Working Paper Series
No. 37

Green goods: are they good or bad news for the environment? Evidence from a laboratory experiment on impure public goods

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November 2008

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Green goods: are they good or bad news for the environment?

Evidence from a laboratory experiment on impure public goods

(Updated version: December 2011)

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Abstract

An impure public good is a commodity that combines public and private characteristics in fixed proportions. Green goods such as dolphin-friendly tuna or green electricity programs provide increasingly popular examples of impure public goods. We design an experiment to test how the presence of impure public goods affects pro-social behaviour. We set parameters, such that from a theoretical point of view the presence of the impure public good is behaviourally irrelevant. In a baseline setting, where the impure public good provides only small contributions to the public good, we observe that on aggregate pro-social behaviour, defined as total contributions to the public good, is lower in the presence of the impure good. Some individuals do not alter their decisions, but roughly two fifths of subjects make a lower contribution to the public good in the presence of the impure public good. On the contrary, in the case where the impure public good favours the public good component at the expense of private earnings, individuals are unaffected in their behaviour. We conclude that the presence of green goods which have only a small environmental component may reduce pro-environmental behaviour.

Keywords: green goods, impure public goods, pro-social behaviour, social norms, experimental economics.

JEL codes: C91, D64, H41, Q59

The authors thank Dirk Engelmann for helpful comments and suggestions and Claire Blackman for her help in recruiting subjects. Marieta Valente acknowledges the financial support of Fundação para a Ciência e a Tecnologia (Grant SFRH/ BD/ 19130/ 2004).

1. INTRODUCTION

So-called green goods involve the joint provision of a private good and an environmental public good and are in fact a specific type of impure public good (Cornes and Sandler, 1994). In market based societies, many green goods are now sold as alternatives to conventional consumer goods in markets as diverse as domestic electricity, investment funds, office stationery and cars. More widely, green goods belong to the class of embedded goods that include an ethical dimension, such as Fair Trade products as well as RED branded goods from Apple, Gap and others. For parsimony we will refer to them all as impure goods. In this paper, we report on two linked experiments designed to test the impact on choices of the presence of an impure good. We seek to examine whether having an impure good available in the choice set raises total contributions to a public good.

The public good characteristic of impure goods may be intrinsic to the production or distribution of the private good or it may be simply embedded in the private good, such as a donation to a public good cause. The case of the intrinsic public good characteristic encompasses goods whose production or distribution process is less environmentally damaging as is the case of green electricity (which is produced with renewable energy sources, thus reducing greenhouse-gas emissions), shade-grown coffee (whose production preserves the natural habitat and biodiversity), recycled stationery (which saves raw resources), dolphin-safe tuna (whose capture process minimizes collateral species damage), hybrid cars (which generate less greenhouse-gas emissions than conventional cars), organic produce (whose production process is claimed to be less environmentally damaging than conventional farming), amongst others. Meanwhile embedded giving can be found in for example charity postcards (which allocate a fixed value of the sales price to the charity), and carbon neutral flights (whose price includes the corresponding carbon offset payment). In effect, as long as a private good is bundled with a type of environmental offset or contribution to reduce environmental externalities, it can be considered an impure good.

Not only have markets for green and ethical goods emerged recently but there is also increased demand for these goods. Furthermore, green goods and eco-labels are considered as instruments in an information disclosure approach to environmental

policy advocated for example by the OECD (2001)[1]. Therefore the relevance of impure goods in all forms is undeniable.

Apart from the growing importance of impure goods commercially and in environmental policy, our motives for conducting the experiment stems from the fact that there at least two main theoretical perspectives on their impact. A straightforward view is that impure goods simply add to the choices open to the consumer (Kotchen, 2005, 2006). One can think of the standard good as being one characteristic and the environmental cause as another characteristic. A green good like a carbon neutral flight then bundles the standard good and the environmental cause of lower carbon emissions into one package. A green good might also lower search costs or reap some economies of scope in production. Alternatively, it might be difficult to combine the characteristics in the same good. Thus in theory the impure good could offer consumption that was more or less efficient than simply purchasing the two goods separately.

simply purchasing the two goods separately.

Alternative perspectives have a psychological element. Consider, for instance, *anchoring* which refers to a non-intentional phenomenon by which final choices and judgment are dependent on the initial anchor value as well as to the process of adjustment that takes place in between (Kahneman et al., 1986). Ariely et al, 200x, for instance show that an anchor provided by the last two digits of an individual's (US) social security number, influence reservation prices in subsequent auctions for real goods. Impure goods may provide an anchor, particularly in situations where preferences are hazy.

[1] Informational approaches to environmental policy have been called the "third wave" of policy control policies, as opposed to the first wave of regulatory instruments and the second wave of economic instruments. Tietenberg (1998) considers that «disclosure strategies seek to enlist market forces in the quest for efficient pollution control» (p. 588).

Another alternative perspective is founded more in social psychology, allied with some evidence from recent economics experiments. This view suggests that human behaviour is often contextual and wily. Kunda (1990) suggests that individuals use a set of cognitive processes that allows them to arrive at the conclusion they want. This direction-based reasoning is limited by the justifiability of the reasoning, that is, "people motivated to arrive at a particular conclusion attempt to be rational and construct a justification of their desired conclusion that could persuade a dispassionate observer" (Kunda, 1990, p. 482). This phenomenon of *motivated reasoning* allows individuals to justify their actions and act in the contrary direction prescribed by the norm. In the context of public good contributions, individuals may acknowledge a norm for altruistic behaviour. However the presence of the impure good may guide individuals towards high or low contributions depending on the technology parameters. In this sense, an impure good with a low share of the public component creates a justification for acting less altruistically than in its absence.

Motivated reasoning is a fairly neutral term. Other social psychologists have used the more loaded expression *moral hypocrisy* to refer to the case where "morality is extolled – even enacted – not with an eye to producing a good and right outcome but in order to appear moral yet still benefit oneself" (Batson et al., 1997). This phenomenon has been extensively documented with experiments where subjects try to give the appearance of acting morally following a pro-social norm, when in reality they are acting selfishly (Batson et al., 1997, Batson, 2002).

Some economic experiments have provided evidence of motivated reasoning effects and apparent moral hypocrisy. Both Lazear et al. (2012) and Dana et al. (2006) ran dictator games in which subjects had the option not to play the dictator game and keep the endowment to themselves without and with a penalty, respectively. In these experiments, dictators make their choice before being informed that they can opt out of the game and keep the endowment or part of it, and 41% and 27.8% of participants, respectively, who had indicated they would have shared something with the recipient, then choose to opt out of the game. Therefore, in both cases some subjects who would have shared something in a straightforward dictator game, prefer not to play the game at all, avoiding thus being in a position where some sort of altruistic norm would

compel them to give to the recipient.

Another source of motivated reasoning occurs in the presence of what Dana et al. (, 2007) have called a moral wriggle room. A wriggle room is present when some element in the decision allows individuals to justify acting selfishly, which implies that if the wriggle room was not present, individuals would act more altruistically. The wriggle room effect will therefore correspond to a selfish behaviour when the wriggle room is present and an altruistic choice otherwise. Several wriggle room catalysts have been identified, namely uncertainty about outcomes and delegation of responsibility, etc.

