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Comprehensive versus inclusive wealth accounting and the assessment of sustainable development: An empirical comparison

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ABSTRACT

This paper compares alternative wealth estimates reported by the World Bank and in the Inclusive Wealth Reports. Although theoretical limitations and shortcomings are widely acknowledged in the literature, the extent to which the alternative approaches to wealth accounting matter empirically is not well known. Comparing the alternative data in levels, shares, growth rates, and monetary sustainability indices derived from them, major differences emerge between OECD and non-OECD countries. For the former, the alternative wealth estimates seem complementary, but only if a key assumption made in the derivation of inclusive wealth is violated. For the latter, the data seem much less useful. For example, depending on which data source is used, for the group of low income countries the share of natural capital in total wealth is either 36.8% or 60.4%, suggesting that extreme care must be taken if the composition of wealth were to be used to inform policy-making. Neither wealth data set provides a 'definite guide' to economic sustainability, but a combination of indices derived from both might be useful in a holistic assessment of sustainability.

1. Introduction

Atkinson et al. (2014) note that the 'capital approach' to sustainability has become ubiquitous in the sustainable development literature. There are two main reasons for this. First, the idea that one has to at least preserve the amount of total, i.e. comprehensively measured, capital (or 'wealth') per capita over time in order to ensure that future generations are at least not worse off than the present generation has great intuitive appeal and, secondly, economists have provided solid theoretical foundations (within the neoclassical economics framework) linking comprehensively measured wealth to sustainability (ibid.).

The seminal contribution that establishes the theoretical link between wealth and sustainability is Pearce and Atkinson (1993). Non-declining wealth as a sustainability indicator assumes the possibility of substitution between natural capital (NC) and other forms of capital. This is the concept of 'weak' sustainability. By contrast, 'strong' sustainability assumes that all or some parts of NC cannot be substituted, i.e. they are 'critical' forms of NC that cannot be allowed to depreciate at all if sustainability is to prevail (ibid.).[1]

A number of major reports by international organisations have published estimates of comprehensive or total wealth for large samples of countries in order to assess the economic sustainability of countries' development paths. In its millennium capital assessment, World Bank (2006) published wealth data for 120 countries for the year 2000, providing estimates not only of comprehensive wealth (CW), but also of

[1] Strong and weak sustainability are usually interpreted as two opposing sustainability paradigms (Neumayer, 2010). Suffice to say, measuring critical NC is not straightforward. Environmental functions that are deemed to have to be sustained need to be identified, and so do their links to NC. However, it might not always be possible to identify critical NC as specific NC elements, as environmental functions might be related to the interacting characteristic of different elements of NC (see Ekins, 2014, for a more detailed discussion and a possible framework and methodology to identify critical NC). Many researchers would designate ecosystems and biodiversity as critical forms of NC (Atkinson et al., 2014), although there are major concerns about the limitations of the methods currently used to estimate their value (Tisdell, 2015).

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its major components, i.e. NC, produced capital (PC) and intangible capital (IC). Extended and updated estimates for three years (1995, 2000 and 2005) were published in World Bank (2011). They enable analysis of changes in CW and its components. The World Bank studies estimate CW as the present value of future consumption. The estimate for IC is obtained indirectly as the residual after subtracting the directly estimated NC and PC from CW.

A related but alternative approach associated with Arrow et al. (2012) is to estimate as many of the components of wealth as possible directly, and then add them up to obtain an aggregate estimate of wealth, called inclusive wealth (IW). In particular, this means measuring only the largest component of IC, i.e. human capital (HC). In December 2014, the United Nations University-International Human Dimensions Programme and the United Nations Environment Programme published such estimates for 140 countries for five-yearly intervals from 1990 to 2010 in their 'Inclusive Wealth Report 2014' (UNU-IHDP&UNEP, 2014).[2] Its objective is to show "how nations are performing in their efforts to sustainably improve the well-being of their citizens" (ibid., p. xxvii). Further, it strives to (ibid.)

> … cement the role of the Inclusive Wealth Index … as the leading comprehensive indicator for measuring nations' progress on building and maintaining inclusive wealth – a central pillar of the sustainability agenda – and gauging global sustainability as part of the post-2015 development agenda as outlined in the Sustainable Development Goals.

These are bold ambitions that deserve careful scrutiny, not only because of the well-known plurality of sustainability measures, many of which are not based on neoclassical economics (Ness et al., 2007; Gasparator and Scolobig, 2012), but also because it is not clear a-priori whether the approach taken in the Inclusive Wealth Reports is superior to that used in the World Bank reports. In the current paper, the focus is on the latter aspect, both in terms of theoretical differences and, particularly, in terms of empirical estimates. Confusingly, the terms CW and IW are used interchangeably in the Inclusive Wealth Report 2014 (UNU-IHDP&UNEP, 2014, p. 324), and Arrow et al. (2012) use 'CW' to denote 'IW'. In order to avoid confusion, the term CW is reserved for the total wealth measure associated with the World Bank, and IW for the total wealth measure associated with Arrow et al. (2012) and UNU-IHDP&UNEP (2012, 2014).

