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A Reformulation of Normative Economics for Models with Endogenous Preferences *

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Abstract

This paper proposes a framework to balance considerations of welfarism and virtue ethics in the normative analysis of economic models with endogenous preferences. We introduce the moral evaluation function (MEF), which ranks alternatives based purely on virtue ethics, and define the social objective function (SOF), which combines the Social Welfare Function (SWF) and the MEF. In a model of intergenerational altruism with endogenous time preference, using numerical simulations we show that maximizing the SWF may not yield a socially desirable state if the society values virtue. This problem can be resolved by using the SOF to evaluate alternative social states.

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1. Introduction

Many theoretical and empirical studies have emphasized and identified various channels through which preferences might be endogenously determined in the economy. In the models studied in the literature of intergenerational cultural preference transmission and formation (see Bisin and Verdier (2011)for a survey), children's preferences are affected by parents' decisions. Habit formation models have been used in macroeconomics (see, e.g., Lawrence, Eichenbaum and Evans (2005)), and finance (see, e.g., Constantinides (1990)). Addiction models have been used in microeconomis (e.g., Becker and Murphy (1988)). In the literature of behavioral economics, reference points are often endogenously determined (see, e.g., Kőszegi and Rabin (2006)).

In normative economics we seek to evaluate social states. The two widely accepted normative criteria are the Pareto principle and the Bergson-Samuelson social welfare function (SWF, henceforth). The basis for both of these methods is welfarism.[1] There are two main issues in using standard SWF-based welfare analysis when preferences are endogenous. First, preference ordering conditional on endogenous economic variables cannot be used as a yardstick for the evaluation of social states. To compare two social states, we need an exogenous basis for such an evaluation. Second, given that preferences may be numerous, some preferences may be considered "better" in terms of moral virtue. Pollak (1978) introduces the concept of unconditional preference ordering and suggests the use of such an ordering for normative analysis when preferences change endogenously. Pollak's proposal resolves the

[1] Sen (1979) identifies welfarism as "the principle that the goodness of a state of affairs depends ultimately on the set of individual utilities in that state, and-more demandingly-can be seen as an increasing function of that set."

first issue since by definition, unconditional preference ordering is exogenous. However, it does not address the second issue. Even though the unconditional preference ordering is exogenous, such a criterion is based on purely welfarist considerations and hence cannot rank alternatives in terms of moral virtues. If a society values virtue, we may not want to rely exclusively on unconditional preference ordering in policy evaluation; we may require an evaluative framework that explicitly accounts for moral virtue considerations.

We thus desire an explicit accounting for moral virtue in normative economics. According to the Stanford Encyclopedia of Philosophy "Virtue ethics is currently one of three major approaches in normative ethics. Virtue ethics emphasizes virtues, or moral character, in contrast to approaches that emphasize duties or rules (deontology) or those that emphasize the consequences of actions (consequentialism)."[2,3] Sandel (2009), after considering other major alternatives, promotes Aristotle's moral virtue ethics. According to Aristotle, "moral virtue comes about as a result of habit." In his explanation, these are "the virtues we get by first exercising them, as also happen in the case of the arts as well."

In this paper, we propose a policy evaluation procedure that balances welfarism and virtue ethics. For this purpose, we first define a *moral evaluation function* (MEF, hence forth) that expresses evaluations based on virtue ethics. We then define an *social objective function* (SOF) that weighs both the MEF and the SWF in evaluating alternative social states.

For the purpose of illustrating our approach by an example, we extend the tough love

[2] `http://stanford.library.usyd.edu.au/entries/ethics-virtue`
[3] Welfarism is a form of consequentialism.

altruism model from Bhatt and Ogaki (2012), adding a bequest motive for the parent. This induces a tradeoff for the parent between childhood transfers and adulthood bequest. The money saved by lowering childhood transfers can be used to increase parental bequest to the child during the childs adulthood. In this setting the government has a policy tool, the bequest tax rate, that can be used to influence the optimizing behaviors of the parent and the child. For instance, a policy that increases the bequest rate will reduce the incentive to leave a bequest, and hence would lead to higher parental transfers to the child. This in turn would lower the child's discount factor in our model.

We use numerical simulations and show that a policy that raises the bequest tax rate from negative to zero represents a Pareto improvement in terms of unconditional preference ordering.[4] However, using conditional preference ordering we find that such a change may not be desirable to the child. Given that there can be many conditional preferences, some of these may be regarded as more desirable by society based on moral virtue considerations. This example illustrates an important limitation of the conventional Pareto principle based evaluation described above: it only uses welfarism as the basis.