In practice with some actual products, the claims of an impure good are not always backed by concrete information concerning the actual contribution to the public good cause (as in the case where a percentage of the profits is said to be given to particular cause without further information[2, 3]). In other cases, with goods such as hybrid cars which are less environmentally damaging, the consumer needs to seek specialized information to fully understand her contribution to the environmental public good. For example some Christmas cards are marketed as contributing some amount to a selected registered charity. These are often more expensive than equivalent conventional Christmas cards and the charitable differential may be less than the markup in price[4]. Hence, a more efficient solution would be to purchase a cheaper option and donate the remaining to charity, often without much effort (given the

[2] For example, two Red products have the following indications in terms of the public good component (source: http://joinred.com/products/) with no clear monetary quantification: «Giorgio Armani is contributing an average of 40 percent of its gross profit margin from sales of all Emporio Armani (PRODUCT) RED Products directly to the Global Fund.» and «5-15% (depending on the product sold) of the net sales of Converse (PRODUCT) RED shoes will be contributed to the Global Fund, to help eliminate AIDS in Africa.»

[3] The New York Times in December 2007 ran both an editorial and an article on how some embedded giving programmes lacked transparency (NYT, 2007a, NYT, 2007b).

[4] For example, in the UK, the Charities Advisory Board (2007) publishes a list of charity Christmas cards and the respective contribution to the designated charity and alerts to the variability in charity contributions by retailer and to the small amounts being donated in reality.

intensive donation campaigns at that time of year). However, though they are often an inefficient option, charity cards are increasingly popular among card purchasers. Despite the often blurry definition of the public good component and the inefficiency in the implicit technology by which the bundling is achieved, impure goods are increasingly chosen in settings where it is also possible to make direct contributions to public good causes. Therefore, there are some reasons to suspect that an impure good may be chosen because it provides an easy moral escape route from a social norm prescribing generosity towards public goods.

To sum up, there are some reasons to suspect that an impure good may be chosen because it provides an easy moral escape route from a social norm prescribing generosity towards public goods. Alternatively, an impure good that fixes the ratio of private to public good expenditure may provide an anchor to individual decisions. Given these considerations, we wish to explore the issue of behavioural relevance of these impure goods for the private provision of public goods. Therefore, we design an experiment where impure goods can be included so as to test their influence on how individuals allocate their endowment between the private and public characteristics. This type of allocation decision can be studied within a dictator game setting, as we will argued. Two related treatments are implemented. Both involve inefficient goods, which do not expand the choice set for the consumer, and should thus be behaviourally irrelevant. The first treatment corresponds to a within-subject test of the behavioural relevance of an impure good that favours the private characteristic (we refer to these as selfish impure goods) and equivalently does not impose a high contribution to the public good (Treatment SIG). Since selfish impure goods will prove to be behaviourally relevant, we need to verify whether this is due to experimenter demand or simply anchoring on the impure good allocation. The second treatment involves an altruistic impure good, which includes a larger contribution to the public good (Treatment AIG). Since the impure good is not behaviourally relevant in this case, experimenter demand and anchoring are not likely to explain the asymmetric relevance of the impure good, so alternative explanations, such as reluctant altruism, are explored.

The plan for the remainder of the paper is as follows. In Section 2, we present the theoretical analysis of impure public goods, and our design. In Sections 3 and 4, we present the results. Conclusions from both experiments are discussed in Section 5.

2. IMPURE PUBLIC GOODS AND THE PRIVATE PROVISION OF PUBLIC GOODS: THEORY AND EXPERIMENTAL DESIGN

2.1. PRO-SOCIAL PREFERENCES AND BEHAVIOURS IN THEORY AND EXPERIMENTS

In the Economics literature on pro-social behaviours, several types of preferences have been identified that may give rise to the private provision of public goods. Generically an altruistic motivation exists when an individual's utility includes the level of public goods. Another such motivation subjacent to the contribution to a public good is the warm glow hypothesis of Andreoni (1990), according to which some individuals derive utility from the contribution to the public good in itself rather than the public good, thus experiencing a "warm-glow" from giving. Alternatively, Hollander (1990) considers that individuals care about what is the social standard of contribution by others and derive utility from how they compare to this standard. This has been denoted as the social approval motivation hypothesis. Furthermore, Brekke, Kverndokk and Nyborg (2003) consider that individuals care about their own perception of their pro-social behaviour relative to others, which is a self-image assumption concerning preferences. However, regardless of how we interpret pro-social behaviour in terms of underlying motivation, in these types of preferences individuals derive utility from the private and public characteristics and not from the means by which these characteristics are achieved.

Assuming consumers have preferences towards public goods, the choice problem of the pro-socially motivated consumer involves allocating income between private and public goods. Impure goods combine both a private and a public dimension with a fixed technology, therefore they represent an additional option for the consumer's

choice problem. Within this setting the consumer engages in the private provision of public goods when she chooses to purchase either the pure public good or the impure good.

In terms of the Experimental Economics literature, pro-social behaviours have been systematically observed in experiments with games such as the dictator game. In dictator games, one subject (the dictator) is endowed with money and instructed to make a decision as to its division between himself and another participant (the recipient). The subject is thus faced with a choice problem involving her payoffs and the payoffs of another participant. A robust generic result has been for some dictators to allocate a positive share of endowment to recipients, despite that fact that a payoff-maximizing individual should keep the endowment. However if we assume the individual cares about the payoff of the other participant, then sharing a part of the endowment may be utility maximizing, and regardless of the motivation prompting individuals to share with the recipient, the fact is that these types of behaviours are observed robustly in dictator game experiments (Camerer, 2003). The dictator game involves no interaction between subjects and is normally a one-shot choice, so there are no confounding issues arising from strategic behaviour, reputation building, cooperation, etc.

To study the behavioural reaction of individuals to the presence of impure goods, we can take a choice setting, such as a dictator game and replace the other subject by a charity, and in this case the subject is asked to allocate the endowment between herself and a public good cause. In this choice setting, we can introduce a generic impure good, and thus study in a controlled environment whether or not individual choices are affected by the presence of the impure good.

2.2. STRATEGIC FRAMEWORK

Our basic design starts with the theoretical work of Kotchen (2005, 2006) who models green goods as impure goods (Cornes and Sandler, 1984, Cornes and Sandler, 1994) and uses a broad definition of green good to include both cases discussed above, namely the intrinsic and embedded public characteristic. Kotchen proposes that

consumer behaviour and the private provision of public goods in markets with impure goods be analyzed within a characteristics approach. Specifically, preferences are based on the consumption of private and the public characteristic regardless of how they are achieved (through pure private, pure public or impure goods). For want of a better term, we will call this the *standard* view.

The budget constraint faced by the consumer is represented by a combination of private characteristics X_i and public characteristics *Y*, which can be obtained via a conventional good (c_i) generating one unit of *X* and costing 1 monetary unit, a direct donation to the public good (d_i) generating one unit of *Y* and costing 1 monetary unit, or via the impure good (g_i). The impure good generates both characteristics $X_i = \alpha g_i$ and $Y_i = \beta g_i$ with positive technology parameters[5] ($\alpha > 0, \beta > 0$) and costs 1. The prices of the characteristics are mainly a function of technology parameters, when obtained via the impure good. An impure good, whose joint production of the characteristics is more efficient than the separate production, i.e. $\alpha + \beta > 1$, will be denoted as efficient, as opposed to the case where $\alpha + \beta < 1$ and $\alpha + \beta = 1$, which will be called inefficient and neutral impure good respectively.

The budget constraint faced by a consumer *i* in the presence of an efficient impure good with exogenous wealth of w_i is defined in terms of the characteristics by equations (0.1) and illustrated by Figure 1.

$$\begin{aligned} Y_i &\le (w_i - X_i)\frac{\beta}{1-\alpha} \\ Y_i &\le w_i - \frac{1-\beta}{\alpha} X_i \end{aligned} \qquad (0.1)$$

[5] Kotchen (2005) suggests that the technology parameter related to the public good characteristic can be interpreted as an awareness parameter related to how consumers perceive this component of the impure public good.

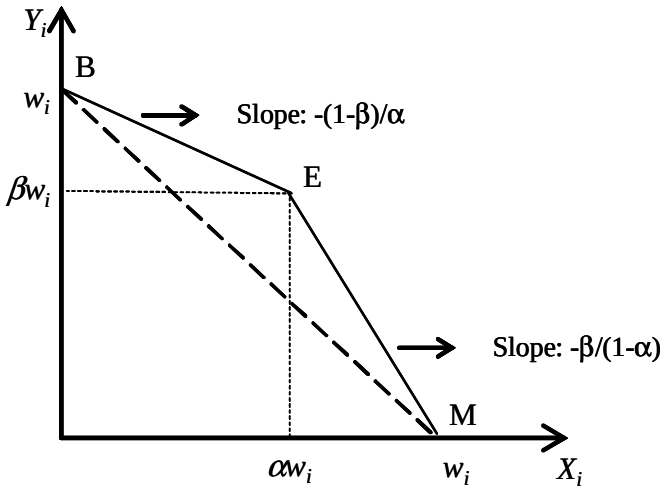


Figure 1 Budget frontiers in the characteristics space with efficient impure good (E)

In the presence of the efficient impure good, the set of possible characteristics bundles is expanded in comparison with just the combination of c_i and d_i. Point M corresponds to the case where individuals allocate all their income to the consumption of X_i through the consumption of conventional private good c_i. To increase the consumption of Y_i, without the impure good, individuals trade-off one for one consumption of c_i for d_i. With the impure good, they can increase consumption of Y_i, by reducing c_i and increasing g_i, thus moving up segment EM. This occurs up to the limit where all income is being allocated to the impure good yielding βw_i of Y_i and αw_i of X_i. B corresponds to the case where individuals allocate all income to the public good thus generating $Y_i=w_i$. To increase consumption of X_i individuals can move down segment BE, decreasing donation and increasing consumption of the impure good, up to bundle E. So, an impure good whose production technology is efficient expands the individual consumption possibilities set.

Given these budget constraints (in equations (0.1)) and assuming that individuals' preferences are defined only on the characteristics space, the individual utility maximization problem over the characteristics is as follows:

$$\begin{aligned} &\underset{X_i,Y_i}{max} U_i\left(X_i,Y_i\right) \\ &s.t.\ \ Y_i \le \left(w_i - X_i\right)\frac{\beta}{1-\alpha} \\ &\qquad Y_i \le w_i - \frac{1-\beta}{\alpha} X_i \end{aligned} \tag{0.2}$$

For the case when the impure good is neutral in terms of its technology ($\alpha+\beta=1$), the same bundle of characteristics is obtainable with a combination of private and public goods. In Figure 2, the consumption set is given by segment BM only. The introduction of this impure good is neutral as far as the consumer optimization problem is concerned, since individual preferences are only defined on the characteristics. If an impure good is inefficient and has a technology such that $\alpha+\beta<1$, it would be possible to spend the same amount of income on a combination of the conventional private and public goods and obtain higher amounts of at least one characteristic. This is illustrated by Figure 3. When the impure goods are either neutral or inefficient, the consumer utility maximization problem implies that the choice of the impure good is always weakly or strongly dominated, since the consumer will always prefer more of each characteristic rather than less. In both cases, when consumer's preferences are defined in terms of private and public characteristics, the introduction of an impure good should not alter the allocation to the consumption of private and public characteristics.

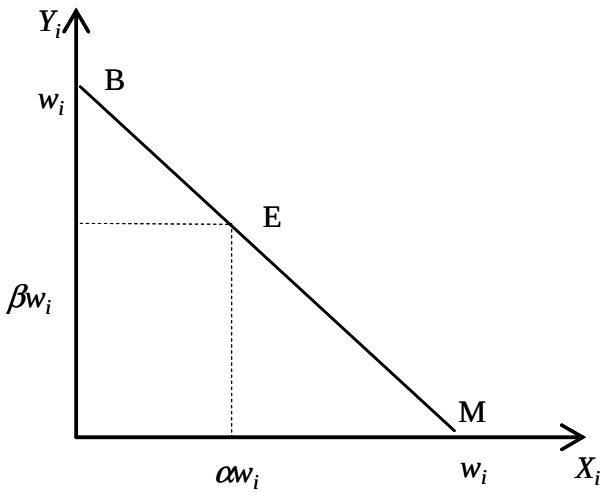


Figure 2 Budget frontiers in the characteristics space with neutral impure good

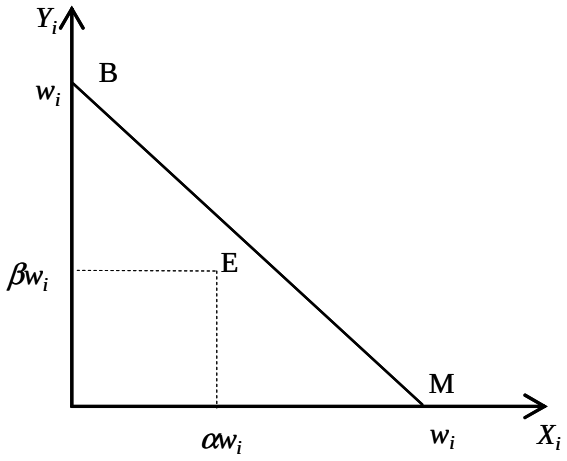


Figure 3 Budget frontiers in the characteristics space with inefficient impure good

In summary, when we assume that individuals' preferences are defined in terms of private and public characteristics, the introduction of an inefficient or neutral impure good does not affect individual's utility maximization problem and therefore does not affect her utility maximizing choices. The purpose of this paper is to investigate whether this theoretical prediction holds experimentally; in other words, we should still find experimentally that as long as the impure good is not efficient it should be behaviourally irrelevant.

2.3. IMPURE GOODS IN A LABORATORY EXPERIMENT

So, from a standard point of view, the introduction of an impure good is just another way of supplying private and public characteristics. If the impure good is efficient, it will expand the consumption possibilities. However if this impure good is neutral or inefficient it does not alter the consumption set and therefore the ultimate utility maximizing choices. Therefore our main hypothesis is:

H0: The presence of an inefficient or neutral impure good is not behaviourally relevant.

A corollary is that the impure good should not be chosen when it is inefficient.

