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Abstract

We consider an economy in which some taxpayers behave in a Kantian way in their donation behavior while others are Nash players. A Kantian taxpayer holds the norm that any suggested deviation from a proposed equilibrium profile would be adopted by him only if when all members of their community adopted the same deviation, they would all achieve a higher level of welfare. In contrast, a Nash player follows the individual rationality criterion: He would deviate if, assuming all others do not deviate, he would improve his own payoff. We show that if all taxpayers are Nash players, then there is an efficiency-inducing tax credit scheme for charitable contributions. In contrast, if all taxpayers are Kantian, the optimal tax credit for charity is zero. If both types of taxpayers co-exist, and the government does not know who is of what type, then it is not possible for the government to induce the first-best outcome, but it must rely on a second-best tax-credit scheme.

JEL-Codes: H210, H310, H410.

Keywords: categorical imperative, Kantian behaviour, Kantian equilibrium, Kant-Nash equilibrium, voluntary contributions to a public good, tax credits.

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1. Introduction

The standard model of the behavior of taxpayers relies on the assumption that individuals maximize their expected utility, taking as given the action of other taxpayers. Recently, that model has been criticized for its failure to explain some empirical facts regarding taxpayers' responses to incentives such as penalties for tax avoidance; for a survey, see Hashimzade, Myles and Tran-nam (2013). As a result, alternative models have been developed to explain taxpayers' behavior. Some of the new models abandon the expected utility framework by adopting the non-expected utility approach. Other models assume that individuals' utility contains elements such as concerns about fairness, social norms, and the like, while retaining the assumption that each behaves in a Nash fashion. In this paper, we suppose that some taxpayers behave in a Kantian way (so that they do not behave in a Nash fashion) and explore how the concept of Kantian equilibrium (introduced by Laffont, 1975, and Roemer, 2010, 2015) and the associated concept of Kant-Nash equilibrium (introduced by Long, 2016, 2020a, 2020b) may shed light on how different groups of taxpayers respond differently to tax credits for charitable donations. We then explore how the government may be able to design a tax-credit scheme that would induce an efficient outcome.

The concept of Kantian norm was first applied to economics by Laffont (1975). He asked a simple question. Why is it that in some countries people do not leave their beer cans on the beach, contrary to individual rationality (in the Nashian sense)? His answer was that individuals in these countries are aware of their collective responsibility toward the environment; their behavior is collectively rational though not individually rational in the Nashian sense. Laffont's work has inspired Roemer (2010, 2015) to formulate the concept of a Kantian equilibrium, in an economy where everyone is Kantian. According to Roemer, a Kantian holds a norm that say: I would deviate from a proposed equilibrium profile only if I would be better off when all other individuals deviate likewise. As Roemer points out, as parents, we teach our children the Kantian norm. We tell our children: Do not throw rubbish in the park; how would you like it if everyone throws their rubbish in the park? This is clearly Kantian reasoning, not Nashian reasoning.

Long (2016) and Grafton et al. (2017) explored the concept of Kant-Nash equilibrium in an economy where some agents follow the Kantian norm while others are Nashian in their behavior. Long (2020b) argued that through moral education, individuals derive warm glow from adhering to the Kantian norms, and that parents collectively have an incentive to provide collective moral education to their offsprings.

We proceed in section 2 to describe the basic elements of the model. Section 3 analyses the model under three different scenarios. Brief concluding remarks are in the final section.

2. Basic elements of the model

Consider an economy consisting of m taxpayers. Each of them has an additively separable utility function, $U = u(c_i) + v(G)$, where $u(c_i)$ is the individual's satisfaction derived from consuming c_i units of a private good, and $v(G)$ is the individual's satisfaction derived from knowing that a public-good project, e.g., *conservation of wildlife,* is receiving an aggregate budget G. For simplicity, we assume that G is equal to the sum of charitable donations from the taxpayers. (Each taxpayer knows that if she donates a dollar, her private consumption level will be reduced by exactly a dollar, unless the government reduces her income tax by granting her a tax credit for her donation.)