In our present framework the MEF is used to evaluate conditional utility functions in terms of moral virtue ethics. We focus here on the virtue of patience. We view the time discount factor as determining the altruism of the present self toward her future self. If the time discount factor is less than one, then the present self is considered too selfish, while if it exceeds one, then the present self is considered to have excessive altruism. Hence, we define

[4]The negative tax rate means that the government subsidizes bequests. As we illustrate in Section 4, a policy to maximize the SWF leads to a positive bequest tax rate but a policy to maximize the SOF can lead to a negative tax rate in order to promote more bequests and higher patience.

the virtue of patience as when the child's discount factor is one. Such a formulation of the virtue of patience is espoused by many economists and philosophers. [5] Having so defined the virtue of patience, we formulate the MEF such that large deviations from this virtue yield lower values. We then define the SOF which weighs both the MEF and the SWF. We propose that the optimal policy should be based on maximizing the SOF to balance both welfarism and moral virtue ethics considerations.

Using numerical simulations, we illustrate the main predictions of our model economy when changes in the bequest tax rate are evaluated using the SOF. There are several findings of interest. First, the laissez-faire policy of setting the tax rate to zero does not maximize the SWF; to maximize welfare, society needs a nonzero tax rate. Second, the SWF is maximized at a positive tax rate, which in our model economy implies that the child's patience is being influenced by the government policy. Given that the policy is already affecting the child's preferences, we argue that it is irresponsible for the government to completely ignore moral virtue considerations. Third, we show that if we select the appropriate weight on the MEF, evaluation of policy based on SOF maximization can resolve the problems we encountered using the Pareto principle. Specifically, the Pareto improvement we obtained by moving from negative bequest tax rate to a zero rate leads to a lower value of the SOF and hence is not socially desirable. Finally, for a given weight on the MEF, the optimum policy may actually be to set the tax rate to be zero. Hence, we believe that the common practice of using the laissez-faire motivation for ignoring moral virtues in normative economic analysis may not be justified, especially when preferences are endogenously determined.

[5] In section 4 we further elaborate the rationale for such a formulation.

The rest of the paper is organized as follows. Section 2 provides a brief review of the related literature. Section 3 presents a model of tough love altruism with the bequest motive for the parent and highlights the limitation of the Pareto principle in evaluating policy alternatives when preferences are endogenously determined. Section 4 defines the MEF, the SOF and illustrate the application of our virtue ethics framework for the tough love altruism model of section 3. Section 5 concludes.

2. Related Literature

In this section we provide a brief review of the related literature. A main contribution of our paper is to propose ways to consider virtue ethics in policymaking. Hence, we begin this section by providing examples from the literature that make a similar argument. This is followed by a discussion of recent research papers that develop and apply conceptual frameworks that balance welfare and virtue ethics considerations to different kinds of economic environments.

This study emphasizes the need for adding moral value considerations when evaluating social states in economic models where preferences are endogenously determined. Our proposal to develop an MEF represents an effort to provide a mathematical framework for the evaluation of social states using virtue ethics. As such, the concept of the MEF can be viewed as a reply to a call by Sandel (2013) to bring more value judgment into economics. Instead of relying solely on virtue ethics for this purpose, we seek to combine welfarism and virtue ethics using the SOF. In the same issue of the *Journal of Economic Perspectives*, Bruni and Sugden (2013) argue that classical and neoclassical economics already incorporate many elements of virtue ethics when "market virtues" are considered. The virtue of patience, on which we focus here, can be considered a market virtue. Thus, we argue that economics can benefit from formalizing the notion of market virtues with an approach such as ours.

A review of the relatively sparse literature on this topic identifies three approaches to bring moral considerations into economics (see, e.g., Hausman and McPherson (1993) and Goldfrab and Griffith (1991) for surveys). These are: 1) moral values as norms, 2) moral values as constraints on behavior, and 3) moral values as preferences. Our approach is most closely related to the meta-preference framework (see, e.g., Sen (1974, 1977), Hirschman (1984), and George (1984)). Meta-preferences are preferences one may have about ones own preferences or about the preferences of others. For example, imagine a non-voter who wants to vote in order to be a good citizen, or a smoker who does not want to smoke. In both cases there is a meta-preference about the preference itself. Although such meta-preferences most commonly derive from moral values (e.g. the duty of a good citizen to vote, in the above example), it is possible to have a non-moral basis as well (the desire not to smoke for health reasons). Such a view is pertinent to our research question, since meta-preferences can provide a normative guide to cope with the conflict between the manifest choice and what our moral values dictate. In this sense the meta-preference framework is a natural way to incorporate moral value considerations in economic models. Our proposed MEF applies this framework to rank conditional preference orderings in models with endogenous preferences, for the purpose of introducing moral virtue ethics into this class of models. Our application of this framework is more related to the sense of duty emphasized by Sen (1974, 1977) than to the free choice emphasized by George (1984).[6]

Our paper is related to the recent literature on the economics of happiness. (Frey, 2008, p. 5) lists eudaimonia as one of the three concepts of happiness. Eudaimonia is Aristotle's concept of happiness as a "good life," defined by the acquisition of and use of virtue. Hence our MEF can be viewed as an expression of an aspect of eudaimonia. Benjamin et al. (2014) used surveys with personal and policy scenarios to estimate relative marginal utilities. They estimated high relative marginal utilities not only for happiness and life satisfaction, but also for aspects related to values (morality and meaning), among other things. Thus they show that eudaimonic aspects are important for policy considerations.