To test this hypothesis we use a modified dictator game as the starting point. In the typical dictator game, the recipient is another individual, usually another player in the experiment. We use a good cause as the recipient (see for example Eckel and Grossman (1996) who use a local branch of the American Red Cross as a recipient). In the baseline decision, individuals can keep the endowment for private purposes or make contributions to public good causes. In the treatment decisions, the impure good is an option with a predefined division of the payoffs between the individual and the charity. When an impure good is present we will refer to this modified game as an impure good dictator game.

Subjects are asked to allocate a given endowment of 10 tokens between themselves and a charity, which is described before the start of the experiment. For this experiment, the charity is the Hardship Fund at Royal Holloway – University of London, UK (RHUL) which assists students financially. We choose this charity to make it relevant to the participants in the experiment, since for the charitable component of the experiment to be salient, subjects should care about it and being students at RHUL, we expect them to feel more strongly towards this charity than another broader charity. Therefore their earnings from this experiment correspond to a private consumption decision and their donation to the charity corresponds to their private provision of the public good (in this case, the welfare of fellow students at RHUL).

2.4. DESIGN

Given a fixed endowment, the underlying budget set can be described by four parameters:

1. The presence or absence of the impure public good.

2. The value of $\alpha+\beta$ – i.e. whether the impure public good is neutral, efficient or inefficient.

3. The value of β/α – i.e. whether the impure public good has relatively more or

less of the public good.

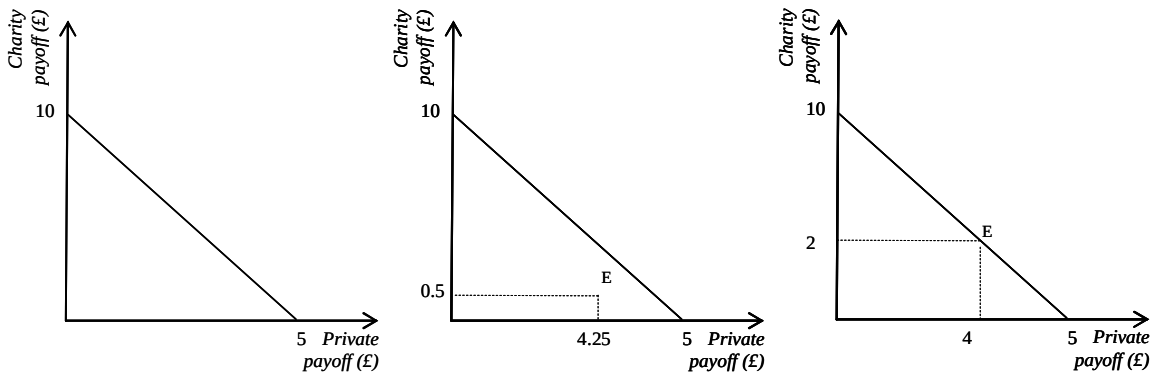
4. The price, *p*, of the public good, relative to the private good.

In the experiment we vary the values of these parameters to consider the robustness of the main hypothesis and to investigate subsidiary theories. We two values of *p*: when the price of making a donation is high, one token kept corresponds to £0.50 in individual earnings and one token allocated to the charity corresponds to a donation of £1; when the price of making a donation is low, one token kept still corresponds to £0.5, but now £2 goes to the charity for each token donated to it. We use two types of β/α. For simplicity we will label impure public goods with the relatively high value of β/α as *altruistic* and ones with a relatively low value of β/α as *selfish*. Obviously these labels are purely relative. Finally, this experiment concerns only impure goods where the technology parameters are such that they are not efficient ($\alpha+\beta\leq 1$).

For the baseline decision (labeled 1H), we use the high price. The budget frontier is illustrated in Figure 4 (a). The range of potential private earnings is [£0, £5] for the individual and [£0, £10] for the charity.

In the treatment decision (Decision 2H), individuals have not only the option to make an allocation of 10 tokens as described above, but also the option to choose a predefined allocation, corresponding to an inefficient and selfish impure good. The inefficient impure good implies earnings of £4.25 for the individual and £0.50 for the charity, corresponding to 8.5 tokens and 0.5 tokens respectively (illustrated in Figure 4 (b)).

In a variant of the treatment decision, the selfish impure good is neutral in its characteristics combination (Decision 3H). This impure good implies private earnings of £4 and donation of £2. The choice set is illustrated in Figure 4 (c).



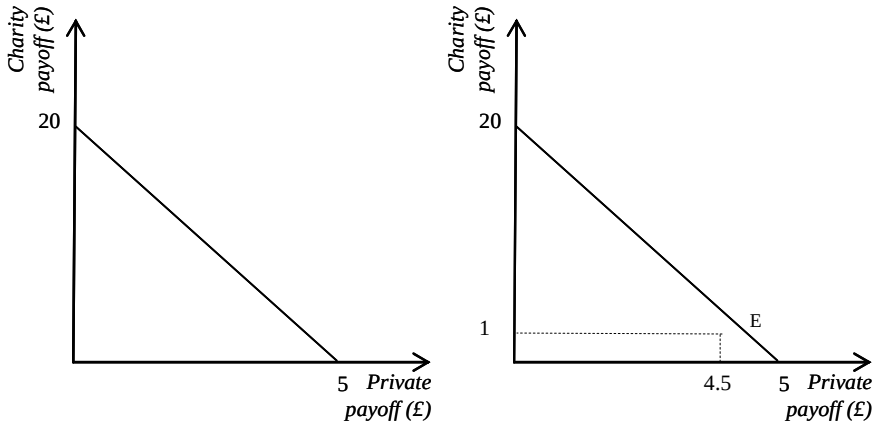
(a) Baseline decision (Decision 1H)

(b) Decision with inefficient impure good (Decision 2H)

(c) Decision with neutral impure good (Decision 3H)

Figure 4 Choice set in baseline decision and decisions with selfish impure goods with high price of giving

Other decisions can be depicted in a similar manner, as in Figure 5.



(a) Baseline decision (Decision 1L)

(b) Decision with inefficient impure good (Decision 2L)

Figure 5 Choice set in baseline decision and decision with inefficient impure good with low price of giving

Subjects are also told they will have to make several decisions but only one will count towards their actual payoff and charity donations, which will be determined by random draw at the end. This procedure follows the random-selection method (Davis and Holt, 1993, p. 438) with neither feedback between decisions nor feedback in terms of what other participants have chosen. As such, subjects have an incentive to

treat each decision independently, and are reminded more than once that they should treat each decision as if it were the one that will determine their actual payoff.

3. EXPERIMENT 1: SELFISH IMPURE GOOD

3.1. IMPLEMENTATION

Subjects were recruited at RHUL by campus and intranet advertisements and via the mailing list for recruitment to economic experiments. The sessions took place in the Experimental Economics Laboratory using z-Tree (Fischbacher, 2007) during the month of October 2007. Subjects were seated at computer terminals and informed that their decisions and earnings would remain anonymous and private. In this experiment, 66 students took part, of which 23 were female (35%) and the average age was 20.9 years.

To familiarize subjects with the computer interface and ultimately the allocation calculations that are later required of them, individuals are asked to read through a hypothetical scenario where allocation decisions are made and asked to make calculations. There is however a clear indication that this is not the actual experimental scenario. In case a participant makes a mistake, she has to wait for the experimenter to discuss the error privately before she can proceed to the actual experiment. Of the 66 participants who took part in the experiment reported here, 9 required intervention by the experimenter. However, there were no significant differences in the distribution of behaviour in any decision between subjects who made a mistake in the practice and those who did not.

