuracy of the instructions for British subjects by having the author and two other Italian native-speakers independently translate the instructions into English. The three versions were then examined by an English native-speaker to check for differences and correct for possible misinterpretation. The best of these three was used in the experiment.

We then took into account differences in payments to subjects because of currency differences. Along with using the current exchange rate between the Euro and GBP,<sup>9</sup> we controlled for differences in purchasing power between Italy and Britain by using the Economist’s Big Mac index. The latter measures did not differ significantly.

We also needed a procedure to ensure the nationality of subjects recruited. Whereas virtually all students in Italy are Italians (and all participants were indeed Italians), the UK has a high concentration of international students. We decided not to pose a direct question regarding nationality because it might bias the experiment or raise nationalistic emotions. Instead, we issued a short, mandatory questionnaire via the e-mail announcing the experiment in which we “hide” the question of nationality among other demographical and academic-related questions.

A further methodological aspect was given by the degree of directness and instantaneousness of interactions between subjects playing from different countries. In all previous experiments (to the best of our knowledge), the decisions of the sub-sample have been collected and sent by the experimenter to the other lab via the Internet, whereupon the second experimenter communicates them to the participants. In our study, we allow subjects to receive the feedback of the foreign sub-sample without experimenter intervention.

Recently, Eckel and Wilson (2006) investigated the levels and the effects of subject’s scepticism towards being matched with another person playing from a different laboratory, when the experiment is conducted in real-time over the Internet (credibility issue). In a trust game, Eckel and Wilson (2006) show that, if subjects do not believe they are matched with a real person, the results may be misleading because subjects trust the experimenter rather than their partner. Frolich et al. (2001)

<sup>5</sup> Managers ranked their colleagues on a scale from 1 to 5, where 1 is the highest level of trustworthiness and 5 the lowest.

<sup>6</sup> The former refers to the contrast between societies where factors such as religion, family ties, deference to authority and avoidance of political conflict are important or not. The latter refers to the contrast between societies that emphasize survival values and those that show “low levels of subjective well-being, report relatively poor health, low interpersonal trust, [and] intolerance toward outgroups” (p. 84).

<sup>7</sup> Putnam (1993), Fukuyama (1995), Knack and Keefer (1997), and other scholars argue that interpersonal trust is crucial for building the social structures on which democratic societies and social organizations are based.

<sup>8</sup> Camerer (2003) suggests that care should be taken to avoid having samples that vary in representation of population from one country to another. Unfortunately, we do not have all the demographic data required to control for this effect.

<sup>9</sup> The exchange rate at that time was £1.00 = €1.40 (or €1.00 = £0.72).

also investigate the credibility issue in a dictator game experiment. They find that most measures of subjects' uncertainties regarding the existence of the individuals they are paired with are not significantly different between treatments.<sup>10</sup> Unfortunately, we were not aware of this study and the potential problem when we ran the experiments. However, during informal debriefings after the sessions, several subjects asked the experimenters about the exact location of the other laboratory in both Foreigner and Italy–UK treatments. This may indicate some level of trust in their partners.

### 3. Experimental design and hypotheses

#### 3.1. The design

All treatments use the same standard public good game. Four subjects are endowed with six tokens each. They decide on the allocation of their endowment between a private good, A ( $x_i$ ), and a public good B ( $g_i$ ). Each token placed in A ( $x_i$ ) earns one unit of Experimental Currency (EC) for the subject. Each token allocated to B ( $g_i$ ) gives  $0.4g_i$  to each member of the group. Accordingly, each subject gets the following payoff:

$$\pi_i = x_i + 0.4 \sum_{j=1}^4 g_j \quad \text{s.t. } x_i + g_i = 6 \quad (1)$$

Players receive feedback on their own contributions and their group's contribution to the public good in each period.

