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Development of a Buddhist Welfare Function: A Theoretical Note on Right Consumption

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Abstract: Buddhist economics has since grown over the past decades as a field of economic inquiry. Among the issues covered in the literature is how a Buddhist approach to an economic way of life may lead to a sustainable form of consumption. The literature also explores the concept of a parabolic welfare function in terms of consumption or wealth. This paper seeks to provide a theoretical framework for such a functional form on societal welfare, as well as grounding the parabolic nature of the welfare function within Buddhist concepts. The study utilizes both static and dynamic optimization methods to and explore the implications of a parabolic welfare function on sustainable consumption. The study then finds sufficient basis that a Buddhist approach to consumption can lead to sustainable outcomes, and provides theoretical basis to the claims of previous studies within this field of inquiry. The study then concludes with suggestions on furthering this line of research.

Key Words: Buddhist economics; consumption; sustainability.

1. INTRODUCTION

Buddhist economics, first termed by the British economist E. F. Schumacher (1966) on an essay on the subject, has since grown over the past decades as a field of economic inquiry. A summary and survey of the wealth of literature in Buddhist economics can be found in Brown and Zsolnai (2018). Among the issues covered in the literature is how a Buddhist approach to an economic way of life may lead to a sustainable form of consumption (see Mendis, 1993; Payutto, 1994; Daniels, 2005; Zsolnai, 2007; Brown, 2017; Kovacs, 2019). Payutto (1994) uses the Buddhist concept of *mattaññutā*, which is the use of moderation as a means of attaining happiness, to motivate the Buddhist approach to consumption. From this, Kovacs (2019) then defines Right Consumption as the level of consumption that satisfies the basic human needs with minimal impact on the environment.

The literature also explores the concept of a parabolic welfare function in terms of consumption or wealth. Both Mendis (1993) and Daniels (2005) argue that a parabolic welfare function, which exhibits diminishing returns beyond a satiation point, provides a sufficient condition for attaining Right Consumption. While both paper use a conceptual diagram to illustrate their arguments, no theoretical framework was provided that could characterize or formalize their findings. This is unfortunate because the use of standard neoclassical framework is not new to the field of Buddhist economics. Kolm (1985) made use to a utility-maximizing individual model to determine the optimal time allocation for consumption, labor, and a meditative practice, wherein the later could serve as other forms of spiritual or well-being enhancing activities that any individual can undertake.

This paper seeks to formalize the conceptual framework of previous studies by developing a theoretical model for a parabolic welfare function. The paper proceeds as follows: section 2 provides a scriptural basis for characterizing a parabolic functional form that is grounded within the Buddhist teachings and concepts, and provides the mathematical framework used within the study; section 3 provides discussion on the results and findings of the static and dynamic optimization methods used in the study; section 4 then concludes with suggestions on furthering this line of research.

2. METHODOLOGY

2.1 Scriptural Basis

The teachings of the Buddha are also referred to as the Middle Way or *Majjhimapāṭipadā* since he argued that true happiness cannot be found in the extremes of abject poverty nor in the accumulation of material wealth. This is evidenced in the Parable of the Lute Player found within the *Sona sutta* in the *Anguttara Nikāya* (AN) 6.55 from the Pali *Tipiṭaka*. Such an argument implies that optimal well-being is then an interior solution to a mathematical programming problem.

The existence and uniqueness of this optimal well-being or *Nibbāna* can be found respectively within the *Dhammacakkappavattana sutta* and the *Ananda sutta*, both of which appears in the *Saṃyutta Nikāya* (SN) 56.11 and 44.10 correspondingly. The Buddhist concept of *Nibbāna* as a form of optimal well-being can be found within the *Dhammapada*, which is a collection of Buddhist sayings and basic teachings, particularly on verses 203 to 204.

2.2 Mathematical Framework

From the scriptures, it can be argued that an individual's welfare W is dependent on their consumption level c. Given that the optimal well-being is an interior solution, and the additional assumptions that welfare is continuous and differentiable in terms of consumption, then the first-derivative test from calculus implies that a Buddhist welfare function $W(c)$ exhibits a parabolic curve.

