

Introducing Virtue Ethics into Normative Economics for Models with Endogenous Preferences*

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Abstract

An important role of normative economics is to provide an analytical framework to evaluate social states. Such an evaluation is based on value judgments derived from moral views of the members of the society. There exist three major approaches in normative ethics, which formalize many people's moral views. These are consequentialism that focuses on consequences of actions; deontology that focuses on moral duties, and virtue ethics has two important aspects: acquiring virtues and human flourishing that can be achieved by using virtues and abilities. Among these, formal analytical frameworks have been developed for important aspects of consequentialism, deontology, and the flourishing aspect of virtue ethics. However, normative economics does not have a formal analytical framework for the learning aspect of virtue ethics. In this paper we develop such a framework for models with endogenous preferences. We apply this framework to a rational addiction model and an intergenerational altruism model. We find that introduction of virtue ethics can lead to very different policy recommendations than those based solely on welfarism where emphasis is on maximizing social welfare functions. Importantly, in contrast to the commonly held view, we find that incorporating virtue ethics into normative economic analysis may not always lead to greater government interventions.

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1. Introduction

This paper develops a formal analytical framework for the learning aspect of virtue ethics for models with endogenous preferences. The reason why the learning aspect of virtue ethics is twofold. First, it is important to incorporate an ethical view that values building up communities. Among the three major approaches in normative ethics, virtue ethics puts highest values to communities, and its learning aspect of virtue ethics values promotes learning non-cognitive abilities such as patience and altruism that are necessary for communities. Some economists have argued that communities are important now because of worsening inequality, the recent rise of populism, low fertility, aging, and natural catastrophes. Rajan (2019) identifies the three pillars that support society, namely, the state, the market, and the community. In his book's title, the third pillar is the community. Rajan argues that imbalances have developed as the community gets weakened, and that empowering local communities as a solution to many current social problems that developed countries face. Ogaki and Ohtake (2019) argue that the community mechanism will become important again in high income countries because of the low fertility and aging in many countries.¹ Zhou (2020, Chapter 1) argues that the community provides post disaster management, compensation, and recovery. The issues of low fertility and aging population make progress in Japan and many countries in the world mean that a large fraction of the population in each country's cognitive ability declines either as a normal aging process or as dementia. In addition, the child care service becomes more important as female labor participation increases. Given

¹Ogaki and Ohtake (2019) use the framework of Hayami (2009) who explains that the economic system consists of three major components: the state, market, and community mechanisms.

that an old person whose cognitive ability has severely declined, or a child cannot effectively use the market mechanism alone, an important problem is how the market and community mechanisms should be combined for the society. A large fraction of the population in each countrys cognitive ability declines either as a normal aging process or as dementia. They argue that an important problem is how the market and *community* mechanisms should be combined for the society.

Second, the learning aspect of virtue ethics is important because many people use it in their everyday lives to think about ethical issues. For example, consider a child who after carefully weighing future costs and benefits of addiction wants to engage in consumption of an addictive good (e.g., tobacco or a highly addictive drug). Suppose that the child will form preferences from which future consumption of the addictive good gives more pleasure. The parent of that child may judge that the child should not form such preferences. Behind this value judgment, there is an element of virtue ethics that one should cultivate preferences that are ethically better.

An important role of normative economics is to provide an analytical framework to evaluate social states. Such an evaluation is based on value judgments derived from moral views of the members of the society. There exist three major approaches in normative ethics, which formalize many people's moral views.² One approach is consequentialism, which emphasizes consequences of actions of individuals and is the underlying moral principle for utilitarianism and other forms of welfarism.³ The other approach is *deontology*, which emphasizes moral

²<http://stanford.library.usyd.edu.au/entries/ethics-virtue>

³Sen (1979) defines *welfarism* as "the judgment of the relative goodness of alternative states of affairs must be based exclusively on, and taken as an increasing function of, the respective collections of individual

duties. Immanuel Kant is widely regarded as one of the most prominent contributors to deontological ethics.⁴ The third major approach is virtue ethics, which has two important aspects: acquiring virtues (which we call the learning aspect) and human flourishing by using virtues and abilities (which we call the flourishing aspect).⁵ Among these, formal analytical frameworks have been developed for important aspects of consequentialism, deontology, and the flourishing aspect of virtue ethics. However, normative economics does not have a formal analytical framework for the learning aspect of virtue ethics. In this paper we develop such a framework for models with endogenous preferences.

Of the three major approaches in normative ethics, consequentialism has been most popular in economics. In particular, for welfarism, which is a form of consequentialism, the standard analytical frameworks of the Pareto criterion and the individualistic Bergson-Samuelson social welfare functions (SWF, henceforth) have been used in many applications.⁶ For example, utilitarianism can be captured by defining a SWF as the sum of individual utilities. Some of the fairness principles, such as fairness as no-envy, are also a form of consequentialism. In contrast, theory of equality of opportunity (Roemer, 1998) is an example of deontology for which formal analytical framework has been developed. Sen's capability approach (Sen, 1980, 1985) incorporates important dimensions of the flourishing aspect of virtue ethics. Standard welfare analysis focuses on commodities and individual orderings over these commodities. Sen offers an alternative called the capabilities approach that is

utilities in these states.”

⁴See <http://plato.stanford.edu/entries/ethics-deontological/>. One version of moral duty by Kant (translation in Kant (1964)) is: “I say that man, and in general every rational being, exists as an end in himself, not merely as means for arbitrary use by this or that will.

⁵Plato, and more especially Aristotle, are often regarded as the founding fathers of virtue ethics.

⁶see, e.g., Pattanaik (2008) for the definitions of the Bergson-Samuelson SWF and individualistic SWF.

based on the notions of functioning and capability. A functioning is defined as state of being and doing, whereas a capability is defined in terms of effective access to various functionings a person has, thus allowing her the freedom to choose between different kinds of life she values. In this framework, it is important to understand what kind of functionings are needed to live a good life and then ask whether individuals in a society have access to such functionings, i.e., capabilities. Accordingly, Sen argues that the overall well-being of a society should be based on assessing whether individual members have capabilities to live a life they have reason to value. In this sense, Sens capabilities approach is closely related to Aristotles virtue ethics and his notion of a good life (see Kaushik and Lpez-Calva (2011) for a discussion on this link and (Sen, 2011, p. 43) for a reference to "the Aristotelian focus on capabilities"). Sens capability approach has been formalized in various ways even though a full formalization may not be feasible (see Kaushik and Lpez-Calva (2011) for a survey).