Our experimental setting involves three treatments, each of them played for ten periods. We implemented a fixed matching protocol. The Native treatment is our control treatment. In this case, subjects know that they play in a group comprising only compatriots. The Italy–UK treatment divides participants into mixed groups of two Italian and two British players. The composition of the group remains the same during the ten periods and subjects know both the composition of the group and the nationalities involved. Subjects play from labs sited in their own country and interact with other group members in real-time. Finally, the Foreigner treatment is organized the same way as the Italy–UK treatment except that subjects do not know the nationality of the foreign participants.

The experiment was conducted at the University of Catania (Italy) and at Royal Holloway, University of London (UK). A total of 136 subjects, equally divided between Italian and British, were recruited among a population of students from a wide range of fields such as economics, law, political science, mathematics, and the arts. Each student participated in only one session of our experiment. For each treatment we ran two sessions. We obtained 10 independent observations from 40 subjects participating in the Native treatment and 12 independent observations for each treatment from 96 subjects in the Italy–UK and Foreigner treatments.

Before beginning the experiment, the instructions were read aloud and explained in detail.<sup>11</sup> Communication of any kind was forbidden. Subjects typed their decisions directly into their computers at their leisure. The staff of the *Centro Informazione Giuridica* at the University of Catania developed the experimental software. At the end of each treatment, subjects were paid anonymously and in cash at the following exchange rates: 1 EC = €0.20 = £0.14. On average, Italian subjects earned €14.45 and British subjects earned £10.40. Each treatment lasted between 40 and 60 min.

#### 3.2. Hypotheses

According to the standard game-theoretic approach, in each period fully rational subjects should be playing the free-riding strategy independent of location and the presence of group members of a different nationality. From many economic studies on individuals' interactions, however, we know that subjects usually deviate from the Nash equilibrium. On this basis, we test for two hypotheses.

**Hypothesis 1.** In homogeneous groups, British subjects contribute less than Italian subjects.

This is based on BH's results stating that British subjects are less cooperative than Italians in a public bad experiment. By comparing the levels of cooperation between the sessions of the Native treatment, we can confirm or deny those results. Moreover, we test the same hypothesis in the case of heterogeneous groups. We do this by comparing the contribution levels reached by the two national samples in the Italy–UK and Foreigner treatments.

**Hypothesis 2.** Participants in heterogeneous groups contribute less than those in homogeneous groups.

This is based on the results of several studies analysing the negative influence of heterogeneous groups on subjects' interactions. For instance, even if participants have a mutual interest in coordinating their activities, this process may become more difficult when cross-cultural interactions take place (Chuah et al., 2007). As suggested by Tajfel and Turner (1979), a decrease in cooperation may be due to the effects of social categorisation and stereotyping. Subjects with similar cultural backgrounds

<sup>10</sup> In the first treatment, dictators and recipients played in the same room, whereas in the second treatment subjects were placed in two different rooms according to their roles.

<sup>11</sup> See Appendix A for instructions of the Italy–UK treatment for British subjects.

**Table 1**  
Average group contribution as percentage of endowment

Treatment	1	2	3	4	5	6	7	8	9	10	Average
Native (10 groups of 4 subjects)	63.33	69.92	62.50	56.57	56.57	60.83	43.75	48.33	42.08	35.00	54.79
Italy–UK (12 groups of 4 subjects)	46.88	46.53	43.75	45.49	42.36	32.64	32.99	27.43	25.59	20.83	36.46
Foreigner (12 groups of 4 subjects)	57.64	50.35	46.53	40.63	32.64	37.85	57.15	37.15	32.64	20.51	40.21

and similar appearances tend to trust each other more (McPherson et al., 2001). Moreover, people may discriminate in favour of in-group members at the expense of out-group members (Sherif, 1966; Ruffle and Sosis, 2004).<sup>12</sup> Support for the influence of cultural differences on individuals' behaviour has also come from cross-cultural communication and psychology literature, suggesting that people behave differently with members of their own culture vis-à-vis members of foreign cultures (Bouchner and Perks, 1971; Bouchner and Ohsako, 1977), and from business studies providing evidence that business negotiators adapt their behaviour in cross-cultural interactions compared with culturally homogeneous interactions (Adler and Graham, 1989).

In addition to the previous hypotheses, we also check for the presence of a country effect between Italian and British subjects due to a particular attitude towards each other. If this is indeed the case, we should observe a difference in the contribution levels when comparing the Italy–UK and Foreigner treatments.

## 4. The results

### 4.1. Nationality and public good contributions

Table 1 shows the average group contributions to the public good for each treatment, pooling the data from the two national samples. Each treatment starts at a quite high level of contribution, between 63.33% (Native) and 46.53% (Italy–UK), and ends away<sup>13</sup> from the Nash equilibrium of zero contribution, between 35% (Native) and 20.83% (Italy–UK).<sup>14</sup> We also analyse the time trend for each treatment and find decreasing patterns all of which show Spearman's  $\rho$  values higher than  $-0.90$ .<sup>15</sup>

In addition, Table 2 reports average contributions for all the 34 independent observations, pooling the data from the two national samples, and provides a clear picture of the variance in the data. The average contributions of the Native treatment (roughly 55% of the endowment) are clearly higher than those of the other two treatments (between 37.04 and 39.96% of the endowment). This result shows that belonging to a heterogeneous group decreases individual contribution by 16% on average. Also the variance in the data increases when moving from homogeneous to heterogeneous groups, from 9.18% in the Native treatment to an average of 19.02% in heterogeneous groups. Thus, the variance reported in both heterogeneous treatments is twice that of the Native treatment. In the following we analyse the experimental results with respect to the two hypotheses formulated in the previous section.

Hypothesis 1 states that British subjects contribute less than Italians when playing in homogeneous groups. Fig. 1 shows that this hypothesis is rejected. In fact, aggregating the levels of contribution made by the two national samples in each treatment, we observe that British values are always higher than the Italian ones, the only exception being the Italy–UK treatment, where the two samples reach the same level.

A similar result is shown in Figs. 2 and 3. In all periods but the last, Britons contribute more than Italians. By comparing the patterns of contribution to the public good achieved in the Italian and British sessions of the Native treatment, we find that Britons contribute almost 9% more than Italians. The computed effect size is equal to 1.04. Thus, the contribution gap of the Native treatment's sessions is quite remarkable if compared with BH's result showing that Britons free-rode 14.5% more than Italians. At the same time, it has to be noted that the computation of statistical power analysis on the non-parametric Mann–Whitney  $U$  (MWU) test,<sup>16</sup> rejecting the null hypothesis that Italians and Britons' contributions in the Native treatment come from the same distribution ( $p$ -value = 0.049), finds a moderate power ( $pw = 0.43$ ). In addition, we test the same hypothesis separately in both Italy–UK and Foreigner treatments. In Italy–UK, we do not find any significant

<sup>12</sup> To this extent, in our experiment, subjects cannot perfectly discriminate between in-group and out-group members. However, knowing that they are playing with either two foreigners or two Italians/Britons may still be enough to observe a decrease in cooperation, albeit to a lesser degree than in the abovementioned papers.

<sup>13</sup> We run a simple OLS regression for each treatment with the individual contributions to the public good as dependent variable and with robust standard errors (White, 1980). In all three cases, the coefficients are quite big showing average individual contributions of half of the endowment in the Native treatment (3.28 tokens) and of one-third of the endowment in the other two treatments (2.42 tokens in the Foreigner and 2.20 tokens in the Italy–UK treatment). We also adopted a censored Tobit regression that confirmed the robustness of our results.

<sup>14</sup> Note that those levels of cooperation are perfectly in line with other experimental results on public goods (see Ledyard, 1995; Davis and Holt, 1993).