The most basic mathematical function that exhibits a parabolic curve is the quadratic function. Hence, defining the Buddhist welfare using the following equation $W = -(c + \alpha)^2 + \beta$ where α and β are shifting parameters. Expanding the expression inside the parenthesis, yields the following expression $W = -c^2 + 2c\alpha - \alpha^2 + \beta$. Requiring that $W(0) = 0$, or that an individual's welfare is nil when consumption level is also nil, results to $\alpha^2 = \beta$. Finally, the Buddhist welfare function can now be expressed and defined as follows:

$$W(c) \equiv -c^2 + 2c\alpha \qquad (1)$$

Since the Buddhist welfare function is expressed as a quadratic equation, the Fundamental Theorem of Algebra posits that there will be two roots to the equation, denoted by c_1 and c_2. The first root is $c_1 = 0$ which represents asceticism or extreme poverty, while the second root has a value of $c_2 = 2\alpha$ and represents extreme consumption indulgence or hedonism.

The optimal level of consumption, denoted by c^*, from the Buddhist welfare equation can be identified using the necessary first-order condition for optimality $dW/dc = 0$, which yields the result that $c^* = \alpha$. Hence, the parameter α also represents the right level of consumption within Buddhist economics, while the maximum level of welfare is then given by $W(c^*) = \alpha^2$. With the neoclassical assumption of rational economic agents, the optimal level of consumption c^* is also an equilibrium state, and therefore a sense of psychological balance. This implication provides neoclassical basis in considering the state of *Nibbāna* as a form psychological equilibrium.

3. RESULTS AND DISCUSSION

The study now utilizes both static and dynamic optimization methods to and explore the implications of a parabolic welfare function on sustainable consumption. The study first proceeds with a resource-constrained optimization problem, and then with a dynamic programming one.

3.1 Right Consumption

Making use of the Buddhist welfare function for solving a resource-constrained optimization problem, which is formally stated as $\max W(c)$ subject to $c \leq R$ where R represents total resources available. Given the functional form of the objective function and constraint, the constraint qualifications are satisfied under concave programming and that the Kuhn-Tucker conditions provide both necessary and sufficient conditions for optimality.

The Lagrangian function to the problem is expressed as $\mathcal{L} = -c^2 + 2\alpha c + \lambda(R - c)$, where λ is the Lagrangian multiplier. The Kuhn-Tucker conditions are summarized in the set of equations below:

$$-2c + 2\alpha - \lambda \leq 0 \quad (2)$$
$$c \geq 0 \quad (3)$$
$$(-2c + 2\alpha - \lambda)c = 0 \quad (4)$$
$$R - c \geq 0 \quad (5)$$
$$\lambda \geq 0 \quad (6)$$
$$(R - c)\lambda = 0 \quad (7)$$

Assuming that the resource constraint is non-binding, such that R is greater than α and that $\lambda = 0$, this then results to an optimal level of consumption c^B that is similar to the unconstrained optimization problem in section 2.2 where $c^B = \alpha$. This implies that the individual will not exhaust environmental resources and still attain optimal well-being. Now, assuming that the resource constraint is binding, such that R is less than α, then $c^B = R$. That is, the individual will now exhaust environmental resources and not obtain optimal well-being. All of these results are consistent with what Mendis (1993) termed as the "Buddhist Law of Diminishing Returns to Human Well-being", wherein under- and over-consumption contributes to a decreasing level of human well-being.

In line with Pryor (1991), wherein he highlights the fundamental distinction between consumption levels based on needs and wants, and in Payutto (1994), where consumption needs are associated with the Buddhist concept of *chanda* (aspiration) and consumption wants with *taṇhā* (craving), consumption levels less than α can be considered as consumption needs or consumption level that is associated with *chanda*, while consumption greater than α can be considered as consumption levels motivated by *taṇhā*. From this, we obtain a theoretical basis on the Buddhist approach to consumption which implies a simplification of desire instead a multiplication of it (Kovacs, 2019).

Daniels (2005) recommends that a development of a Buddhist economic system should involve a systematic comparison with a neoclassical framework of mainstream economics. In comparison therefore to a neoclassical approach, we express now the resource-constrained optimization problem that an individual must solve as $\max U(c)$ subject to $c \leq R$ where $U(c)$ represents the individual's neoclassical utility function that is characterized by the assumption of non-satiation $U_c(c) \geq 0$. Hence, it can be shown that the resource constraint is always binding and that the optimal level of consumption under the neoclassical approach, denoted by c^N, is given by $c^N = R$. That is, an individual following a neoclassical approach to consumption will always exhaust environmental or natural resources. The result that c^B is strictly less than c^N captures the notion of simplification of consumption as prescribed in Buddhist economics literature (Payutto, 1994; Kovacs, 2019). The difference $c^N - c^B$ then represents a theoretical basis for the Buddhist economics concept of non-consumption which contributes to the well-being of the individual and the environment (Payutto, 1994).

3.2 Sustainability

To determine which approach leads to a sustainable form of consumption, assume that the second root of the quadratic welfare equation $c_2 = 2\alpha$ represents the total natural resources available such that $2\alpha = R$. Then, the Buddhist approach to consumption is given by $c^B = R/2$ while the neoclassical approach is characterized by $c^N = R$. Hence, it can be argued that a Buddhist approach leads to a more sustainable level of natural resource consumption as this approach consumes less every time period.

To show sustainability, we assume that the law of motion for natural resources R is given by

$$\dot{R} = \gamma R - c \qquad (11)$$

where $0 < \gamma < 1$ represents the growth rate of natural resources. Substitution of the corresponding consumption levels into equation (11), yields the following differential equation for natural resources under the Buddhist and neoclassical approach, respectively:

$$\dot{R} = (\gamma - ½)R \qquad (12)$$
$$\dot{R} = (\gamma - 1)R \qquad (13)$$

Solution to each differential equation, is given by $R^B(t) = R_0 e^{(\gamma - ½)t}$ and $R^N(t) = R_0 e^{(\gamma-1)t}$ where R_0 represents some initial level of natural resources. That is, $R^B(t)$ represents the time path for natural resources under the Buddhist approach and $R^N(t)$ for the neoclassical approach. For the neoclassical approach, the level of natural resources will unambiguously decay over time. However, under the Buddhist approach, when the growth rate γ is greater than ½ then natural resources will grow over time. Hence, the Buddhist approach will not lead to a complete exhaustion of natural resources, while the neoclassical approach guarantees that natural resources will be depleted at some point in time.

Let $\tilde{R}$ be the carrying capacity of the individual's environment and that $\tilde{R}$ is less than the initial level of resources available R_0. Solving for the time period when each approach will reach the subsistence level of natural resources $\tilde{R}$, yields the following expression for the Buddhist approach as follows:

$$t^B = \frac{\ln(\tilde{R}/R_0)}{\gamma - ½} \qquad (14)$$

where t^B is the time period when the environment's natural resources are close to the carrying capacity level of $\tilde{R}$. Similarly, for the neoclassical approach, it can be shown that

$$t^N = \frac{\ln(\tilde{R}/R_0)}{\gamma - 1} \qquad (15)$$

Based on the expressions alone, t^N will be strictly less than t^B. That is, under the neoclassical approach to consumption, natural resources are stripped faster relative to the Buddhist approach. Hence, the Buddhist approach leads to a more sustainable level of consumption relative to the neoclassical approach. This result then provides theoretical justification and support to the claims found in Mendis (1993), Payutto (1994), Daniels (2005), and Kovacs (2019).

3.3 Dynamics

Under a dynamic programming context, the individual seeks to maximize lifetime discounted welfare $\int_0^\infty W(c(t))e^{-\rho t}\,dt$ where $e^{-\rho t}$ is the subjective discount factor of the individual for future consumption, subject to the law of motion for natural resources $\dot{R} = \gamma R - c$. The necessary first-order conditions for optimality are characterized by the Euler equation $\dot{W}_c/W_c = \rho - \gamma$ and the law of motion for natural resources. Since $W(c) \equiv 2\alpha c - c^2$ then $W_c = 2(\alpha - c)$ and $\dot{W} = -2\dot{c}$. Therefore, the Euler equation can be expressed as $\dot{c} = -(\gamma - \rho)c + (\gamma - \rho)\alpha$. The first-order condition equations now constitute a dynamic system in consumption c and natural resources R:

$$\dot{c} = -(\gamma - \rho)c + (\gamma - \rho)\alpha \quad (16)$$
$$\dot{R} = \gamma R - c \quad (17)$$