Normative economics has not developed an analytical framework that incorporates the learning aspect of virtue ethics. In this paper, we provide a framework that can be used to explicitly embody this aspect of virtue ethics in evaluating alternative social states.⁷ For this purpose, we make three methodological choices. First, we focus on economic models with endogenous preferences. Second, we use the meta-preference approach (some preferences are morally better than others) that offers a normative guide when our manifest choice comes into conflict with our moral values (see, e.g., Sen (1974, 1977)). Third, we use the modified

⁷Note that in this paper we provide a starting point for introducing the learning aspect of virtue ethics into formal economic analysis. Dahlsgaard et al. (2005) identify 6 core universal virtues: courage, temperance, humanity, justice, wisdom, and transcendence. In this paper we only focus temperance and humanity and incorporating other virtues requires different formalization than what we present in this paper.

criteria approach which allows balancing different ethical views.⁸ Accordingly, our proposed framework is formulated in two steps. In the first step we modify the Pareto criterion and also introduce new criteria of virtue ethics. In the second step, in addition to the social welfare function (SWF) denoted by W , we introduce two new evaluation functions. The first function is the moral evaluation function (MEF) denoted by M that expresses evaluations based on virtue ethics. The second function is the social objective function (SOF) defined as $S(M, W)$ that allows for a balanced evaluation of social states by weighing both the MEF and the SWF.

For the purpose of illustrating possible applications of our framework, we use two examples of endogenous preferences models. Our first example is the rational addiction model proposed by Becker and Murphy (1988), which is one of the standard approaches to modeling the consumption of addictive goods such as alcohol, cigarettes, binge eating, etc. In this framework, an individual chooses the level of addictive good consumption by maximizing his lifetime utility. The non-zero level of addictive good consumption will result from such maximization as long as the benefit from consumption exceeds any cost of future addiction. An important policy implication of this framework is that the welfare maximizing tax rate is zero as long as there is no externality. By contrast, using the framework developed in this paper we show that any positive weight placed on virtue ethics makes the optimum tax rate positive even in the absence of an externality.

As our second example, we use the tough love altruism model in Bhatt and Ogaki (2012) from the literature on intergenerational cultural preference transmission and for-

⁸For example, see the modified Pareto Criterion, which Bhatt et al. (2015) adapted from Temkin (2011).

mation. Given that virtue is often taught by parents, this type of model is important for our purpose. In the model, greater childhood consumption leads to a smaller discount factor for the child during adulthood. Hence, a parent can use childhood transfers, an important determinant of a child's consumption, to influence the child's discount factor. We extend the tough love altruism model by adding a bequest motive for the parent. This induces a trade-off for the parent between childhood transfers and adulthood bequest. For example, the amount saved by lowering childhood transfers can be used to increase parental bequest during the child's 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. The optimum tax rate depends on functional forms and parameters, but in our numerical example, the optimum tax rate is positive if the government maximizes the SWF by placing zero weight on virtue ethics. However, if the weight is increased, then the optimum tax rate becomes smaller and becomes zero at a certain weight on virtue considerations.

Thus, introducing virtue ethics into normative economics may imply a greater role for the government through optimum policies as in our addiction model example, but it can also lead to a smaller role for the government as in our tough love altruism model example. One conclusion we draw from these two examples is that incorporating virtue ethics considerations into normative economic analysis does not necessarily lead to greater intervention in the market by the government. Consequently, it is important to distinguish between utilizing virtue ethics in normative economic analysis and discussion of the role of the government in the economy.

The rest of the paper is organized as follows. Section 2 provides a brief review of the related literature. Section 3 presents our theoretical framework and defines the MEF and SOF. Sections 4 and 5 first highlight the limitation of Pareto Efficiency in policy evaluation and then illustrates the application of our framework to the rational addiction model and the tough love altruism model, respectively. Section 6 concludes.

2. Related Literature

Our framework is developed by combining two types of literatures in economics; the literature on endogenous preferences and the literature on introducing moral considerations other than welfarism into normative economics.

There is now a large literature, theoretical and empirical, that identifies various channels through which preferences might be endogenously determined in the economy.⁹ For example, Doepke and Zilibotti (2017) document variation in parenting styles in data and argue that much of this variation can be attributed to the disagreements between parent and child about future-orientation. They propose a model of intergenerational transmission of patience and show that such a channel plays an important role in determining parenting styles that is consistent with empirical evidence.¹⁰

In the economics of education, there is much empirical evidence for the idea that non-cognitive and cognitive abilities respond to interventions both at schools and at home (see

⁹For instance, addiction models have been used in microeconomics (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)). Habit formation models that are closely related to addiction models have been widely used in macroeconomics (see, e.g., Lawrence et al. (2005)), and finance (see, e.g., Constantinides (1990)). 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.

¹⁰Doepke and Zilibotti (2017) also focus on risk aversion in their theoretical framework.

Heckman and Mosso (2014) and Heckman and Kauts (2014) for surveys).¹¹ Cunha and Heckman (2007) identify non-cognitive abilities to include values such as perseverance, time preference, and self-control. In a recent related study, Alan and Ertac (2018) provide experimental evidence that the time preference measured as time discount factors is endogenous and responds to interventions in elementary schools. So some of the evidence for non-cognitive abilities is directly related to endogenous preferences.

There are two main issues in exclusively using the standard normative analysis based on the Pareto criterion and SWF 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 virtue.