Our framework introduces moral virtues in evaluating alternative social states. One implication of our proposed framework is that policy interventions may be aimed at enhancing character and foster moral virtues. Cunha and Heckman (2007) identify non-cognitive skills to include values such as perseverance, time preference, and self control. Heckman and Mosso (2014) survey the literature on interventions aimed at enhancing cognitive and non-cognitive skills during childhood. They suggest that early childhood interventions have lasting effects, are more effective than programs aimed at helping disadvantaged adolescents, and an important channel through which they improve adult outcomes is the enhancement of non-cognitive skills.[7] More importantly, the findings from this literature suggest that most promising interventions involve active mentoring. They define mentoring to involve teaching values such as perseverance and cooperation among other character values.

[6] For a more detailed discussion on this issue please refer to section 4.

[7] For example Heckman, Pinto and Savelyev (2013) used dynamic factor approach to evaluate the effect of Perry Preschool Program on later life outcomes such as health, wages, and education. They attribute the effects of this program mainly through the improvement of non-cognitive skills.

Our paper is also related to the literature of behavioral normative economics, in which many models explicitly or implicitly have endogenous preferences. For example, the reference point of prospect theory is often simply assumed to be the level of the initial endowment. Because the initial endowment has been determined endogenously in the economic system (represented more generally by a dynamic model), prospect theory implies a model with endogenous preferences. Bhatt, Ogaki and Yaguchi (2015) provide a review of the literature on behavioral normative economics, and highlight the dominance of welfarism as a basis for policy evaluation in this field of inquiry.

In this paper we illustrate the application of the virtue ethics framework in the context of the market virtue of patience. In a companion paper, Bhatt, Ogaki and Yaguchi (2015) develop a model of endogenous altruism a ĺa Mulligan (1997), in which a worker can devote resources to become more altruistic toward a disabled stranger. In this model they consider the virtue of altruism toward strangers, which is not a market virtue. Hence, our framework can incorporate non-market virtues into economic models. Using simulations, we show that optimal policy recommendations based on virtue ethics considerations may deviate significantly from those recommended by the purely welfarist concerns. In an application of our virtue ethics framework, Bhatt and Ogaki (2014) study the rational addiction model á la Becker and Murphy (1988). This model represents consumption of addictive goods as a rational choice and hence recommends a zero tax on these goods in the absence of any externalities from such consumption. We argue that a society may find that preferences with drug addiction caused by past drug consumption are less virtuous than preferences without any drug addiction. Just as a parent may think that it is better for his child to grow without any drug abuse even when he knows that the child would enjoy the pleasure of that consumption, a society may exhibit a similar value judgment. We think that it is desirable for to have a mathematical framework to express the value judgments of such a society. We apply our virtue ethics framework to a model of rational addiction and show that the optimum tax rate for the addictive good consumption may be nonzero even when there is no externality imposed by the consumption.

3. A Tough Love Altruism Model with Bequest Motive

An important limitation of applying conventional welfare analysis to models with endogenous preferences arises from the conditionality of the preference ordering on endogenous economic variables. Pollak (1978) suggests the use of unconditional preference ordering in welfare analysis. Although such an approach meets the exogeneity condition, given that a multitude of conditional preference orderings exist, some of these preferences may be deemed "better" on moral virtue grounds. We now illustrate this possibility using a model of endogenous preferences that introduces a bequest motive for the parent in Bhatt and Ogaki (2012) tough-love altruism model.

3.1. Model Economy

Imagine a three-period model economy with three agents; the representative parent, the representative child, and the government. For simplicity, we consider the case of a single parent and a single child. The three periods considered are childhood, work and retirement for the child. We make the following seven assumptions. First, the timing of the model is assumed to be such that the life of the parent and the child overlap in the first two periods of the child's life. Hence, the parent has the child in the second period of his own life, which in turn corresponds to the first period of the child's life. Second, the parent not only cares about his own consumption, but is also altruistic toward the child. He assigns a weight of θ to the child's lifetime utility, where $0 \leq \theta \leq 1$.[8] Third, in period 2 of his life the parent receives an exogenous income, denoted by y^P. For simplicity, we assume that the parent receives no income in the last period of his life, but simply divide savings from the previous period into his own consumption and bequest. The bequest is taxed at the rate of τ by the government. Fourth, the parent maximizes utility over the last two periods of his life by choosing consumption, inter-vivos transfers, and bequest, denoted by C^P, T, and B, respectively. Fifth, the child is assumed to be a non-altruist, and derives utility only from her own consumption stream $\{C_t^K\}_{t=1}^3$.[9] y_2^K denotes child's second period exogenous income, and we assume that she receives no income in the first and last period of her life. Sixth, the child's childhood consumption is assumed to be equal to the parent's inter-vivos transfers, because of social convention (alternatively, the child is assumed to be borrowing constrained in period 1 with a binding constraint) . Lastly, there is no uncertainty in the economy.

In the tough love model, the parent wants the child should grow to be patient, but is

[8]When compared to the framework of Bhatt and Ogaki (2012), we have the following relationship:

$$\theta = \widetilde{\beta}\left(\frac{1-\eta}{\eta}\right)$$

[9]In this simple consumption good economy, we view consumption as a composite good that may include leisure activities such as TV time, video game time etc.

tempted to spoil the child. This interpretation is captured by the following two important features of the model. First, the child's discount factor is endogenously determined as a decreasing function of period 1 consumption:

$$\beta_K(C_1^K) \quad ; \quad \frac{d\beta_K}{dC_1^K} < 0.$$

We assume that the child's childhood consumption equals transfers from the parent ($C_1^K = T$). Therefore, the childs period t discount factor is given by $\beta_K(T)$. The idea is that if the child is spoiled by too much consumption during her childhood, then she will grow to be impatient.

Second, the parent does not use the child's endogenous discount factor, but uses a constant discount factor, $\beta_{t,P}$ to evaluate the child's lifetime utility. The parent's objective function is given by,

$$U_P(x) = u(C_2^P) + \widetilde{\beta} u(C_3^P) + \theta \Big(u(C_1^K) + \beta_P u(C_2^K) + \beta_P^2 u(C_3^K) \Big). \tag{1}$$

where $\widetilde{\beta}$ is the parent's own consumption discount factor and β_P is the discount factor used to evaluate the child's future utility, and θ denotes the altruism parameter.

The government collects the bequest tax from the parent, and distributes s as a lump sum subsidy. We assume that $s = \tau B$. An allocation in this economy consists of $x = (C_2^P, C_3^P, C_1^K, C_2^K, C_3^K)'$. The parent solves the following optimization problem:

$$\max_{C^P,T,B} \Big[v(C^P) + \widetilde{\beta} v(R(y^P - C^P - T) - B)\Big]$$

$$+\theta\Big[u(T) + \beta_P u(C_2^{K*}) + \beta_P^2 u(R(y_2^K + (1-\tau)B + s - C_2^{K*}))\Big], \tag{2}$$

subject to:

$$\left\{C_2^{K*}\right\} \equiv \arg\max_{C_2^K} \Big[u(C_2^K) + \beta_K(T) u(R(y_2^K + (1-\tau)B + s - C_2^K))\Big]. \tag{3}$$

where R is the gross interest rate, which is assumed to be exogenously fixed by a linear technology.

In the above framework, the government can influence the child's patience by changing the bequest tax rate. If the bequest tax rate is reduced, then the parent has a greater incentive to leave bequests than to make transfers to the child. Lower transfers in turn would imply a higher discount factor for the child. It should be noted that the government's objective when setting the bequest tax rate may not have anything to do with affecting the child's preferences, but any nonzero tax rate does in fact affect her preferences.

3.2. Limitation of the Pareto Principle

We use the tough love altruism model described in the previous section to illustrate what we view as important limitations of the Pareto principle in evaluating policy alternatives when preferences are endogenously determined. Using simulations we show that under certain parametric specifications a bequest tax policy change that yields a Pareto improvement in terms of the child's unconditional preference ordering may not lead to a Pareto improvement in terms of her conditional preference ordering. We then argue that a reasonable value judgment may not agree with the policy that produces the Pareto improvement.

The child's unconditional utility function, which represents her *unconditional preference ordering* is defined by the following expression:

$$U_K(x) = u(C_1^K) + \beta_K(C_1^K)u(C_2^K) + \beta_k(C_1^K)^2 u(C_3^K). \tag{4}$$

Given the state variable of the parent's transfer, T, the child's conditional utility function, which represents *conditional preference ordering*, is given by the following expression:

$$U_K(x|T) = u(C_1^K) + \beta_K(T)u(C_2^K) + \beta_k(T)^2 u(C_3^K). \tag{5}$$

The optimization problem for the parents described by equations (2) and (3) has no closed form solution. Hence, we numerically solve the parent's optimization as a non-linear root finding problem. For the purpose of simulations, we assume the following functional forms for the period utility and the child's discount function:

$$u(C) = \frac{C^{1-\sigma}}{1-\sigma}. \tag{6}$$

The discount factor is given by:

(7) $$\beta_K(T) = \beta_0 + \frac{1}{1+aT} \quad \textit{where} \quad a > 0 \textit{ and } \beta_0 \leq 0.$$

In our solution algorithm we impose the government's budget constraint: $s = \tau B$.[10]

Now, imagine that $\tau_0 = -0.15$ is the original policy situation. The government has been promoting bequests using this negative bequest tax rate. Consider a policy change to eliminate this negative tax by setting the tax rate to zero: $\tau_1 = 0$. Let $x(\tau_i)$ be the allocation under the bequest tax rate of τ_i, $U_P(x(\tau_i))$ be the parent's utility under τ_i, and $U_K(x(\tau_i))$ be the child's unconditional utility under τ_i. Let $U_K(x|T(\tau_0))$ be the child's conditional utility given $T(\tau_0)$ (the equilibrium transfer when the tax rate is τ_0). The conditional utility is the child's retrospective evaluation of her lifetime consumption stream in the allocation x based on the grown-up child's utility function under the original policy regime.

Table 1 presents the optimal values of the unconditional utility for both child and parent, the discount factor of the child, and the conditional utility of the child. These are reported for both values of the bequest tax rate and utilize a given set of values for the model parameters.[11] As observed from this table, in terms of the unconditional utility function, we have a Pareto improvement when the policy changes from τ_0 to τ_1:

(8) $$U_P(x(\tau_1)) > U_P(x(\tau_0))$$

$$U_K(x(\tau_1)) > U_K(x(\tau_0))$$

[10]The details of our solution algorithm are provided in the appendix.
[11]We use the same parametric values as used by Bhatt and Ogaki (2012).

The parent gains utility from the policy change because he gets more utility from succumbing to temptation to spoil the child. If the child is asked about the policy change during childhood, she will prefer being spoiled under the zero tax rate. However, in terms of the child's conditional utility function given the original tax rate, the child is made worse off by this policy change:

$$U_K(x(\tau_1)|T(\tau_0)) < U_K(x(\tau_0)|T(\tau_0)) \tag{9}$$

If the child, after growing up to be patient under the negative tax policy, is asked in retrospect about the policy change, then she will prefer the negative tax rate.

The results of or Table 1 highlight the limitation of the Pareto principle in evaluating policies when preferences are endogenous. If the society values patience as a virtue then $\tau_0 = -0.15$ is the socially more desirable policy when compared to the Pareto improvement (in terms of unconditional utility) represented by $\tau_1 = 0.0$. This example illustrates why relying exclusively on the unconditional preference ordering and welfarism may not be the best way to achieve the socially desirable policy when preferences are endogenous. The unconditional preference ordering is convenient for our welfare analysis because it is exogenous. However, if our value judgment regards some conditional preference orderings as socially more desirable than others, we need to explicitly incorporate such values in the policy evaluation process. In the next section we propose once such framework based on virtue ethics and apply it to the tough love altruism model.

Table 1: Pareto Efficiency and Policy Evaluation

Global Parameters		
$\theta = 0.51$; $R = 0.4$; $\sigma = 1.2$; $\beta_0 = -0.5$		
$\widetilde{\beta} = \beta_p = 0.99$; $y_2^K = 1$; $y^P = 10$; $a = 0.18$		
	$\tau_0 = -0.15$	$\tau_1 = 0.0$
$U_P(x^P(\tau_i))$	-16.8126	-16.8067
$U_K(x^K(\tau_i))$	**-6.8551**	-6.8241
$\beta_K(T(\tau_i))$	0.3107	0.3066
$V_K(x^K(\tau_1)\|T(\tau_0))$	-	**-6.8604**

4. Reformulating Policy Evaluation based on Virtue Ethics

In this section we propose a framework that explicitly incorporates virtue ethics considerations in normative economic analysis.[12] Our approach is based on three evaluation functions. The first is the social welfare function (SWF), which captures welfarist considerations. The second is the moral evaluation function (MEF), which is based on virtue ethics. Finally, we have the social objective function (SOF,) which weighs both welfarism and virtue ethics. We begin by formalizing these concepts, and then define these functions in the context of the tough love altruism model described in Section 3. This is followed by a discussion , based on simulation results, of the policy evaluation process for a wide range of scenarios corresponding to different weights assigned to moral virtue considerations.

[12]Bhatt, Ogaki and Yaguchi (2015) introduced the principle of learning to unconditionally love, and our approach can be viewed as an application of this principle.

4.1. Defining the evaluation functions for policy analysis

Consider an economy with N agents. Let x denote a social state and $U_i(x)$ be the utility function of agent i, and $\psi_i(x)$ be a function that expresses properties of the endogenous utility function of agent i. Let $SWF(U_1(x), ..., U_N(x))$ be the social welfare function. The moral evaluation function (MEF) is a function $MEF(\psi_1(x), ..., \psi_i(x))$ that evaluates $(\psi_1(x), ..., \psi_i(x))$ in terms of moral judgments such as deviations of these properties from perfect moral virtue. The social objective function $SOF(MEF(x), SWF(x))$ is a function that evaluates social states by considering both moral virtue and welfarism.

We now illustrate the application of the above framework by defining these evaluation functions for our tough love altruism model. The SWF is defined as follows:

$$SWF = U_p + V_k \tag{10}$$

where U_P and V_K are given by equations (1) and (4), respectively.

The MEF is given by:

$$MEF = -(\beta_K(T) - 1)^2 \tag{11}$$

so that larger deviations from the virtue of patience are morally undesirable.

An important component of the above formulation of the MEF is the definition of the virtue of patience. We define perfect patience as the time discount factor being exactly one.[13]

In the context of intertemporal choice models, Bhatt (2014) discusses the arguments for and against the view that zero discounting is a moral virtue. He argues that the common arguments against zero discounting conflate the normative with the positive aspects of the debate. Bhatt (2014) identifies two common criticisms against the view that zero discounting is a moral virtue. First is a lack of empirical evidence for such discounting behavior, and second is the undesirable implications of zero discounting for optimum consumption path in certain economic environments (Koopmans (1967), Olson and Bailey (1981)). He argues that although both are important elements in understanding individual choice, they do not serve as a normative basis for discounting. He finds that the ethical foundation for zero discounting as a moral virtue is fairly robust. Such a view is also supported by others in the field of economics and philosophy (Brink (2010), Broome (1994), Ramsey (1928)). In this paper, we employ the MEF to express a moral judgment that one has a duty to value ones future self exactly as much as ones present self. It is important to note that the dictate of our MEF formulation is normative and not prescriptive. When a child cultivates preferences such that she is *pleased* with this duty, she is said to have the moral virtue of patience. Observe that this sense of duty is expressed in terms of preferences in our model, rather than in terms

[13] An important point here is to distinguish between intragenerational discounting and intergenerational discounting. Our definition of the virtue of patience concerns with the intragenerational discounting where we seek the normative value for the discount factor for discounting future utilities over one's own lifetime. On the other hand, intergenerational discounting concerns the discounting of the well-being of future generations. The issue of intergenerational discounting and the implied social discount rate is a key parameter in public policy debate. For instance, see the climate change debate surrounding the Stern Review (Stern, 2007). Some economists have criticized the social discount rate value used by the report as being too low (Nordhaus (2007), Weitzman (2007), Dasgupta (2007)). However, even among these critics most are sympathetic to the view that from a normative perspective, the pure time preference rate should be zero (Cowen and Parfit (1992), Broome (1994), and Dasgupta (2007))

of *actions*; the choice of how much to save depends on the interest rate even when one has the virtue of patience.[14] emphasizes, we need to model the decision-making process when the sense of duty expressed by the MEF affects individual behaviors. For example, one can model the voting behavior of the child in the model when she feels that the MEF expresses her sense of duty and when she is tempted to vote for more spoiling. That type of modeling is beyond the scope of this paper.

For the purpose of defining the SOF we have to account for the fact that MEF and SWF are in different units and hence not directly comparable. To overcome this we adaptKaneko and Nakamura. (1979) Nash SWF to the SOF. For this purpose, we first define the two functions for the worst case scenario:

$$\overline{SWF} = U_p(x_0) + V_K(x_0) \tag{12}$$

$$\overline{MEF} = -\ (\beta_K(T_0) - 1)^2 \tag{13}$$

In the above definition of the $\overline{SWF}$, we utilize the worst possible allocation (x_0) in terms of the SWF for the parent and the child.[15] We assume that the worst possible value for the moral evaluation function is obtained when the child receives the maximum possible transfers, because in that case her discount factor will be the lowest possible. In our model, $T_0 = y^P$ and hence we use $\overline{MEF} = -\ (\beta_K(y^P) - 1)^2$ in our simulations. The SOF is then

[14] In order to model the free choice that George (1984)

[15] In our simulations we assume that the minimum level of each agents consumption is 0.001, and use this level for each agents consumption in x_0.

given by the following expression:

$$SOF = (MEF - \overline{MEF})^{\alpha} \times (SWF - \overline{SWF})^{1-\alpha} \quad (14)$$

where $0 \leq \alpha \leq 1$ is the parameter of the SOF that sets the relative weights given to the moral virtue and welfare considerations.

4.2. Simulation Results

We solve the parents optimization problem described by equations (2) and (3) numerically, using the same parametric specification and parameter values as in Section 3.2., for a menu of bequest tax rates. We assume that the tax rates available to the government range from -0.5 to 0.5, with an increment of 0.05. Table 2 presents the resulting optimal (i.e., SOF-maximizing) bequest tax policies. The optimized values for the SOF are presented in the bold in the table. We discuss simulations for four policy scenarios, each of which is consistent with one of four alternative principles guiding government policy. The first is based on laissez-faire, wherein the government avoids affecting preferences through policy action. In this case the government would set the tax rate to zero. The second is based on welfarism, which involves maximizing the social welfare function (SWF). In our framework this implies setting $\alpha = 0$ and maximizing the $SOF(\alpha = 0)$. The third is based on our framework that weighs both welfarism and moral virtue considerations in policy evaluation. This can be achieved by setting $\alpha \in (0, 1)$ and then by maximizing the social objective function(SOF).

Finally, the fourth is based solely on moral virtue ethics and aims to maximize only the moral evaluation function (MEF). This obtained by setting $\alpha = 1$ in our model.

There are several findings of interest from the simulation results presented in Table 2. First, because laissez-faire and welfarism do not coincide for our economy, a policy based on laissez-faire may lead to a social cost in terms of lower welfare. This can be observed from the simulations corresponding to $\alpha = 0$ in Table 2. We observe that based on laissez-faire, the tax policy of $\tau = 0$ does not maximize the $SOF(\alpha = 0)$ and hence is not a welfare maximizing policy.

Second, if we follow the principle of welfarism, which seeks to only maximize social welfare ($SOF(\alpha = 0)$), the optimal tax policy is $\tau = 0.2$. Hence, the government can achieve a higher level of welfare in our model economy by abandoning laissez-faire and following welfarism. An important point to note here is that in this case the government policy is impacting the preferences of the child, leading to a lower level of patience.

The reason for a non-zero tax rate being optimum when we seek to maximize social welfare is the difference between the SWF and the objective function of the parent. The SWF in our model is based on utilitarianism and is defined to be the sum of the life-time utilities of the parent and the child. The parent's objective function in our model consists of two components. The first is a form of virtue ethics (based on the parameter β_p). The second is a form of utility maximization that involves temptation away from this virtue ethics component and a smaller weight for the child's utility in his altruistic part. The difference between the SWF and the parent's objective function exists whenever the parent's objective function deviates from the value judgment expressed by the SWF.

Third, given that the government policy is affecting preferences when it follows welfarism, it seems irresponsible for the government to completely ignore the moral virtue consideration by setting $\alpha = 0$. A more balanced approach would be to assign positive weights to both the SWF and the MEF. As we observe from Table 2, for small values of $\alpha = 0.01$ the optimum bequest tax based on maximizing the SOF leads to a smaller but still positive tax rate. On the other hand, if the government chooses to put a larger weight on moral virtue ethics then the optimum tax rate becomes negative. For instance, with $\alpha = 0.1$ the optimal bequest tax rate is -0.35. An interesting policy scenario is that of setting $\alpha = 0.05$. In this case the SOF is maximized at $\tau = 0$. Thus in our model economy, a balanced consideration of both moral virtue ethics and welfarism can lead to a zero tax rate; this is superficially similar to laissez-faire, but the motivations for the policy recommendation are different.

Fourth, an extreme case is when the government only pursues moral virtue ethics and sets $\alpha = 1$. We observe that even in this case, the optimum tax policy of $\tau = -0.5$ fails to perfectly attain the virtue of patience, because the corresponding level of $\beta_K < 1$.

Finally, because the economy in Table 2 is the same as the one in Table 1, it is of interest to investigate whether policy evaluation based on the SOF can resolve the limitation of the Pareto principle highlighted earlier. As we observed from the Table 1 simulations, the change in the bequest rate from $\tau_0 = -0.15$ to $\tau_1 = 0.0$ represents a Pareto improvement based on the unconditional utility function of the child, but is no longer a Pareto improvement in terms of the conditional utility functions of the child. If the society values patience as a virtue, since $\tau_0 = -0.15$ is associated with greater patience than $\tau_1 = 0.0$, the negative tax rate may be socially more desirable. We now use the simulation results presented in Table 2 to illustrate that the SOF-based evaluation can overcome this conflict. With $\alpha = 0$, evaluation by the SOF must satisfy the weak Pareto principle. Therefore, the SOF value should be higher for $\tau = 0$ than for $\tau = -0.15$. For small enough values of α, the SOF value needs to be higher for $\tau = 0$. From Table 2, we observe that for $\alpha \leq 0.05$, we get higher SOF values when $\tau = 0$ than when $\tau = -0.15$. However, for large enough values of α, the SOF value can be smaller for $\tau = 0$ than the one associated with $\tau = -0.15$. For instance, for $\alpha = 0.075$ the SOF is maximized at $\tau = -0.15$ which renders any other bequest tax rate (including $\tau = 0$) undesirable. In this way, the evaluation based on the SOF can resolve the limitation of the Pareto principle in an economic environment with endogenously determined preferences.

Table 2: SOF vs SWF

Global Parameters

$\theta = 0.51;\ R = 0.4;\ \sigma = 1.2;\ \beta_0 = -0.5;\ \widetilde{\beta} = \beta_p = 0.99$
$y_2^K = 1;\ y^P = 10;\ a = 0.18$

τ	-0.5	-0.35	-0.15	0	0.15	0.2
β_K	0.3195	0.3158	0.3107	0.3066	0.3024	0.3010
$SOF(\alpha = 0)$	80.7976	80.8560	80.9228	80.9597	80.9785	**80.9790**
$SOF(\alpha = 0.01)$	77.1939	77.2446	77.3012	77.3309	**77.3431**	77.3417
$SOF(\alpha = 0.05)$	64.3164	64.3413	64.3645	**64.3706**	64.3620	64.3546
$SOF(\alpha = 0.075)$	57.3831	57.3956	**57.4029**	57.3980	57.3799	57.3698
$SOF(\alpha = 0.1)$	51.1971	**51.1998**	51.1943	51.1807	51.1552	51.1430
$SOF(\alpha = 1)$	**0.8431**	0.8380	0.8310	0.8254	0.8195	0.8176

