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# On the behavioural relevance of optional and mandatory impure public goods: results from a laboratory experiment

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# On the behavioural relevance of optional and mandatory impure public goods: results from a laboratory experiment

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**Abstract**

Ethical goods are increasingly available in markets for conventional goods giving pro-ethically motivated consumers a convenient option to contribute to public goods. In a previous experiment we explored the behavioural relevance of impure public goods in a within-subject setting and observed reduced aggregate pro-social behavior in the presence of impure goods that favor private consumption at the expense of public good provision.

In this experiment, we implement a between-subject design to test the behavioural relevance of impure public goods with only a token contribution to a public good cause. From a theoretical perspective, assuming people demand private and public characteristics regardless of how they are provided, we would expect no behavioural relevance of the presence of impure public goods. However, this experiment establishes that pro-social behaviour defined as contributing to a public good, is negatively affected by impure goods with token contributions, in comparison to when they are absent. Furthermore, if the token impure good is mandatory instead of optional the negative effect on pro-social behaviour seems to be offset. The results from this experiment suggest impure public goods are not behaviourally irrelevant, can decrease pro-social behaviour but their optional or mandatory nature can have different behavioural consequences.

**Keywords**: Experimental Economics, impure public goods, ethical goods, pro-social behaviour, social norms, experimental dictator games

**JEL codes**: C91, D64, H41, Q59

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## 1. INTRODUCTION AND FRAMEWORK

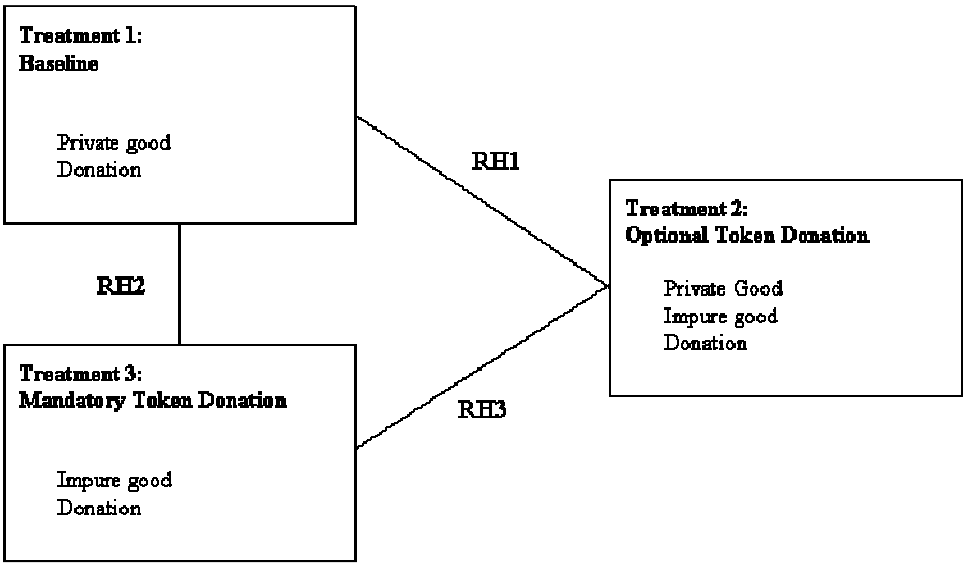
There are several types of impure public goods available in markets for conventional private goods. These impure public goods (as defined by Cornes and Sandler, 1994) correspond to the joint provision of a private good and a public good, and are often called joint products (Cornes and Sandler, 1984). The public good component can simply correspond to a charity donation which is embedded in a private good, as is the case with charity Christmas postcards or the range of red consumer goods whose price includes a contribution to a charitable fund. Alternatively, the public good component may be intrinsic to the production, distribution or use of the private good. For example, some goods are produced with less environmentally damaging processes than existing alternatives; similarly fairtrade products benefit their producers in developing countries more than non-fairtrade goods. In both the case of the embedded and the intrinsic public good component, it is common for the public good to represent a small percentage of the retail price. Often the charitable component is mostly a token component. For example, many Christmas postcards retailed as charity postcards in the UK include only a small donation to the charity (Charities Advisory Board, 2007).

In a market that includes impure public goods, individuals can still make a direct contribution to a public good cause as is the case when there are only pure goods. In theory, in a market with impure goods, the available choices are not affected, unless the impure good is efficient in how it combines the private and public characteristics. Except for that case, there is no reason for pro-social behaviour to be affected by the presence of an impure good, in particular a neutral good that does not expand the consumption setting (Kotchen, 2006). However, based on the results from a previous experiment (Munro and Valente, 2009), we can conjecture that the presence of an impure public good with only a symbolic public good component may affect charitable behaviour negatively. Some donors, that would be generous in the absence of this token impure public good, may interpret the token amount as a cue to give less generously. Some people can simply buy the impure good and restrict donations to the token amount. For others, the impure good may influence the determination of the appropriate donation and generate a wriggling effect, whereby people become less generous than in the absence of the impure good, either via its purchase or simply because of its presence.

The results from Munro and Valente (2009) of the behavioural relevance of selfish impure goods invite further testing. Given the prevalence in the real world of token donations, one such area of testing concerns symbolic donations embedded in private goods. This experiment addresses the effect on charitable behaviour of an embedded token donation in a neutral impure good. First, contrary to Munro and Valente (2009) involving mainly inefficient impure goods, in this experiment the combination of private and public characteristics in the impure public good can be equally obtained via the pure goods. We focus on neutral impure goods, because the setting is now less abstract than in Munro and Valente (2009), so an eventual inefficiency of the impure good might be too suspicious for subjects, generating noisy decisions. Munro and Valente (2009) already established that even inefficient impure goods are behaviourally relevant in a laboratory experiment. Second, the impure good used in this experiment includes only a symbolic donation. This token contribution to the public good corresponds to the case of many of the embedded donations in impure goods.

In this experiment, three market configurations will be explored and are illustrated in Figure 1. In all three markets, consumers have the possibility to make a direct contribution to the public good, via donations to a charity. First, as a baseline, there is the conventional case, where the consumer can buy a pure private good. Second, in some markets, impure goods have emerged alongside private goods as alternatives, and their purchase is optional. Finally, it is also possible that the pure private good disappears and there are only impure goods available, so that individuals are constrained to make a contribution to a public good even if reluctantly, because the private characteristic is only available via the impure good.

**Figure 1 Representation of treatments in this experiment and research hypotheses**




Three research hypotheses stem from the comparison of treatments. The first research hypothesis in This experiment addresses the behavioural (ir)relevance of the token impure good. From a theoretical point of view, if the person can consume a private good and make a donation, an impure good that does not expand her consumption possibilities should not affect choices. To test this hypothesis, we compare a setting where the impure good is present and another one where it is absent. Treatment 1 provides the baseline case and includes a conventional private good and a conventional public good. Treatment 2 introduces into the baseline market, an impure public good with a token donation. Comparing these two decisions, the impact of the impure good can be inferred. Research hypothesis 1 can thus be stated as follows:

**Research hypothesis 1 (RH1): Adding a neutral impure good with an embedded token donation to a conventional market does not alter public good contributions.**

Alternatively, the token impure public good may entice individuals, that would not be contributors otherwise, to buy the impure good and implicitly donate, while others remain unaffected. In this case, the impure public good would promote pro-social behaviour in the form of higher contributions to the public good.

On the other hand, the impure good may create a wriggling effect (as in Munro and Valente, 2009). Some individuals may buy the impure good and feel that they have

fulfilled their moral obligation to contribute; in this case, they reduce their contribution relative to the case where there is no impure good alternative. Results from Munro and Valente (2009) show that an impure public good that favours personal payoffs and involves only a small donation, tends to decrease charitable behaviour. Not only may some individuals choose this new option and reduce their charitable behaviour, but others also become less generous when making donations, since the presence of the selfish impure good creates wriggle room and licenses individuals to act less altruistically. With moral wriggling enabled by the selfish impure good, there would be a negative impact on contributions.

Impure public goods are also present in markets where there is no pure private good alternative, which corresponds to Treatment 3. This type of market emerges if there are regulatory standards that require a specific type of good to be an impure public good, for instance legislation mandating that all wood be procured from sustainable sources or that paper be partially made of recycled paper. These goods become impure goods in varying degrees and pure private goods disappear from the market, because the public good component becomes mandatory. In this case, all consumers of the private good are forced to make a minimum contribution to the public good. Treatment 3 in makes the token contribution compulsory for all market participants. Theoretically the choice setting for those individuals contributing more than the token amount is not altered, so the removal of the private good alternative should be behaviourally irrelevant. For some subjects who would otherwise not give or make a contribution smaller than the token amount, the impure good contribution becomes binding. As such, this binding effect may increase total and average contributions. Research hypothesis 2 addresses this issue:

**Research hypothesis 2 (RH2): Replacing the private good in a conventional market with a neutral impure good with an embedded token donation increases average contributions.**

Alternatively, when making the token contribution mandatory, it is possible that average contributions do not increase because of a wriggling effect and a crowding-out effect. The wriggling effect, as defined above, occurs because of the presence of the impure good. A crowding-out effect would occur because of the compulsory nature of the token donation. The purchase of the impure good allows individuals to maintain a charitable self-image at a small cost. The intrinsic motivation of

individuals may be crowded out since they no longer feel good about themselves for donating, since this is exogenously imposed. If the utility from a contribution comes from making an optional and deliberate choice, introducing a compulsory contribution can alienate some people. These subjects might resent being made to contribute, and thus reduce their pro-social behaviour. Therefore, the net impact on contributions is not straightforward, and will depend on the shares of people for whom a binding effect, a wriggling effect or a crowding-out effect occurs.

Finally, the experiment addresses another research hypothesis, which is in fact a consequence of RH1 and RH2. By transitivity, if both hypothesis are verified, then when comparing a market with pure goods and an impure public good (Treatment 2) and the market where there is no strictly pure private good (Treatment 3), contributions should also be higher in the latter market because contributions are compulsory for anyone wishing to purchase the private good. This research hypothesis can be stated as follows:

**Research hypothesis 3 (RH3): Removing the private good option from a market with an impure public good, increases average contributions.**

Treatments 2 and 3 differ in the compulsory nature of the impure good which may generate an effect in the opposing direction of the binding effect, namely the above mentioned crowding-.out effect. This would dampen any eventual increase in donations because the token becomes binding.

The following section describes the design of this experiment and how it was implemented and parameterized. The results are presented in Section 3 and discussed in the Section 4.

## 2. EXPERIMENTAL DESIGN AND IMPLEMENTATION

This experiment extends Munro and Valente (2009) on impure public goods which is designed in an abstract way involving the decision to distribute monetary payoff between the subject and a charity. Similarly for This experiment, the decision framework is close to a dictator game where individuals can share an endowment between themselves and a charity. This framework is extended to include a third good, namely a specific private good (for the experiment reported here it is a box of chocolates), that can be modified into an impure good or a conventional private good.

In the experiment, subjects have two options. In the **purchase option** they can play a dictator game framed in such a way that they need to buy a pure private or impure good and they have an endowment which they can use to make a donation to a charity or keep to themselves. The chosen charity is Oxfam, which is a development and poverty alleviation charity working in several countries. In the **opt-out option**, subjects can opt out of playing the dictator game and keep a part of the endowment to themselves. Since we would like individuals to engage in the previous purchase setting, it is always worthwhile to take the option to buy the private or impure good, since the opt-out alternative yields a lower monetary option. This feature of an opt-out option with an opportunity cost has been explored in the setting of a dictator game by Dana et al. (2006) and was shown to be behaviourally relevant[2]. So, despite the opt-out cost, some subjects have a strong aversion to taking part in a "giving" experiment and sacrifice payoff to avoid it.

The design is a between-subject treatment and each individual only makes one decision in each treatment. In all treatments, the opt-out option is present, as shown in Table 1.