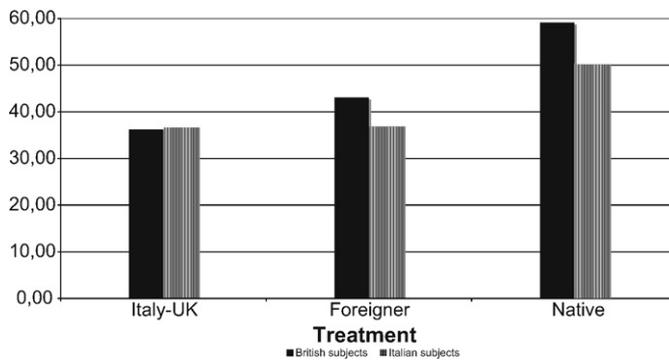
<sup>15</sup> All the non-parametric tests presented in this section are run on the level of independent observations. The Spearman's  $\rho$  values for each treatment calculated over all data are  $\rho_{\text{Italy-UK}} = -0.98$ ,  $\rho_{\text{Foreigner}} = -0.97$ ,  $\rho_{\text{Native}} = -0.90$ . To provide further statistical significance, we calculate the Spearman's  $\rho$  values for each independent observation and, then, use a one-sided sign test to show that negative  $\rho$  values are significantly more likely to happen than positive. The  $p$ -values are  $p_{\text{Italy-UK}} = 0.003$ ,  $p_{\text{Foreigner}} = 0.07$ ,  $p_{\text{Native}} = 0.001$ .

<sup>16</sup> For a detailed discussion on non-parametric tests applied to behavioural science, see Siegel and Castellan (1988).

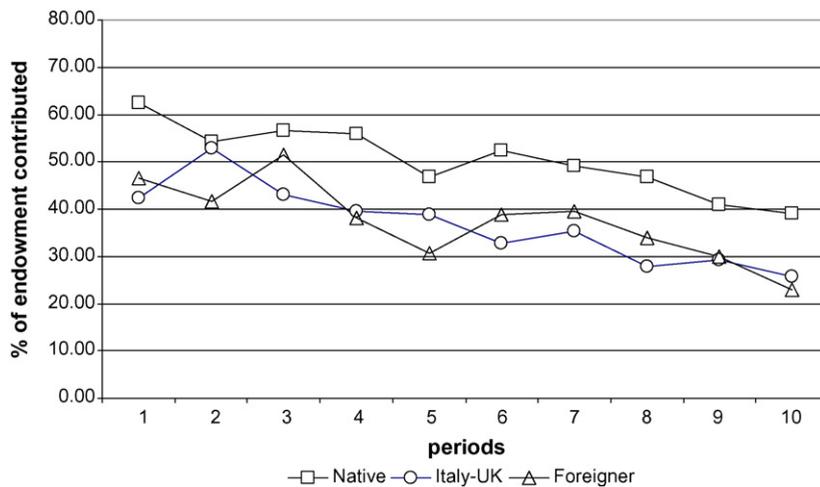
**Table 2**  
Average contribution for all independent observations

Groups	Treatments		
	Native <sup>a</sup>	Italy-UK	Foreigner
1	75.42	40.00	46.67
2	64.58	77.92	23.75
3	52.92	24.17	26.25
4	52.92	20.42	26.25
5	50.00	20.83	22.50
6	54.58	28.75	29.17
7	45.83	43.75	92.10
8	50.42	51.67	37.92
9	44.58	32.50	45.00
10	56.67	48.33	36.25
11		17.50	62.92
12		39.17	30.83
Average	54.79	38.83	38.59
S.E.	9.18	17.73	20.68

<sup>a</sup> The first five values refer to the British session, whereas the last five refer to the Italian session.



