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ANALYSIS

Measuring sustainable development: Some empirical evidence for France from eight alternative indicators

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ABSTRACT

This paper presents results from a time-series analysis of eight measures of development and/or sustainability for France. The measures chosen are green national net product, Genuine Savings, ecological footprint, Indicator of Sustainable Economic Welfare, Genuine Progress Indicator, Pollution-sensitive Human Development Indicator, Sustainable Human Development Indicator and French Dashboard on Sustainable Development. A theoretical description of each index highlights their advantages and drawbacks, underlining the fact that no indicator is perfect and no one can give an exhaustive view of sustainable development. Therefore, the analysis of various indicators is necessary to evaluate sustainable development with accuracy. Empirical results of measures of well-being show that French development was improving between 1990 and 2000. Concerning sustainability, indicators support different conclusions. It seems that French development was weakly sustainable but unsustainable in the strong sense over the period examined.

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1. Introduction

In 1992, the United Nations Conference on Environment and Development in Rio de Janeiro underlined the limitations of gross domestic product (GDP) as a measure of sustainable development for a country. Indeed, “common indicators such as gross domestic product and measures of different resources or pollution flows do not assess the sustainability of economic systems” (paragraph 40.4 of Agenda 21). This article also points

out that “sustainable development indicators must be constructed in order to form a useful basis for decision making”. Therefore, since the beginning of 1990, measures aiming at completing the GDP and limiting its supremacy have been built.

This paper lies within the framework of development of indicators of sustainable development. In fact, whereas alternative and competitive measures have been created, none of them is perfect: each index is based on a specific definition and so takes into account only some aspects of sustainable

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development. Therefore, it is important to begin with a definition of sustainable development. In this paper, I used the widespread definition of the Brundtland Report (*Our common Future*, 1987): “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It aims at assuring the on-going productivity of exploitable natural resources and conserving all species of fauna and flora”. In my view, two key ideas are expressed in this definition: i) concern for the well-being of future generations and ii) recognition of the bi-directional impacts between economic activity and the state of the environment and natural resources. In this context, sustainable development takes into account human development (in terms of welfare) and sustainability of such development (in terms of condition on the stock of capital). Within this broad definition, two main approaches can be described: weak sustainability and strong sustainability. Although these two views define development as a non-declining level of well-being for future people, the requirement for sustainability is different. Weak sustainability only requires a non-declining combined stock of all capital. It is then possible to substitute between human, man-made and environmental capital. In this approach, natural capital is not different from other resources. The aim is to keep the stock of total capital constant or increasing, whatever the combinations of the three types of capital are. On the contrary, strong sustainability gives an essential position to natural capital. It is a different form of capital without which human life cannot exist. Strong sustainability requires the maintenance of environmental functions and critical natural capital needed for the life of ecosystems. Therefore, models of strong sustainability incorporate real world constraints on the possibility of substitution between man-made, human and environmental capital. Contrary to weak sustainability that focuses on maintaining a combined stock of capital intact, strong sustainability deals with specific environmental functions that ought not to be undermined by economic activity and possible ecological limits to growth.

In this context, an indicator of sustainable development must assess human development (i.e. is welfare non-declining?) and sustainability (i.e. is the stock of total capital (weak sustainability approach) or natural capital (strong sustainability view) intact?). However, no single measure does a perfect job at reflecting sustainable development per se. Therefore, it is necessary to look at different indicators of development and sustainability to give a better valuation of the sustainable development of a country. This paper presents results from time-series analysis of eight measures for France. Whereas the green national net product, the Genuine Savings and the ecological footprint are indicators of sustainability, The Indicator of Sustainable Economic Welfare, the Genuine Progress Indicator and the two “green” Human Development Indicators measure national welfare. The French Dashboard on sustainable development is an imperfect assessment of both concepts of sustainable development (i.e. well-being and sustainability). This paper adopts the same methodology as the one used by Hanley et al. (1999).¹ These authors

calculate seven alternative indicators for Scotland. Whereas the measures are supposed to assess the same phenomena, their results lead to opposing views of the national sustainability. The main aim of my paper is to draw a parallel between the eight measures to determine whether the indexes show a trend towards sustainable development. In other words, what are the results concerning the sustainable development of France emerging from the connection between the eight indicators? To sum up, this article attempts to highlight that the study of a single measure is not sufficient to assess the sustainable development of a country and policies based on the conclusion of only one indicator should not be implemented because the empirical results could be misleading.

The remainder of this paper is divided into four sections. Section 2 deals with indicators of sustainability and Section 3 with measures of welfare. Section 4 presents the French Dashboard on sustainable development, an assessment of sustainable development per se. Sections 2, 3 and 4 have the same structure. Firstly, they give a description of each kind of indicator by focusing on the theoretical basis and practical problems. Then, empirical results for France are presented. Finally, Section 5 concludes by confronting opposite trends and presenting missing indicators and research prospects.

2. Measures of sustainability

2.1. Green national net product

2.1.1. Theoretical description

Gross national product (GNP) is the traditional measure of economic performance and is implicitly used to assess national development and welfare. GNP measures the value of goods and services produced by domestically owned factors of production. This indicator takes into account human capital imperfectly but does not integrate natural capital. The first step to compute green national net product (gNNP) is to work out national net product (NNP) by subtracting depreciation of physical capital from GNP. Then, many adjustments are necessary to obtain gNNP. These modifications are derived from a neoclassical model of growth with a constant rate of discount and are linked to specific environmental variables (exhaustible resources, renewable natural resources, pollution flows, discoveries) (see Hamilton, 1994 and Hanley, 2000 for a review of the different optimal adjustments). Note that there is not a consensus among economists concerning the reasons for those modifications and on the techniques used to compute them.

Another point of disagreement is the interpretation of gNNP. According to some authors (e.g. Solow, 1993; Hartwick, 1990), gNNP is a measure of the Hicksian income, i.e. it represents the maximum amount of possible consumption during a period that does not reduce the possibilities of future consumption. In this context, if gNNP is rising and superior or equal to current consumption, the studied country will be sustainable. Note that an increase of gNNP means that the maximum level of sustainable consumption is improving (Hanley, 2000). On the contrary, a falling gNNP is a sign of unsustainability in the sense that the maximum amount that can be consumed without undermining productive capacity is

¹ Note that only five indicators are identical between Hanley's paper and mine (green GNP, genuine savings, ISEW, GPI and ecological footprint). The three other measures studied are two green HDI and the French Dashboard on sustainable development.

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