Niklas Gogoll[ab] & Felix Schlieszus[ac]

[a] Chair of Institutional Economics (VWL V), University of Bayreuth, 95440 Bayreuth, Germany

[b] Niklas.Gogoll@uni-bayreuth.de

[c] Corresponding Author, Felix.Schlieszus@uni-bayreuth.de

Why Being a Frequent Flyer and an Environmental Activist is no Contradiction

The Willingness to Pay for Public Goods and its Components

Abstract: This article examines the willingness to pay for public goods. Motivated by the question whether it is hypocritical to call for a better environment and act – at first glance – contradictory by polluting the environment for instance by flying frequently, we develop a theoretical model to explain the underlying utility optimization problem. Flying frequently – even though an individual has a high preference for the environment – can be explained by the marginality of this individual's impact on the public good which gives an incentive to free ride. However, it is possible that individuals show behaviour which supposedly improves the environment although being aware that their impact is negligibly small. We argue that these actions are not based on the preference for the public good itself but are to fulfill social incentives e.g. silence one's conscience or avoid negative reputation. The only way to impact the environment is therefore to force reciprocal behaviour which can be achieved by governmental intervention. By introducing a theoretical construct, the Quasi-Monarch, we are able to include both kinds of willingness to pay in our model – for the public good itself and for fulfilling one's social incentives.

Keywords: Willingness to Pay, Public Goods, Social Incentives, Quasi-Monarch, Collective Action.

JEL Codes: H41, D71, D02, D11

1 Introduction

Environmental activist movements have raised the focus of media attention in recent years. Typically, these movements demand drastic changes of our present consumption patterns to improve public goods, e.g. reducing greenhouse gas emissions. One of these climate-intensive activities is flying, which is often criticized harshly. As a consequence one would expect especially those people, who are actively engaged, to reduce flights. However, the number of flights of the aforementioned group has been growing the fastest (ADV 2018). There are more examples of this kind to be found which, at first glance, seem to be contradictory behaviour. A study of the German Federal Environment agency suggests that members of the "critical-creative milieu" are prone to consuming resources at a level high above the average, and this is not compensated by buying food in organic grocery stores (Umweltbundesamt 2018). This is why some accuse environmental activists of hypocrisy, i.e. to not practice what they preach (Book 2019). But is frequent flying and being an environmental activist really hypocritical? In this paper we will argue the opposite.

The effect of one person restricting herself to a sustainable consumption is negligibly small. Hence, just changing one's own behaviour will not improve the public good, e.g. the climate. Even though the environment may be important to an environmental activist, the individual's lower strain on the environment does not compensate for the loss of an individual's utility when flying less. Instead, free-riding is the rational choice even when having a high preference for the public good.

Following this argument we do not expect rational individuals to spend money for improving a large public good individually. However, the increasing amount of individually compensated CO_2 emissions (Donofrio et al. 2021), provides evidence against this hypothesis. How can this behaviour be explained assuming that individuals know, that their impact on the public good is marginally small? Individuals might hope to motivate others to change their consumption patterns as well. But reciprocal behaviour of other individuals is very uncertain – especially for large public goods (Budescu et al. 1990, Rapoport and Suleiman 1993, Hine and Gifford 1996 and Jagers et al. 2020). Instead it

can be explained by the individual's preference to for instance soothe one's conscience after a long-haul flight by compensating CO_2 emissions. These payments based on social incentives (e.g. conscience, reputation or morality) are linked to the willingness to pay for improving the public good, but they have to be viewed separately, because these payments do not increase the level of the public good.

Knowing that reciprocal behaviour is not feasible, the only way environmental activists can target the level of a public good is by implementing or increasing standards and rules on a societal level, for instance with the introduction of a carbon tax, which prohibits free-riding behaviour. Without state intervention, these environmental activists cannot achieve any significant change of the level of the public good. Therefore, they will not change their individual consumption pattern and still fly frequently. To show why environmental activists do not act hypocritically by flying frequently it is important to separate these two forms of willingness to pay. We achieve this by devising a simple model in this paper.