Regarding the first issue, an early critique of the standard welfare analysis based on the constancy of preferences is provided by Schoeffler (1952), Harsanyi (1954), and von Weizsacker (1971). Schoeffler (1952) argues that preference orderings of individuals are very sensitive to changes in their environments. As a result, a policy action that affects the economic environment faced by an individual may also affect his/her preferences. Consequently, the standard welfare analysis, which is based on welfare comparisons for a given fixed preference, has little appeal in situations of changes in preferences. Using a framework where past consumption choices affect current choices, von Weizsacker (1971) discusses the

¹¹For example, Heckman et al. (2013) used a dynamic factor approach to evaluate the effect of the 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 abilities..

welfare implications of such endogeneity in consumption preferences. In his framework an individual's long run demand function can represent her real preferences whereas short run preferences are manifestation of limited information and/or satisficing behavior.¹² In this setting he recommends use of long run preferences in welfare analysis. Similarly, Schoeffler (1952) argues that if there exists an absolute ordering of alternative social states for an individual, then it can be used to evaluate alternatives even with changing preferences.¹³ Pollak (1978) introduces the concept of "unconditional preference ordering" and suggests the use of such an ordering for normative analysis when preferences change endogenously.

Although these early contributions provide an exogenous basis for normative analysis when preferences are endogenous, they do not address the second issue. For instance, 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 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 virtue ethics considerations.¹⁴ A similar argument is made in Harsanyi (1954) who proposed

¹²In a related paper, Hammond (1976) derives conditions under which a long run preference exists when short-run preferences depend on past consumption.

¹³An example of applying the method of Schoeffler (1952) is Guttman et al. (1992), who extend the theory of rent seeking by allowing for preferences to change through explicit investment in educating individuals about socially desirable preferences such as altruism. They show that under certain conditions altruistic preferences may be superior to egoist preferences if the cost of education needed to generate altruistic preferences is less than that of rent seeking.

¹⁴Dixit and Norman (1978) focus on estimating the welfare effect of advertising. Galbraith (1958) provides a discussion on this issue. Because advertising typically induces changes in tastes, standard welfare analysis based on a fixed yardstick cannot be applied in this case. They argue that the existence of multiple possible standards with changing tastes should be tackled by examining the consequences of using each possible standard and comparing the outcomes under each yardstick. They use pre and post-advertising tastes as two separate standards and evaluate the welfare effects of advertising under different assumptions about market power.

a normative framework where an individual is able to compare utility from consumption over time when they are subject to changes in tastes and hence is able to rank alternatives in terms of their welfare gains. However, an evaluation of alternatives on the basis of a given moral standard may generate very different rankings (Harsanyi, 1954; von Weizsacker, 1971).

The second type of literature related to our framework is that on introducing moral considerations other than welfarism into economics. Bruni and Sugden (2013) argue that virtue ethics has received little attention from contemporary economists, and that a significant body of philosophical work in virtue ethics is associated with a critique of this neglect by economists¹⁵ They also explain that virtues of sympathy and benevolence are important in Smith (1759 [2010]), even though they play only minor roles in his economic analysis.¹⁶ They 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 in our second example in this paper, can be considered a market virtue . This virtue is also important for the community mechanism: it seems hard for a child to develop virtues of altruism toward others that are necessary for the community mechanism to work unless the child first learns to be altruistic toward his future selves. In Smith (2010), Adam Smith invokes the impartial spectator and emphasizes the normative significance of assigning equal concern for all parts of ones life. According to Smith, a prudent man who treats his present and future well-being in the same manner earns approval of the impartial spectator.

¹⁵For example, see Sandel (2013) published in the same issue as Bruni and Sugden (2013) for an example of this critique. Bruni and Sugden (2013) write capability theories of justice in the articles first sentence, and seem to classify the capability theories as deontology. We believe that capability theory has dimensions of the flourishing aspect of virtue ethics as discussed in the Introduction section as well as dimensions of deontology.

¹⁶McCloskey (2008) explains how later readers of *Moral sentiments* diluted Smith’s focus on virtue ethics.

This suggests a link between the virtue of prudence and temporal neutrality that demands equal concern for all parts of ones life. Brink (2010) interprets this claim of Adam Smith and argues that such a concern can be extended to the well-being of others as well. Consequently, temporal neutrality is also embedded in notions of impartiality and benevolence (Brink (2010)). For these reasons we believe that virtue ethics (especially its learning aspect) should be introduced into economics not only for the studies of the market mechanism but for the studies of the community mechanism.

From the literature on introducing moral considerations other than welfarism into economics, we see two difficulties for introducing virtue ethics into normative economics. One difficulty is that the Pareto principle is violated when other moral considerations are introduced. For example, (Sen, 1970) showed that liberal values cannot be combined with the Pareto principle, the result known as the *liberal paradox*. Similarly, Kaplow and Shavell (2001) show that the Pareto principle is violated when any other moral considerations are introduced. One solution to this difficulty is to refrain from introducing any non-welfarist considerations (e.g., only allowing inequality aversion for fairness considerations as in Kaplow and Shavell (2002) and the ensuing literature surveyed by Fleurbaey and Maniquet (2018)) or incorporate only particular dimensions of non-welfarist considerations into welfarism (e.g.,(Sen, 2011, p. 41-42) explains this by an example of accommodating Rawls' theory of justice (Rawls, 1971) into the maxmin SWF. The other solution to this difficulty is to weaken or modify the Pareto principle. For example, see the conditional Pareto principle proposed by Sen (1976) and Suzumura (2011) for a survey of the ensuing literature.

We believe that both the Pareto principle and virtue ethics should be honored and neither should be taken as the absolute principle when preferences are endogenous.¹⁷ Hence, we propose to modify both the weak Pareto criterion and the criterion of virtue ethics. For the Pareto principle, we use Bhatt et al. (2015) modification that adapted Temkin’s modification of the Pareto criterion (Temkin, 2011, p. 408).

The second difficulty is how to formalize the learning aspect of virtue ethics? We adapt the framework of meta-preferences (see, e.g., Sen (1974, 1977) and George (1984)) to models with endogenous preferences. Meta-preferences are preferences one may have about one’s own preferences or about the preferences of others. For example, imagine the parent who does not want his child to form preferences for an addictive good in the Introduction or a parent who wants his child to grow to form patient time preferences. 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 because 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 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

¹⁷In a companion paper Bhatt et al. (2015) use the analytical framework developed in this paper for the goal of integrating the three main approaches in normative ethics by the principle of learning to unconditionally love. For this principle, both welfarism and virtue ethics play important roles. Thus it recommends that both the Pareto principle and virtue ethics should be honored in evaluating social states.

the free choice emphasized by George (1984).