We assume that there are two groups of taxpayers with different behavioral characteristics. The first group consists of n taxpayers who adopt the standard Nash behavior. We call them the Nashians. Each Nashian agent i takes as given the sum of donations of the other $m-1$ taxpayers (denoted by G_{-i}) and chooses her donation level g_i to maximize her utility, knowing that $G_{-i}+g_i=G$. The second group of taxpayers consists of the remaining $k\equiv m-n$ individuals, indexed by $j=n+1,n+2,\ldots,n+k$. We call these individuals Kantians. Assume that Kantian individuals behave according to a Kantian norm, which is formulated as follows: I would deviate from my equilibrium donation level g_j^* if and only if my utility level would increase when all other members of the Kantian group would deviate in the same way. This Kantian norm was proposed by Roemer (2010) in a model where everyone is Kantian. In our model, there is an important difference: the Kantians know that there are Nashian taxpayers, who do not share the Kantian norm. Consequently, Kantians do not consider Nashians as members of the Kantian community.

3. A model of donations by Kantians and Nashians

In order to focus on the consequence of differences in behavior, we assume that Kantians and Nashians have the same utility function and the same income level, denoted by Y. An individual's consumption is equal to her income minus her donation: $c_i=Y-g_i$. As a preliminary step, let us find out what is the socially optimal aggregate donation G if there is a social planner in North that can dictate how much each resident of North must donate to the wildlife fund. The social planner's objective is to maximize the sum of utility levels of Northern residents. Assume that u and v are concave and increasing functions. Then the social planner will make sure that all residents enjoy the same level of utility. Therefore, the planner chooses a common donation level $g \in [0, Y]$ to maximize the social welfare function $S \equiv mu(Y-g) + mv(mg)$. Let us assume that (i) $mv'(0) > u'(Y)$, so that the socially optimal g is strictly positive, and that (ii) $u'(0) > mv'(mY)$, so that the socially optimal g is smaller than Y. Then the socially optimal donation is the unique g_{so} that satisfies the first order condition $u'(Y - g_{so}) = mv'(mg_{so})$. This condition can also be expressed in the familiar Samuelsonian rule on efficient provision of a public good: the marginal rate of transforming a private good into a public good is equated to the sum (across all individuals) of the individual marginal rates of substitution of between the public good and the private good:

$$1 = \sum_{i=1}^{m} \frac{v_i'(G_{so})}{u_i'(Y - g_{so})}$$

Example 1

Assume that $u(c) = Alnc$ and $v(G) = ln(B + G)$, with $A > 0, B > 0$, $Y > AB$. It follows that $mv'(0) > u'(Y)$ and $u'(0) > mv'(mY)$, so that at the social optimum, we have $g_{so} \in (0, Y)$. (The subscript denotes that this is the social optimal solution.) Indeed the first order condition gives

$$\frac{A}{Y - g_{so}} = \frac{m}{B - mg_{so}}$$

Solving, we get the social optimal solution

$$g_{so} = \frac{Y - (AB)/m}{A + 1} > 0.$$

Example 2

Assume $u(c) = c$ and $v(G) = \beta lnG$. Assume $Y > \beta > 0$. The FOC is $-1 + m\beta \frac{1}{mg_{so}} = 0$, which yields $g_{so} = \beta$, an interior solution.

In the following subsections, we compare the benchmark outcome under the social planner with the outcomes under private contributions to a public good and show how the socially efficient outcome can be decentralized by taxation schemes where individuals are awarded tax credits for their charitable donations. We will consider three cases. In case 1, all individuals are Nashian, i.e., $n = m$, which means $k = 0$. In case 2, all individuals are Kantian, i.e., $k = m$, which means $n = 0$. In case 3, there is a mixture of Kantians and Nashians in the population.

3.1 Case 1: optimal tax credits for charitable donations when all individuals are Nashian

Consider now the case in which all individuals are Nashian, i.e., $n = m$ and $k = 0$. Each individual i takes the aggregate donation of all other individuals, G_{-i}, as given and chooses g_i to maximize her own utility, $u(Y - g_i) + v(g_i + G_{-i})$. The FOC is

$$u'(Y - g_i) + v'(g_i + G_{-i}) = 0$$

In a symmetric Nash equilibrium, the Nash contribution of each individual is g^N and aggregate contribution is mg^N, so that $u'(Y - g^N) = v'(mg^N)$. Compared with the social optimum solution, the Nash contribution level is too low.

