



**University of
Leicester**

DEPARTMENT OF ECONOMICS

Non-Monotonic Welfare Dynamics in a Model of Sustained Income Growth

Dimitrios Varvarigos, University of Leicester, UK

**Working Paper No. 10/02
January 2010**

Non-Monotonic Welfare Dynamics in a Model of Sustained Income Growth

Dimitrios Varvarigos[‡]
University of Leicester

January 3, 2010

Abstract

In an overlapping generations economy with endogenous income growth, I combine themes from the work of Cooper *et al.* (2001), Kapur (2005), and Eaton and Eswaran (2009) in order to provide an example of an economy whose welfare dynamics are non-monotonic. Particularly, the evolution of workers' welfare can be distinguished between two different regimes that arise naturally during the process of economic development. At relatively early stages, status concerns are inactive and welfare increases following the rising consumption of normal goods. During the later stages, however, workers engage in some type of status competition that does not allow consumption to improve well-being: their welfare actually declines as successive generations of workers increase their labour effort at the expense of leisure.

JEL classification: D62, O41

Keywords: Welfare; Economic growth; Positional goods; Leisure

1 Introduction

Does more income make people happier? Conventional economic modelling would provide an affirmative reply. People enjoy utility by satisfying their need to consume goods and services. A rise in income allows consumers to acquire more of their desired goods and services and, therefore, improves their welfare. Furthermore, a positive propensity to save implies that higher income leads to an increase in savings which, in a dynamic setting, can

[‡] **Address:** Department of Economics, Astley Clarke Building, University Road, Leicester LE1 7RH, England.
Telephone: ++44 (0) 116 252 2184 **Email:** dv33@le.ac.uk

improve welfare over many periods as it increases the resources available for future consumption.

If the above reasoning is always correct then the significant increase in real GDP per capita, in countries that have gone through (or still undergo) a process of uninterrupted economic growth, should be accompanied by analogous improvements in the overall well-being of their populations. Alas, notwithstanding the obvious difficulties in constructing a concrete measure of happiness, many studies and opinion polls that have tried to trace changes of perceived happiness in countries that experience positive per capita GDP growth produce results that are not as straightforward as conventional wisdom suggests (e.g., Easterlin, 1974, 1995; Frey and Stutzer, 2002; Blanchflower and Oswald, 2004; BBC, 2006; van der Bergh, 2009). There are instances where happiness indices have remained still or even declined, while in cases where these indices show an upward trend, the improvement is not as high as one would expect given the significant increase in available resources.¹

Even if one decides to focus in cases where the relationship appears to be positive, a recent analysis by Kahneman *et al.* (2006) sheds some doubt on both its magnitude and on the robustness of its positive sign. They report results of a study in which higher income is strongly correlated with such negative feelings as anxiety and anger whereas its correlation with experienced happiness is weak. Following this observation the authors argue that people may actually exaggerate when evaluating the contribution of income towards their overall well-being. One explanation is that “when someone reflects on how additional income would change subjective well-being, they are probably tempted to think about spending more time in leisurely pursuits such as watching a large-screen plasma TV or playing golf, but in reality they should think of spending a lot more time working and commuting and a lot less time engaged in passive leisure” (Kahneman *et al.*, 2006; p.1910).

Such arguments reveal that the aspect of time allocation and its relation with changes in income is pertinent to the welfare implications of economic growth, given that leisurely pursuits may have a significant contribution towards overall life satisfaction. The relevance becomes more transparent once we consider the studies of Schor (1992), Burtless (1999) and Frank (2000) who provide evidence to support their claim that the uninterrupted increase in

¹ Some analyses have questioned the validity and robustness of results that do not support a positive impact of per capita GDP on happiness, thus generating a (sometimes) heated academic debate. See, for example, Hagerty and Veenhoven (2003) and the response in Easterlin (2005).

average GDP per capita experienced by the United States has been accompanied by an increase in labour time and a corresponding decline in leisure activities for American workers. Naturally, one would like to examine whether there are any fundamental causes for the apparent decline in leisure and the increase in working effort during the later stages of an economy's development process? Although many factors may be jointly responsible, Schor (1992) and Frank (2000) seem to make a connection to the idea that some consumption choices are not governed by the need to consume per se; instead, they are driven by people's tendency to compare their circumstances against the circumstances of others and their inner desire to be better positioned, or at least as equal, as a result of this comparison. Indeed, there is sufficient evidence (e.g., Solnick and Hemenway, 1998; Luttmer, 2005; Heffetz and Frank, 2008) to support the view that status or positional concerns are major determinants of people's choices and actions.