Our paper is also related to the literature of normative behavioral economics. Unlike the standard economic model, no general consensus has been reached for a standard normative framework for behavioral models. In recent years some researchers have proposed general frameworks for normative behavioral economics. However, to the best of our knowledge, no work in this literature has the goal of introducing virtue ethics into a general analytical framework of normative economics unlike ours. Most of the work in this literature is focused on welfarism when some choices show inconsistencies. One approach is to define true utility or preferences as in Kahneman et al. (1997) and Kahneman (1999). Another approach is to extract normative preferences from individual choice data even when the axioms of the standard economic model are violated. For instance, Bernheim and Rangel (2009) propose a normative framework that utilizes the coherent aspect of a decision-maker's choices. In an effort to address the cases where individual choices may not be in her best interests, Dalton and Ghosal (2011, 2018) propose a framework that allows extraction of normative preferences from individual choices where the decision-maker does not fully internalize consequences of these choices. In their framework the ability to partially predicting changes in psychological states that choices can trigger is sufficient to utilize choice data for welfare analysis even when these choices are not in the best interest of the decision-maker.

Our paper complements the literature on normative behavioral economics in the following sense. Unlike the existing literature that uses choice data but focuses on welfarism as the basis of normative analysis, our paper provides a general framework to explicitly incorporate

virtue ethics in such analysis.¹⁸ At the same time, it is beyond the scope of this paper to analyze how choice data can be used for our framework which is based on preferences and meta-preferences. For the future work on how to measure meta-preferences (say, from experimental choice data) and how inconsistent choices can be handled in our proposed framework, the insight from the literature on normative economics that utilizes choice data can be useful.

This paper is also related to other literatures in economics. The discussion presented in this 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 in virtue ethics as a "good life," defined by the acquisition 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. Sachs (2013) argues that promoting virtue ethics should form an important part of policy to increase happiness in a society. In his discussion, he provides arguments for incorporating virtue ethics in public education and promoting virtuous behavior through public policy. Crespo

¹⁸Bhatt et al. (2015) use the analytical framework developed in this paper for the goal of integrating the three main approaches in normative ethics within behavioral economics. The approach proposed by Bernheim and Rangel (2009) based on the principle to respect choices as presented in their paper is consistent with welfarism. However, their approach can also be applied to either deontology or virtue ethics. For example, to allow for deontological concerns one can replace the welfare-relevant domain in Bernheim and Rangel (2009) with social contract-relevant domain in order to identify choices that provide guidance for normative analysis.

and Mesurado (2015) propose an approach to base economics of happiness on eudaimonia and positive psychology.

3. Reformulating Normative Economics to Introduce Virtue Ethics

In this section, we propose a framework that explicitly incorporates virtue ethics considerations in normative economic analysis. 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. In this section, we formalize these concepts and then illustrate their application in the context of the rational addiction model and the tough love altruism model in Sections 4 and 5, respectively.

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 . For example, in the context of the rational addiction model, $\psi_i(x)$ is the stock of addiction good of agent i .¹⁹ Let $W(U_1(x), \dots, U_N(x))$ be the individualistic social welfare function (SWF). The moral evaluation function (MEF) is a function $M(\psi_1(x), \dots, \psi_N(x); \psi^*)$ that evaluates $(\psi_1(x), \dots, \psi_N(x))$ in terms of moral judgments such as deviations of these properties from perfect virtue, ψ^* , in the context of the model econ-

¹⁹The utility function for individual i , $U_i(x)$, must be exogenous in our framework. One such candidate proposed by Pollak (1978) is a utility function that represents the unconditional preference ordering. However, there are alternative formulations possible depending on the particulars of the economic model under consideration. For example, the commitment utility function in models such as Krusell et al. (2010) is a candidate if endogenous temptation utility functions are introduced.

omy such as zero addiction stock in a rational addiction model. The social objective function (SOF), denoted by $S(M(x), W(x))$, is a function that evaluates social states by considering both virtue and welfarism. We require that the $S(\cdot)$ is differentiable and both of its partial derivatives are strictly positive.

Just as the individualistic SWF must satisfy the weak Pareto Criterion for pure welfarism, we need formal criteria that add ethical considerations of virtue for the MEF and the SOF. In order to achieve this, we first need a modification of the Weak Pareto Criterion that allows for ethical factors in comparing social states. This is because any social evaluation that is not pure welfarist, such as those based on our proposed SOF, will violate the weak Pareto criterion (Kaplow and Shavell, 2001). To address this issue, a companion paper Bhatt et al. (2015) adapts Temkin’s modification of the Pareto criterion (Temkin, 2011, p. 408), and proposes the *Modified Weak Pareto Criterion: Given two social states x and y , if everyone strictly prefers x to y , then x should be evaluated to be better than y for society as long as x is not evaluated to be worse than y in terms of other ethically relevant factors.* The conditional statement implied by “as long as” in the aforementioned modified criterion allows for the possibility that ethical considerations such as virtue may outweigh purely welfarist considerations.

Second, we need a criterion that can rank conditional preference orderings in terms of purely virtue ethics considerations in order to implement the MEF based evaluation proposed by us in this paper. We adapt the Bhatt et al. (2015) criterion of Virtue of Altruism to a more general *Criterion of Virtue Ethics: Given two social states x and y , if at least one person’s*

conditional preference ordering is strictly better in terms of virtue ethics and everyone else's conditional preference ordering is at least as good in terms of virtue ethics in x than in y , then x should be evaluated to be better.

Finally, for the SOF, we need to modify the above criterion to allow for the possibility that other ethically relevant factors such as welfarism may outweigh the considerations of virtue ethics. Hence we define the *Modified Criterion of Virtue Ethics*: *Given two social states x and y , if at least one person's conditional preference ordering is strictly better in terms of virtue ethics and everyone else's conditional preference ordering is at least as good in terms of virtue ethics in x than in y , then x should be evaluated to be better as long as x is not evaluated to be worse than y in terms of other ethically relevant factors.*

In our proposed mathematical framework, the individualistic SWF satisfies the Weak Pareto Criterion, the MEF should be specified to satisfy the Criterion of Virtue Ethics, and then the SOF will by definition satisfy both the Modified Weak Pareto Criterion and the Modified Criterion of Virtue Ethics.