Example 1 (continued)

With $n = m, k = 0$, the Nash equilibrium contribution is the solution of the equation

$$\frac{A}{Y - mg^N} = \frac{1}{B + mg^N}$$

Solving, we get

$$g^N = \frac{Y - AB}{Am + 1} > 0$$

It is easy to see that $g_{so} - g_N > 0$.

Example 2 (continued)

Each Nashian agent i takes G_{-i} as given and chooses g_i to maximize $Y - g_i + \beta ln(g_i + G_{-i})$. With $n = m, k = 0$, the Nash equilibrium contribution is $g^N = \frac{\beta}{m}$.

In both examples, the aggregate contribution is below the social optimum. To achieve the socially optimal outcome, consider the following taxation scheme. Each taxpayer is charged an income tax tY, but can deduct from that an amount sg_i. Each also receives from the government a lumpsum transfer amount L. The government's balanced budget constraint is $mtY - mL - s\sum_{i=1}^{m} g_i = 0$. Individuals take the income tax rate t , the tax credit rate s and the lumpsum transfer L as given. Individual i takes the aggregate contribution of other individuals, G_{-i}, as given and chooses g_i to maximize her utility

$$u[Y(1 - t) + L - (1 - s)g_i] + v(g_i + G_{-i})$$

Note that her consumption level is $c_i = Y(1 - t) + L - (1 - s)g_i$.

The FOC is

$$\frac{du}{dc_i}\frac{dc_i}{dg_i} + v'(g_i + G_{-i}) = 0$$

Let g^{N*} denote the symmetric Nash equilibrium contribution that results from this tax scheme. Then

$$-(1-s)u'[Y(1-t) + L - (1-s)g^{N*}] + v'(mg^{N*}) = 0$$

This equation yields the equilibrium contribution as a function of the taxation parameters t, s and L

$$g^{N*} = \varphi(t, s, L)$$

The government then chooses a vector (t, s, L) such that $\varphi(t, s, L) = g_{so}$. There are many such (t, s, L). The simplest one is achieved by setting $L = 0$, which implies that the gross tax revenue is equal to the tax credit:

$$Yt^* = s^*\varphi(t^*, s^*, 0)$$

Now, to induce Nashian taxpayers to donate the amount which is exactly equal to the socially optimal donation g_{so}, the parameters t^* and s^* must be chosen such that $\varphi(t^*, s^*, 0) = g_{so}$. Proposition 1 below characterizes s^* and t^* that would achieve that objective.

Proposition 1: *When all individuals are Nashian, the government can induce them to achieve the social optimum by setting (i)* $s^* = 1 - \frac{1}{m}$ *and (ii)* $t^* = \frac{g_{so}}{Y}s^*$.

Proof: Recall that g_{so} is defined by the social planner's FOC equation $\frac{1}{m}u'(Y - g_{so}) = v'(mg_{so})$ and that g^{N*} is defined by

$$(1-s)u'[Y(1-t) + L - (1-s)g^{N*}] = v'(mg^{N*})$$

By setting $(1-s) = \frac{1}{m}$, $L = 0$, $tY = sg_{so}$, the second equation becomes

$$\frac{1}{m}u'[(Y - sg_{so}) + 0 + sg^{N*} - g^{N*}] = v'(mg^{N*})$$

Clearly, this equation and the social planner's FOC equation are identical when $g^{N*} = g_{so}$ ■

To illustrate Proposition 1, let us return to example 1, and show that, given that the government sets $(1-s) = \frac{1}{m}$, $L = 0$, $tY = sg_{so}$, the Nash equilibrium contribution indeed equals g_{so}. Given s, t, the condition that characterizes the symmetric Nash equilibrium is

$$A(1-s)[B + mg^{N*}] = Y - tY - (1-s)g^{N*}$$

This equation gives g^{N*} as a function of the taxation parameters s, t and other parameters:

$$g^{N*} = \frac{Y[(1-t)/(1-s)] - AB}{Am + 1}$$

It is easy to verify that when we set $s = \frac{m-1}{m}$ and $tY = sg_{s0} = \frac{m-1}{m}g_{so} = \frac{m-1}{m}\left[\frac{Y - AB/m}{A+1}\right]$ then $g^{N*} = g_{so}$

3.2 Optimal tax credits for charitable donations when all individuals are Kantian

In this subsection, we show that when all individuals are Kantian then their charitable donations are socially optimal and therefore there is no need to introduce a tax credit system. Let us recall that Kantians do not behave like Nashians. Instead, they obey a behavior norm. As in Roemer (2015, p. 46), we take it that each Kantian would affirm the following. *I hold the norm that says: If I want to deviate from a contemplated action profile (of my community's members), then I may do so only if I would have all other deviate in like manner*. It is as if each Kantian believes that when she increases (or decreases) her donation amount by a factor $\lambda > 0$, then other Kantians will do likewise. Formally, when all individuals are Kantian, i.e., when $k = m$ and $n = 0$, a vector of contributions $(g_1^K, g_2^K, \dots, g_m^K) > (0,0, \dots, 0)$ is a Kantian equilibrium if for each i, it holds that the utility level

$$u(Y - \lambda g_i^K) + v(\lambda g_i^K + \lambda G_{-i}^K)$$

attains its maximum with respect to λ at the value $\lambda = 1$, where $G_{-i}^K \equiv \sum_{j \neq i}^{m} g_j^K$.

We now can prove the following Proposition:

Proposition 2: *When all individuals are Kantian, the vector* $(g_1^K, g_2^K, \dots, g_m^K) > (g_{so}, g_{so}, \dots, g_{so})$ *is the symmetric Kantian equilibrium. It follows that there is no need to introduce a tax credit scheme to achieve the social optimum.*

Proof: If $(g_1^K, g_2^K, \dots, g_m^K)$ is a Kantian equilibrium, then for each person, it must hold that the derivative of her utility function with respect to λ, when evaluated at $\lambda = 1$, is equal to zero. That is, for each i, the FOC is

$-g_i^K u'(Y - g_i^K) + G^K v'(G^K) = 0$. Under symmetry, $G^K = m g_i^K$. Therefore, the FOC for a Kantian equilibrium is identical to the FOC for a social optimum. The SOC is satisfied because of the concavity assumption. ∎

3.3 Case 3: voluntary contributions when Nashians and Kantians co-exist

Now, we turn to the more realistic case where Nashians and Kantians co-exist. In this case, there is the possibility that the Nashians completely free ride on the Kantians, by contributing nothing. Whether complete freeride is individually rational from the point of view of the Nashians depends on the parameters of the model. Let us illustrate this by consider a continuation of Example 1, under the assumptions that an economy with m agents, of which n behave in a Nashian way while k are Kantians.

Example 1 (continued)

Let us show that under certain parameter values, the Nashians find it individually rational to contribute nothing, while the Kantians' contributions are strictly positive. Let $\mathcal{N} \equiv \{1,2,\dots,n\}$ denote the set of Nashians and $\mathcal{K} \equiv \{n+1, n+2, \dots, n+k\}$ denote the set of Kantians. We assume that $k \geq 2$, so that the community of Kantians has at least two members.