2 Willingness to pay for public goods

The willingness to pay for public goods has engaged economists since Samuelson (1954) and Olson (1971). Early literature suggests that, when a public good is provided for privately, individuals have the incentive to free-ride and therefore not participate in its provision (see Samuelson 1954, Olson 1971, Brubaker 1975 and Sandler 1992). The currently accepted view is that one cannot make general statements on the willingness to pay for public goods, as it depends highly on the good and the framework of its provision (Dawes 1980, Fleishman 1988 and Jagers et al. 2020).

Improving a public good is not the only reason why individuals would be willing to pay for it. For instance, an individual may not care about a public good at all, but for fear of social sanctions yet decides to contribute towards its provision. This individual would even cooperate in the case when her own contribution does not benefit the level of the public good, since she is motivated by social reasons only. In other words, the willingness to pay for improving a public good and the willingness to pay based on social sanctions

might be linked, but they arise from different preferences. Despite this, most literature does not distinguish these two kinds of willingness to pay, even when social incentives are accounted for. In the following we will separately discuss these two types of willingness to pay for public goods. We start with social incentives, which are the focus of our model presented later.

Social incentives

Willingness to pay based on social incentives is relatively well established in the economic literature (see e.g. Sen 1977, Udehn 1993 and Moreh 1994). While there are many different kinds of social incentives, we will focus on reputation, altruism and social norms.

An individual might be willing to contribute to a public good in order to achieve some form of social benefit or avoid social sanctions – even if they are non-monetary. These reputational, external considerations potentially reduce free-riding in public goods games, as individuals would include reputational payoffs into their optimization strategy (Olson 1971, Kreps and Wilson 1982, Ostrom 1990, Bornstein et al. 1990 and McCabe et al. 1996). This could, for instance, mean that consuming less of a good can be rational, when fearing social sanctions. This would imply in our example that environmental activists fly less due to social sanctions.

Additionally, other social incentives, not linked to reactions of other individuals, potentially play a role. For example, an individual might act on the basis of altruism. The literature often describes altruistic persons as ones, who would participate in improving a public good, even when not directly benefiting from its improvement (see e.g. Margolis 1983, Taylor 1987 and Guagnano et al. 1994). An altruist might for instance consider to consume less of an environmentally harmful good with the goal of increasing the welfare of another person, even if the altruist does not benefit directly and even if her own influence on the public good is negligibly small. I.e. in a situation, where it would be optimal to free-ride, an altruist might still contribute. So, altruism is considered to be the perceived obligation to cooperate in a public goods game, which is sometimes called "warm glow of giving" (see Andreoni 1990 and Kahneman and Knetsch 1992). This means that even

if large public goods are provided privately, i.e. without any state intervention, in the presence of altruists some level of the public good would still be provided.

Other internal social incentives may be based on social norms. Social norms are defined as a catalogue of generally accepted behaviour (see Elster 1985 and Coleman 1986). Elster (1985) argues that social norms influence the willingness to pay in two ways: Firstly, some social norms (e.g. morality) may drive people to participate in the provision of a public good independently of the actions of others, if only it leads to an expected increase in overall welfare. Secondly, collective action can also arise through the norm of fairness. Contrary to morality, fairness might be conditional on the choices of other players (Elster 1989). An individual is only willing to cooperate, if enough other players do so as well (conditional cooperation). Once this threshold is reached, an individual considers the game to be fair and feels obliged to participate as well (Ostrom 2000).

Willingness to pay for public goods

The willingness to pay based on social incentives is independent on whether or not it improves the public good, as our discussion on social sanctions above shows. But there are situations when it is based on the preference for the public good itself as well. This happens when the public good can be provided by one person or reciprocity is feasible (i.e. cooperation is the dominant strategy). Reciprocal behaviour can increase the contribution of other players, which leads to a higher level of the public good (Axelrod 1984, Nowak and Sigmund 2005, Ule et al. 2009 and Mani et al. 2013), though economic literature does not agree on whether it is dynamically stable (Andreoni 1995, Gale et al. 1995, Roth and Erev 1995 and Palfrey and Prisbrey 1997).