Finally, for the SOF, we need to modify the above criterion to allow for the possibility that other ethically relevant factors such as welfarism may outweigh the considerations of virtue ethics. Hence we define the *Modified Criterion of Virtue Ethics*: *Given two social states x and y , if at least one person's conditional preference ordering is strictly better in terms of virtue ethics and everyone else's conditional preference ordering is at least as good in terms of virtue ethics in x than in y , then x should be evaluated to be better as long as x is not evaluated to be worse than y in terms of other ethically relevant factors.*

In our proposed mathematical framework, we use the individualistic SWF , so that the modified the Modified Weak Pareto Criterion is automatically satisfied. One simple method to extend our framework to incorporate moral considerations other than welfarism and virtue ethics such as fairness it to incorporate them into a non-individualistic SWF, $W(x)$. However, with this method, the Modified Weak Pareto Criterion will be violated by the resulting SOF. A better method is to define a different function, say $G(x)$, for such moral considerations and define $S(M, W, G)$ as the SOF.

4. Rational Addiction and Virtue Ethics

Consider an economy with infinitely many identical consumers who derives utility from the consumption of an addictive good (a_t) and a non-addictive good (c_t). The representative consumer also derives utility from the stock of past consumption of the addictive good denoted by S_t . The period t instantaneous utility is assumed to take the following form:

$$(1) \quad u_t = u(c_t, a_t, S_t) \quad t = 0, 1$$

In the above formulation, we assume that the utility function is twice continuously differentiable. The positive cross-partial derivative, $\frac{\partial^2 u(c_t, a_t, S_t)}{\partial a_t \partial S_t} > 0$, indicates the addictive nature of the good as its consumption will increase future marginal utility. We assume that the stock of past consumption of the addictive good evolves as follows:

$$(2) \quad S_{t+1} = (1 - d)S_t + a_t \quad t = 0, 1$$

where d is the rate of depreciation of the stock.

In the economy in period 0, y_0 units per capita of endowment of the non-addictive good falls from a tree. One unit of the endowment in period 0 can be transformed by an intertemporal linear technology into R units of the non-addictive good in period 1. In each period, one unit of the non-addictive good in period t can be transformed into p_t units of the addictive good with intra-temporal linear technologies.

In this economy, an allocation is determined by competitive markets in which relative prices and the interest rate are determined by linear technologies. Let p_t denote the price of the addictive good and the price of the non-addictive good is normalized to 1. Let y_0 denote the exogenously given income in period 0 and b_0 denote the first period savings. For simplicity, we assume that there is no second period income and the individual simply consumes his first period savings that earn a gross interest rate of R . We also assume that the consumption of the addictive good is taxed at a time-invariant rate denoted by τ and the individual receives a subsidy every period denoted by z_t . The budget constraints faced by the individual in each period are given as follows:

$$(3) \quad \textit{Period 0} : p_0 a_0 + c_0 + b_0 = y_0 - \tau a_0 + z_0$$

$$\textit{Period 1} : p_1 a_1 + c_1 = R b_0 - \tau a_1 + z_1$$

We can combine the above two constraints and write the intertemporal budget constraint as follows:

$$(4) \quad p_0 a_0 + \frac{p_1 a_1}{R} + c_0 + \frac{c_1}{R} = y_0 - \tau(a_0 + \frac{a_1}{R}) + z_0 + \frac{z_1}{R}$$

In our framework, the optimization problem of the individual can be expressed as follows:

$$(5) \quad \max_{c_0, c_1, a_0, a_1} u_0 + \beta_1 u_1$$

subject to (4)

We assume that the government budget is balanced in each period giving us the following government budget constraint:

$$(6) \quad z_t = \tau a_t ; \quad t = 0, 1$$

4.1. Introducing Virtue Ethics into Policy Evaluation

We now illustrate the application of our theoretical framework that balances welfarism and virtues within the rational addiction framework. For this purpose, we define the SWF to be the same as the unconditional utility function:²⁰

²⁰Given a particular value Q for the state variable of the stock of the addictive good, S_1 , the conditional utility function, which represents the *conditional preference ordering*, for an allocation $x = (c_0, a_0, c_1, a_1)$ is given by the following expression:

$$U(x|S_1 = Q) = u(c_0, a_0, 0) + \beta(u(c_1, a_1, Q))$$

$$(7) \quad W(c_0, c_1, a_0, a_1) = u(c_0, a_0, S_0) + \beta(u(c_1, a_1, S_1))$$

The moral evaluation function is given by:

$$(8) \quad M(a_0) \quad \text{where} \quad M'(a_0) < 0$$

The above formulation of the MEF implies that a larger future stock of the addictive good ($(S_1 = a_0)$) is evaluated to be morally undesirable.

Finally, the SOF is given by the following expression:

$$(9) \quad S(M, W) \quad \text{where} \quad S_1 = \frac{\partial S}{\partial M} \geq 0 \quad \text{and} \quad S_2 = \frac{\partial S}{\partial W} \geq 0$$

In the above formulation, $S_1 \geq 0$ and $S_2 \geq 0$ ensures that the two modified criteria proposed in Section 3, namely the modified Weak Pareto Criterion and the modified Criterion of Virtue Ethics, are satisfied by the SOF. The above social objective function combines the concepts of welfarism and virtue. Hence, maximizing the SOF is an expression of a balanced approach that combines welfarism and virtue ethics considerations.

Using the above framework we state our main result in the following proposition:

Proposition 1 *The optimum tax rate on addictive good consumption is not zero as long as $\tau = 0$ and $S_1 > 0$, $\left[\frac{\partial a_0^*}{\partial \tau} + a_0^* \frac{\partial a_0^*}{\partial z_0^*} + a_1^* \frac{\partial a_0^*}{\partial z_1^*} \right] \neq 0$, and the consumer's optimization is obtained with interior solution. Furthermore,*

1.1. *If $\left[\frac{\partial a_0^*}{\partial \tau} + a_0^* \frac{\partial a_0^*}{\partial z_0^*} + a_1^* \frac{\partial a_0^*}{\partial z_1^*} \right] < 0$ then the optimal tax rate is positive.*

1.2. If $\left[\frac{\partial a_0^*}{\partial \tau} + a_0^* \frac{\partial a_0^*}{\partial z_0^*} + a_1^* \frac{\partial a_0^*}{\partial z_1^*} \right] > 0$ then the optimum tax rate is negative.