**Table 1 Design of the treatments**

| Available options | **Treatment 1** Baseline | **Treatment 2** Optional token donation | **Treatment 3** Mandatory token donation |
|---|---|---|---|
| **Opt-out option** (earn £8) | ✓ | ✓ | ✓ |
| **Purchase Option 1:** (earn £12) Buy private good (price £2) Make optional donation | ✓ | ✓ | |
| **Purchase Option 2:** (earn £12) Buy impure good (price £2.25 including donation £0.25) Make additional donation | | ✓ | ✓ |

[2] Dana et al. (2006) implement a dictator game playable for $10 and after the decisions are recorded the dictators have the possibility of opting out of the game and earning $9. They observe that 28% of subjects pick this opt-out option and the majority of which had intended to share something with the recipient. A feature of this design is that the recipient is not made aware of the origin of their earnings, if the dictator picks the opt-out option.

In the baseline treatment (**Treatment 1: Baseline**) the purchase option consists of buying a private good and making an optional donation. This purchase option corresponds to a market with a conventional private good and the possibility to donate (conventional market). Specifically, there is an opt-out option where individuals earn £8 and can make no donation. The alternative option involves an endowment of £12 but requires that subjects buy a private good (box of chocolates) which is being sold for £2[3]. Subjects can make a donation to Oxfam out of their remaining money. Therefore they have £10 left from the purchase of the private good to allocate between themselves and the charity. The wording of the instructions is such that individuals are endowed with £12, but buy the chocolates for £2. This wording alludes to a purchase scenario, which is the focus of this experiment, and draws participants' attention to the private good being purchased. Also, when an embedded donation is introduced in the other treatments it is essential that there is a price to embed the donation in, thus this type of purchase wording.

**Treatment 2 (Optional Token Donation**) includes the same purchase option as in the baseline, but it is also possible to buy an impure public good, whose price is higher than the private good by the token amount. This token amount is a small donation to a charity. Given the endowment of £10, the token corresponds to 2.5% of that endowment. Individuals are still allowed to make a donation when they choose to purchase the private good or an additional donation when they choose to purchase the impure good. These purchase options make up a market with a conventional private good, impure public good and the possibility to donate.

**Treatment 3 (Mandatory Token Donation)** is similar to Treatment 2 but the private good option is absent. Individuals only have an impure public good in this market which already includes a token donation to a charity. Subjects can make an additional and active donation. Therefore the purchase option in Treatment 3 corresponds to a market with an impure public good and a donation possibility.

This experiment was implemented at the end of a first and second year undergraduate Economics lecture at Royal Holloway – University of London in March 2008 and February 2009. Students were asked to take part in a short economics experiment (without disclosing more details) and those who did not wish to participate were

[3] This is worth £6 at contemporaneous retail prices.

allowed to leave the room before the start of the experiment. The experimenter requested that all the decisions be made in private and no interaction was observed between participants. Finally, participants were informed that there would be a raffle draw at the end of the session and that approximately 10% of choices made would be implemented.

In each lecture, the three treatments were randomly distributed. A total of 247 students participated[4] and there were 82, 85 and 80 participants per treatment.

## 3. RESULTS

The results from the three treatments are summarized in Table 2 and Table 3. Table 2 presents descriptive statistics about contributions per treatment as a share of the endowment. For the three treatments, the endowment is £10, since in the purchase option the subjects have £12 but buy the box of chocolates for £2 or £2.25; in the latter case, £0.25 are already a donation, even if made passively, and as such are considered as part of the endowment.

[4] These 247 participants were distributed as follows: 114 and 28 were in the first and second year lecture in March 2008 and 105 attended the first year lecture in February 2009. The initial number of participants was 269 but 22 were dropped out of the sample because they did not comply with the instructions or because they had either participated in a pilot experiment similar to this experiment or in an experiment involving charity donations. There was a question in the post-experimental questionnaire to ensure no contamination between experiments. These participants were still included in the raffle draw but were not informed their decisions would be excluded from the analysis.

**Table 2 Contributions per treatment**

| | # | Mean | Standard deviation | Median |
|---|---|---|---|---|
| All subjects | | | | |
| Treatment 1 | 82 | 32.9% | 34.7% | 20% |
| Treatment 2 | 85 | 26.0% | 33.3% | 10% |
| Treatment 3 | 80 | 30.9% | 33.4% | 20% |
| Contributors only | | | | |
| Treatment 1 | 61 | 44.3% | 33.4% | 20% |
| Treatment 2 | 62 | 35.6% | 34.4% | 20% |
| Treatment 3 | 71 | 34.8% | 33.5% | 20% |

Note: contributions as share of endowment (£10).

Contributions include token donation when the impure good is chosen

**Table 3 Classification of types per treatment**

| | Treatment 1 | | Treatment 2 | | Treatment 3 | |
|---|---|---|---|---|---|---|
| | # | % | # | % | # | % |
| Non-contributors | 21 | 25.6% | 23 | 27.1% | 9 | 11.3% |
| *Opt-out option* | *12* | *14.6%* | *6* | *7.1%* | *9* | *11.3%* |
| *Purchase option* | *9* | *11.0%* | *17* | *20.0%* | *0* | *0.0%* |
| Contributors | 61 | 74.4% | 62 | 72.9% | 71 | 88.8% |
| *Minimum giver (<=£0.25)* | *0* | *0.0%* | *10* | *11.8%* | *11* | *13.8%* |
| *Other givers (>£0.25)* | *61* | *74.4%* | *52* | *61.2%* | *60* | *75.0%* |
| Total observations | 82 | | 85 | | 80 | |

Note: % of total observations per treatment

In terms of contributions, subjects share more on average in Treatment 1 than in the other treatments, namely 32.9% of the endowment in Treatment 1, 30.9% in Treatment 3 and 26% in Treatment 2. Therefore subjects contribute more on average when the impure good is not present. When it is present, the average contributions are higher when it is compulsory then when it is optional.