5. Conclusion

In this paper, we proposed a new way to evaluate social states in models with endogenous preferences. In our approach, moral virtue ethics is used in combination with welfarism to evaluate policy alternatives. Based on informal discussions, we believe that many economists object to the use of moral value ethics considerations in public policy evaluation, because such an approach involves the government influencing people's preferences. Using a model of intergenerational altruism, we first illustrate that a government policy based solely on welfarism can also influence an agents preferences in economic environments where preferences are endogenously determined. Hence, the government may be influencing people's preferences even when it does not use any moral virtue consideration in the policy evaluation process. On the other hand, when we place a certain weight on moral virtue ethics, we find that the optimum tax rate is zero. Thus, incorporating moral virtue ethics may result in a policy that does not affect people's preferences. This illustrates that introduction of moral virtue ethics need not automatically lead to greater governmental influence on people's preferences. We also illustrate that by appropriately balancing moral virtue ethics and welfarism, it is possible to overcome the difficulty faced by the Pareto principle-based evaluation of policy alternatives when preferences are endogenously determined.

Given these findings, one implication of our theoretical analysis is that how a certain government policy influences people's preferences is an important empirical issue not only for those who believe that moral virtue ethics should be taken into consideration but also for those who believe that the government should not influence people's preferences. We believe that an important direction for future research in public policy is to gather empirical evidence for or against models with endogenous preferences. For the tough love altruism model used in this paper, there already exists some empirical evidence. A starting point of any model with endogenous time discounting is that genetic factors do not completely determine time discounting. Using a unique data set of twins in Japan, Hirata et al. (2010) found empirical evidence in favor of this. The next step is to examine predictions of the model. Akabayashi et al. (2014) found evidence that is inconsistent with the standard intergenerational altruism model and is consistent with the tough love altruism model, using a time preference experiment with parent-child pairs in Japan. Kubota et al. (2013*a*,*b*) found empirical evidence that supports the main predictions of the tough love altruism model, using unique survey data for the U.S. and Japan. Similarly, Akkemik et al. (2013) found evidence that is consistent with the tough love altruism model for Germany, Turkey, and Turkish migrants in Germany. We believe that more efforts to empirically validate models of endogenous preferences are needed in order to provide better insights into the effect of government policies on preferences. In our view, robust empirical evidence on this issue will significantly inform the discussion on public policy evaluation.

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Appendix: Solution Algorithm

In this appendix we explain the numerical optimization method we used to solve the decision-maker's problem outlined in Section 3.2.

Step 1: Given T and B, the child solves the following optimization problem:

$$\max_{C_2} \frac{C_2^{1-\sigma}}{1-\sigma} + \beta_k \frac{[R(y_2 + (1-\tau)B + z - C_2)]^{1-\sigma}}{1-\sigma} \tag{A-1}$$

where

$$\beta_k = \beta_0 + \frac{1}{1 + a(y_1 + T)}$$

The above optimization problem gives us a closed form solution for optimal values of C_2 and C_3:

$$C_2^* = \frac{R(y_2 + (1-\tau)B + z)}{R + (\beta_k R)^{\frac{-1}{\sigma}}} \tag{A-2}$$

$$C_3^* = R(y_2 + (1-\tau)B + z - C_2^*) \tag{A-3}$$

Step 2: We substitute for optimal C_2 and C_3 in the objective function and solve the parent's optimization problem:

$$\max_{T,B} W \frac{[R(y_p - T) - B]^{1-\sigma}}{1-\sigma} + \theta\left(\frac{T^{1-\sigma}}{1-\sigma} + \beta_k \frac{C_2^{*1-\sigma}}{1-\sigma} + \beta_k^2 \frac{C_3^{*1-\sigma}}{1-\sigma}\right) \tag{A-4}$$

where

$$W = \frac{1 + \tilde{\beta}(\tilde{\beta}R)^{\frac{1-\sigma}{\sigma}}}{[R + (\tilde{\beta}R)^{\frac{1}{\sigma}}]^{1-\sigma}}$$

The step 2 optimization problem has no closed form solution for T and B. Hence we use numerical methods to find the solution to the above function. For this purpose we define a grid for T and B and choose a baseline for model parameters. Given these we search for the values of T and B that yields the maximum value for the objective function defined in equation (A-4). To implement this we need to initialize values of three key variables: T, B and the level of subsidy, i.e., z. For a given tax level set by policy, τ, we adopt the following algorithm to choose initial values:

1. For a given τ_i, we set:

$$T_{0i} = T^*(z^*_{i-1}; \tau_{i-1})$$

$$B_{0i} = B^*(z^*_{i-1}; \tau_{i-1})$$

2. For choosing the initial level of the subsidy we use:

$$z_{0i} = \tau_i B^*(z^*_{i-1}; \tau_{i-1})$$

We initialize the above process by first solving for the laissez-faire policy of $\tau = z = 0$.