Proof: See A.1 in the appendix for a proof. ■

In the above proposition, the assumption of $S_1 > 0$ implies that there is a positive weight attached to virtue ethics considerations in the evaluation of alternative social states. Unless $\left[\frac{\partial a_0^*}{\partial \tau} + a_0^* \frac{\partial a_0^*}{\partial z_0^*} + a_1^* \frac{\partial a_0^*}{\partial z_1^*} \right] = 0$ (this equality only holds by chance), introducing virtue ethics considerations implies more government intervention in that the optimum tax rate deviates from 0 and the equilibrium addictive good consumption decreases.^{21,22}

5. Tough Love Altruism with Bequest

Introducing virtue ethics meant more government intervention in the addiction model in the last section, but it can mean less government intervention in other models. The main purpose of this section is to give such an example. For this purpose, we extend the tough love altruism model of Bhatt and Ogaki (2012) by adding a bequest motive for the parent. In this model, the parent with a tough love motive uses monetary transfers to shape the endogenous discount factor of the child.

Because parents often play important roles in teaching virtue to their children, this kind of intergenerational framework is useful for our purpose. As mentioned in Section 2, in the

²¹There is a large literature on the effectiveness of taxes in discouraging consumption of addictive goods. For instance, see Chaloupka et al. (2012) for an excellent survey of empirical evidence on the effectiveness of tobacco taxation in reducing tobacco use. Similarly, Wagenaar et al. (2009) conduct a meta-analysis of empirical literature on the effect of prices/taxes on alcohol consumption, and find that policies such as raising taxes tend to lower alcohol consumption.

²²In the context of our discussion of undesirable addiction, it is strange to subsidize the addictive good by imposing a negative tax rate. The most important condition for obtaining a positive optimal tax rate is that $\left[\frac{\partial a_0^*}{\partial \tau} + a_0^* \frac{\partial a_0^*}{\partial z_0^*} + a_1^* \frac{\partial a_0^*}{\partial z_1^*} \right] < 0$. Even though this condition can be violated in general, it should hold for most reasonable specifications of the economy.

literature on intergenerational transmission of preferences the parent plays an important role in influencing economic preferences of the child and such a channel often feeds back into the child's economic success. Pertinent to the model we present in this section, the discount factor of the child has been emphasized as an important economic parameter of interest. In the model presented in this section one can interpret the discount factor as a measure of altruism towards her future selves. As we discussed in Section 2, it seems hard for a child to develop virtues of altruism toward others unless the child first learns to be altruistic toward his future selves, and this argument has a long tradition in Economics that dates back to Adam Smith. For these reasons we believe that the discount factor has ethical salience and hence it deserves special attention as a preference parameter.

5.1. Economic Environment

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. Just as in the previous section, we consider this economy with linear technologies so that the interest rate is not affected by the government policy. We will evaluate how the policy affects the allocation determined by a competitive equilibrium of markets among identical families where a game is played between the parent and the child in each family.

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 $0 \leq \theta \leq 1$.²³ 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 divides 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-vivo 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 $\{C_t^K\}_{t=1}^3$.²⁴ y_2^K denotes the 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-vivo 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 thinks that his child should grow to be patient, but is tempted to spoil her. 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

²³When compared to the framework of Bhatt and Ogaki (2012), we have the following relationship:

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

²⁴In 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.

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 child's 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,

$$(10) \quad U_P(x) = u(C_2^P) + \tilde{\beta}u(C_3^P) + \theta \left(u(C_1^K) + \beta_P u(C_2^K) + \beta_P^2 u(C_3^K) \right).$$

where $\tilde{\beta}$ 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 child's unconditional utility function that represents an *unconditional preference ordering* is assumed to be given by:²⁵

²⁵Given the state variable of the parent's transfer, T , the child's conditional utility function that is represented by a *conditional preference ordering* is

$$U_K(x|T) = u(C_1^K) + \beta_K(T)u(C_2^K) + \beta_K(T)^2 u(C_3^K).$$

$$(11) \quad U_K(x) = u(C_1^K) + \beta_K(C_1^K)u(C_2^K) + \beta_k(C_1^K)^2u(C_3^K).$$

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:

$$(12) \quad \begin{aligned} & \max_{C_2^P, T, B} \left[u(C_2^P) + \tilde{\beta}v(R(y_2^P - C_2^P - T) - B) \right] \\ & + \theta \left[u(T) + \beta_P u(C_2^{K*}) + \beta_P^2 u(R(y_2^K + (1 - \tau)B + s - C_2^{K*})) \right], \end{aligned}$$

subject to:

$$(13) \quad \{C_2^{K*}\} \equiv \arg \max_{C_2^K} \left[u(C_2^K) + \beta_K(T)u(R(y_2^K + (1 - \tau)B + s - C_2^K)) \right].$$

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.²⁶

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

²⁶It 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.

and the child's discount function:

$$(14) \quad u(C) = \frac{C^{1-\sigma}}{1-\sigma}.$$

The discount factor is given by:

$$(15) \quad \beta_K(T) = \beta_0 + \frac{1}{1+aT} \quad \text{where } a > 0 \text{ and } \beta_0 \leq 0.$$

In our solution algorithm we impose the government's budget constraint: $s = \tau B$.²⁷

5.2. Introducing Virtue Ethics in Policy Evaluation

We now introduce virtues in the tough love altruism model and derive policy implications of such an extension. For this purpose, we need to define the three evaluation functions, namely, SWF, MEF, and SOF. The SWF is defined as follows:

$$(16) \quad W = U_p + U_k$$

where U_P and U_K are given by equations (10) and (11), respectively. The MEF is given by:

$$(17) \quad M = -(\beta_K(T) - 1)^2$$

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

²⁷The details of our solution algorithm are provided in appendix B.

virtue of patience. In virtue ethics, a virtue is defined as a mean between extremes of deficiency (impatience, discount factor less than 1 in our case) and excess (too much patience, discount factor greater 1 in our case). Accordingly, we define virtue of patience to be attained when the discount factor is equal to 1, with no excess or deficient regard for the present (or future). Note that this definition concerns intragenerational discounting where we seek normative value of the discount factor for future utilities over ones own lifetime.^{28,29} Such a view is also supported by others in the field of economics and philosophy (e.g., Broome (1994), Ramsey (1928)). In particular, as we discussed in section 5 (pages 19-20), a prudent man treats his present and future well-being in the same manner. We believe that this connection between prudence and temporal neutrality is especially relevant for our purpose because prudence is universally accepted as a virtue. Temporal neutrality requires an equal concern for all parts of an individuals life and that provides a rationalization for our definition of the virtue of patience.

In this paper, we employ the MEF to express a moral judgment that one has a duty to value one's future self exactly as much as one's present self. It is important to note that the

²⁸It is important to distinguish between intragenerational discounting and intergenerational discounting. 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 debates. For example, 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))

²⁹In the context of intertemporal choice models, Bhatt (2014) discusses the arguments for and against the view that zero discounting is a virtue. Bhatt (2014) identifies two common criticisms of the view that zero discounting is a virtue. First, is a lack of empirical evidence for such discounting behavior, and second, is the undesirable implications of zero discounting for the optimum consumption path in certain economic environments (Koopmans (1967), Olson and Bailey (1981)). Bhatt (2014) argues that although both are important elements in understanding individual choice, they do not serve as a normative basis for discounting and the ethical foundation for zero discounting as a virtue is fairly robust.

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 virtue of patience. Observe that this sense of duty is expressed in terms of preferences in our model, rather than in terms of *actions*; the choice of how much to save depends on the interest rate even when one has the virtue of patience.³⁰

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. Following the approach of section 4.2, we first define the two functions for the worst case scenario:

$$(18) \quad \bar{W} = U_p(x_0) + U_K(x_0)$$

$$(19) \quad \bar{M} = - (\beta_K(T_0) - 1)^2$$

In the above definition of the \bar{W} , we utilize the worst possible allocation (x_0) in terms of the SWF for the parent and the child.³¹ 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 his discount factor will be the lowest possible. In our model, $T_0 = y^P$ and hence we use $\bar{M} = - (\beta_K(y^P) - 1)^2$ in our simulations. The SOF is then given by the following expression:

$$(20) \quad S = (M - \bar{M})^\alpha \times (W - \bar{W})^{1-\alpha}$$

³⁰In order to model the free choice that George (1984) 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.

³¹In our simulations we assume that the minimum level of each agent's consumption is 0.001, and use this level for each agent's consumption in x_0 .

where $0 \leq \alpha \leq 1$ is the parameter of the SOF that sets the relative weights given to the virtue and welfare considerations.³²

Simulation Results

We solve the parent's optimization problem numerically and use the same parametric specification and parameter values as in Section 5.1, 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 1 presents the resulting optimal (i.e., SOF-maximizing) bequest tax policies. The optimized values for the SOF are presented in 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 social welfare (i.e, maximizing $SOF(\alpha = 0)$). The third is based on our proposed framework that weighs both welfarism and virtue ethics 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 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 1. First, 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 1. We observe that

³²Note that here the multiplicative functional form is assumed to serve as an example and in general the SOF can assume different specifications. The multiplicative specification assumed here ensures that any affine transformations of the SWF and the MEF do not change the ordering of social states

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.³³

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 is that in this case government policy is impacting the preferences of the child leading to a lower level of patience.

Third, given that the government policy is affecting preferences when it follows welfarism, it seems irresponsible for the government to completely ignore the 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 4, 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 virtue ethics then the optimum tax rate becomes negative. For example, 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 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 very different.

Fourth, an extreme case is when the government only pursues virtue ethics and sets $\alpha = 1$. We observe that even in this case, the optimum tax policy of $\tau = -0.5$ fails to fully

³³A similar argument is developed in Pavoni and Yazici (2016) who argue that when parents and children disagree about intertemporal allocation of resources the optimal taxation may differ from the laissez-faire policy. An important difference between our framework and the one proposed by Pavoni and Yazici (2016) is that their model does not have endogenous discounting for the child.

attain the virtue of patience because the corresponding level of $\beta_K < 1$.

Table 1: SOF vs SWF: Tough Love Altruism

<u>Global Parameters</u>						
$\theta = 0.51; R = 0.4; \sigma = 1.2; \beta_0 = -0.5; \tilde{\beta} = \beta_p = 0.99$						
$y_2^K = 1; y^P = 10; a = 0.18$						
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

6. Conclusion

In this paper, we proposed a new framework to introduce virtue ethics into the evaluation of social states for models with endogenous preferences. In our approach, virtue ethics is used in combination with welfarism (or deontology). Using two models of endogenous preferences as examples, we illustrated that compared with the policy based purely on welfarism, introduction of virtue ethics may imply greater or lesser government intervention.

For our evaluation framework, we proposed the introduction of virtue ethics captured by the MEF and defined the SOF that combines the MEF and SWF. The MEF must satisfy the *Criterion of Virtue Ethics* and the SOF must satisfy both the *Modified Weak Pareto Criterion* and the *Modified Criterion of Virtue Ethics*. The idea of modifications of these criteria is that we allow these two criteria to fail in our SOF evaluation, but only when a

benefit in terms of one approach in normative ethics (say, welfarism), is dominated by the cost in terms of another approach (say, virtue ethics).³⁴

An important step here was to define *virtue* for each example. In our rational addiction model example, we regarded having zero stock of addiction as a virtue. In our tough love altruism example, we focused 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 be excessively altruistic. Hence, we define 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. In our proposed framework virtue ethics considerations are captured by an MEF, and for both examples of endogenous preferences considered in this paper we formulate the MEF such that large deviations from virtue yield lower values.

In the rational addiction example, we showed that even with a small weight given to the virtue ethics considerations in the policy evaluation process, the optimal tax on the addictive good is positive even there is no externality. This is in stark contrast to the existing literature that focuses either on externalities or hyperbolic discounting to rationalize such a tax. Many people are in favor of taxing tobacco even when externalities are becoming minimal because of separating smoking areas. This may reflect virtue ethics elements in their judgments.