Table 3 includes information about the prevalence of different types of subjects per treatment. In terms of the opt-out option it is more commonly chosen in Treatment 1 than in the other treatments with 14.6% of subjects picking it. However in terms of non-donors they are equally frequent in Treatments 1 and 2, namely they represent 25.6% of subjects and 27.1% respectively. Since in Treatment 3 only those who opt

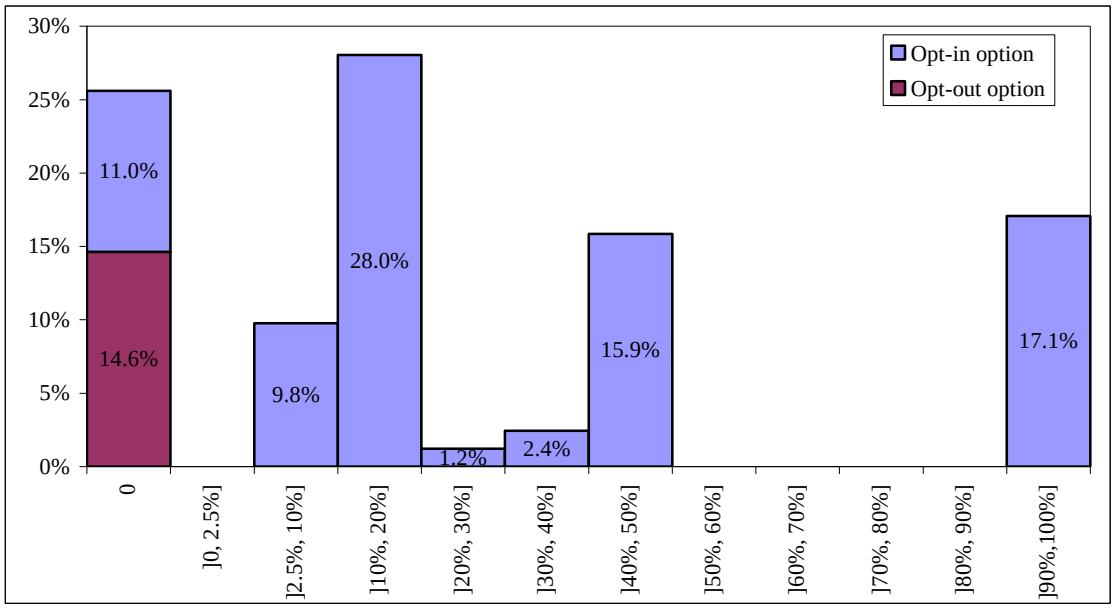
out are able to avoid contributing, the share of non-donors, 11.3%, is smaller than in the other treatments.

In the following Subsections each treatment will be inspected in closer detail and the significance of behavioural differences tested so as to address the research questions outlined above.

***Treatment 1: Baseline treatment***

The baseline treatment corresponds to a dictator game played with a charity. In this treatment, 14.6% of subjects choose to opt out of the purchase options (Table 3). As mentioned previously, this is an expected result in this type of experiments with opt-out options. The mean donation is 32.9% of the maximum possible donation and there are 74.4% of individuals who donate to charity. Specifically, 17.1% donate everything to charity. The donation frequencies are illustrated in Figure 2.

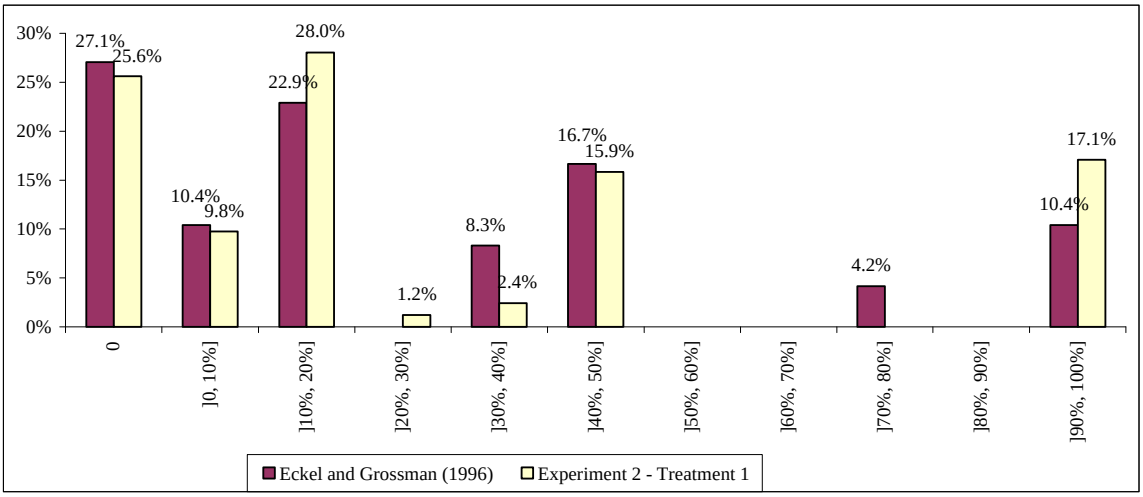
**Figure 2 Amount donated in Treatment 1 (as % of endowment)**




This behaviour is in line with previous experiments on charitable behaviour with similar frameworks. For example, Eckel and Grossman (1996), henceforth EG, conduct a dictator game with a charity and observe that 72.9% of subjects share their payoff with the charity and on average donate 31% of the endowment. They also observe some individuals donating everything (10.4%). Furthermore, a comparison of the distribution of choices by subjects in the charity treatment of EG and in this baseline treatment yields a similar pattern as far as donations as a percentage of the

maximum allowed is concerned (Figure 3). Also, neither the Wilcoxon-Mann-Whitney rank-sum test[5] (z=0.207, p=0.836) nor the Epps-Singleton test[6] (w2=3.02, p=0.555) yield statistically significant differences between the distributions. Therefore, the results in the baseline decision of the impure good dictator game reported here are coherent with EG. Even acknowledging that This experiment and EG are experiments with different procedures and different subject pools, the results from the former add to the robustness of pro-social behaviour in dictator games with charities. In fact, the similarity of results occurs despite the fact that there is an opt-out option in this experiment. In both experiments roughly 1/4 of subjects make no contribution. It is possible that some of the non-contributors in EG would have chosen an opt-out option instead of playing the game, had it been available.