For a session that never exceeded one hour, average earnings were £8.14, with a minimum earned of £5.40 and a maximum of £9, which include a show-up fee of £4. This is comfortably above the minimum hourly wage for the UK.

3.2. RESULTS

Order effects

We implement two treatments, each with 12 decisions, which differ in the order with which the baseline decision (Decision 1H) and the decision with impure good (Decision 2H) are implemented as well as in the order of other decisions. In order treatment 1, the first decision is the baseline decision (with high cost of giving) followed by the decision with an impure good (with high cost of giving), and the reverse is implemented in order treatment 2. Respectively, 29 and 37 subjects participate in each order treatment. The Wilcoxon-Mann-Whitney rank sum test (WMW test) yields no statistically significant differences in donations in the baseline decision in both treatments (test statistic of z=-0.669 and 2-tailed p-value = 0.504). Meanwhile, the difference in charitable behaviour in the presence of the impure good in both order treatments is not statistically significant, following the WMW test (z=0.013, 2-sided p=0.985). Similarly there are no order treatment differences for the other decisions made by subjects in this experiment. Hence, the data for each decision is pooled for the following analyses.

Behaviour in the baseline decision

In our experiment, in the baseline decision with high price of giving (Decision 1H), 77% of subjects donate a positive amount to charity, as can be seen in Figure 6. On average the amount donated is £2.42 which corresponds to 24.2% of the maximum donation possible (Table 1 summarizes the donations for this decision and for the decisions that will be discussed later). Also, considering only the donors, the average donation is 31.3% of the maximum allowed.

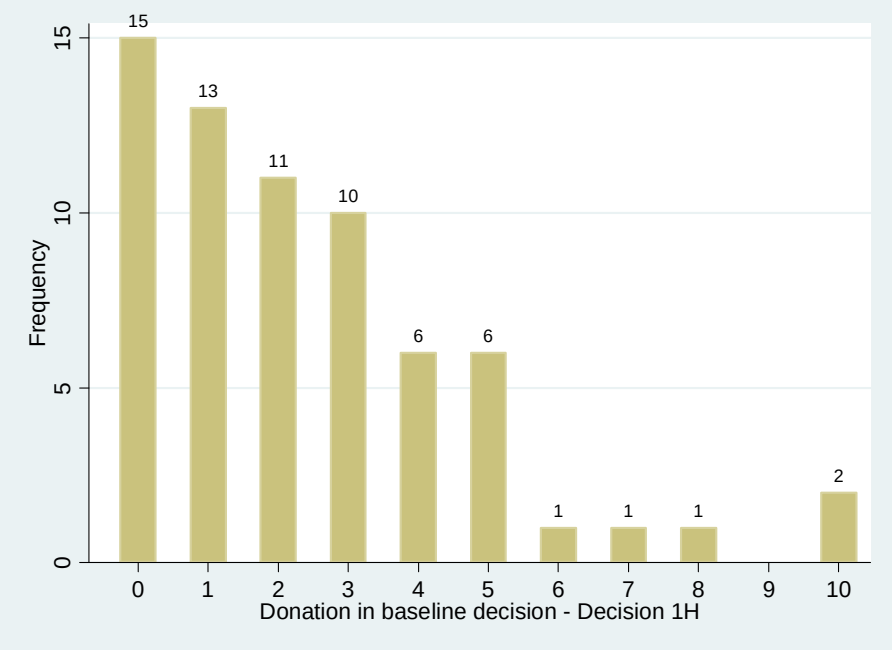


Figure 6 Frequency of donations in Decision 1H

Table 1 Donations in Experiment 1: descriptive statistics

			Mean	Standard deviation	Median	Minimum	Maximum
High price of giving	Baseline Decision	Decision 1H	2.42	2.33	2	0	10
	Decision with inefficient selfish impure good	Decision 2H	1.67	1.86	1	0	9
	Decision with neutral selfish impure good	Decision 3H	1.89	1.56	2	0	10
Low price of giving	Baseline Decision	Decision 1L	5.30	5.78	4	0	20
	Decision with inefficient selfish impure good	Decision 2L	2.77	3.99	2	0	20

Note: 66 observations

The results are in line with previous work. Lazear et al. (2012) observe in their baseline treatment (with anonymity) that 67% of the 46 participants share something with the recipient of the $10 with which they are endowed; on average subjects share 24.2% of the endowment and considering only the individuals who share something, the average shared is 37.1%. Meanwhile, Eckel and Grossman (1996) observe that 73% of subjects donate to the charity.

Behaviour in the presence of a selfish and inefficient impure good

In Decision 2H, the impure good gives an earning of £4.25 to the individual and £0.50 to the charity. In this decision the impure good can be classified as both selfish, since the implicit token allocation favours the individual, and inefficient, since it generates a loss of 1 token, or equivalently £0.50 in private earnings or £1 in donation

The null hypothesis is that the impure good is not behaviourally relevant. However, comparing individual charitable behaviour in the presence and absence of the impure good, we reject this hypothesis. In the baseline decision, 1H, mean donations are £2.42; in decision 2H, in the presence of the selfish and inefficient impure good the mean donation is £1.67 (refer to Table 1 and Figure 7 for the frequency of donations). The mean donation is lower because 42.5% of subjects (28) donate less to the charity in the presence of the impure good, whereas only 21% (14) increase their contribution. Comparing donation choices in Decision 1H and 2H, we conclude that this behavioural difference is statistically significant ($z=2.65$, $p<0.01$) [6].

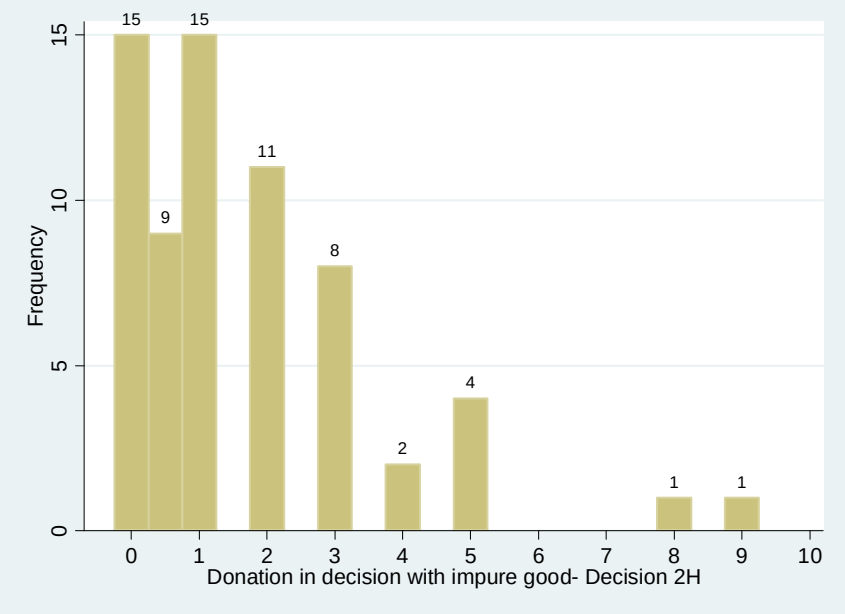


Figure 7 Frequency of donations in Decision 2H

[6] Unless otherwise stated, the reported p-values for the statistical tests are 1-tailed p-values and the reported test results are for the Wilcoxon matched-pairs signed rank test (W test).