In the tough love altruism model, we showed that introducing virtue ethics may mean less

³⁴It should be noted that the new criteria can be used to evaluate social states without relying on the MEF and SOF just as the Pareto criterion can be used without relying on the SWF.

government intervention for the optimal policy in a numerical example. We first show that the laissez-faire policy of setting the tax rate to zero does not maximize social welfare (i.e., the SWF). 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 virtue ethics considerations. Finally, for a given weight on the MEF, we show that the optimum policy may actually be to set the tax rate to zero.

Based on informal discussions, we believe that many economists object to the use of virtue ethics considerations in public policy evaluation because they believe that such an approach involves the government influencing people's preferences. The second example in our paper is constructed to show that this argument is conflating the government's motivation and its action. If a government is motivated to increase the SOF, then its action will often deviate from the laissez-faire policy. If endogenous preferences are a reality, then this deviation means that the government is influencing people's preferences. Introducing virtue considerations may necessitate greater or lesser government intervention depending on the particulars of the economic environment under study. Given these findings, one important implication of our theoretical analysis is that whether or not a certain government policy *does* influence people's preferences is an empirical issue that is independent of whether or not we think that the government *should* influence preferences.

These findings suggest that an important direction for future research is to gather empirical evidence for (or against) models with endogenous preferences. For rational addic-

tion models, there is already a large empirical literature testing the key predictions of this framework.³⁵ For instance using data on state excise tax increases and monthly smoking consumption, Gruber and Kőszegi (2001) find strong evidence for forward-looking behavior on the part of consumers that is consistent with the rational addiction model. Similarly, there is also empirical evidence supporting the tough love altruism model. For instance, Kubota et al. (2013a,b) use survey measures of parental tough love and find evidence for such motive for parents in the U.S. and Japan. Using similar methodology, Akkemik et al. (2013) find empirical evidence for tough love motive using household data from Turkey and Turkish migrants in Germany. Akabayashi et al. (2014) use experimental approach and using parent-child pairs they find strong evidence for tough love motive for Japanese households. We believe that more studies aimed at empirically validating endogeneity of different types of economic preferences are needed to provide better understanding of preference formation and how they can be influenced by public policy.

Another direction of future research is to empirically investigate the effect of public policies on preferences. There is some empirical evidence on this effect. Ito et al. (2015) find that people who experienced participatory/cooperative learning process in their elementary schools in Japan tend to form more altruistic preferences. Another way for a public policy to affect preferences is by affecting social norms. Thaler and Sunstein (2009) provide several examples of such policies implemented in different states in the U.S. For example, Montana used data on teenage smoking and ran a successful advertisement campaign called

³⁵See Gruber and Kőszegi (2001) for an excellent review of the empirical literature on rational addiction model.

“Most (71 percent) Montana teens are tobacco free” with the objective of influencing the social norms regarding smoking by correcting the social perceptions about such consumption. These policies based on libertarian paternalism can change social norms, affect some people’s behaviors and their conditional preference orderings, for example, by changing the stock of the addictive good.

A.1 Proof of Proposition 1

In this appendix we provide a proof for *Proposition 1*. We begin by first deriving a general expression for the derivative of the *SOF* with respect to τ . By definition:

$$(A.1) \quad S = S(M, W)$$

Taking the derivative with respect to τ , we get:

$$(A.2) \quad \frac{dS}{d\tau} = S_1 \frac{\partial M}{\partial \tau} + S_2 \frac{\partial W}{\partial \tau}$$

where $S_1 = \frac{\partial S}{\partial M}$ and $S_2 = \frac{\partial S}{\partial W}$.

Using the definitions of *MEF* and *SWF*, the first order conditions for the optimization problem of the decision-maker, the resulting optimal choices given by $(a_0^*, a_1^*, c_0^*, c_1^*)$, and applying the first welfare theorem, we get:

$$(A.3) \quad \left. \frac{\partial M}{\partial \tau} \right|_{\tau=0} = M'(a_0^*) \left[\frac{\partial a_0^*}{\partial \tau} + a_0^* \frac{\partial a_0^*}{\partial z_0^*} + a_1^* \frac{\partial a_0^*}{\partial z_1^*} \right]$$

and

$$(A.4) \quad \left. \frac{\partial W}{\partial \tau} \right|_{\tau=0} = 0 \quad \text{by the First Welfare Theorem}$$

Hence, for $\tau = 0$, we can rewrite equation (A.2) as follows:

$$(A.5) \quad \left. \frac{dS}{d\tau} \right|_{\tau=0} = S_1 M'(a_0^*) \left[\frac{\partial a_0^*}{\partial \tau} + a_0^* \frac{\partial a_0^*}{\partial z_0^*} + a_1^* \frac{\partial a_0^*}{\partial z_1^*} \right]$$

Given that by assumption $S_1 > 0$, and $M'(a_0^*) < 0$, we get $\left. \frac{dS}{d\tau} \right|_{\tau=0} \neq 0$ if $\left[\frac{\partial a_0^*}{\partial \tau} + a_0^* \frac{\partial a_0^*}{\partial z_0^*} + a_1^* \frac{\partial a_0^*}{\partial z_1^*} \right] \neq 0$. Further,

$$(i) \quad \left. \frac{dS}{d\tau} \right|_{\tau=0} > 0 \text{ if } \left[\frac{\partial a_0^*}{\partial \tau} + a_0^* \frac{\partial a_0^*}{\partial z_0^*} + a_1^* \frac{\partial a_0^*}{\partial z_1^*} \right] < 0.$$

$$(ii) \quad \left. \frac{dS}{d\tau} \right|_{\tau=0} < 0 \text{ if } \left[\frac{\partial a_0^*}{\partial \tau} + a_0^* \frac{\partial a_0^*}{\partial z_0^*} + a_1^* \frac{\partial a_0^*}{\partial z_1^*} \right] > 0.$$

B. Solution Algorithm

In this appendix we explain the numerical optimization method we used to solve the decision-maker's problem outlined in Section 5.2.

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

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

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 :

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

$$(B.3) \quad C_3^* = R(y_2 + (1 - \tau)B + z - C_2^*)$$

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

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

where

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

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 yield 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. To choose 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, $\tau = z = 0$.

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