A few factors can influence the probability of reciprocal cooperation, the most important of which is information. This is why Boyd and Richerson (1985), Güth (1995) and Börgers and Sarin (1997) argue that observable actions may increase cooperative behaviour, as individuals see how high cooperation actually is.[1] Cooperation can also arise in public good games where actions are hidden, but all players are allowed to communi-

[1]Conversely, more information can also decrease cooperation, if it exposes a high number of defectors (Güth 1995, Keser and van Winden 2000 and Fischbacher and Gächter 2010).

cate (Frank et al. 1993, Sally 1995, Ostrom 1998). Then assurances based on trust can lead to collective action (Sen 1967, Shaw 1984, Sabia 1988).

The smaller the public good, the more feasible reciprocity is. Larger public goods are typically more costly to provide and correlated with larger groups of individuals, who are non-excludable from consumption. This decreases the marginal effect of an individual's contribution on the public good and decreases the probability of cooperation, even if the groups are heterogeneous and some players have a high willingness to pay for this public good (Esteban and Ray 2001 and Pecorino and Temimi 2008).

So, only if an individual believes that her own contribution has a high influence on the public good – which is the case when either the public good is very small or her influence on other individuals' contributions is high – cooperation is a stable outcome. Otherwise free-riding becomes optimal and the willingness to pay for the public good goes to zero. Note, however, there may still be some willingness to pay based on social incentives. Thus the sum of these two, the total willingness to pay, could nevertheless be non-zero. If individuals are not interested in improving the public good or reckon that their own contribution is marginal, they may still have a positive total willingness to pay for goods or services that supposedly improve the public good just to satisfy social incentives. Therefore, we propose to separately study these two kinds of willingness to pay and to consider the total willingness to pay for a public good as the sum of the two. This may also help to solve disputes in the economic literature on whether free-riding or cooperation is the dominant form of strategic action.

3 Model

3.1 Baseline model

To keep our model as simple as possible, let us assume that an individual – in our case an environmental activist – can choose between consuming two goods x_1 (e.g. trees) and x_2 (e.g. flights) with a given budget restriction.[2] Additionally, this environmental

[2] x_2 can also be interpreted as the sum of all other consumption choices instead of flights.

activist is also concerned with the level of the environment e, which increases her utility with higher levels. Assume that good x_1 increases the level of the public good e, though insignificantly for a single individual. When planting trees (or paying someone to plant trees) the environmental activist receives some form of utility based on social incentives (e.g. conscience, social norms, reputation). x_2 negatively influences the level of the public good e. The utility is determined by the environmental activist's preferences α, β and γ for the level of the public good e, the social satisfaction derived from consuming x_1, and the consumption of x_2, respectively.[3] Assuming a Cobb-Douglas form, the utility function can then be written as

$$u(x_1, x_2) = e^{\alpha} x_1^{\beta} x_2^{\gamma} \tag{1}$$

In the next step we have to specify the relation between x_1, x_2 and the public good e. Unlike for private goods, consumption of the public good e does not decrease its level (property of non-rivalry). We assume, that the level of the public good e in period t is dependent on its level in the previous period e_0 and the impact from all individuals $i = 1, 2, \cdots, n$, which we define as Δe_n. We assume that e can be written as

$$e = e_0 + \Delta e_n. \tag{2}$$

The consumption of x_1 increases the environmental level e. x_2 has a negative impact on e.

If you consider large public goods, a single individual's consumption has either no or only a very small influence on the level of the public good, unless reciprocity plays a large role. Since cooperation based on reciprocity is unlikely for large public goods, we assume that the effect of an individual's consumption of good x_1 and x_2 on the environment e is negligibly small. A simple algebraic relationship between the consumption levels x_{1i}

[3] An individual could of course also gain utility by consuming x_1 besides social incentives and the consumption of x_2 could be negatively impacted by social incentives. To keep the model as simple as possible, we omit these extensions for now.

