Ecological Economics 144 (2018) 292–303

Contents lists available at ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon

Methodological and Ideological Options

Revisiting ISEW Valuation Approaches: The Case of Spain Including the Costs of Energy Depletion and of Climate Change

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ARTICLE INFO

Keywords:
ISEW, Welfare
Sustainable
Spain
Energy
Costs of Climate Change

ABSTRACT

This paper develops an Index of Sustainable Economic Welfare for Spain from 1970 to 2012 and seeks to update valuation approaches to a number of items. Two approaches have proven particularly controversial over recent decades; the costs of energy depletion and of climate change. The valuation implications in measuring present welfare have proven problematic, as both include future sustainability consequences arising from resource depletion and environmental impacts. This study includes a '*transition cost*' approach to energy depletion, a modified approach to costs of climate change and water pollution, and removes the cost of ozone depletion. The results illustrate that while GDP per capita increased significantly, the ISEW per capita shows a widening gap. Household labour contributes strongly, but income distribution, energy depletion and costs of climate change limit improvement. Sensitivity analysis shows that accumulating climate change costs and escalating energy depletion costs have significant effects. Nevertheless, the new valuation approaches do not alter conclusions that welfare has shown little improvement. The ISEW provides a useful alternative to current indicators such as GDP subject to awareness of limitations. It is a measure of welfare that uses sustainability accounting methods when estimating costs, but is not an indicator of whether welfare is actually sustainable.

1. Introduction

The search for indicators of welfare, wellbeing and sustainability has hastened in recent years. The shortcomings of Gross Domestic Product (GDP) as a measure of welfare or socio-economic progress are increasingly acknowledged as GDP is a measure of the flow in market value of goods and services. It was originally intended only as a measure of national income by its instigator Simon Kuznets. Among many critiques, the Stiglitz Commission on the measurement of economic performance and social progress stated that while GDP has often been treated as a measure of economic wellbeing, confusing an economic indicator with one of welfare can lead to misleading indications and wrong policy decisions (Stiglitz et al., 2009). Criticism has included its failure to account for the value of household labour, the effects of income inequality, or losses due to environmental degradation and for wrongly considering defensive expenditures as contributions to welfare. Systems that supplement income such as the Human Development Index (HDI) (UNDP, 1999) have been advocated as measures of 'human development'. Stiglitz et al. termed a number of more complex measures that adjust for hidden costs and benefits as 'adjusted GDP' but which actually commence with household consumption rather than GDP. These began with the original Measure of Economic Welfare (MEW) of Nordhaus and Tobin (1973), to the Index of Sustainable Economic Welfare (ISEW) of Daly and Cobb (1989) and the related Genuine Progress Indicator (GPI) (Redefining Progress, 1995). Separate satellite national accounts of environmental indicators are also used to supplement the standard System of National Accounts (SNA) of economic activity. The ISEW is an aggregate welfare measure composed of economic values that integrate a macroeconomic measure of consumption, with distribution inequality of income, social impacts, environmental damage, environmental quality and items beneficial to welfare.

Since its inception, the ISEW has been applied to > 25 countries and more recently to dozens of studies of regions or states (Bleys and Whitby, 2015; Posner and Costanza, 2011). Within the field, the index has not been without controversy, particularly due to valuation

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http://dx.doi.org/10.1016/j.ecolecon.2017.07.024
Received 12 August 2016; Received in revised form 3 May 2017; Accepted 18 July 2017
Available online 11 September 2017
0921-8009/

methods (Neumayer, 1999), and Lawn (2003) has emphasised the need for more robust and consistent valuation methods. In the wider sphere of welfare indicators, the ISEW treatment of sustainability (Stiglitz et al., 2009), and the type of treatment of the links between consumption and welfare (Fleurbaey, 2009) have been questioned. Fleurbaey and Blanchet (2013) have pointed out the important contribution of the ISEW/GPI through the inclusion of resource depletion and distribution of income, but Lawn (2003) has also noted the problematic nature of consumption, suggesting a sensitivity analysis of excluding some categories such as 'cigarettes and tobacco' (Lawn, 2005). As yet, the varying contribution of different consumption categories to human wellbeing is a nascent field of research which requires further development (Stanca and Veenhoven, 2015). Lawn (2014) has actually advocated a possible return to the original Nordhaus and Tobin title of 'Measure of Economic Welfare', to avoid confusion with measuring 'sustainability' or all that is entailed by 'genuine progress'.

This paper is the first national estimate of an ISEW for Spain. It seeks to address prominent controversies in ISEW valuation methods, the implications for welfare in Spain, and for the wider use of the index itself. Spain is an interesting case study as it emerged from the Franco dictatorship between 1975 and 1978. It is perceived to have engaged in a development catch-up from the mid 1980's through GDP growth, and it experienced a deep economic recession that began in 2008. While the development of the ISEW/GPI has concentrated on expansion to more countries with standardisation of the approach, Bleys (2008) sought to improve the two controversial valuations; depletion of non-renewable resources and the long-term costs of climate change. Both remain problematic and have been the subject of ongoing debate for almost twenty years. The study returns to these valuations termed for brevity; '*energy depletion*'[2] and the '*costs of climate change*'. Bagstad et al. (2014) discussed how it is necessary to revisit the component list in studies such as GPI, to ensure that it represents the range of benefits and costs to welfare that are currently well recognised in the social science, environmental, and economic literature. Following Bagstad et al. we reviewed all of the items used to calculate an ISEW. In addition to focussing on energy depletion and the costs of climate change, we also modified the approach to calculating the costs of water pollution and omitted the place of ozone depletion. The approaches used to estimate all of the items in the Spanish ISEW are detailed in the supplementary materials.