**Fig. 1.** Average contributions in each treatment.



**Fig. 2.** Italian behaviour across treatments.

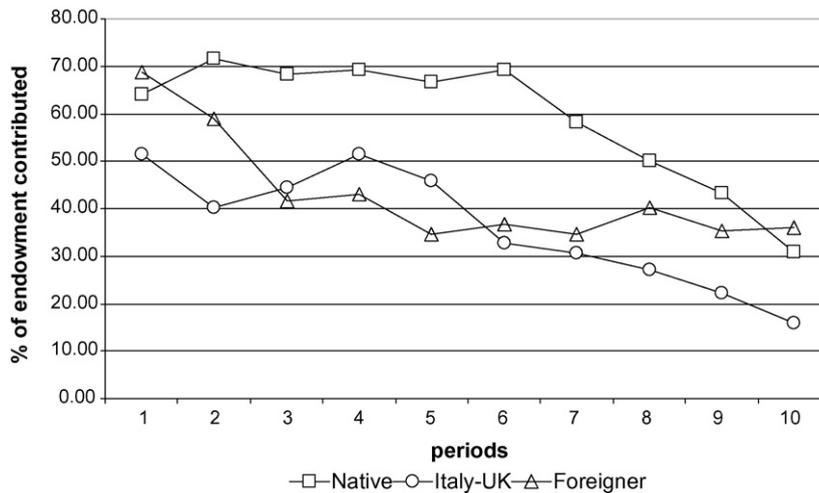


Fig. 3. British behaviour across treatments.

difference between the contribution levels reached by British and Italian subjects. In Foreigner, the contributions made by the two national samples differ at a significance level of 10%, but the related power of the test is very low ( $pw = 0.024$ ).<sup>17</sup>

The results from the Native treatment confirm the effects of cultural differences on the individual contributions to the public good,<sup>18</sup> as shown in several papers on cross-country comparisons with public good experiments (Ockenfels and Weimann, 1999; Cason et al., 2002; Gaechter et al., 2003). This overturns the findings of BH (1997) showing that British players free-ride 14.5% more than Italians. We summarize the results as follows.

**Observation 1.** *In homogeneous groups, British subjects contribute significantly more than Italians. Moreover, when British subjects play in heterogeneous groups knowing that one member of each group is a compatriot and the other two are foreigners, they also contribute significantly more than Italians. By contrast, when subjects play in heterogeneous groups knowing the nationality of the group members, there are no significant differences in the contribution levels between the national samples.*

According to Hypothesis 2, subjects playing in heterogeneous groups should free-ride more than in the case of homogeneous groups. Figs. 2 and 3 show that, regardless of nationality, the contributions in the Native treatment are always higher than in the other two treatments. Thus, Hypothesis 2 is confirmed by our data. At the aggregate level, the contributions made in the Native treatment (55% of endowment) are substantially doubled if compared to both Italy-UK and Foreigner treatments (27 and 28% of endowment, respectively). The MWU test shows that the contributions in the Native treatment are significantly higher than in both Italy-UK ( $p = 0.008$ ) and Foreigner treatments ( $p = 0.009$ ). The power values of these two MWU tests turn out to be nicely high ( $pw = 0.86$  for the comparison between Italy-UK and Native treatments, and  $pw = 0.62$  for the comparison between Foreigner and Native treatments). In addition, the effect size related to the comparison between Italy-UK and Native treatments is equal to 1.28, whereas it is equal to 0.94 in the comparison between Foreigner and Native treatments.<sup>19</sup> At the same time, the MWU test does not find any difference between the Italy-UK and Foreigner treatments ( $p = 0.53$ ) with an effect size of 0.15. Using the Italian and the British sub-samples separately, these results are confirmed in that there are still significant differences between the Native treatment on the one hand and the Italy-UK and Foreigner treatments on the other hand (all  $p < 0.01$ ). Our results confirm the substantial and negative influence of heterogeneous groups on subjects' interactions.