We also observe that the impure good is chosen by 9 out of 66 subjects (13.6%) in Decision 2H. This behaviour is not consistent with assuming that individuals care only about the private or public characteristics. A closer inspection of the individuals who choose the impure good reveals that 7/9 give a higher donation in the baseline decision.

If we restrict attention to the individuals who do not choose the impure good (57 subjects), the mean donation is £2.29 in Decision 1H and £1.85 in Decision 2H. For this subsample, the charitable behaviour is significantly higher in Decision 1H than in Decision 2H following the Wilcoxon matched-pairs signed rank test ($z=1.747$, $p=0.04$). In other words donations are typically lower in the presence of the impure good.

With a low price of giving we get the same difference between tasks. A breakdown of the frequency of donations is presented in Figure 9. Decision 1L is the same as the baseline decision but with a low price of donating. In Decision 1L the 66 participants donate on average 2.65 tokens, corresponding to £5.30, and specifically 53 (80%) are donors (Figure 8), donating 3.30 tokens or equivalently £6.60. Similarly decision 2L is the same as 2H but for the lower price of giving. Again donations are lower in the presence of the impure good. The mean donation is only £2.77 in 2L. Median behaviour is significantly higher in Decision 1L than in Decision 2L ($z=4.37$, $p<0.01$). Meanwhile in 2L, the impure good is chosen by 22.7% (15/66) subjects. Considering only the 51 individuals who do not choose the impure good in Decision 2L, the same behavioural effect from the presence of the impure good is observed relative to Decision 1L. The mean donation is lower (£4.66 to £3.29) and the behavioural difference between median decisions is statistically significant ($z=3.093$, $p<0.01$).

As an aside we can examine the effect of lowering the price of donations by comparing behaviour in 1L and 1H. In terms of tokens donated there are no statistically significant differences in individual decisions ($z=-0.143$, 2–tailed $p=0.88$), whereas, as a consequence, the difference in monetary donations is statistically

significant between decisions (z = -4.232 and p<0.01). Therefore, subjects do not change their own earnings as a consequence of the decrease in the price of giving, however they are able to become more generous without sacrificing any personal gain. These results are in line with the findings of Karlan and List (2007) who find that an increase in matching has no significant effect on the amount directly donated (before matching) by individuals.

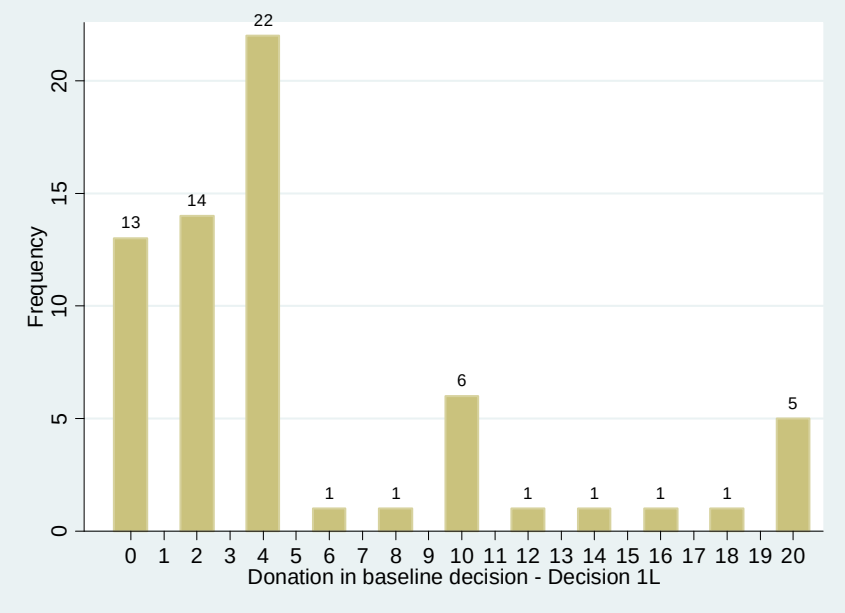


Figure 8 Frequency of donations in Decision 1L

To sum up, both the hypothesis of behavioural irrelevance of the inefficient impure good and the corollary of no-choice of inefficient impure goods are rejected. Not only do some subjects choose the inefficient impure good and decrease their donation as a consequence, but the ones who make an explicit allocation, give a lower average contribution to the charity in the impure good dictator game.

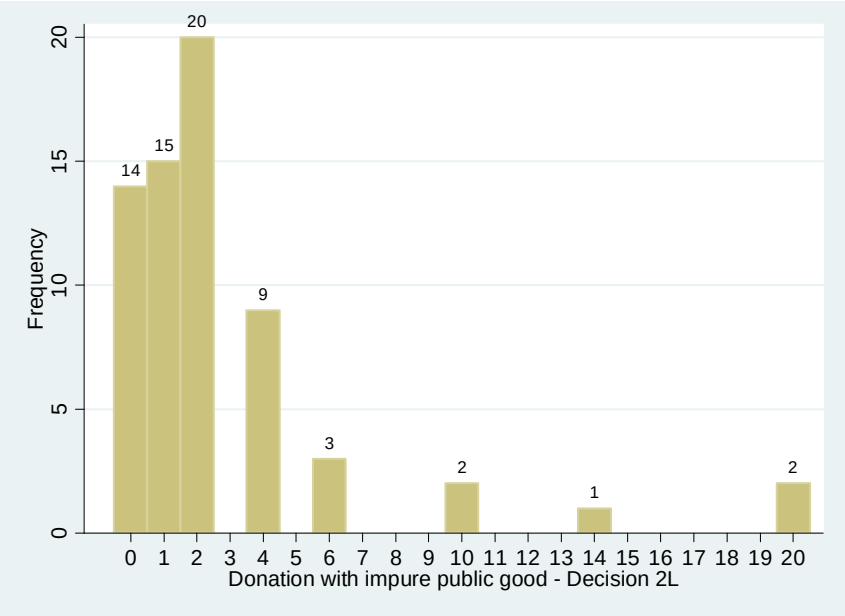


Figure 9 Frequency of donations in Decision 2L

3.3. SELFISH AND NEUTRAL IMPURE GOOD

We include in the tasks a variation on Decision 2H, which consists of making the impure good neutral instead of inefficient (Decision 3H). Again the standard theoretical prediction for individuals who care only about the private and public characteristics is for their charitable behaviour not to be influenced by the presence of the neutral impure good. In terms of implementation, this decision consists of the choice set representation in Figure 4 (c), where the impure good has a payoff of £4 for the individual and £2 for charity, which is equivalent to 8 tokens kept and 2 donated.