The basic idea behind both the World Bank's and the Inclusive Wealth Reports' approaches to 'wealth accounting' is the same. Economic sustainability is assumed to require a non-declining level of total assets (i.e. capital or wealth) per capita over time, not a non-declining level of output as conventionally measured by GDP per capita (GDPpc), and ecological sustainability is more likely to occur if the value of nature (i.e. all forms of NC) is properly measured and incorporated into the wealth accounts.

Proponents of the capital approach to sustainability argue it has provided an array of insights about development (see Hamilton and Naikal, 2014). The most obvious one is that, in general, the proportion of NC in total wealth declines with the level of development, but the monetary value of NC increases. Moreover, the share of IC constitutes the largest form of capital in most countries (oil exporters are an exception). Hamilton and Naikal argue that for individual countries, perceiving sustainable development as the efficient management of a portfolio of capital assets that explicitly includes NC has many implications for policy-making. However, it is widely recognised that monetary estimates of NC at best only form part of the assessment of whether a development path is ecologically sustainable. Wealth accounting has to be supplemented with non-monetary indices (Stiglitz et al., 2009; World Bank, 2011; UNU-IHDP&UNEP, 2014). This can be seen as a concession by proponents of the capital approach that weak and strong sustainability are not mutually exclusive when it comes to devising and implementing policies aimed at ensuring economic and environmental sustainability.

Both approaches to wealth accounting are usually cited by governments that try to develop detailed national wealth accounts. A prominent example is the U.K. (Khan, 2013; Khan et al., 2014). Conceptual shortcomings and advantages of both approaches are acknowledged. However, the extent to which the differences in methodology matter empirically, in general and specifically for economic sustainability indices derived from the data, is not well explored, if at all. Hamilton (2012) discusses discrepancies between wealth estimates derived from both approaches, but only for the U.S. The current paper attempts to fill this gap in our knowledge by comparing the alternative wealth estimates for the largest sample of countries currently possible. This sheds light on some peculiar features of the wealth estimates, indicates areas for improvement, and cautions against relying exclusively on a particular economic sustainability index.

Section 2 briefly reviews some major aspects of the methodologies used in the two wealth accounting approaches and some of the assumptions made in the derivation of the empirical estimates. The data analysis is reported in Section 3. It focusses on comparing the data in levels and in terms of capital shares and growth rates of the capital stocks. Section 4 explores how closely monetary economic and ecological sustainability indices derived from both wealth data sets are correlated. Section 5 contains concluding comments.

2. Wealth Accounting Methodologies and Measurement of Capital Stocks

The same body of theory linking wealth to sustainability and intergenerational well-being underpins both approaches to wealth accounting. World Bank (2006, 2011) and UNU-IHDP&UNEP (2014) provide reviews of this literature.[3] In both approaches, 'well-being' is related not to its constituents, but to its determinants, i.e. capital assets (for a critique of this core assumption of wealth accounting see, e.g., Gowdy, 2005; Thiry and Roman, 2014). However, the empirical derivations of wealth stocks differ in many ways.

2.1. Comprehensive Wealth

Following Hamilton and Hartwick (2005), the current value of CW in year t, CW_t, is estimated as the present value of sustainable consumption, i.e. the present value of the consumption level that leaves the capital stock intact. Measured this way, CW tries to account for intertemporal equity issues and thus becomes the object of the sustainable development paradigm (Hamilton and Naikal, 2014).

It can be shown that $CW_t = \int_t^{\infty} C(t)e^{-\rho(s-t)}ds$, where C is current (sustainable) consumption, ρ is the pure rate of time preference, and s is another time index. CW_t is a function of consumption at time t and the pure rate of time preference. Derivation of this formula requires the assumptions that the elasticity of utility with respect to consumption equals one and that consumption changes at a constant rate. Sustainable consumption levels for 1995, 2000 and 2005 are proxied by five-year centred consumption averages. In cases where savings adjusted for depletion of PC and NC are negative, they are subtracted from actual consumption (World Bank, 2011, p. 142). Furthermore, the pure rate of time preference is presumed to be 1.5% and the time horizon is set at 25 years (ibid., p. 143). The CW estimates are divided by population to obtain 'CW per capita' (CWpc). All wealth estimates in World Bank (2011) are reported in constant 2005 U.S. dollars, using nominal market exchange rates, not purchasing power parity adjusted

[2] The scope of the report is much greater than that of the 2012 Inclusive Wealth Report (UNU-IHDP&UNEP, 2012) that covered only 20 countries.

[3] A brief and concise overview of main developments in the theoretical literature is provided in World Bank (2006, Box 1.1, pp. 15-17).