In this paper, I draw upon the theoretical work of Cooper *et al.* (2001), Kapur (2005), and Eaton and Eswaran (2009) so as to provide an example of an economy whose welfare dynamics are non-monotonic along the process of (endogenous) income growth – an example motivated by the arguments developed in the preceding paragraphs. The next Section discusses the basic idea and the driving mechanisms of my results in relation to existing theoretical results on the possibility of non-monotonic welfare dynamics. In Section 3, I describe the characteristics of the economy and in Section 4 I impose the condition that allows income to increase constantly through endogenous growth. Section 5 solves the individuals' optimal problem and derives the equilibrium allocations while Section 6 presents the main results concerning the dynamics of welfare as income rises over time. In Section 7, I conclude.

2 Related Literature and an Overview of the Results

The apparent lack of clear trends in the relationship between income and happiness – both within single countries and across nations – has attracted, as expected, the attention of theorists. In response, a number of theoretical analyses have provided examples that illustrate how and why conventional held views about the income-happiness nexus may not actually hold.

De la Croix (1998) incorporates a social norm, which is related to past levels of consumption, in a Ramsey-type economy. In this setting, he illustrates examples where

steady-state utility does not respond to changes in consumption. In terms of transitional dynamics, the model is able to reproduce cases where welfare is actually declining. In his model, Peng (2008) introduces the concept of relative deprivation – i.e., the idea that a person’s utility is negatively affected by the existence of agents with greater wealth – in an endogenous growth model with income inequality. He finds that, when the weight of this negative externality is sufficiently strong, welfare may decrease over time despite the fact that income grows constantly.

As mentioned previously, my model borrows themes from the theoretical analyses of Cooper *et al.* (2001), Kapur (2005), and Eaton and Eswaran (2009) so as to provide a novel example of non-monotonic welfare dynamics. In Cooper *et al.* (2001) individuals have preferences over normal and status goods. Although only the former have the potential to increase utility in equilibrium, resources are diverted towards innovative activities that increase the quality of the status goods. As this happens, consumers spend less of their income in the consumption of normal goods – a situation that may eventually lead to negative utility growth. Their model, whereas a dynamic one, abstracts from the dynamics of output: there is not any form of capital, output is constant every period and equal to the (fixed) amount of unskilled labour. Consequently, any intertemporal change occurs solely as a result of innovations that alter the quality of goods and the fraction of skilled labour devoted to the R&D sector of each industry. Thus, their model cannot account explicitly for the simultaneous correlation of welfare with changes in aggregate income.

Kapur (2005) assumes preferences for leisure, normal goods and status good in a Ramsey-type economy where growth is exogenous. The way that status goods are introduced in the utility function differs from Cooper *et al.* (2001). In equilibrium, a rise in the growth rate increases the utility from the consumption of both normal and status goods but it is also responsible for an increase in labour and a corresponding decline in leisure. As a result, a higher growth rate has conflicting effects on utility – implying that faster income growth may, under some circumstances, cause a reduction in welfare. However, the author does not provide a formal exposition of a scenario where the negative effect dominates. More importantly, the relationship between welfare and the rate of income growth is not as informative on the correlation between welfare and income levels as we may presuppose it to be. If, for example, these conflicting effects are balanced at a utility maximising growth

rate then welfare maximisation is still compatible with a scenario at which income increases constantly over time.

The endogenous labour-leisure choice within a model where agents choose between normal and status/positional goods is a theme also utilised in a model by Eaton and Eswaran (2009). Their model is a static one, therefore there is no capital and production takes place solely through labour. The authors undertake numerical simulations to examine the welfare effects generated by permanent shifts in productivity (i.e., the wage per unit of labour). They find that these can be non-monotonic because, although higher productivity increases the consumption of both status and normal goods, leisure may actually decrease for sufficiently high values of productivity.

The model that I will present in the following Sections is built upon a discrete-time overlapping generations setting. Workers/savers decide optimally on how to allocate their time between labour and leisure – as in Kapur (2005) and Eaton and Eswaran (2009) – when young and on how to allocate their retirement income between the consumption of normal and positional (or status) goods when old.² The incorporation of positional goods in the utility function follows the manner of Cooper *et al.* (2001). The growth rate is endogenously sustained, by capital accumulation, and positive – meaning that income increases constantly over time. In equilibrium, the optimal allocations behave differently depending on whether the economy's resources are below or above an endogenously determined threshold level for the stock of physical capital. Below this threshold, the status motive is inactive, agents devote their entire income towards the consumption of normal goods and leisure is constant. When the economy surpasses this threshold, however, the status motive becomes active: individuals consume both types of goods but only the consumption of positional goods increases with income. The consumption of normal goods is constant and, at the same time, individuals respond to higher income by devoting more time towards labour and less time engaging in leisure activities.

Given these results, I derive two regimes concerning the relationship between income and welfare in a growing economy. Initially, as the status motive is inactive and leisure is constant, any change in the welfare of successive generations results from changes in the

² The term 'positional goods' originates from Hirsch (1977). Examples of positional goods are property in exclusive locations, the pursuit of public office, fame, and goods that confer status such as bespoke/branded clothing, high-end wrist watches, works of art, the very latest electronic gadgets, expensive cars, holidays in luxurious resorts etc.

consumption of normal goods – therefore, the increase in income is associated with improvements in welfare. Nevertheless, the economy keeps growing and at some point the status motive will be activated: from that moment onwards, given that the consumption of normal goods is constant, any change in welfare emerges solely as a by-product of changes in leisure activities. Since leisure time responds negatively to income, the welfare of successive generations declines as income levels rise constantly over time.

The idea that preferences for status may generate a negative sign on the income-welfare relationship through the behaviour of leisure is by no means a new one. Nevertheless, the emergence of an endogenous threshold that governs the extent of status-seeking behaviour and, correspondingly, the different patterns of consumption, work and leisure in different stages of development – thus leading to inverse-U shaped welfare dynamics – is, to the best of my knowledge, a novelty. Hence, it represents the paper’s main contribution.

3 The Economy

I construct an overlapping generations economy in which time takes the form of discrete periods. These are indexed by $t = 0, 1, 2, \dots$ while, in each period, there are two groups of agents inhabiting the economy – ‘workers/savers’ and ‘entrepreneurs’. At the beginning of a period, a mass of each group comes into existence. The sizes for both groups of agents are normalised to unity.

3.1 Preferences

Workers/savers (indexed by i) live for two periods. When born, they are endowed with a unit of time (or effort) which they allocate between leisure activities, denoted $l_{i,t}$, and labour, denoted $n_{i,t}$. Therefore,

$$n_{i,t} + l_{i,t} = 1. \quad (1)$$

Their labour is supplied to entrepreneurs and it yields a real wage of w_t per unit of working time. Allocating their time between work and leisure is the only decision they make when young. Their consumption choices occur during their retirement period. For this reason, they deposit their entire wealth to a financial intermediary which, next period, pays it back augmented by the gross real interest rate r_{t+1} . Subsequently, they decide how to allocate

their income between the consumption of normal goods, denoted $c_{i,t+1}$, and the acquisition of positional (or status) goods, denoted $x_{i,t+1}$, given the budget constraint

$$c_{i,t+1} + p_{t+1}x_{i,t+1} = r_{t+1}w_t n_{i,t}, \quad (2)$$

where p_{t+1} is the price of the positional good.

All choices are governed by the lifetime utility function

$$u_{i,t} = l_{i,t}^a c_{i,t+1}^\beta (\psi + x_{i,t+1} - X_{t+1})^{1-a-\beta}, \quad (3)$$

where, $a, \beta \in (0,1)$ and $\psi > 0$.³ The presence of the term X_{t+1} is crucial in characterising goods as ‘status’ or ‘positional’. Particularly, this term is equal to the average consumption of positional goods by workers, i.e.,

$$X_{t+1} = \int_0^1 x_{i,t+1} di. \quad (4)$$

This implies that the consumption of positional goods will result in utility increments as long as a worker’s consumption is above the relevant average of her peers.⁴

Entrepreneurs (indexed by j) live for only one period. Each one is endowed with a technology through which she can produce a specific variety j of an intermediate product under monopolistically competitive conditions. They earn a real profit of $\pi_{j,t}$ from this activity which they consume at the end of the period. For simplicity, I will assume that entrepreneurs are not affected by status considerations and, thus, they only care about consuming a quantity of normal goods according to a utility function $u_{j,t}$ which is increasing in their consumption. Hence, maximising utility corresponds to profit maximisation.

3.2 Technologies and Production

As stated previously, each entrepreneur is endowed with a technology that allows her to produce a specific variety j of an intermediate product. Specifically, she can combine labour

³ The particular manner through which positional goods are introduced in the utility function implies that, effectively, workers engage in a status game against their peers. As in Cooper *et al.* (2001) the presence of the positive parameter ψ ensures that the “reaction functions are everywhere properly defined” (Cooper *et al.*, 2001; p.649).

⁴ This assumption is supported by empirical studies. For example, in the experiment conducted by Solnick and Hemenway (1998), more than half of the participants responded that they would prefer a situation in which their annual income is higher relative to others compared to a situation in which their income is below the average, despite the fact that the second scenario involved much higher income and purchasing power in absolute terms.

from young workers, $N_{j,t}$, and capital from financial intermediaries, $K_{j,t}$, so as to produce $Y_{j,t}$ units of an intermediate product according to

$$Y_{j,t} = K_{j,t}^\gamma (\Gamma_t N_{j,t})^{1-\gamma}, \quad (5)$$

where $0 < \gamma < 1$. The variable Γ_t indicates some type of labour-augmenting technological progress. Following Frankel (1962) I assume that this is related to the aggregate capital-labour ratio according to a learning-by-doing externality. That is

$$\Gamma_t = \bar{\Gamma} \left(\int_0^1 \frac{K_{j,t}}{N_{j,t}} dj \right)^\theta, \quad \bar{\Gamma}, \theta > 0. \quad (6)$$

Denote the wage by w_t , the price of capital by r_t , the marginal cost of producing intermediate goods by m_t and the price of intermediate products by $\varrho_{j,t}$. Cost minimisation results in

$$w_t = m_t (1-\gamma) K_{j,t}^\gamma N_{j,t}^{-\gamma} \Gamma_t^{1-\gamma}, \quad (7)$$

and

$$r_t = m_t \gamma K_{j,t}^{\gamma-1} (\Gamma_t N_{j,t})^{1-\gamma}, \quad (8)$$

while (7) and (8) imply that entrepreneurial profit is equal to

$$\pi_{j,t} = (\varrho_{j,t} - m_t) Y_{j,t}. \quad (9)$$

The entrepreneur sells her product to firms who produce the economy's two types of final goods – the normal good (indexed by C) and the positional good (indexed by X). The respective technologies are given by

$$Q_{C,t} = \left(\int_0^1 q_{C,j,t}^{\frac{\sigma-1}{\sigma}} dj \right)^{\frac{\sigma}{\sigma-1}}, \quad (10)$$

and

$$Q_{X,t} = \left(\int_0^1 q_{X,j,t}^{\frac{\sigma-1}{\sigma}} dj \right)^{\frac{\sigma}{\sigma-1}}, \quad (11)$$

where $\sigma > 1$ is the elasticity of substitution between different varieties of intermediate inputs.

Let us assume that the basic good is the numéraire and that all final goods firms operate under perfect competition. Profit maximisation leads to the demand functions

$$q_{C,j,t} = \varrho_{j,t}^{-\sigma} Q_{C,t}, \quad (12)$$

and

$$q_{X,j,t} = \varrho_{j,t}^{-\sigma} p_t^{\sigma-1} Q_{X,t}. \quad (13)$$

Given that $Y_{j,t} = q_{C,j,t} + q_{X,j,t}$, we can substitute (12) and (13) in (9) and solve for the price that maximises entrepreneurial profits. It can be easily established that this equals

$$\varrho_{j,t} = \frac{\sigma}{\sigma-1} m_t, \quad (14)$$

i.e., the price is set as a mark up over the marginal cost of production. Equation (14) also reveals a well-known outcome associated with monopolistic competition, i.e., the symmetric equilibrium. That is, $\varrho_{j,t} = \varrho_t \forall j$. Therefore, $K_{j,t} = K_t$, $L_{j,t} = L_t$ and $Y_{j,t} = Y_t$ for every j .

Denote the aggregate price index by

$$\bar{\varrho}_t = \left(\int_0^1 \varrho_{j,t}^{1-\sigma} dj \right)^{\frac{1}{1-\sigma}}. \quad (15)$$

Substituting (12) in (10) and cancelling out terms leads to

$$\int_0^1 \varrho_{j,t}^{1-\sigma} dj = 1. \quad (16)$$

A similar procedure for equations (11) and (13) results in

$$\int_0^1 \varrho_{j,t}^{1-\sigma} dj = \left(p_t^{1-\sigma} \right)^{\frac{\sigma-1}{\sigma}}. \quad (17)$$

Combining the results from (16) and (17) gives us the price of positional goods as

$$p_t = 1, \quad (18)$$

while substitution of (16) in (15) leads to

$$\varrho_t = \bar{\varrho}_t = 1, \quad (19)$$

which is the equilibrium value of the aggregate price index for intermediate goods.