In this decision, the mean donation is £1.89 as opposed to £2.42 in the baseline decision (Decision 1H). Comparing these two decisions, charitable behaviour in the baseline is higher with weak statistical significance ($z=1.607$, $p=0.054$), which again corroborates the finding of behavioural relevance of a non-efficient impure good. Also, 26 out of the 66 participants (39.4%) choose the neutral impure good, but for these individuals we observe no significant behavioural change relative to the baseline decision ($z=0.89$, 2-tailed $p=0.372$). On the contrary, the subjects who make the allocation in Decision 3H decrease their mean donation from £2.3 in the baseline to £1.82 and the median donation pattern is weakly significantly higher in the baseline

relative to Decision 3H (z=1.402, p=0.08). Furthermore, whereas the inefficient impure good is only chosen by 13.6% (9/66) of subjects, the neutral good is picked by 39.4% (26/66), even though out of these 26 subjects, only 6 donate the same £2 in Decision 1H that they are implicitly donating in Decision 3H through the impure good.

Given that we observe the same type of donation decrease in the presence of either an inefficient or a neutral selfish impure good, it is interesting to further investigate if there is any further change in generosity when the good is neutral relative to when it is inefficient. For this purpose we can compare behaviour in Decision 3H involving a neutral impure good and Decision 2H involving an inefficient impure good. Charitable behaviour in the presence of the former is weakly significantly higher than in the presence of the latter (z=1.5, p=0.065). It can be the case that overall subjects become more generous towards the charity or that the inefficiency is in fact being passed on to the charity. In fact we observe that whereas donations are lower relative to the baseline, private payoffs are similar to the baseline (z=0.99, 2-tailed p=0.321), so the slight increase in donations comes from the fact that the impure good is no longer inefficient. Also, the result is mostly driven by the behaviour of the individuals who choose the neutral impure good, since the remaining 40 subjects do not significantly alter their donations between Decision 2H and 3H (z=0.332, 2-tailed p=0.7395), but decrease them relative to Decision 1H (z=-1.402, p=0.08). Therefore even though we observe an overall increase in donations when the impure good loses its inefficiency, this is not driven by a behavioural change by those who are making the active allocations but by the fact that the good is neutral.

In summary, relative to the baseline decision, the introduction of the neutral selfish impure good decreases charitable behaviour, mostly because subjects not choosing the impure good decrease their donation. On the contrary, those individuals who pick the neutral impure good remain on aggregate consistent in their donation behaviour relative to the baseline. Also, when the impure good is neutral donation behaviour is slightly higher than when it is inefficient, since the inefficiency in the impure good is being brunt by the charity.

3.4. ANCHORING OR EXPERIMENTER DEMAND

This experiment extends the dictator game to include the option of a transparent impure good. Even though, we would expect selfish impure goods, either neutral or inefficient to be behaviourally irrelevant, we have rejected both the behavioural irrelevance hypothesis and its corollary of no-choice of the inefficient impure good.

One possible explanation for this behavioural relevance of the impure good may be due to a cognitive process of anchoring and/or experimenter demand.[7] Anchoring refers to a non-intentional phenomenon by which final choices and judgment are dependent on the initial anchor value as well as to the process of adjustment that takes place in between (Tversky and Kahneman, 1974). Since the impure good in this experimental setting provides a defined allocation of tokens and earnings, this may provide some anchoring bias in the individual decisions in the presence of the impure good, especially given the consecutive nature of the decisions, even if within a random lottery of decisions for payoff determination. Alternatively, decisions may be driven by experimenter demand, whereby subjects try to comply with what they see as the wishes of the experimenter.

Since anchoring is typically defined as a non-motivated phenomenon, if it is present it should occur in an experiment setting such as this one regardless of the nature of the impure good. We therefore run a second experiment with an altruistic impure good, designed to test the following null hypothesis:

H0: The presence of an inefficient or neutral impure good is not behaviourally relevant when the impure good is altruistic.

If we reject this null, then anchoring or experimenter demand appears to be a likely explanation of our results. Alternatively, if we accept the null then we reject anchoring and experimenter demand explanations of behaviour in Experiment 1.

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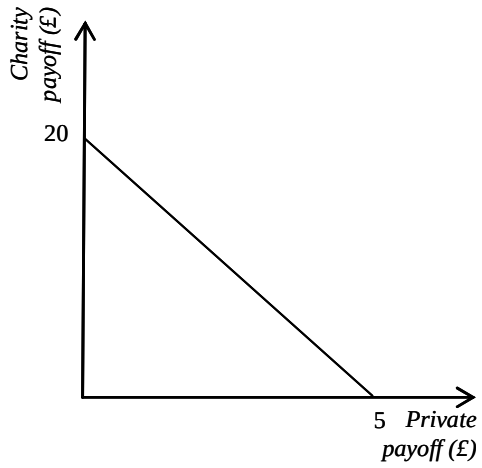
[7] The wider significance of our results would differ between these explanations. If impure goods caused an anchoring effect, their presence could lower or raise pro-social behaviour depending on the value of the anchor. If on the other hand are results were driven by experimenter demand then they would have no obvious policy implications.

4. EXPERIMENT 2: ALTRUISTIC IMPURE GOOD

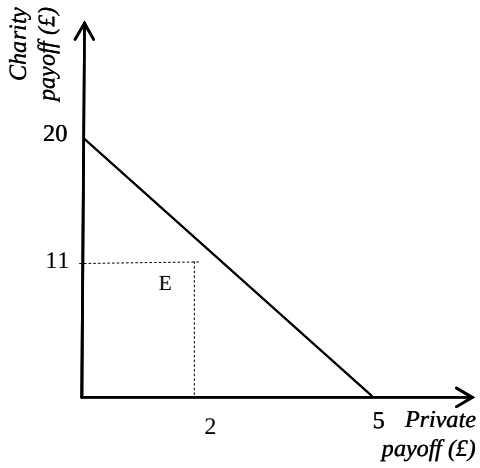
4.1. DESIGN

This experiment is similar to Experiment 1, except for the fact that in the treatment decision, the impure good favours the charity rather than the individual. From the standard theoretical point of view the null hypothesis of behavioural irrelevance of the inefficient impure good should hold. Individuals are faced with 9 decisions and informed that only one of these decisions will be randomly picked at the end to determine their payoff from the experiment. The focus of this experiment is to study the effect of an altruistic impure good in a similar setting to Experiment 1. Therefore the first two decisions correspond to the baseline decision and the treatment decision.

In the baseline decision, participants can allocate 10 tokens between themselves and the charity. The price of donating is low, which means that every 1 token the individual donates, corresponds to £2. Since each token is worth £0.50 in private earnings, this low price of giving is equivalent to a matching ratio of £1: £3. The choice set in this decision is illustrated in panel (a) of Figure 10. The treatment impure good is altruistic because it favours the charity in terms of the allocation (Decision 4L). In this case the individual earns £2 and the charity receives £11, which corresponds to 4 tokens kept and 5.5 donated, so this impure good is inefficient.



(a) Baseline decision



(b) Decision with inefficient impure good

Figure 10 Choice set in baseline decision and decision with altruistic impure good with low price of giving

4.2. RESULTS

Subjects were again recruited at Royal Holloway – University of London during December 2007. In this experiment, 33 individuals participated, of which 16 were female (48%) and the average age was 21.3 years. In the baseline decision, 78.7% of subjects donate a positive amount to charity (28/33), and the mean donation is £4.90 for the whole sample and £6.23 for donors only. The donation choices are illustrated in Figure 11 and descriptive statistics are in Table 2.

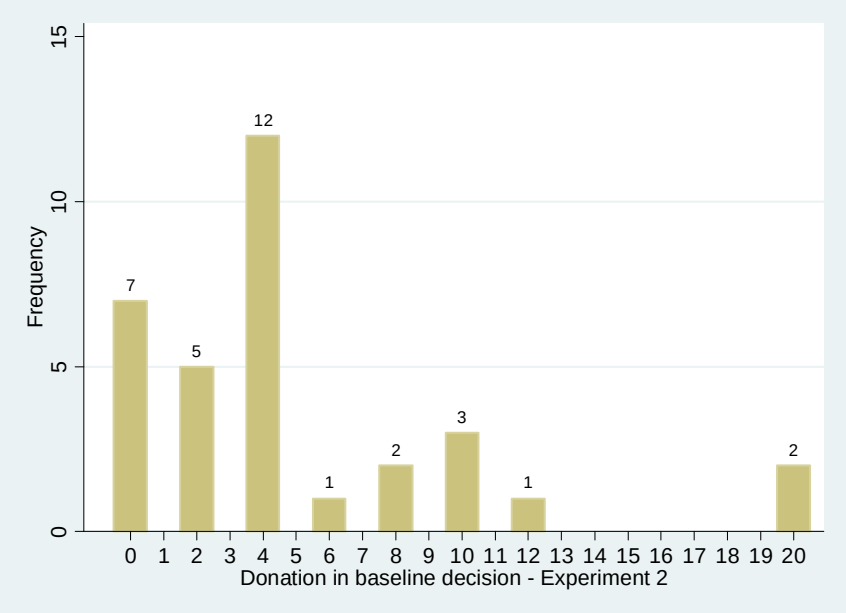


Figure 11 Frequency of donations in baseline decision in Experiment 2

Table 2 Donations in Experiment 2: descriptive statistics

			Mean	Standard deviation	Median	Minimum	Maximum
Low price of giving	Baseline Decision	Decision 1L	4.90	5.07	4	0	20
	Decision with inefficient altruistic impure good	Decision 4L	5.54	5.67	4	0	20

Note: 33 observations

In the presence of the impure good (decision 4L), the mean donation is £5.54 and 72.7% of subjects donate something to charity (24/33). The impure good is chosen by 5 out of the 33 participants (15.2%). Experiment 1 established that participants decreased their donations in the presence of the selfish impure good. But for these two decisions in Experiment 2, there is no statistically significant behavioural difference (z=-0.981, 2-tailed p-value=0.326).

Therefore, the hypothesis of behavioural irrelevance of an altruistic and inefficient impure good is not rejected. As such, if the results in Experiment 1 had been driven by either anchoring or experimenter demand we would expect a similar influence of this more altruistic impure good, generating more generous behaviours. However, as observed the altruistic cue is ignored by subjects.

5. DISCUSSION

From a standard point of view the presence of an impure good that is not efficient should not affect individual charitable behaviour. Our experiments introduce inefficient and neutral impure goods in a choice setting and test the behavioural irrelevance hypothesis in a laboratory environment.

Experiment 1 introduced an impure good that favoured the individual in terms of earnings. As shown, the presence of the selfish impure good decreases individual charitable behaviour (Decision 2H). On the one hand, individuals who were donating more money to charity decrease their donation; specifically 31.8% (21/66) of participants make active allocations that imply a lower donation in the presence of the impure good. On the other hand, we saw that 13.6% (9/66) of subjects opt for the impure good despite its inefficiency and thereby 7 are in fact being less generous than before. These individuals who choose the impure good are in a sense opting out of the

dictator game before them and taking a convenient solution, for which they are willing to sacrifice some donations. Given that the impure good is inefficient, while many subjects were influenced, most did not choose it, which does not mean, as we showed, that they were not impacted by the presence of the impure good.

Maintaining the inefficiency of the impure good, Experiment 2 tests the behavioural irrelevance hypothesis but with an impure good that favours the charity. In this case, the impure good did not generate statistically significant behavioural changes. Therefore what we observe in Experiment 1 does not seem to be the result of experimenter demand or, a mostly unconscious phenomenon such as anchoring[8], since we would expect similar results in Experiment 2 if this were the case.

It seems the presence of the impure good actually plays a role in the decisions, even when it is inefficient. However its role is asymmetric since it becomes relevant when it favours the individual but irrelevant when the charitable component is more important. We see that when a selfish impure good is present, either neutral or inefficient, it is chosen by some individuals. Even when the impure good is not chosen, the amount donated to the charity is lower in comparison with the decisions where it was not present.

Green goods are becoming increasingly available in markets for private goods. When the technology is efficient, their presence actually expands the choice set of individuals and may have a positive effect on the private provision of environmental public characteristics in equilibrium. However, in reality not all green good technologies are more efficient than the simple combination of consumption of private goods and donations to charity, and yet consumers still demand green goods. Therefore, despite the appeal that green and ethical goods may have for a decentralized private provision of public goods, we wonder if impure goods foster or discourage pro-environmental or pro-social behaviours.

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[8] Anchoring may still be driving the results in Experiment 1 since we cannot be sure how individuals are being influenced by the cue implied by the impure public good allocation. However, individuals only seem to be influenced by an eventual anchor when it is in their self-interest to do so, so if we assume anchoring is not self-serving, it should be present in both Experiments.

As our experiment reveals, the introduction of a selfish impure good, either neutral or inefficient, is behaviourally relevant, not only because it alters median behaviours, but also because the impure good is chosen despite its inefficiency or neutrality. In sum, for a non-negligible part of the sample their pro-social behaviours in the presence of the impure goods are not consistent with pro-social motivations as normally interpreted, for example assuming altruistic motivations. From a theoretical point of view if individuals are assumed to have pro-social motivations and derive utility from a public good, they should care about the level of the public good regardless of whether it is achieved via a donation to a charitable cause or via an impure good. However, in our experiment some individuals decrease their donations, choose inefficient and selfish options, despite the private and public characteristics being transparent in all decisions. Thus individuals appear to care about more than the two characteristics.

Authors such as Lazear et al. (2012), Dana et al. (2006) and Dana et al. (2007) have recently hypothesized that part of the altruistic behaviour previously observed in economic experiments may in fact be some sort of reluctant altruism, i.e. were these individuals to be given the possibility to "get away" with not being altruistic they would seize it. Given the conclusions of our experiment, the selfish impure good seems to be acting as an option to opt-out of the dictator game or providing leeway for a motivated reasoning process by which individual choose to behave less altruistically than in the absence of the impure good. Therefore in the absence of these impure goods, choices are transparent and there is no room to wriggle, so individuals who acknowledge an altruistic norm are more generous. Introducing a selfish impure good provides wriggle room and decreases pro-social behaviours. In the case of green goods, though their emergence appears appealing for the private provision of environmental public goods, they may ultimately decrease pro-environmental behaviours.

In summary, the results from our experiments add to the growing literature on contextual effects in experiments on pro-social behaviour, where altruistic behaviours become less prevalent than in previous experiments and more context-dependent. On the other hand, our experiments provide an approach to studying the impact of impure goods on pro-social behaviours and by generating somewhat unexpected results create

room for future explorations of this topic.

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