**Figure 3 Distribution of donations as share of maximum possible in Treatment 1 and Eckel and Grossman (1996) – charity treatment**




The share of individuals sharing the total endowment in Treatment 1 of this experiment is higher than in the experiment by EG (respectively 17.1% and 10.4%). This may be due to the fact that subjects not opting out are already receiving a box of chocolates with a market price of £6, so donating the £10 to charity is not the same as donating all potential earnings to the charity. Also, this was run as an experiment during a lecture and not via recruitment so subjects had no time to form an

[5] The results reported for the non-parametric tests in this chapter are the test statistic and the p-value (p) for the 2-tailed test. Henceforth the Wilcoxon-Mann-Whitney rank sum test will be referred to as WMW, the Epps-Singleton test as ES and the Kolmogorov-Smirnov test for equality of distribution functions as KS.

[6] This test was implemented in Stata following Goerg and Kaiser (2009) and the command "escftest" programmed by the authors.

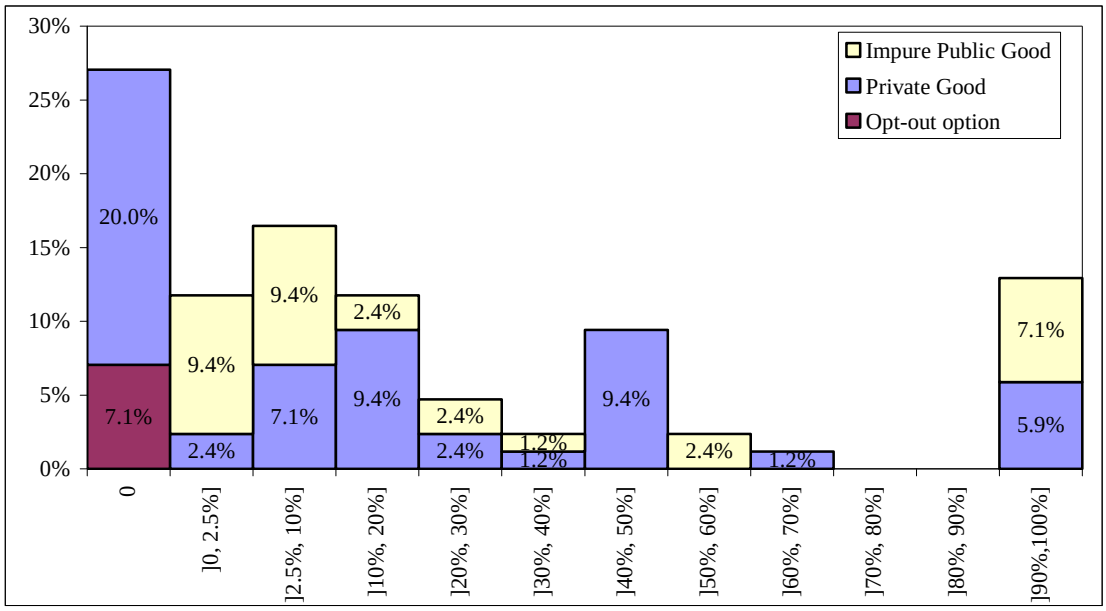
expectation of getting a monetary payoff and were thus perhaps more generous than if they had specifically enrolled to earn money from experiments and had an opportunity cost to be compensated. However, the distribution of donations is not significantly different from EG, so the specificities of this experiment do not seem to be biasing the overall pattern of giving in a dictator game setting.

***Treatment 2: Optional Token Donation***

Treatment 2 is a dictator game in a conventional market with an optional impure good. There are two alternatives for the purchase option, one corresponding to the private good already present in Treatment 1 and the other option corresponding to an impure public good. The purchase options also endow individuals with £12, but in the private good case it costs £2 and in the impure good case (which is the same box of chocolates) it costs £2.25 and includes a donation of £0.25 to Oxfam. Individuals also have the option to donate directly to the charity whatever the purchase option they choose.

In Treatment 2, the mean donation is 26% (Table 2) and 72.9% of individuals contribute (Table 3). The remaining 27.1% of individuals keep the endowment to themselves (of which 6 choose the opt-out option), whereas 11.8% donate everything to charity. The donation decisions in this treatment are illustrated in Figure 4.

**Figure 4 Amount donated in Treatment 2 (% of endowment)**




Note: Contributions when the impure good is chosen include the token donation

The comparison of behaviour in Treatment 1 and Treatment 2 addresses RH1 and the behavioural relevance of a token impure good. One possible approach is to include all subjects that take part in each treatment. The mean contribution to the public good is lower in Treatment 2 (26%) than in Treatment 1 (32.9%). In terms of donations in Treatments 1 and 2, the WMW test does not yield statistical significance in terms of the differences in behaviour for the two-tailed test ($z=1.47$, $p=0.141$); however the KS and the ES tests are statistically significant (KS $d=0.199$, $p=0.052$; ES $w2=8.29$, $p=0.082$), capturing distributional differences. There are noteworthy differences between the two treatments and these are explored next.

In Treatment 2, fewer subjects choose to opt out of the game, namely 7.1% and 14.6% in the baseline. These subjects may be seen as unaffected by the impure good, since they simply choose not to buy any good. Since more subjects opt out in Treatment 1, it is possible that in Treatment 2 the impure good serves as an excuse to donate low amounts for some subjects who would have otherwise opted out. To distil the impure good impact, a more relevant comparison excludes the subjects who opt out of the game. In this case, the mean donation is 38.6% in Treatment 1 and 28% in Treatment 2. There are statistically significant differences in contributions (WMW $z=2.472$, $p=0.013$; ES $w2=14.706$, $p<0.01$; KS $d=0.276$, $p<0.01$). The same conclusions are corroborated parametrically. Regressing donations (as % of the endowment) on the treatment, controlling for whether subjects choose to opt for the purchase option, yields a statistically significant negative coefficient for the Treatment 2 indicator variable both in the comparison between Treatments 1 and 2 (Regression 1 in Table 4) and between all treatments (Regression 2).

**Table 4 OLS regression of donations on treatment**

| | Regression 1: Treatments 1 and 2 | Regression 2: all treatments |
|---|---|---|
| Treatment2 | -9.567 * | -9.567 * |
| | (5.086) | (5.055) |
| Treatment3 | | -3.1930 |
| | | (5.007) |
| Opt-in | 34.836 *** | 34.834 *** |
| | (3.195) | (2.507) |
| Constant | 3.189 | 3.190 |
| | (1.978) | (2.535) |
| n | 167 | 247 |
| $R^2$ | 0.1098 | 0.1102 |

Notes:
Donations as % of endowment.
Coefficient significant at: *** p<0.01,** p<0.05, * p<0.10
White (1980) standard errors in parentheses.
Treatment*i* : indicator variable for Treatment *i*
Opt-in: indicator for choosing the purchase option

Another behavioural comparison relevant to infer treatment effects includes only subjects who make a contribution. Munro and Valente (2009) established that in the presence of a selfish impure good, some donors are likely to wriggle out of giving as generously as in the baseline. In this case, the mean donation of donors is lower in Treatment 2 (35.6%) than in the baseline (44.3%) and the difference in donation behaviour between treatments is statistically significant (WMW z=2.072, p=0.038; ES w2=17.231, p<0.01; KS d=0.256, p=0.023).

A closer inspection at the type of choices made by subjects clarifies why contributions are lower in Treatment 2, even though roughly 3/4 of subjects donate in both treatments. In fact, 11.8% of subjects in Treatment 2 are "minimum givers" by donating up to the token amount, with 8 of those 10 subjects picking the impure good. In the baseline, there are no minimum givers. For the minimum givers in Treatment 2, the token impure good generates a wriggling effect. On the contrary, the mean donation of non-minimum givers is 44.3% and 42% in Treatment 1 and 2 respectively with no statistically significant differences in donations (WMW z=0.572, p=0.567; ES w2=4.421, p=0.352; KS d=0.1381, p=0.582). The share of non-minimum givers is lower in Treatment 2, so even though their behaviour does not differ from non-

minimum givers in Treatment 1, the presence of the impure good creates wriggle room for subjects who only make a small sacrifice.

Another mechanism by which the impure good impacts choices concerns behavioural differences between those who pick the impure good or the private good in Treatment 2. In Treatment 2, 58.8% of individuals choose the private good option and donate an average of 25.9%, whereas 34.1% choose the impure public good option and donate 31.6% (including the token donation). There are no statistically significant differences in donations between subjects who buy the private good and those who buy the impure good according to the WMW test (z=-1.29, p=0.197). Testing for differences in the distributions yields statistically significance differences between these two groups (ES w2=11.51, p=0.021; KS d=0.36, p=0.009). Subjects who choose the pure good have two types of motivations. While some subjects wish to donate, others want to keep the whole endowment to themselves. Excluding the latter, the remaining subjects make a positive contribution and represent 38.8% of subjects in Treatment 2; their mean contribution is 39.2% of the endowment. To check for behavioural differences by good purchased, we restrict the sample only to contributors, who donate on average 39.2% and 31.6% in Treatment 1 and 2 respectively. In this case, the difference in donations is statistically significant (WMW z=1.73, p=0.084; ES w2=12.27, p=0.015; KS d=0.309, p=0.067). As such, donors who purchase the impure good are less generous than donors who purchase the private good. Again the impure good seems to provide wriggle room for subjects to act less generously, in this case through the choice of good.

In summary, the presence of a token impure good generates a wriggling effect, whereby subjects who opt in as well as subjects who donate are less generous in Treatment 2. Also, the purchase of the impure good generates lower donations from donors. These results are in line with the results from Munro and Valente (2009), whereby there was a wriggle effect in the presence of the impure good relative to the baseline.

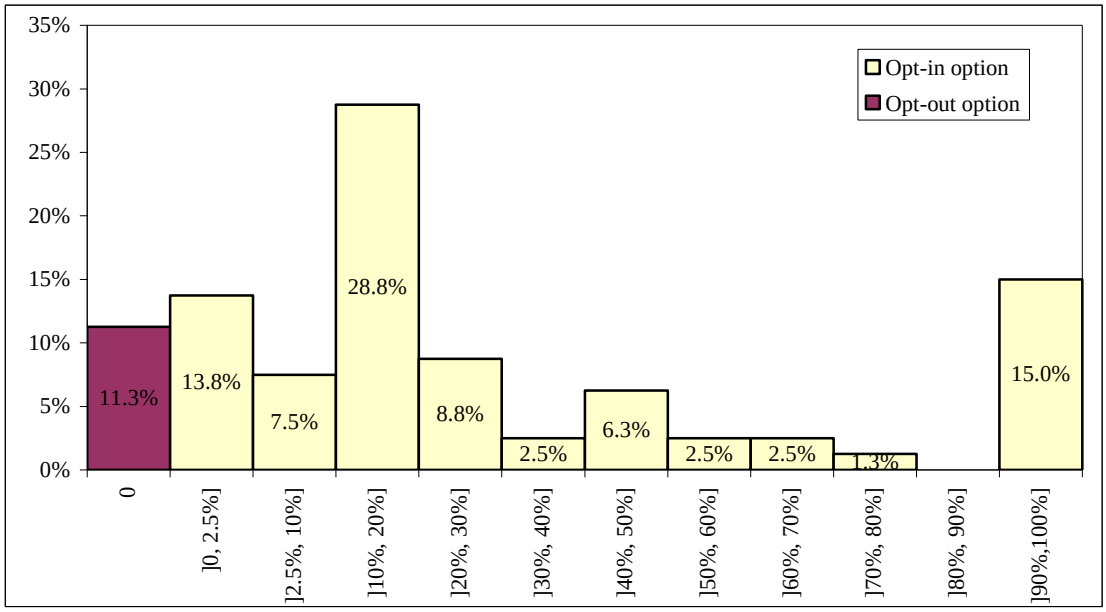
***Treatment 3: Mandatory Token Donation***

Treatment 3 is a dictator game with an impure public good, but without the private good option. There is an opt-out option of £8 and only the purchase option of an impure public good (as present in Treatment 2), which includes a token donation to charity. Even though a donation is compulsory if the individual wishes to purchase the

good, the corresponding donation is essentially symbolic as it only represents 2.5% of the private payoff.

In Treatment 3, the mean donation is 30.9% (Table 2) and considering only the individuals who do not opt out of the game, the mean is 34.9%. The distribution of donations is illustrated in Figure 5. Similarly to what happens in the other treatments, some subjects choose the opt-out option (11.3%). There is also a 13.8% share of individuals that give all the endowment to the charity (Table 3). The distribution of donations is depicted in Figure 5.

**Figure 5 Amount donated in Treatment 3 (% of endowment)**




Treatment 3 makes the token donation compulsory for all subjects who do not opt out of the purchase option. Therefore for some subjects, who would have preferred not to contribute, it becomes binding. If the behaviour of the others remains unaffected, then there might be an overall increase in contributions relative the case where the donation is not binding. This is theoretically expected since the impure good is neutral and corresponds to RH2. The mean contribution is 32.9% and 30.9% respectively in Treatments 1 and 3. Comparing Treatment 3 with the baseline, there are differences in distributions according to the ES test ($w2=9.68$, $p=0.046$). However, there is no statistically significant difference in donation behaviour (WMW $z=-0.18$, $p=0.857$). This result is corroborated by Regression 2 on Table 4, where the coefficient of Treatment 3 is not statistically significant relative to the baseline, once the choice of

opting in has been controlled for. Hence, there is no evidence of a change in donations between these two treatments.

The absence of statistical significance in the overall treatment differences may result from the netting out of effects in opposing directions. The mandatory impure good can generate three effects: a binding effect, which increases total and average contributions, and in the opposite direction a wriggling and crowding-out effect.

The binding effect reflects the fact that some subjects would have preferred not to give and for them the impure good is binding. The inspection of Table 3 reveals that in Treatment 1 there are 11% of subjects who purchase the good but make no contribution and there are no minimum givers, so all contributors donate more than the token amount. In Treatment 3, however, since the impure good is compulsory for those who opt in, everyone who takes the purchase option needs to make a contribution. There are however 13.8% of minimum givers. So for these subjects, the token donation is binding, and it is possible they would have preferred not to contribute (like the 11% of subjects in Treatment 1).

One the other hand, a wriggling and crowding-out effect would impact on the other donors. The wriggling effect refers to the dampening effect of a selfish impure good on donations. Therefore, it is possible that there is a wriggling effect when comparing Treatment 3 with Treatment 1, whereby the selfish impure good is once again interpreted as a self-serving cue to be less altruistic. The crowing-out effect would be specific to Treatment 3 and reflects the fact that the mandatory donation crowds out intrinsic motivation and makes subjects less generous either for resentment of being forced to give, or because they derive no warm-glow from exogenously imposed altruism.

To check for these effects, it is pertinent to investigate whether donor behaviour differs in the presence and absence of the impure good. One approach is to consider only donors in both treatments. Making the impure good compulsory increases the share of donors relative to the baseline: there are 74.4% of contributors in Treatment 1 and 88.7% in Treatment 3, who donate on average 44.3% and 34.9% respectively; there are statistically significant differences in donations between treatments (WMW $z=1.944$, $p=0.052$; ES $w2=15.32$, $p<0.01$; KS $d=0.207$, $p=0.087$). This follows from the fact that all givers in Treatment 1 give more than the symbolic token amount, whereas in Treatment 3 some contributors give only the token amount. The statistical significance of the differences in donations may be driven by the binding nature of the

impure good for some subjects. This results warrants further investigation since there could be either a wriggling or crowding-out effect present in Treatment 3. A further test excludes subjects for whom the impure good is binding and focuses just on non-minimum givers. The non-minimum givers in Treatment 3 do not behave differently from those in Treatment 1. There are 75% of contributors who give more than the token in Treatment 3 (with an average donation of 44.3%). These subjects can be compared with the corresponding 74.4% of donors in Treatment 3 (with an average donation of 40.8%). The donation behaviour is not significantly different between the treatments (WMW z=0.438, p=0.661; ES w2=5.95, p=0.2035; KS d=0.109, p=0.821). Thus, lower donations by donors in Treatment 3 relative to the baseline are not being driven by non-minimum givers. For them the presence of a mandatory token donation does not crowd out the intrinsic motivation of subjects or create wriggle room.

In summary, despite the fact that the token donation is binding for a non-negligible share of subjects, it is too small to engender an overall increase in donations relative to the baseline case. So, in this experiment, the compulsory token does not seem to promote pro-social behaviour on aggregate relative to the case where the impure good is absent. Given that non-minimum givers are unaffected in Treatment 3 relative to Treatment 1, it is possible that a higher compulsory embedded donation would make average contributions higher in Treatment 3 than in the baseline.

Having established that making a token contribution compulsory does not affect average contributions in this experiment, it remains to be checked if there are differences between the case where the impure good is optional or mandatory. RH3 states that contributions should be on average higher in Treatment 3 than in Treatment 2, because some subjects will be forced to donate, whereas the remainder should be unaffected. This comparison also allows a test of the crowding-out effect attached to the mandatory nature of the impure good.

Even though Treatment 2 and 3 both include a token impure public good and differ only on the compulsory token nature in the latter, there are noteworthy behavioural differences between them. The mean donation is 26% and 30.9%, respectively. The WMW test yields statistically significant differences in behaviour in both treatments (WMW z=-1.963, p=0.05; ES w2=8.94, p=0.069; KS d=0.228, p=0.018). The absence of the private good alternative generates higher contributions, when comparing with

the market in Treatment 2, thus corroborating RH3[7]. One cause for this result is the higher share of non-contributors in Treatment 2 than in Treatment 3 (27.1% and 11.3% respectively), which may drive up the results in the latter. As for the positive donors, they behave on average similarly in both treatments. In fact, there are 88.7% donors in Treatment 3 contributing roughly the same on average as the 72.9% of donors in Treatment 2 (34.9% and 35.6% respectively) and there is no statistically significant difference between contributions of donors in these two treatments (WMW z= -0.271, p=0.787; ES w2=2.23, p=0.694; KS d=0.147, p=0.392). It also relevant to investigate whether there is a crowding-out effect for non-minimum donors, so as to exclude the impact of the binding effect of the impure good in Treatment 3. These are the subjects who clearly wish to give more than the token amount. When the impure good is mandatory, these subjects might dislike being forced to make a contribution. There may be crowding out of intrinsic motivation. The mean donation of non-minimum givers is 42% in Treatment 2 and 40.8% in Treatment 3 and there are not statistically significant differences in behaviour between these treatments (WMW z=0.236, p=0.813; ES w2=5.26, p=0.261; KS d=0.402, p=0.327). Overall the behavioural differences between Treatments 2 and 3 are being driven by the presence of low donors in Treatment 2 and their absence in Treatment 3. Therefore making the token donation mandatory does not generate crowding-out and there is no incremental wriggling in one treatment relative to the other.

In summary, average contributions are higher when the token contribution is compulsory relative to when it is simply optional, which is being driven by a binding effect not a wriggling effect.

## 4. DISCUSSION AND CONCLUSIONS

This experiment was designed to provide a robustness test for the results in Munro and Valente (2009) and also to address the issue of whether making the impure public good compulsory could counteract the dampening effect of selfish impure public

[7] It should be noted that RH3 is a corollary of the other research hypotheses. If we expect no behavioural change from Treatment 1 to Treatment 2 (RH1) and that making the token contribution binding increases contributions from Treatment 1 to Treatment 3 (RH2), then it follows by transitivity that contributions in Treatment 2 should be smaller than in Treatment 3. In reality, RH3 is verified because contributions are smaller in Treatment 2 than in Treatment 1, and are similar in Treatment 3 and Treatment 1.

goods on contributions, as identified in Munro and Valente (2009). Given the nature of the impure public good used, namely a neutral impure good including only a token contribution, this experiment provides one specific example to these purposes.

The baseline treatment in this experiment is similar to a dictator game where the recipient is a charity and the results here are in line with other dictator game experiments. we introduced an opt-out option in line with the dictator games of Dana et al. (2007) and Lazear et al. (2006). Coherent with their results some subjects in each treatment take this option foregoing monetary payoff and the private good, which reinforces the notion that some of the observed altruism in experiments may be reluctant altruism.

In theory, if individuals care about the private and public characteristics of the goods and not the goods themselves and care about the level of the public good or about their contribution to the public good, the existence of an impure public good option should not be relevant. In the within-subject design of Munro and Valente (2009), subjects become less generous if the impure good favours them but remain unaffected if the impure good is altruistic. Therefore, if there is any type of anchoring at play, it is asymmetric and it is allowed to occur only opportunistically. We argued that this may be due to a phenomenon of moral wriggling whereby the presence of a small donation allows individuals to justify acting less altruistically than they would in the absence of the impure good.

In this experiment, the baseline treatment presents individuals with a pure private good and the possibility to make a donation. Treatment 2 offers these options plus an impure public good with a token donation. In the presence of the token impure good the subjects who do not opt out are less generous, and the same holds for the subjects donating positive amounts. This result is coherent with the result found in the within-subject design of Munro and Valente (2009). The hypothesis of behavioural irrelevance of the selfish impure public good is rejected and the presence of the impure good seems to add wriggle room for subjects to behave less altruistically. Also, those individuals who pick the impure good are less generous than the contributors who pick the private good in the same treatment. The impure good generates less generous behaviour, which is coherent with the concept of moral licensing of Zhong et al. (2009): having picked the impure good option, subjects feel licensed to be less generous.

In Treatment 3 there is only an impure public good and the possibility of additional donations, thereby forcing individuals who do not opt out to donate at least the token amount. It is similar to Treatment 2, but has no private good possibility and therefore makes individuals to share some of their endowment with the charity. Since individuals are forced to contribute to the public good the effect on pro-social behaviour is not straightforward. There is a binding effect for those subjects who would otherwise free-ride by making them contribute. A contrary effect would occur if the presence of the impure good acts as wriggle room, as in Treatment 2. Also, there may be crowding-out of the intrinsic motivation for giving, since the imposing of a minimum donation may be negatively perceived. There is however no evidence of a wriggling or crowding-out effect since subjects who give beyond the token amount behave similarly to subjects in the baseline treatment, and the share of those donating more than the minimum is not different.

Therefore, the negative effect that the optional impure good has on donations in Treatment 2 relative to Treatment 1 seems to be offset when the impure good is made compulsory in Treatment 3. In fact, adding an optional impure good to the baseline decreases the generosity of givers (donations decrease from Treatment 1 to Treatment 2); on the contrary, making the impure good compulsory instead of optional generates the same aggregate donation behaviour as when the impure good is absent (donations increase from Treatment 2 to Treatment 3). This indicates that the compulsory impure good is not interpreted as wriggle room when there is no private good. Subjects may simply see this as a design feature, so non-minimum givers do not behave differently from donors in Treatment 1 (who also give beyond what was defined as a token amount). In Treatment 2 there are two goods available, so when subjects pick the impure good they may feel good about themselves by donating small amounts and using the value of the token as a self-serving anchor for their choices.

In summary, we find further evidence that a self-interested impure public good has a negative effect on charitable behaviour when comparing a setting with pure goods and a setting with an optional impure good. The optional impure public good provides wriggle room and justification for those individuals that would rather be less generous but feel compelled to give in a standard dictator game setting. However, in a setting where there is only an impure good and no private alternative, the impure good is the only available option and thus does not provide wriggle room.

The results show that a setting with a minimum binding level of contribution is not different from the baseline, but it does not address the impact of higher compulsory contributions. It is possible that the intrinsic motivation associated with giving of higher donors is reduced when everyone is forced to contribute a lot. On the contrary, if these individuals remain unaffected, making non-contributors increase their contributions may have a net positive impact on public good provision. Also, if in a real market, legislation is introduced to make the mandatory minimum too high, it is possible that some consumers will simply not buy the good, which could offset the binding effect and not have the intended effect of increasing contributions. This issue warrants further investigation.

This experiment adds to the results on reluctant altruism in experimental dictator games in particular in the presence of experimental impure public goods. It also reinforces the results of Munro and Valente (2009) by highlighting that impure public goods, even with token contributions, can have perverse effects for overall public good provision.

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