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Life quality time allocation index – an equilibrium economy consistent version of the current life quality index

Ove Ditlevsen *, Peter Friis-Hansen

Department of Mechanical Engineering, Coastal, Maritime and Structural Engineering, Technical University of Denmark, Nils Koppels Allé, Building 403, DK 2800 Kgs, Lyngby, Denmark

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Abstract

The definition the life quality index for a country as originally suggested by Nathwani, Lind and Pandey is based on the gross domestic product (GDP), the expected life in good health at birth, and the fraction of life time the anonymous citizen of the country is occupied with money making work. The LQI is invented to serve as a mean to evaluate how much money that reasonably can be allocated to safety improving investments by simply requiring constancy of the LQI. By choosing that the importance of increments in the two first variables should be measured relative to the current values of the variables themselves, the relative increment of the LQI becomes defined as a convex combination of the two relative increments. The combination parameter is obtained by an optimality argument about the anonymous citizen's distribution of his or her time between free time and work time. In the original definition this equilibrium economy principle is applied under the assumption that the GDP is directly proportional to the work time fraction. This direct proportionality has been relaxed by the first author in two earlier papers with an essential effect on the combination parameter. The present paper presents a further development casting the definition into dimensionless quantities that make the index get a pure unit of time and not the somewhat obscure unit as a power product of a money unit and a time unit. To avoid confusion, this new variant of the LQI is called the life quality time allocation index (LQTAI). Moreover, the Danish data from the period from 1948 to 2003 show good agreement with the relation between the productivity and the work time as obtained from the optimality argument. The data fitting leads to an estimate of the combination coefficient of $c = 0.092$

* Corresponding author. Tel.: +45 4525 1387; fax: +45 4588 4325.
E-mail addresses: od@mek.dtu.dk (O. Ditlevsen), pfh@mek.dtu.dk (P. Friis-Hansen).

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together with a reduction factor of $r = 0.92$ to be applied to the total life expectation at birth to obtain the expected life in good health. Among other infinitely many choices of (c, r) there are $(0.085, 1.0)$ and $(0.1, 0.85)$.

Keywords: Equilibrium economy developing path; Life quality time allocation index; Implied cost of averting a fatality; Life quality index; Time equivalent productivity

1. Introduction

In [1] the first author presented an alternative and more general definition of the life quality index (LQI) as compared to the definition in [2], originally given by Nathwani, Lind, and Pandey in [3] on the basis of quite reasonable principles. The LQI is intended as a social indicator that reflects the expected length of "good" life, in particular the enhancement of the quality of life by good health and wealth.

The definition is attached to the concept of a societal economy, a concept invented as a terminology in [1]. A societal economy has members. The members are all human beings that live and for a part of their life make productive work within a geographical region in which there is statistical homogeneity of wealth and expected life at birth. A societal economy can be thought of as a part of a country, an entire country or a suitably selected group of countries of similar standard of living of their populations. When talking about "average" it relates to average over a considered social economy.

In short, the life quality index differential $\mathrm{d}Q$ is defined such that the average importance of the increment $\mathrm{d}Q$ is $\mathrm{d}Q/Q$ and this importance is simply set to a convex linear combination of the importance of $\mathrm{d}G$ and the importance of $\mathrm{d}[(1-w)E]$, where G is the gross domestic product per person, E is the life expectancy at birth, and w is the fraction of time spent with money making work. Thus

$$\frac{\mathrm{d}Q}{Q} = c\frac{\mathrm{d}G}{G} + (1-c)\frac{\mathrm{d}[(1-w)E]}{(1-w)E}, \tag{1}$$

where $0 < c < 1$ is a suitably chosen combination coefficient that must be a constant under variation of the variables G, E, and w, of course. The differential form is an exact differential for the function

$$Q = G^c[(1-w)E]^{1-c}. \tag{2}$$

The question in [1] is then how to choose the coefficient c for the convex combination. In [1] it is assumed that G is proportional to some differentiable function g of $w - w_0$, where w_0 is the fraction of time with unpaid work, here assuming that w contains both the money making work $w - w_0$ and the unpaid work w_0 needed to stay in healthy and clean condition to be fit for work. Simplifying relative to [1] by neglecting the controversial contribution w_0 (that is, setting $w_0 = 0$),