Each Nashian agent i takes as given the aggregate contributions of the Kantians, $G^K \equiv \sum_{h\in\mathcal{H}} g_h^K$, and the sum of contributions of all other Nashians, G_{-i}^N, and chooses her own contribution $g_i \geq 0$ to maximize her utility

$$u(Y - g_i) + v(g_i + G_{-i}^N + G^K)$$

Her FOC for a maximum is $-u'(Y - g_i^N) + v'(g_i^N + G_{-i}^N + G^K) \leq 0$ (with strict equality holding if $g_i > 0$). Each Kantian agent h is in a Kantian equilibrium with strictly positive contributions if, given the Nashians' aggregate contribution G^N, the strictly positive contribution pair (g_h^K, G_{-h}^K) is such that the utility level $u(Y - \lambda g_h^K) + v(\lambda g_h^K + \lambda G_{-h}^K + G^N)$ attains its maximum with respect to λ at $\lambda = 1$. The FOC is

$$-g_h^K u'(Y - g_h^K) + (g_h^K + G_{-h}^K)v'(g_h^K + G_{-h}^K + G^N) = 0$$

Let us find a symmetric Kant-Nash equilibrium where the Nashians find it strictly optimal to contribute nothing, i.e., $g_i^N = 0$, and all the Kantians contribute each the same amount $g^K > 0$. That is, we seek parameter values under which the following two conditions hold simultaneously: First, $v'(kg^k) < u'(Y)$, i.e., given that the Kantians collectively donate the amount kg^K, each Nashian would incur a utility loss if she were to donate, because from her point of view the marginal valuation of conservation is already too low relative to her marginal valuation of consumption; second, $u'(Y - g^K) = kv'(kg^K)$, i.e., given that the Nashians contribute nothing, the Kantians are in equilibrium if their marginal evaluation of private consumption, $u'(Y - g^K)$, just equals the sum of their individual marginal evaluations of wildlife conservation, $kv'(kg^K)$. Applying these conditions to the functions $u(Y - g) = Aln(Y - g)$ and $v(G) = \ln(B + G)$, we find that if both the inequality $\frac{1}{B+kg^K} < \frac{A}{Y}$ and the equality $\frac{A}{Y-kg^K} = k\frac{1}{B+kg^k}$ are satisfied, then the Nashians contribute nothing while each Kantian contributes the amount $g^K = \frac{kY-AB}{(A+1)k}$ which is strictly positive provided that $kY > AB$, that is, the number of Kantians is sufficiently large. Substituting for g^K into the Nashian's inequality condition for non-contribution, we obtain the following result:

Proposition 3: *Assume* $[A(1 - k) + 1]Y < AB < kY$. *Then there exists a Kant-Nash equilibrium such that the Nashians do not donate, and each Kantian contributes a positive amount,* $g^K = \frac{kY-AB}{(A+1)k}$.

Remark: If $k = 1$ then it is not possible to satisfy condition $[A(1 - k) + 1]Y < AB < kY$.

Proposition 4: *Assume* $[A(1 - k) + 1]Y < AB$ *and* $kY > AB$. *Then there exists a Kant-Nash equilibrium such that the Nashians make positive contributions, with* $g^N = \frac{1}{An+A+1}\{Y[A(1 - k) + 1] - AB\}$ *and* $g^K = \frac{Y[k+A(n+2)(k-1)-AB]}{k(An+A+1)}$. *Each Kantian contributes more than each Nashian.*

Corollary: If Nashians and Kantians face the same tax scheme, it is not possible to achieve the social optimum where everyone contributes the same amount, $g_{so} = \frac{Y-(AB)/m}{A+1}$.

While the first best social optimum cannot be achieved, it is possible to design a tax scheme such that the total donation, $ng^N + kg^K$ is equal to mg_{so}. The proof of this result is straightforward and is not supplied here for lack of space.

4. Conclusion

Using a simple model where some taxpayers follow the Kantian behavioral norm while others follow the Nashian concept of individual rationality. We first showed that if all taxpayers are Nashian, then a tax credit system for charitable donation will achieve the socially optimal outcome. In contrast, when all taxpayers are Kantian, there is no need for giving tax credit for charitable donation. In the third scenario, we show that it is not possible to achieve the first-best utilitarian outcome where all individuals contribute the same amount of donation to a charitable cause, because Nashians tend to free-ride on Kantians. However, it is possible to design a tax scheme such the aggregate donation is equal to the sum of first-best donations.

Extension of the model to the case where not Kantians have the same characteristics is a challenging topic. Another possible extension is to introduce an intertemporal model in which Kantians and Nashians interact. (See Grafton et al., 2017).

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