and x_{2i} of individuals $i = 1, 2, \cdots, n$ and the change in the environmental level Δe_n that satisfies the above assumptions is

$$\Delta e_n = \sum_{i=1}^{n} x_{1i}\theta_1 + x_{2i}\theta_2, \tag{3}$$

where θ_1 is the influence of one consumed unit of x_1 on e. We assume that θ_1 is positive, but so small that $x_{1i}\theta_1 \approx 0$ for each single $i = 1, 2, \cdots n$. The same is true for θ_2, which we assume to be negative. Hence within an individual's utility function we can consider Δe_n as an exogenous term, and therefore

$$u(x_1, x_2) = (e_0 + \Delta e_n)^{\alpha} x_1^{\beta} x_2^{\gamma} \tag{4}$$

We assume that each individual's budget constraint can be written as

$$m = p_1 x_1 + p_2 x_2, \tag{5}$$

where m is the budget and p_j the price of good x_j for $j = 1, 2$.

Deriving the optimal bundle of goods with respect to x_1 and x_2, by maximizing (4) with respect to (5) we obtain the demand functions

$$D_{x_1}(p_1) = \frac{\beta m}{p_1(\beta + \gamma)} \tag{6}$$

$$D_{x_2}(p_2) = \frac{\gamma m}{p_2(\beta + \gamma)} \tag{7}$$

The resulting demand functions are identical to the ones of the standard Cobb-Douglas utility functions. It is important to note that the willingness to pay for x_1 and x_2 is independent of the preference α for the public good. Neither does the initial level of the environment e_0 nor the consumption of others, summarized in the Δe_n term, influence the individual willingness to pay for x_1 or x_2.

Assuming that this model describes the rational calculus of individuals with respect to large public goods in reality, we can derive the following: An individual, who is not interested in improving the public good or understands that their own contribution is marginal, still exhibits a positive willingness to pay for the public good due to social incentives, even if their contribution need not actually impact the public good. Environmental activists hence contribute an optimal amount that e.g. silences their conscience. By being environmentally active they still try to increase the level of the environmental good. This is possible for instance if the preference for social incentives β of all other individuals increased as well. So, strategy could be to appeal to the conscience of all other individuals, which will be less feasible with larger public goods.

Our model explains multiple seemingly irrational decisions to pay for public goods. For instance, Desvousges et al. (1992) and Kahneman and Knetsch (1992) come to the conclusion that the willingness to pay for the rescue of birds seems to be independent of the number of birds actually rescued. This seems to be hypocritical at first glance. If people really care for the birds' welfare (public good), their willingness to pay should increase with the number of birds which can be rescued. But as the above model shows, it can be utility maximizing, and therefore rational, to just spend a specific amount of money on goods that supposedly improve the public good as the amount spent is not directly linked to the improvement of the public good but to any kind of social incentives.

The sum of all consumption choices of x_1 and x_2 influences the level of the public good. Knowing that one own's contribution does not influence the public good, this does not mean, that an environmental activist acts hypocritically, if she flies frequently. Therefore, flying frequently and being environmentally active is not a contradiction. On this individual level, the resulting change of the public good is only a non-intentional consequence of fulfilling social incentives, hence a positive externality. Furthermore, this does not imply that the public good cannot be influenced through other channels (e.g. via increasing all other individuals' β).

3.2 Quasi-Monarch model

In our baseline model an environmental activist can only marginally influence the level of the public good. However, the sum of all marginal contributions can add up to have a significant impact on the level of the public good, even if the impact of the single individual is negligibly small. The only way of influencing the contributions of all individuals – since we assume that reciprocity is not feasible – is to force a change in consumption patterns.

This is where the state can step in. By collecting taxes from its citizens, it can provide the public good, solve the coordination problem and force reciprocal behaviour. This shows how demanding the intervention of a public entity, while (apart from social incentives) individually defecting to raise the level of the public good remains the dominant strategy of an environmental activist.

To include this public enforcement mechanism into our framework, we add a direct per capita state consumption x_{1S} of good x_1 to our model. As it is financed through taxes, both the utility function and budget constraint need to be adjusted. Unlike individual consumption, the state consumption has a significant positive impact on the public good. In fact its level is of the same order of magnitude as the total consumption of all individuals in our baseline model, as it is determined by the number of people in the state n and the desired level of per capita state consumption x_{1S}. We take the impact of one unit of x_{1S} on the public good to be identical to the impact of x_1 in the baseline model, which is θ_1. For simplicity, we assume that the state collects the same amount of taxes from all individuals. Therefore the more tax-paying individuals the higher the impact, or equivalently, the lower the per capita cost. Hence, the resulting level of the environmental good e equals

$$e = e_0 + \Delta e_n + n x_{1S} \theta_1 \tag{8}$$

and the utility function of an individual becomes

$$u(x_1, x_2) = (e_0 + \Delta e_n + n x_{1S} \theta_1)^\alpha x_1^\beta x_2^\gamma. \tag{9}$$

In comparison to the budget constraint of the baseline model, individuals have to in addition pay for the state consumption of x_{1S} in form of a lump-sum tax. Therefore,

$$m = p_1(x_1 + x_{1S}) + p_2 x_2 \tag{10}$$

In reality $p_1 x_{1S}$ is exogenous and should be thought of as decreasing an individual's budget m. To uncover the willingness to pay for the improvement of the public good, one could let an individual decide the level of state consumption, and hence tax contribution, for everyone including herself. As the effect of state consumption is substantial and everyone has to pay the chosen tax, nothing stops the individual from stating their true willingness to pay. We call this hypothetical construct the *Quasi-Monarch*.

Hence we only need to solve the constrained optimization problem (given by equations 9 and 10) for an individual in order to derive the demand functions for x_1, x_2 and x_{1S}. A straightforward computation yields

$$D_{x_1}(p_1) = \frac{\beta(mn\theta_1 + p_1(e_0 + \Delta e_n))}{np_1\theta_1(\alpha + \beta + \gamma)} \tag{11}$$

$$D_{x_2}(p_2) = \frac{\gamma(mn\theta_1 + p_1(e_0 + \Delta e_n))}{np_1\theta_1(\alpha + \beta + \gamma)} \tag{12}$$

$$D_{x_{1S}}(p_1) = \frac{\alpha mn\theta_1 - p_1(e_0 + \Delta e_n)(\beta + \gamma)}{np_1\theta_1(\alpha + \beta + \gamma)} \tag{13}$$

The above demand functions are in line with our intuition and consistent with previous results. It is important to note that the willingness to pay for x_1 and x_2 decreases with larger n. Note, however, that per capita state consumption x_{1S} increases with n, as $\frac{\partial D_{x_{1S}}}{\partial n} > 0$. When optimizing, one unit x_{1S} has a higher total impact on the level of the public good – as it is multiplied by n.

Without state intervention, an individual can only increase her utility by consuming x_1 and x_2. Her own consumption (e.g. frequently flying) individually has a negligible effect on the public good. But the state can control the level of the public good by demanding everyone to contribute x_{1S}. Then the environmental activist would reduce her consumption of x_2, e.g. by flying less frequently, and reduce x_1 to maximize her utility. This shows that being an environmental activist and flying frequently is by no means contradictory or even hypocritical. An environmental activist demands a higher x_{1S} and will only start reducing her flights once a public entity intervenes and ensures her impact is not marginal anymore. Hence, the same individual makes different choices depending on the "rules of the game". The environmental activist aims to change these rules such that "choices within rules" improve the public good.

Without state intervention the level of the environmental good depends on the preference β for social incentives. If β is relatively high a high level of the environmental good will be sustained, though not due to the utility derived from the enjoyment of the environmental good itself. Instead individuals consume x_1 based on their preference for social incentives, which in sum leads to a high level of the environmental good. Vice versa, for a low β the environmental good e remains on a relatively low level, even when the preference α for the environmental good e is high. If the state intervenes, the level of e compared to the situation with no public provision depends on the preferences α and β.

Splitting up the willingness to pay for a public good in two parts is crucial for making policy decisions. Naturally public entities have to provide multiple public goods, but their resources are limited, as the state cannot or does not want to collect more than a certain amount of tax. Hence the question arises in which public goods a policy maker should invest.[4] Private versus public provision leads to different levels of a public good, depending on the preferences of individuals, as we showed in our framework above. Public entities could base their resource allocation decisions on the differences between these levels. If individuals have a relatively high preference for social incentives, they, in sum, already provide a relatively high level of the public good, and less state intervention is needed.

[4]There is a large literature on the optimal provision of public goods (see e.g. Samuelson 1954, Olson 1971, Varian 1993 and Anomaly 2015).

3.3 Extensions

We have so far made many simplifying assumptions, as is often the case in economical modeling.[5] For example, one can include a negative effect of x_2 on social incentives. This decreases the willingness to pay for x_2, while increasing it for x_1 (and x_{1S} in the Quasi-Monarch model). Many other extensions are feasible without changing the qualitative results presented in this paper so far. There exist some exceptions though.

Social incentives and the level of the public good

One could argue that social incentives depend on the level of the public good. For instance, an increasing level of the environmental good e may reduce the social reward an individual earns for consuming x_1, which in turn shifts consumption towards x_2 and x_{1S}. Assume we extend the baseline to capture such an effect. Would the level of e at optimum be larger or lower than for the Quasi-Monarch model described in Section 3.2? At first one might expect the level of e to be larger as the consumption of x_{1S} increases. However, since all individuals lower their consumption of x_1, the change Δe_n is substantial, and in fact larger than the preceding increase in e. Therefore, the environmental level e is actually lower than for the Quasi-Monarch model due to the stronger crowding-out effect.

Impact of state consumption on social incentives

We have assumed, that only private consumption has an impact on the utility based on the preference for social incentives β. However, we can easily imagine the case that higher state consumption x_{1S} is positively linked to internal motivations – e.g. soothes an individual's conscience as well. The optimal consumption of x_1 and x_2 would then decrease, while x_{1S} increases. With an increasing marginal utility of x_{1S}, the level of the public good e increases as well.

[5] The mathematical proofs of the following results can be made available on request.

Overestimation of own impact

We argued that individual consumption choices, when considering large public goods, have a negligibly small impact on the level of the public good. Therefore, we assumed it to be zero. However, this is not true for smaller public goods or if people overestimate their individual impact on the public good. This can be caused by information asymmetries or the hope of reciprocity. The own consumption of x_1 could influence other individuals, so that they increase their consumption of x_1 as well. As a result, the willingness to pay for x_1 increases as its marginal utility increases. Therefore, x_{1S} decreases as it will be (partly) substituted by x_1. Finally, e increases in the model without governmental intervention, whereas it remains constant in the Quasi-Monarch model, if we assume homogeneous individuals. However, due to the overestimation of the own impact, the utility of an individual decreases in both cases, as the impact of the individual consumption on e isn't as large as expected.

4 Conclusion

In this paper we argued that frequent flying environmental activists do not suffer from hypocrisy, if they only demand the state to intervene but don't change their consumption choices on an individual level in the same manner. Despite a high preference for a public environmental good, it is optimal to free-ride, as individual consumption choices do not influence its level and hence their impact is marginal. Only the sum of all individuals' behaviour can alter the level of the good, but due to the lack of reciprocity this does not factor into decision-making. Nevertheless some level of the environmental good is sustained, but only due to social incentives linked to the public good rather than the public good itself.

Environmental activists, however, will demand the state to intervene, as they understand that collective action is needed. To squash free-riding the state can force every individual to contribute towards the public good by for instance levying a tax. We suggested the following method to determine the individual willingness to pay for the tax:

Treat one individual as Quasi-Monarch, who can set a level of state consumption for everyone including themselves, which resolves the free-riding incentive.

By considering the environmental activist as an example, we argued that the total willingness to pay for a public good is based on the utility derived from the public good itself and the associated social incentives. This split is important for making policy decisions. Politicians need to understand both the social incentives and the preference for the public good of their electorate in order to determine the optimal level of state provision of the public good. Studying interactions between preferences is important to prevent over or under supplying the public good due to crowding-out or -in effects. How to empirically measure these two types of willingness to pay needs to be subject of further research.

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