We then compare our findings to the stream of literature analysing the effects of cultural and social backgrounds on cooperation levels (Sherif, 1966; Tajfel and Turner, 1979; McPherson et al., 2001; Ruffle and Sosis, 2004; Chuah et al., 2007). In particular, our results confirm the previous experimental findings on individuals' behaviour in heterogeneous groups such as Fershtman and Gneezy (2001), which show the levels of ethnic discrimination in Israeli Jewish society; Willinger et al. (2003), who find different choices between German and French subjects; Carpenter and Cardenas (2004), who observe significant differences only between individual extraction decisions; and Chuah et al. (2007), who note cultural differences between the behaviour of Malaysian and UK subjects. We summarize the result as follows.

**Observation 2.** *Regardless of nationality, subjects participating in heterogeneous groups contribute substantially less than members of homogeneous groups.*

<sup>17</sup> Given that in both the Italy-UK and Foreigner treatments pairs of different nationalities interact with each other, the appropriate test is the Wilcoxon Signed-Rank (WSR) test. The  $p$ -values referring to the WSR test are  $p_{\text{Italy-UK}} = 0.77$  and  $p_{\text{Foreigner}} = 0.09$ .

<sup>18</sup> Although our paper does not investigate whether potentially different behaviour across groups within a country may be as large, or even larger, than the differences between the two countries, we acknowledge this possibility. The effects of such a result are described by Gerxhani and Schram (2006).

<sup>19</sup> All the  $p$ -values represent the results of two-tailed Mann-Whitney  $U$ -test.

**Table 3**

Regression-dependent variable: individual contribution to the public good

Explanatory variables	Coefficient	Coefficient	Coefficient	Coefficient
Constant	3.28*** (0.31)	3.07*** (0.32)	3.10*** (0.32)	4.07*** (0.33)
Foreigner	-0.87** (0.42)	-0.87** (0.42)	-0.87** (0.42)	-0.87** (0.42)
Italy–UK	-1.01*** (0.42)	-1.01*** (0.42)	-1.14*** (0.44)	-1.14*** (0.44)
UK	–	0.43*** (0.11)	0.37** (0.16)	0.37** (0.15)
Italy–UK × UK	–	–	0.12 (0.22)	0.12 (0.22)
Trend	–	–	–	-0.18*** (0.02)
R <sup>2</sup>	0.049	0.061	0.061	0.122
N	1360	1360	1360	1360

The standard errors are robust (White, 1980).

\*\* The coefficient is significant at the 5% level.

\*\*\* The coefficient is significant at the 1% level.

**Observation 3.** In heterogeneous group treatments, there is no evidence to support the presence of a country effect between Italian and British subjects.

#### 4.2. Regression analysis

To quantify the effects detected by the non-parametric tests above, we run a statistical analysis of individual contributions to the public good as the dependent variable.<sup>20</sup> Table 3 displays the results of the regressions. Explanatory variables include the time trend (Trend) and some dummy variables for treatments Foreigner and Italy–UK, for the country of subjects' origin (UK) and an interaction variable (Italy–UK × UK) between the Italy–UK and UK dummies to account for the behaviour of British subjects playing in heterogeneous groups and knowing the nationality of their group members. We apply a random effects model with groups-clustering and White (1980) robust standard errors to our data in order to obtain panel data estimates.<sup>21</sup>

Table 3 shows the different regression models we estimate by sequentially introducing the explanatory variables. We notice that results shown by the four regressions are robust in terms of sign, magnitude and statistical significance of coefficients. Thus, we discuss the results coming from the complete regression model, which confirm all the findings described in the previous section. First, we check the effect size for the multiple regression computing the Cohen's  $f^2$  that measures the combined impact of the predictors on the dependent variable (Cohen, 1988). Our computation shows a medium effect size,  $f^2 = 0.14$ . Thus, we move to the analysis of the effects of regression's coefficients. The UK dummy captures the country effect on individual contributions to the public good independently from the nationality of group members. As reported by Observation 1, the UK dummy coefficient shows that British subjects, on average, contribute more than Italians. However, it has to be noted that the coefficient is quite small (from 0.43 in the first regression to 0.37 in the last two regressions) reporting an increase of almost half token in contribution levels due to being British.

The non-parametric analysis previously conducted showed that the individual contribution levels are significantly and negatively affected by being in a heterogeneous group. In our regression, both Italy–UK and Foreigner dummies capture the effects of being in a heterogeneous group. Across the regression models, the Foreigner coefficient remains constant (–0.87), while the Italy–UK coefficient slightly increases in the last two models (from –1.01 in the first two regressions to –1.14 in the last two regressions). Both coefficients show that being in heterogeneous groups decrease, on average, individual contributions to the public good by one token. This is indeed a remarkable effect corresponding to a reduction in individual contributions of almost 20% of the endowment. Figs. 2 and 3 show that the values for both national samples of Italy–UK and Foreigner treatments are almost always below the Native treatment ones.<sup>22</sup> Thus, Observation 2 is confirmed by the regression results.

Interestingly, we cannot differentiate between the influences of these two dummies given that their coefficients are not significantly different according to the Wald test ( $p = 0.70$ ). This matches the result reported in Observation 3 stating that further information on the nationality of foreign group members does not cause any additional effect on the contri-

<sup>20</sup> The contributions to the public good are expressed in terms of the absolute number of tokens allocated to the public good.

<sup>21</sup> To test the robustness of our result, when compared with an alternative specification such as the fixed effects model, we perform the Hausman specification test in order to test the null hypothesis of no systematic difference in coefficients between the two models. The test fails to reject the null hypothesis ( $\chi^2 = 0.07$ ). We also adopted different specifications of our regression in order to test the robustness of the results. Thus, we run both an OLS regression with group clustering and a censored Tobit. Regardless of the specification used, our results proved to be robust in terms of sign, magnitude and statistical significance of the coefficients.

<sup>22</sup> The first and last period values of the British sample in the Foreigner treatment constitute the only exceptions.

bution levels. In fact, in neither national sample there are significant differences between the patterns of contribution in Italy–UK and Foreigner. The interaction variable between the UK and Italy–UK dummies (Italy–UK  $\times$  UK) introduced in the last two regression models captures the eventual effect on contributions of being British and playing in heterogeneous groups formed by two Italians and two Britons. The interaction term Italy–UK  $\times$  UK turns out to be always insignificant, showing that the British subjects do not behave differently from the Italian subjects when they play in heterogeneous groups.

Finally, we test the influence of the time trend on individual decisions to contribute to the public good. The last regression shown in Table 3 reports this effect to be highly significant and negative, although the coefficient turns out to be very small (–0.18). Thus, approaching the end of the experiment, we observe a constant but moderate decline in the contributions to the public good.

## 5. Concluding remarks

The present paper is an experimental study on behavioural differences between subjects from different cultural backgrounds. Thus, we focused on interactions between Italian and British student subjects playing a series of ten 4-player public good games in a partners setting. Subjects were placed either in culturally homogeneous or mixed groups. In the mixed groups, they may or may not have known the nationality of the two foreigners, but always knew that one player had the same nationality as they did. Hence, three treatments have been examined (Native, Italy–UK and Foreign), with 10 independent observations (i.e. groups of four players) in the Native treatment and 12 in each of the other two treatments.

The main results of our study were that (1) in the Native treatment the British subjects contributed more to the public good than the Italian subjects did and (2) in the Native treatment, all subjects contributed more to the public good than in either of the mixed treatments, which were statistically indistinguishable. The first result comes as a surprise when compared to the results of a study by Burlando and Hey (1997) that shows more free-riding among UK subjects than among Italians. The second result is in line with numerous economic and psychological studies on in-groups and out-groups, all showing that the willingness to cooperate and to trust in culturally more homogeneous groups is higher than in mixed groups.