Writing the dynamic system equations in matrix notation, yields the following expression

$$\begin{bmatrix} \dot{c} \\ \dot{R} \end{bmatrix} = \begin{bmatrix} -(\gamma - \rho) & 0 \\ -1 & \gamma \end{bmatrix} \begin{bmatrix} c \\ R \end{bmatrix} + \begin{bmatrix} (\gamma - \rho)\alpha \\ 0 \end{bmatrix} \quad (18)$$

The long-run equilibrium values for consumption $\bar{c}$ and natural resources $\bar{R}$ are given, respectively, as follows: $\bar{c} = \alpha$ and $\bar{R} = \alpha/\gamma$. Note that the long-run consumption level is consistent with static optimization for individuals from sections 2.2 and 3.1. That is, we have $\bar{c} = c^B$.

The eigenvalues of the coefficient matrix found in equation (18) are $\lambda_1 = \rho - \gamma$ and $\lambda_2 = \gamma$. Hence, the stability of the long-run equilibrium depends on whether the subjective discount factor ρ is greater than or less than the growth rate of natural resources γ. If γ is less than ρ, then $(\bar{c}, \bar{R})$ is an unstable fixed point. However, when γ is greater than ρ, the long-run equilibrium $(\bar{c}, \bar{R})$ is a saddle-point. Since ρ is also a measure of the individual's patience, meditative practices that cultivate patience implies a lower ρ and possibly lead to a stable level of consumption and natural resources. This finding is consistent with and again provides theoretical justification to claims of Kolm (1985), Payutto (1994), Ng (2018), and Kovacs (2019).

Since saddle-points are generally unstable, we derive the saddle-path, or an expression for the stable branch. Using the eigenvector associated with the eigenvalue with $\lambda_1 = \rho - \gamma$. In this case, the eigenvector is given by $\mathbf{v}_1' = [2\gamma - \rho \quad 1]$. Hence, the saddle-path is characterized by the equation below:

$$R = \frac{1}{2\gamma - \rho}(c - \bar{c}) + \bar{R} \quad (19)$$

The saddle-path equation then provides a condition on the initial values for consumption c_0 and natural resources R_0 that ensure both variables will converge to their long-run equilibrium values.

Using the saddle-path equation, a policy function can be obtained which relates consumption to a given level of natural resources:

$$c = (2\gamma - \rho)(R - \bar{R}) + \bar{c} \quad (20)$$

This expression is a form of consumption function in terms of natural resources. This can then be used to determine the level of initial consumption level c_0 for a given level of initial natural resources R_0 that ensures stability of the dynamic system. Such a consumption function is then dependent on the parameter ρ which in itself can be made endogenous through meditative practices of Buddhism.

4. CONCLUSIONS

This paper was able to study the effects of a quadratic Buddhist welfare function on an individual's level of consumption. By providing scriptural basis on the parabolic characteristic of human well-being, the paper ties the mathematical framework developed in the study to the teachings of the Buddha. The paper was also able to establish a connection between a quadratic Buddhist welfare function from Mendis (1993) and Daniels (2005) to the Buddhist economics concept of Right Consumption as defined by Payutto (1994) and Kovacs (2019). Dynamic programming methods also provide further connections and theoretical justification for meditative practices that can lead to a more sustainable level of consumption.

While this paper has focused on individual decision making, a quadratic Buddhist welfare function can also be utilized under situations with more than one individual and involves interaction between several economic agents. That is, implementing such a functional form on welfare to game theoretical models such as the Prisoner's Dilemma game or the Tragedy of the Commons could lead to more efficient outcomes relative to when the neoclassical assumption of non-satiation is considered. The analysis can also be further extended to agent-based models, such as the Sugarscape model developed by Epstein and Axtell (1996), and determine if more equitable outcomes can be achieved when agents have a Buddhist welfare function instead of a neoclassical one.

The field of Buddhist economics is fairly recent with most papers within the literature providing conceptual frameworks on sustainability, equitable income distribution, and on other ways to measure human welfare (such as Bhutan's development of the Gross National Happiness index). Hopefully, this paper is able to provide a formal grounding and theoretical rigor to the field. May all beings be at peace.

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