Substituting (19) in (14) gives us $m_t = (\sigma-1)/\sigma$ – a result which can be used together with the symmetry conditions in (7) and (8), in order to obtain the values for the wage and the interest rate. These are

$$w_t = \frac{\sigma-1}{\sigma} (1-\gamma) K_t^\gamma N_t^{-\gamma} \Gamma_t^{1-\gamma}, \quad (20)$$

and

$$r_t = \frac{\sigma-1}{\sigma} \gamma K_t^{\gamma-1} (\Gamma_t N_t)^{1-\gamma}, \quad (21)$$

respectively. These results, combined with (5) imply that an entrepreneur's profits are equal to

$$\pi_t = \frac{1}{\sigma} Y_t. \quad (22)$$

4 Balanced Growth

Given that the analysis is concerned with the issue of welfare dynamics in a growing economy, I need to impose a condition that will, first of all, guarantee that the economy attains a constant growth rate for output. In the context of this model, a necessary restriction for balanced growth is to set $\theta=1$ in equation (6) (see Aghion and Howitt, 1998). Henceforth, I assume that this condition holds.

Now, we can derive the implications for output dynamics through

Lemma 1. *Assume that $[(1-\gamma)\bar{\Gamma}^{1-\gamma}(\sigma-1)/\sigma] > 1$ holds. Then the economy's capital stock and output grow constantly at a rate $g > 0$, i.e., $Y_{t+1}/Y_t = K_{t+1}/K_t = 1+g$ therefore $Y_{t+1} > Y_t$, $K_{t+1} > K_t$ for every $t \geq 0$.*

Proof. We know that workers' savings provide the resources through which capital formation takes place over time. Thus,

$$K_{t+1} = \int_0^1 w_t n_{i,t} di = w_t \int_0^1 n_{i,t} di.$$

Given the labour market clearing condition $\int_0^1 N_{j,t} dj = N_t = \int_0^1 n_{i,t} di$, this expression can be rewritten as

$$K_{t+1} = w_t N_t.$$

Substituting (6) and (20) in the above expression results in

$$K_{t+1} = (1-\gamma)\bar{\Gamma}^{1-\gamma} \frac{\sigma-1}{\sigma} K_t = (1+g)K_t,$$

where $g = [(1-\gamma)\bar{\Gamma}^{1-\gamma}(\sigma-1)/\sigma] - 1$. Now, move equation (5) one period forward and substitute (6) to get

$$Y_{t+1} = \bar{\Gamma}^{1-\gamma} K_{t+1} \Rightarrow \frac{Y_{t+1}}{Y_t} = \frac{K_{t+1}}{K_t}.$$

Consequently, we have

$$Y_{t+1} = (1+g)Y_t.$$

Given $[(1-\gamma)\bar{\Gamma}^{1-\gamma}(\sigma-1)/\sigma] > 1$, it is $g > 0$ therefore $Y_{t+1} > Y_t$ and $K_{t+1} > K_t$. ■

5 Optimal Allocations

The problem of a worker/saver is to allocate her unit of time between work and leisure and her entire retirement income between the consumption of normal and positional goods in an optimal fashion. This entails that she maximises lifetime utility, given in (3), subject to the constraints in (1) and (2) and the non-negativity constraints $l_{i,t}, c_{i,t+1}, x_{i,t+1} \geq 0$. The first order conditions for this problem are

$$\frac{a}{l_{i,t}} \leq \frac{\beta r_{t+1} w_t}{r_{t+1} w_t (1-l_{i,t}) - p_{t+1} x_{i,t+1}}, \quad l_{i,t} \geq 0, \quad (23)$$

and

$$\frac{1-a-\beta}{\psi + x_{i,t+1} - X_{t+1}} \leq \frac{\beta p_{t+1}}{r_{t+1} w_t (1-l_{i,t}) - p_{t+1} x_{i,t+1}}, \quad x_{i,t+1} \geq 0, \quad (24)$$

together with the budget constraint $c_{i,t+1} + p_{t+1} x_{i,t+1} = r_{t+1} w_t (1-l_{i,t})$.

It should be evident that the optimal solutions are symmetric – i.e., the same for every individual indexed by i . For this reason, this subscript will be dropped in the subsequent analysis. From (23) we can also see that $l_t = 0$ cannot be an equilibrium as this will violate the complementary slackness condition. Therefore, equation (23) holds with equality. Nevertheless, as we will see, the same does not apply for equation (24). To clarify this point, we can solve for x_{t+1} and substitute (18) to get

$$x_{t+1} \geq \frac{1-a-\beta}{1-a} r_{t+1} w_t (1-l_t) - \frac{\beta}{1-a} (\psi - X_{t+1}). \quad (25)$$

Given the symmetric equilibrium and equation (4), it is $x_{t+1} = X_{t+1}$. Substituting this result back in (25) and rearranging yields

$$x_{t+1} \geq r_{t+1} w_t (1-l_t) - \frac{\beta \psi}{1-a-\beta}. \quad (26)$$

The above result allows us to establish

Lemma 2. Denote $\kappa_{t+1} = r_{t+1}w_t(1-l_t)$ and $\tilde{\kappa} = \beta\psi / (1-a-\beta)$. Then

$$\begin{cases} x_{t+1} = 0, & \text{if } \kappa_{t+1} \leq \tilde{\kappa} \\ x_{t+1} > 0, & \text{if } \kappa_{t+1} > \tilde{\kappa} \end{cases}.$$

Proof. When $\kappa_{t+1} > \tilde{\kappa}$, the right hand side of (26) is positive. This implies that $x_{t+1} > 0$ because, otherwise, the complementary slackness condition would be violated. In the case where $\kappa_{t+1} \leq \tilde{\kappa}$, however, the right hand side of (26) is not positive. As a result, the only solution is $x_{t+1} = 0$ because, otherwise, the complementary slackness condition would imply that x_{t+1} is negative, thus violating the non-negativity constraint on the variable. ■

Obviously, the composite term κ_{t+1} corresponds to a worker's lifetime income. Therefore, we can see that the status motive, despite being inherent in the agent's preferences, becomes active only when a sufficient amount of income is available for consumption. Otherwise, the individual devotes her entire wealth to the consumption of normal goods.

The previous analysis provides a hint on the fact that the economy's resources, in terms of the physical capital's stock, can be crucial in determining the consumption profile that is optimally chosen by workers. Furthermore, it will become clear that resource endowments are also crucial in determining the optimal behaviour of individuals in terms of their chosen time allocation between labour and leisure. All these issues are formally described in

Proposition 1. There exists a threshold $\tilde{K} > 0$ such that

$$\begin{cases} x_{t+1} = 0, c_{t+1} = \gamma\bar{\Gamma}^{1-\gamma} \frac{\sigma-1}{\sigma} K_{t+1} = C(K_{t+1}), l_t = \frac{a}{a+\beta} = \bar{l} & \text{if } K_t \leq \tilde{K} \\ x_{t+1} = \gamma\bar{\Gamma}^{1-\gamma} \frac{\sigma-1}{\sigma} K_{t+1} - \frac{\beta\psi}{1-a-\beta}, c_{t+1} = \frac{\beta\psi}{1-a-\beta} = \bar{c}, l_t = L(K_t) & \text{if } K_t > \tilde{K} \end{cases},$$

where $L(K_t) = \frac{a\psi(1-\gamma)}{a\psi(1-\gamma) + (1-a-\beta)\gamma(1+g)^2 K_t}$, $L'(\cdot) < 0$ and $L(K_t) < \bar{L}$, $C(K_{t+1}) \leq \bar{c}$.

Proof. See the Appendix. ■

The results from Proposition 1 have equipped us with the necessary elements so as to examine the dynamics of welfare during the process of economic growth. This is a task undertaken in the following Section.

6 Economic Growth and Welfare Dynamics

The analysis of welfare dynamics is straightforward once we substitute the solutions from Proposition 1 into the lifetime utility function given in (3). Before doing so, however, we will make use of

Lemma 3. *Assume that $K_0 < \tilde{K}$. Then, there is a time period $T \geq 2$, such that $K_0 < K_{T-1} < \tilde{K} < K_T$.*

Proof. This is a straightforward outcome related to fact that, by Lemma 1, the economy grows constantly over time. ■

We are now able to derive the main result of the paper which comes in the form of

Proposition 2. *Assume that $K_0 < \tilde{K}$. Then, despite the fact that income grows constantly, the dynamics of welfare are not monotonic. The welfare of successive generations of workers improves for some periods but, subsequently, it declines constantly over time.*

Proof. Let us revisit Lemma 3 and focus, initially, on $t \in [0, T-1]$. Obviously, $K_t < \tilde{K}$ in which case, substituting the equilibrium solutions from Proposition 1 in equation (3) leads to

$$u_t = \bar{L}^a \left(\gamma \bar{L}^{1-\gamma} \frac{\sigma-1}{\sigma} K_{t+1} \right)^\beta \psi^{1-a-\beta}.$$

Rewriting the same expression for $t-1$ and dividing by parts, yields

$$\frac{u_t}{u_{t-1}} = \left(\frac{K_{t+1}}{K_t} \right)^\beta.$$

By Lemma 1, it is $K_{t+1} > K_t$ therefore, $u_t > u_{t-1}$.

Now, let us focus on $t \in [T, \infty)$. Given that $K_t > \tilde{K}$, substitution of the corresponding solutions to the lifetime utility function leads to

$$u_t = [L(K_t)]^a \bar{c}^{-\beta} \psi^{1-a-\beta}.$$

Writing this in terms of $t+1$ and dividing by parts yields

$$\frac{u_{t+1}}{u_t} = \left[\frac{L(K_{t+1})}{L(K_t)} \right]^a.$$

Since $L'(\cdot) < 0$, it is $L(K_{t+1}) < L(K_t)$, therefore $u_{t+1} < u_t$. ■

For $t = 0, \dots, T-1$, during which the level of income is relatively low, individuals find optimal to consume only normal goods because the utility return on positional goods is not sufficient enough. During this stage, the increase in income supports welfare improvements for successive generations of workers because they are able to increase the consumption of goods with intrinsic utility value. As income grows and people become richer, however, they find optimal to start engaging in some type of positional competition with their peers. Thus, for periods $t = T, T+1, \dots$, the demand for positional goods increases with income – for both the individual and the other members of the reference group. Given the nature of positional goods, and as illustrated in (23), individuals respond by diverting even more resources away from the consumption of normal goods – whose demand comes to a standstill – in order to keep up with the status competition. Individuals support this futile quest for status by devoting more effort for work at the expense of their leisure. Hence, during this later stage of the development process, the successive generations of workers face a decline in the time available for pursuing leisurely activities – a decline that lowers welfare despite the continuing increase in income levels.

7 Conclusion

In this paper, I have presented an example of an economy in which the evolution of welfare can be distinguished between two different regimes that arise naturally during the process of development. Particularly, I constructed an economy whose welfare dynamics admit an inverse U-shape over time. Given that the non-monotonic evolution of welfare arises in an economy that can (endogenously) sustain a positive rate of economic growth may partially explain the apparent inconclusiveness of empirical research on the income-happiness nexus. Hence, the model's results have some explanatory power on why (other things being equal) there may not be a clear-cut relationship between income and happiness, either on an individual country basis over time or among different countries, with different levels of per capita GDP, at a given moment in time.

References

1. Aghion, P., and Howitt, P. 1998. *Endogenous Growth Theory*, MIT Press, Cambridge (MA)
2. Blanchflower, D.G., and Oswald, A.J. 2004. "Well-being over time in Britain and the USA", *Journal of Public Economics*, 88, 1359-1386
3. British Broadcasting Corporation (BBC), 2006. "Britain's happiness in decline", article by Mark Easton (the article can be accessed electronically at http://news.bbc.co.uk/1/hi/programmes/happiness_formula/4771908.stm)
4. Burtless, G. 1999. "Squeezed for time: American inequality and the shortage of leisure", *The Brookings Review*, 17, 18-22
5. Cooper, B., García-Peñalosa, C., and Funk, P. 2001. "Status effects and negative utility growth", *The Economic Journal*, 111, 642-665
6. de la Croix, D. 1998. "Growth and the relativity of satisfaction", *Mathematical Social Sciences*, 36, 105-125
7. Easterlin, R.A. 1974. "Does economic growth improve the human lot? Some empirical evidence" in David, P.A., and Reder, M.W. (eds.) *Nations and Households in Economic Growth: Essays in Honour of Moses Abramovitz*, Academic Press, New York, 89-125

8. Easterlin, R.A. 1995. "Will raising the incomes of all increase the happiness of all?", *Journal of Economic Behaviour and Organization*, 27, 35-48
9. Easterlin, R.A. 2005. "Feeding the illusion of growth and happiness: a reply to Hagerty and Veenhoven", *Social Indicators Research*, 74, 429-443
10. Eaton, B.C., and Eswaran, M. 2009. "Well-being and affluence in the presence of a Veblen good", *The Economic Journal*, 119, 1088-1104
11. Frank, R.H. 2000. *Luxury Fever: Money and Happiness in an Era of Excess*, Princeton University Press, Princeton
12. Frankel, M. 1962. "The production function in allocation and growth: a synthesis", *American Economic Review*, 52, 995-1022
13. Frey, B.S., and Stutzer, A. 2002. "What can economists learn from happiness research?", *Journal of Economic Literature*, 40, 402-435
14. Hagerty, M.R., and Veenhoven, R. 2003. "Wealth and happiness revisited: growing national income *does* go with greater happiness", *Social Indicators Research*, 64, 1-27
15. Heffetz, O., and Frank, R.H. 2008. "Preferences for status: evidence and economic implications", Johnson School research paper no. #05-09, Cornell University
16. Hirsch, F. 1977. *Social Limits to Growth*, Routledge and Kegan Paul Ltd, London
17. Kahneman, D., Krueger, A.B., Schkade, D., Schwarz, N., and Stone, A.A. 2006. "Would you be happier if you were richer? A focusing illusion", *Science*, 312, 1908-1910
18. Kapur, B.K. 2005. "Can faster income growth reduce well being?", *Social Choice and Welfare*, 25, 155-171
19. Luttmer, E.F.P. 2005. "Neighbors as negatives: relative earnings and well-being", *Quarterly Journal of Economics*, 120, 963-1002
20. Peng, B. 2008. "Relative deprivation, wealth inequality and economic growth", *Journal of Economics*, 94, 223-229
21. Schor, J.B. 1992. *The Overworked American: The Unexpected Decline in Leisure*, Basic Books, New York
22. Solnick, S.J., and Hemenway, D. 1998. "Is more always better? A survey on positional concerns", *Journal of Economic Behaviour and Organization*, 37, 373-383
23. van den Bergh, J.C.J.M. 2009. "The GDP paradox", *Journal of Economic Psychology*, 30, 117-135

Appendix

Proof of Proposition 1

Substituting (1), (21), the labour market equilibrium condition $n_t = N_t$ and $K_{t+1} = w_t N_t$ yields

$$x_{t+1} \geq \gamma \bar{\Gamma}^{1-\gamma} \frac{\sigma-1}{\sigma} K_{t+1} - \frac{\beta\psi}{1-a-\beta}.$$

Therefore, using $K_{t+1} = (1+g)K_t$ and $g = \left[(1-\gamma)\bar{\Gamma}^{1-\gamma}(\sigma-1)/\sigma \right] - 1$, we infer that there is a threshold

$$\tilde{K} = \frac{\beta\psi(1-\gamma)}{\gamma(1-a-\beta)(1+g)^2},$$

such that, for $K_t \leq \tilde{K}$, we have $x_{t+1} = 0$ and

$$c_{t+1} = r_{t+1}w_t(1-l_t) = r_{t+1}w_t N_t = \gamma \bar{\Gamma}^{1-\gamma} \frac{\sigma-1}{\sigma} K_{t+1} = C(K_{t+1}).$$

Substituting $x_{t+1} = 0$ in (23) and solving for l_t leads to

$$l_t = \frac{a}{a+\beta} = \bar{l}.$$

Now, let us consider the scenario for which $K_t > \tilde{K}$. In this case,

$$x_{t+1} = \gamma \bar{\Gamma}^{1-\gamma} \frac{\sigma-1}{\sigma} K_{t+1} - \frac{\beta\psi}{1-a-\beta} > 0,$$

which we can substitute, together with (18), in the budget constraint to get

$$c_{t+1} = r_{t+1}w_t(1-l_t) - x_{t+1} = \frac{\beta\psi}{1-a-\beta} = \bar{c}.$$

We can use the solution x_{t+1} in (23) and solve for l_t to get

$$l_t = \frac{a\psi}{(1-a-\beta)r_{t+1}w_t}.$$

Multiply both sides with $\frac{1}{1-l_t}$, use (1), (20), (21), $g = \left[(1-\gamma)\bar{\Gamma}^{1-\gamma}(\sigma-1)/\sigma \right] - 1$, $n_t = N_t$

and solve the resulting expression for l_t . Eventually, we get

$$l_t = \frac{a\psi(1-\gamma)}{a\psi(1-\gamma) + (1-a-\beta)\gamma(1+g)^2 K_t} = L(K_t).$$

Now, it is straightforward to substitute $K_t = \tilde{K}$ above in order to establish that

$$L(\tilde{K}) = \frac{a}{a+\beta} = \bar{l}.$$

Since $L'(\cdot) < 0$ we can see that $L(K_t) < \bar{l}$ for $K_t > \tilde{K}$. Similarly, using $K_{t+1} = (1+g)K_t$, we can establish that, for $K_t = \tilde{K}$, we have $C(\cdot) = \bar{c}$. Therefore, given $C'(\cdot) > 0$, we can establish that $C(K_{t+1}) \leq \bar{c}$ because $K_t \leq \tilde{K}$. ■