Our paper offers a general insight on the higher propensity to contribute to public goods shown by British students when compared with Italians. This result can be traced to general socio-economic phenomena such as charitable giving, which is a good example to look for differences in the amount of privately provided public goods between the two countries. In the years 1995–2002 the level of private philanthropy (including both giving and volunteering), measured as a share of GDP, amounted to 3.70% in the UK and to 0.91% in Italy (Salamon et al., 2003). Similar values can be found when looking at the two components of private philanthropy. In fact, the levels of volunteering were 2.97% in the UK and 0.80% in Italy, whereas the values of giving were 0.84% in the UK and 0.11% in Italy. In addition the percentages of adult population volunteering were 30% in the UK and 4% in Italy, with the developed country average being 15%.

Hence the empirical observations on charitable giving evidently confirm the existence and the significant magnitude of the different propensity to privately contribute to public goods shown by Italian and British subjects. From a policy perspective, it follows that those who seek to construct political or economic institutions, and specifically at European level, ought to be sensitive to the differences in cultural backgrounds between subjects in their institutions. In the complex non-market world of social interactions, assumptions of subjects' cultural homogeneity are likely to be too simplistic to generate uniformly accurate models. In fact, the level of cultural differences is likely to vary according to the cultural backgrounds of the subjects interacting. Therefore our results emphasize the necessity to take more into account the impact of cultural differences on economic decisions underpinning the design of public interventions such as charitable-enhancing policies.

## Appendix A. Subjects instructions for the Italy–UK treatment

### INSTRUCTIONS

Welcome to our Experiment

You are participating in an experiment about individual decision-making. You will be assigned to a group of four people and each group will be formed by two British subjects and two Italian subjects. You will play in the same group throughout the experiment. It will not be possible to distinguish between the British based members and the Italian based members of your group.

The instructions are simple. According to your decisions and to the decisions made by the other members of your group, you can earn a considerable amount of money. The money you will earn will be paid to you, in cash, at the end of the experiment. The funds for this study have been provided by the Royal Holloway College.

If any of the instructions are unclear, or if you have any questions, please attract the attention of the experimenter by raising your hand. Please do not communicate with any other participant from now on.

## Appendix A (Continued)

The Experiment

This experiment consists of 10 decision rounds.

The amount of money you can earn will depend on the decision that you and the other 3 members of your group make. Your profit will be measured in Experimental Currency (EC) and, at the end of the experiment, changed into pounds at the following exchange rate: 1 EC = £0.14 (for the Italian players the exchange rate is 1 EC = €0.20).

In each decision round, you and the other 3 members of your group will be given 6 tokens each. Each player will be choosing how to allocate his/her tokens between two options: Project A and Project B. These will now explained in turn.

Project A

Each token you allocate to the Project A will earn you 1 EC.

*Example.*

Suppose you put 3 tokens in the Project A. Then your earnings would be 3 EC from the Project A.

Project B

Your earnings from Project B will depend on the total number of tokens that you and the other 3 members of your group allocate to Project B.

Every token in the Project B will earn 0.40 EC for every member of the group, not just the member who allocated it.

*Example.*

Suppose you decided to put 3 tokens into the Project B and the other 3 members of your group allocate a total of 12 tokens to the Project B. This makes a total of 15 tokens.

Your earnings from the Project B would be  $15 \times 0.40 \text{ EC} = 6 \text{ EC}$ . The other three members of your group would also earn 6 EC from the Project B.

To Summarize:

In each decision round you will earn:

1 EC times the number of tokens you allocate to Project A **PLUS** 0.4 EC times the total amount of tokens allocated to Project B by everyone in your group.

After each decision round, you will be able to see your earnings from that round on the screen. You will also be told the total number of tokens that your group invested in Project B. You will not be able to know the individual decisions or earnings of any of the other participants.

If you have any more questions, please ask them before the experiment begins.

GOOD LUCK!

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