Following the introduction, the paper is structured as follows; Section 2 provides detail on the methodological approach to update valuations of energy depletion, the costs of climate change, the costs of water pollution, and a re-consideration of the place of the costs of ozone depletion. Section 3 presents and interprets the results of the Spanish ISEW, Section 4 provides a discussion of implications for Spain and for wider application of the index and Section 5 provides concluding remarks.

2. Methodology

Since the development of the early ISEW studies there have been important changes in the relative importance, understanding and valuation of key indicators used to calculate the index. These have reflected the changing scientific and policy agenda, such as the increasing focus on climate change and energy, and declining in the case of ozone depletion. While the approach used here is based on the earlier antecedents (Daly and Cobb, 1989; Cobb and Cobb, 1994; Jackson et al., 1997), and updates to these approaches that have followed in the literature in the intervening years such as Bleys (2009), as noted by Bleys (2008), a complete discussion of the approach, data sources and assumptions is crucial with an ISEW. For transparency, replicability and comparability the other items calculated are comprehensively documented in the supplementary material to this paper. The period from 1970 to 2012 is chosen due to availability of more comprehensive data with less gaps, allowing greater confidence in underlying data while retaining a period of sufficient length for long-term trends to emerge. Table 1 gives an overview of the items included in the Spanish ISEW study; its impact, rationale and a short summation of the methodology. All data is converted into constant 2010€ prices, using the appropriate exchange rate (ECB) and GDP deflator (World Bank) where relevant. Changes in Net Capital Growth and Net International Investment Position have been excluded from the final index as recommended by Bleys (2008) as they are not compatible with the Fisherian concept of income (Lawn, 2013) which constitutes the theoretical basis of ISEW/GPI. The cost of ozone depletion has been excluded from the index on the basis of re-consideration of its place within the ISEW as is discussed in Section 2.3. This follows the suggestion of Bagstad et al. (2014) and the limitations in the valuation of the social cost of ozone depleting substances that are discussed in this study.

2.1. Depletion of Non-renewable Resources as 'Energy Depletion'

Since the inception of the ISEW the depletion of non-renewable energy (Item S) has changed in focus and valuation, and proven controversial. Daly and Cobb (1989) originally used the more broad *mineral resources extraction cost* as the reference, with subsequent studies varying by using national consumption or production. The valuation was then applied to the reference consumption or production quantity as either total resource rents or the El Serafy method (El Serafy, 1989) was used to calculate resource user costs. Cobb and Cobb (1994) modified item S substantially, with the new method based on a *replacement cost*, intended as the theoretical cost of future replacement of non-renewable fossil fuel and nuclear resources with renewables. This cost was valued as an arbitrary $75 in 1988 per barrel of oil equivalent (BOE), with an escalating increase of 3% each year. The approach reflected the relative infancy of knowledge in the area at the time, and according to Bleys (2009), has been the most commonly applied in ISEW studies. It has however proven controversial owing to a perceived high cost of substitution and the escalating cost factor (Neumayer, 1999). Neumayer (2000) suggested that while renewables were expensive in the late 1990's, a declining replacement cost would likely be more valid. In response, Bleys (2008) sided with Neumayer and excluded the escalating cost factor. Bleys continued with the Cobb and Cobb cost in the absence of sufficient knowledge of transition costs. In Diefenbacher et al. (2013) the Nationalen Wohlfahrtsindex or National Welfare Index (NWI) for Germany, the authors suggest that non-renewable energy can be consumed only if renewable energy sources are built up at the same time in order to guarantee future energy supply. Annual costs were estimated by multiplying the quantity of final non-renewable energy by a corresponding price for renewable energy as a replacement cost. They employ a current price for renewable energy rather than a future cost and consequently do not address the timing of replacement or the inevitable change in cost in the future. Knowledge of the mechanisms and costs of energy transition have evolved considerably in recent years, but arriving at a refined valuation approach requires some framing conditions; technically, ethically and economically.

As a contributor to development, the age of fossil fuels may come to be seen as a blip in the history of civilisation. An important contributor to how past human progress unfolded since the industrial revolution, it came with numerous hidden costs; now known as potentially catastrophic in the form of anthropogenic climate change and highly disruptive in the form of depletion and peak production. A dominant place for fossil fuels in future development trajectories is now anathema to a sustainable and secure future. Following a hardening of the science of climate change; by cause, impact and response since the early 1990's, policy and legal processes are now moving inexorably towards ushering the end of the fossil era. The pathway is becoming clearer as avoiding

[2] Including both fossil fuels and nuclear as non-renewable energy resources.