



ELSEVIER

Available online at www.sciencedirect.com

 ScienceDirect

JOURNAL OF
Economic
Dynamics
& Control

Journal of Economic Dynamics & Control 31 (2007) 2827–2846

www.elsevier.com/locate/jedc

Invariance in growth theory and sustainable development

Vincent Martinet*, Gilles Rotillon

EconomiX (UMR 7166 CNRS-UPX), Université Paris X-Nanterre, 200 av. de la république, 92001 Nanterre Cedex, France

Received 14 April 2005; accepted 4 October 2006

Available online 4 December 2006

Abstract

This paper analyzes the general concept of sustainability from a different point of view than that generally found in the literature. If sustainability is defined as the requirement to keep something constant or at least non-decreasing throughout time, the choice of the thing to be preserved is controversial. Neo-classical models mainly assume that sustainability requires that consumption or a utility level has to be preserved. In this paper, we object to this a priori conception of sustainability and define all the quantities that can be preserved in neo-classical optimal growth models. We thus wonder if invariant quantities can be found along the optimal paths defined by a classical representation of an economy with an exhaustible resource. We use the *Noether theorem* to determine the conservation laws of dynamic systems. We examine under which conditions there is such invariance and how it could be interpreted as a sustainability indicator. We emphasize the limits of the economic growth theory for coping with the sustainability issue.

© 2006 Elsevier B.V. All rights reserved.

JEL classification: Q01; O40

Keywords: Sustainable development; Optimal control; Economic conservation laws; Hartwick rule

*Corresponding author.

E-mail address: vincent.martinet@u-paris10.fr (V. Martinet).

1. Sustainability as the conservation of something throughout time

In this paper, we propose a novel approach to sustainability. We search for endogenous invariant quantities in optimization problems. We then ask whether such constant quantities can be interpreted as ‘the thing to conserve for sustainability’. For this purpose, we examine and interpret the conditions under which these quantities remain constant. Let us detail our research program.

In the economic literature, the sustainable development issue is often tackled in the way: ‘Something must be kept constant, or at least not decreasing’, and the debate is about the ‘thing’ to be preserved.¹ Solow (1993, pp. 167–168) claimed that

If the sustainability means anything more than a vague emotional commitment, it must require that something be conserved for the very long run. It is very important to understand what that thing is: I think it has to be a generalized capacity to produce economic well-being.

Sustainability criteria can be used to determine what is to be conserved for sustainability (Heal, 1998). The most commonly used criterion is the neo-classical discounted utility

$$\max \int_0^{\infty} e^{-\delta t} U(t) dt.$$

This criterion is criticized mainly because the discount factor is decreasing² and the criterion does not take long-term utility into account. According to Chichilnisky (1996) this criterion is a dictatorship of the present.

An equity requirement is often added to the criterion. Asheim et al. (2001) and Stavins et al. (2003) propose to require a non-decreasing utility or consumption level. The social objective (sustainability of the utility) is not considered in the objective function (in the criterion to optimize) but as an added constraint to an economic criterion. This approach is criticized by Krautkraemer (1998) and Cairns and Long (2006) who argue that the objective function has to be defined in order to consider the sustainability issue, and especially intergenerational equity.

We agree with this point of view. For us, this approach is not relevant because it defines sustainability as an a priori constraint, leading to the following steps: a criterion is chosen (it is often the discounted utility maximization). Then, the constraints representing sustainability (constant consumption, non-decreasing utility...) are defined a priori. Finally, optimal paths are characterized. These paths are then interpreted thanks to the a priori definition of sustainability, leading to recommendations of the form: ‘The economy follows a sustainable path if³ the utility function (the production function, the pollution abatement function) is of the form...’. We reject this approach because the results are limited: how restrictions on the form of the utility function can be justified? Does the social planner have to

¹See Dobson (1996) for a typology of sustainabilities.

²This discount factor can be hyperbolic.

³One should read: ‘the program defined as representing sustainability has a solution if...’.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات