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THE ISEW – NOT AN INDEX OF SUSTAINABLE ECONOMIC WELFARE*

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INTRODUCTION

Over the last couple of years some "ecological economists", as they call themselves, have proposed an "Index of Sustainable Economic Welfare" (ISEW) as an alternative to a country's Gross National Product (GNP) or Gross Domestic Product (GDP).[1] ISEWs have been developed out of the concern that GNP is not an adequate indicator for either current welfare or the achievement of sustainability, which is usually defined as the capacity to provide non-declining future welfare. The main critiques have been that GNP is flawed because (a) it does not take the value of household labour, (b) the welfare effects of income inequality, and (c) the welfare loss due to environmental degradation into account and (d) considers "defensive expenditures" wrongly as contributions to welfare.

The ISEW is supposed to provide a remedy for these and a couple of other shortcomings in order to provide a more reliable monetary indicator of welfare and sustainability. It attempts to improve earlier measures of welfare such as Nordhaus and Tobin (1972) and Zolotas (1981).[2] ISEW-studies have become increasingly popular recently and have prompted widespread attention.[3] Studies have been undertaken for the U.S. (Daly and Cobb, 1989; Cobb and Cobb, 1994), the United Kingdom (Jackson and Marks, 1994; Jackson et al., 1997), Germany (Diefenbacher, 1994), Italy (Guenno and Tiezzi, 1996, preliminary study only), Sweden (Jackson and Stymne, 1996) and Austria (Stockhammer et al., 1997). What these studies show is that the ISEW of a country has been growing much slower since 1945 than her GNP or GDP and indeed has been fallen since the early 1980s.

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Computation of an ISEW usually starts from the value of personal consumption expenditures which is a sub-component of GDP since GDP = Personal consumption + Public consumption + Investment + (Exports – Imports). Consumption expenditures are weighted with an index of "distributional inequality" of income (usually a modified Gini Coefficient). Then, certain welfare relevant contributions are added and certain welfare relevant losses are subtracted. As an example take the U.S.-study of Cobb and Cobb (1994): After having weighted personal consumption expenditures by a modified Gini Coefficient of pre-tax income distribution data, they add the estimates of the value of the services from household labour, consumer durables and streets and highways. They also add net private investment into man-made capital and changes in the net international investment position of the U.S.[4] They subtract most expenditures on health and education because these are regarded as mostly defensive expenditures. They also subtract expenditures on consumer durables, estimates of the costs of commuting, car accidents, and the costs of environmental degradation such as water, air and noise pollution, loss of wetlands and farmlands, the depletion of nonrenewable resources and long term environmental damage due to CO_2-emissions. The ISEW is simply the sum of the weighted personal consumption expenditures and all the mentioned corrections.

In this article, I will argue first that the ISEWs lack a sound theoretical foundation. I will show second that their conclusions are highly dependent on certain key and rather arbitrary assumptions about the weighting of income distribution, the valuing of the depletion of non-renewable resources and long-term environmental damage and the neglect of technical progress and increases in human capital. Third, I will argue that the ISEWs and their authors in criticising GNP for its deficiencies as an indicator of welfare miss the point since GNP was never thought of as providing this function by its founders. Finally I will show that the ISEWs rest on two methodological inconsistencies. One is that the ISEW meshes together the measurement of two entities, current welfare and sustainability, that should be kept separate. This is because an indicator of current welfare ideally consists of items that are not relevant for questions of sustainability and vice versa. The second methodological inconsis-

tency is that although ISEWs are usually undertaken by economists who are in favour of some stronger version of sustainability (natural capital and certain of its sub-categories are regarded as being not amenable for substitution), the ISEW implicitly assumes perfect substitutability within natural capital and between natural and other forms of capital.

The concluding section draws policy implications out of the analysis. There I argue that it is erroneous to search for a single indicator that commands enough general agreement to measure welfare and sustainability. Scarce time and resources should be put into developing new and improving existing indicators of the quality of life that all fall well short of trying to provide one single and clear-cut measure of welfare and sustainability. At the same time, it should be constantly warned against misinterpreting GNP as an indicator of welfare.

A SHORT REVIEW OF ISEW-STUDIES

As mentioned, ISEW-studies have been undertaken for a couple of high income countries. The detailed methodology varies somewhat from study to study depending on the authors' preferences and the availability of data. The methodology of the German (Diefenbacher, 1994), Italian (Guenno and Tiezzi, 1996), Swedish (Jackson and Stymne, 1996), and early UK (Jackson and Marks, 1994) studies is basically the same as in Cobb and Cobb (1994) which is itself a revision and update of the pioneering U.S. study in Daly and Cobb (1989). The update of the UK-study (Jackson et al., 1997) and the study for Austria (Stockhammer et al., 1997) have undertaken some changes in methodology as we will see later on. Importantly, the basic conclusions are the same for all these studies: "Sustainable Economic Welfare" has risen much slower than growth rates of GNP would suggest and, indeed, has fallen from the 1980s onwards. Jackson et al. (1997, p. 2) cite Max-Neef (1995, p. 116) who suggests that the computation of an ISEW for various countries provides evidence for a "threshold hypothesis" which holds "that for every country, economic growth (as conventionally measured) brings about an improvement in the quality of life, but only up to

a point – the threshold point beyond which more economic growth leads to a decline in the quality of life."

For the U.S., e.g., covering the period 1950 to 1990, the ISEW is already slightly declining during the 1970s by 0.14% per year – a decline that is accelerating to 1.26% per year in the 1980s according to Cobb and Cobb (1994, p. 76). They suggest resource depletion, long-term environmental damage and a more unequal income distribution as the main factors for the decline in the ISEW.

For Germany, basically the same trend is detected covering the period 1950 to 1987: Diefenbacher (1994, p. 228) finds after 1980 "ongoing growth of the GNP, but a rather sharp decline of the ISEW". He provides basically the same reasons for this decline in the German ISEW in the 1980s as Cobb and Cobb (1994) do for the U.S.

Jackson and Marks (1994, p. 28) in a pilot study for the UK found that over the period 1950 to 1990 "there is virtually no overall growth" and the "per capita ISEW in 1990 is just 3% higher than it was in 1950". This dismal performance is mainly due to the 1980s for which Jackson and Marks (1994, p. 29) compute a *decline* in ISEW per capita of 4.7% p.a.! They cite rising income inequality and environmental degradation as major reasons for this dramatic decline in the last decade of their period of analysis (p. 32).

In the updated study, Jackson et al. (1997), the period up until 1996 is covered. As mentioned, the methodology for the computation of the revised index has somewhat changed from Jackson and Marks (1994). The two main changes are as follows:

- Income inequality is measured via computing a so-called Atkinson income instead of using a modified Gini coefficient. The Atkinson income indicates "the proportion of the present total income that would be required to achieve the same level of social welfare as at present if incomes where equally distributed" (Atkinson, 1983, p. 57). In varying an explicit parameter for aversion against inequality in income distribution, the valuation of income inequality is undertaken explicitly rather than implicitly as is the case with the Gini coefficient.
- Following the methodology of Cobb and Cobb (1994), Jackson and Marks (1994, p. 24) computed accumulating long-term environmental damage by valuing each tonne of coal equivalent

of non-renewable fuels consumed in the UK with a constant, rather arbitrary rate of £3.73 (1985 pounds Sterling).[5] Jackson et al. (1997) instead use explicit cost estimates for long-term environmental damage from global warming. Starting from an estimate of about £11 marginal costs per tonne of carbon emitted in 1990, they compute the costs per tonne of carbon in retrospect and up to 1996 under the assumption that marginal social costs of carbon dioxide emissions rise over time according to the cumulative level of emissions from past activities. As Cobb and Cobb (1994) did, Jackson et al. (1997) let the costs from long-term damage *accumulate* over time which is inappropriate since they use *marginal* damage costs for valuing CO_2-emissions. Jackson et al.'s (1997) method to compute damage from CO_2-emissions amounts to multiple counting.[6]

In spite of these changes in methodology, Jackson et al. (1997) come to the same basic conclusions as Jackson and Marks (1994). Mayo, MacGillivray and McLaren (1997, p. 1), the short version of Jackson et al. (1997), detect that "since 1980, according to the ISEW, real well-being has actually fallen by over 20 per cent". As key reasons for this decline they cite "environmental degradation (in particular depletion of non-renewable resources and long-term environmental damage) and income inequality" (p. 5). The decline in welfare shown by the updated ISEW is slightly smaller than the one detected by the pilot ISEW of Jackson and Marks (1994). "The principal reason for this has been the choice of a relatively low aversion to income inequality" (Jackson et al., 1997, p. 34).

For Austria, Stockhammer et al. (1997, p. 32), covering the period 1955 to 1992, come up with similar findings as the other studies. In addition, they cite the substitution of household work with market production as a major reason for the widening gap between GNP and the ISEW: the substitution increases GNP but not the ISEW since Stockhammer et al. (1997, p. 26) value the contribution of household labour to welfare in the ISEW according to market prices. The methodology Stockhammer et al. (1997) use is different in many respects from Cobb and Cobb (1994). The main changes are as follows:

- Instead of weighting the starting point, personal consumption expenditures, by a "distribution inequality index", it is the

final item, the ISEW, that is weighted for changes in income distribution.

- All investment items are multiplied by the productivity of capital in order to convert capital stocks into consumption flows.
- Most defensive expenditures are computed as the expenditures exceeding the level in the base year 1955. The idea is that 1955 represents something close to a sustainable level.
- For air and water pollution *potential* defensive costs are taken into account as well. Stockhammer et al. (1997, p. 23) define potential defensive costs as "those costs that would have occurred if society had reacted to environmental devaluation in the same way (concerning one 'unit of pollution') as it reacts today."
- Whereas Cobb and Cobb (1994) valued the depletion of non-renewable resources by replacement costs for renewable resources, Stockhammer et al. (1997) value this item as the value added of the Austrian mining sector. Long-term environmental damage is valued cumulatively similar to Jackson et al. (1997) and the same criticism that was raised against this method further above applies to Stockhammer et al. (1997) as well. Marginal social cost is assumed to be about öS 3402,30 in 1987 prices (about 150 pounds sterling) and is not assumed to increase over time (Hochreiter et al., 1995, p. 447).[7]

A CRITIQUE OF THE ISEW

LACKING THEORETICAL FOUNDATION

One of the most fundamental problems of an ISEW is that it lacks a sound theoretical foundation. The corrections are simply undertaken without giving any theoretically sound justification for doing so. The correction terms, e.g. those for the depletion of non-renewable resources and the cost of long-term environmental damage, are not derived from a dynamic optimisation model which would be able to provide a theoretically sound indicator of welfare (Hartwick, 1990). The same applies to corrections such as for the decrease in welfare due to traffic costs, health care, pollution abatement and other

expenditures that allegedly only function as a "defence" against a decline in welfare. More formal modelling has shown that defensive expenditures should not be netted out of consumption expenditures to arrive at an indicator of welfare (Mäler, 1991; Hamilton, 1994, 1996).

The ISEW can also be criticised for being arbitrary in the components it includes or (implicitly) excludes as contributors to welfare. One prominent item, defensive expenditures, provides a case in point. The concept of defensive expenditures is very dubious and elusive since it is rather arbitrary what should count as defensive. This argument applies both to the question of what should count as environmentally defensive expenditures and to what should count as defensive expenditures in general. If health expenditures are defensive expenditures against illness, why should food and drinking expenditures not count as defensive expenditures against hunger and thirst? Are holiday and entertainment expenditures defensive expenditures against boredom? Should they all be subtracted from consumption expenditures? Daly and Cobb (1989, p. 78) defend their concept of subtracting defensive costs in saying that " 'defensive' means a defense against the unwanted side effects of other production, not a defense against normal baseline environmental conditions of cold, rain and so on." But even accepting this definition, one could argue that at least part of food, drink, entertainment and holiday expenditures are caused by the stressful, exhausting and boring modes of modern production that make these expenditures necessary as a defense against their unwanted side effects. As the United Nations' revised system of national accounts rightly retorts: "Pushed to its logical conclusion, scarcely any consumption improves welfare in this line of argument" (United Nations 1993, p. 14).

More generally, what determines welfare is open to everybody's own subjective judgement. If you include a correction term for income inequality, why not include a correction term for the degree of political freedom, a correction term for the extent of crime or a correction term for the degree of equality between the sexes? And how do you provide a reliable estimate of these correction terms?

RESULTS DEPENDING ON ARBITRARY ASSUMPTIONS

To substantiate the critique that the results of the ISEWs depend on arbitrary assumptions, let us have a closer look at the two main determinants of the decline in the ISEWs, namely environmental degradation and "worsening" income distribution.

Let us start with the latter first: The valuation of the distribution of income fails to command general agreement. Mishan (1994, p. 172) is right in noting that "all efforts to adjust the welfare index to accommodate changes in distribution (. . .) must be regarded with misgivings. They are either arbitrary or politically biased and are, therefore, invariably a focus of attack." Of course, not undertaking any explicit valuation is tantamount to assuming implicitly that the marginal utility of income is constant and the same for the rich and the poor alike – an assumption no less arbitrary than the one embraced by the proponents of an ISEW. The fact that the weighting for income distribution exerts a big influence on the ISEW should caution against adjustments for changes in distribution, however. In Cobb and Cobb (1994), e.g., the ISEW for 1990 would be 12% higher without adjustments for income distribution. In Jackson et al. (1997) per capita ISEW between 1973 and 1996 is *declining* by 13.4% if income is weighted by the inequality index, but is *rising* by 7.8% without adjustment for changes in distribution. It follows that with appropriate weighting widely differing conclusions can be drawn.

As far as the ISEW is supposed to measure sustainability, i.e. the capacity to provide future welfare, it should be noted that the distribution of income at any given point of time does not directly impinge upon the capacity to provide future welfare: First, it is not clear *a priori* that a more equal society is more apt to secure non-declining future welfare. Torras and Boyce (1997, p. 9) find in an econometric cross-section study of the determinants of environmental quality that, contrary to their expectation, higher income inequality sometimes tends to improve environmental quality. Also, sustainability can be hampered by a more equal income distribution. Generally, future welfare is increased by raising current savings. How to do this? Since rich people usually have a higher marginal propensity to save than poor people, one way could be to redistribute income from currently poor to rich people. Hence, the goals

of intra- and inter-generational distribution can conflict with each other.

Second, there is no direct link between the distribution of income and sustainability. The personal income distribution can change quite dramatically over a course of, say, two or three generations and the current income distribution is almost irrelevant for a representative member of a future generation who is likely to be more concerned about whether the current generation strives for sustainability than about the current income distribution.

As concerns long-term environmental damage, the computations are largely dependent on highly disputable ad hoc-assumptions. Cobb and Cobb (1994, p. 266), e.g., value the consumption of a domestically produced barrel of oil or its equivalent in 1988 with 75 US$, because that is the presumed cost of replacing the barrel with renewable energy from biomass. For other years the replacement costs are computed in retrospect and are forwarded under the assumption that they rise at the constant rate of 3% p.a. over time. If you think 75 US$ is not much, compare it to the costs of importing a barrel of oil from abroad which is about 20 US$. Or compare it to the cost of providing solar energy in a couple of decades when U.S. non-renewable energy resources are depleted which will certainly be much less than 75 US$ and is decreasing over time, not increasing, as technical progress makes renewable resource use cheaper. Also, Cobb and Cobb (1994, p. 267) arbitrarily assume that the consumption of each barrel of oil or its equivalent causes accumulating environmental damage costs of 0.50 US$ due to CO_2-emissions and that the production of each kilogram of CFC-11 and CFC-12 causes accumulating damage of 15 US$ (p. 273). Without the corrections for the depletion of non-renewable resources, long-term environmental damage and ozone depletion the ISEW in 1990 would be 83.5% higher! These items are so large in magnitude that they dominate any other subtraction terms by one or two orders of magnitude.

To substantiate the critique that the results of ISEW-studies crucially depend on a number of arbitrary assumptions, we take a closer look at the ISEW of two countries. Figure 1 provides some sensitivity analyses for the U.S. ISEW. There are six graphs, all are presented in per capita terms and constant 1972 US$ to relate to

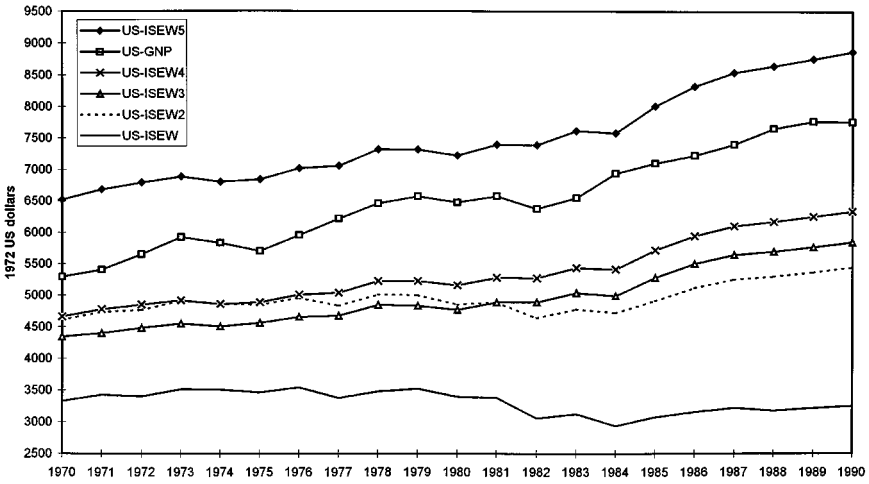

Figure 1. Sensitivity analysis for US-ISEW.

Cobb and Cobb (1994). For lack of data, only the period 1970 to 1990 is covered. The lowest graph plots the ISEW as presented in Cobb and Cobb (1994).

The dotted line called US-ISEW2 uses a different methodology for computing the depletion of non-renewable resources and long-term environmental damage than Cobb and Cobb (1994). It is computed as follows: Instead of arbitrary replacement costs for non-renewable resources, US-ISEW2 subtracts total Hotelling rents from consumption expenditures. Total Hotelling rents are the product of price minus average cost and resource depletion/harvest: (P-AC)*R.[8] Theoretical modelling (e.g. Hamilton, 1994, 1996) shows that this can be regarded as a plausible correction term to account for resource depletion/harvest, derived from a dynamic optimisation model.[9] Data are taken from World Bank (1997a). Note that US-ISEW2 is covering more non-renewable resources than Cobb and Cobb (1994) because it takes the depletion of mineral resources into account as well, not only energy resources. It encompasses Hotelling rents from oil, natural gas, hard coal, brown coal, bauxite, copper, iron, lead, nickel, zinc, phosphate, tin, gold, silver and forests.[10] As concerns long-term environmental damage, US-ISEW2 values annual CO_2-emissions at 20 US$ per metric tonne of carbon instead of arbitrarily assuming that each barrel of oil equivalent causes accumulating damage of 0.50$. Theoretical modelling (e.g. Hamilton, 1994, 1996) again shows that this is a reasonable

correction term to account for damage caused by CO_2-emissions. The 20 US$ is taken from Fankhauser (1995) and is often regarded as a consensus estimate for the *marginal* cost of CO_2-emissions. Data are again taken from World Bank (1997a). Since marginal costs are used, the damage costs are not accumulated over time.

The graph marked by the small triangles called US-ISEW3 is like US-ISEW2, but with the further change that consumption expenditures are not weighted with an index of distribution inequality. It is apparent from the graphs that US-ISEW2 and even more so US-ISEW3 are not only much higher than US-ISEW, but also follow the trend of US-GNP (per capita GNP, the graph marked with squares) rather closely. Instead of declining slightly over time as US-ISEW does, both US-ISEW2 and US-ISEW3 increase over time.

Hence, changing two sensitive parameters in Cobb and Cobb's (1994) methodology completely changes the presented picture about the changes in welfare and sustainability. US-ISEW2 is certainly to be preferred to US-ISEW on theoretical grounds since its correction terms for resource depletion and environmental damage are derived from modelling and not arbitrarily chosen. Whether US-ISEW3 should be preferred to US-ISEW2 depends on how you value distribution inequality.

Both US-ISEW2 and US-ISEW3 are still below US-GNP. This is because of the 14 items Cobb and Cobb (1994) subtract from personal consumption expenditures, I have only changed one (ISEW2) or two (ISEW3), respectively. Yet another criticism is that the ISEWs are constructed in a way that prompts one to suspect that their very aim is to show that welfare is lower than GNP and has risen much more slowly than indicated by GNP or has even fallen – e.g. by excluding investment into human capital and technical progress from their measurement (Eisner, 1994; Atkinson, 1995). Another correction that could be undertaken and would likely raise the ISEW considerably is adjusting for improved quality of consumer goods over time.

As concerns investment into human capital, Cobb and Cobb (1994, p. 53) exclude most expenditures for education because they believe that education "contributes little to productivity" and should hence not be counted as investment. On the other hand, Cobb and Cobb believe that education should not count as consumption

either since "most schooling appears to be defensive. In other words, people attend school because others are in school and the failure to attend would mean falling behind in the competition for diplomas or degrees that confer higher incomes on their recipients." As a consequence, only one-half of post-secondary education is counted as pure consumption (Cobb and Cobb, 1994, p. 54).

That education contributes little to productivity is at odds with most studies of the determinants of long-run growth (World Bank, 1995, p. 62) which usually hold that "human capital is the most critical factor of production" (Eisner, 1994, p. 99). In the graph with the small crosses called US-ISEW4 in Figure 1, education expenditures have therefore been fully added to US-ISEW3.[11] As can be seen in comparison to US-ISEW3, the level of welfare and sustainability is considerably higher with the inclusion of education expenditures.

As concerns technical progress, Weitzman and Löfgren (1997) have estimated the upward-correction to an indicator of sustainability due to expected future technical progress. For the U.S. they estimate that sustainable income in 1987 is about 40% higher than NNP, that is GNP minus depreciation of man-made capital. The exact magnitude of this estimate is dependent on a series of crucial assumptions (see Weitzman and Löfgren, 1997) and should not be given too much credit. More for illustrative purposes therefore, I have simply assumed that the estimate is correct and of the same magnitude for the rest of the period 1970 to 1990. The upper graph in Figure 1 with the black diamonds called US-ISEW5 plots the graph US-ISEW4 augmented by 40%. For every year, US-ISEW5 lies above US-GNP and would thus signal a higher achievement of sustainability.

Figure 2 provides an analogous analysis for the UK ISEW. All graphs are again in per capita terms, but constant 1990 pounds Sterling. The lowest graph plots the ISEW as presented in Jackson et al. (1997). The graph with the squares represents GDP. All other graphs are computed analogous to the analysis for the U.S. For simplicity and lack of different data it is assumed that the upward correction factor for technical progress is also 40%. The conclusions for this sensitivity analysis are quite similar: UK-ISEW2, UK-ISEW3 and UK-ISEW4 move rather close with UK-GDP. There is a growing gap between these modified ISEWs and the original UK-ISEW of

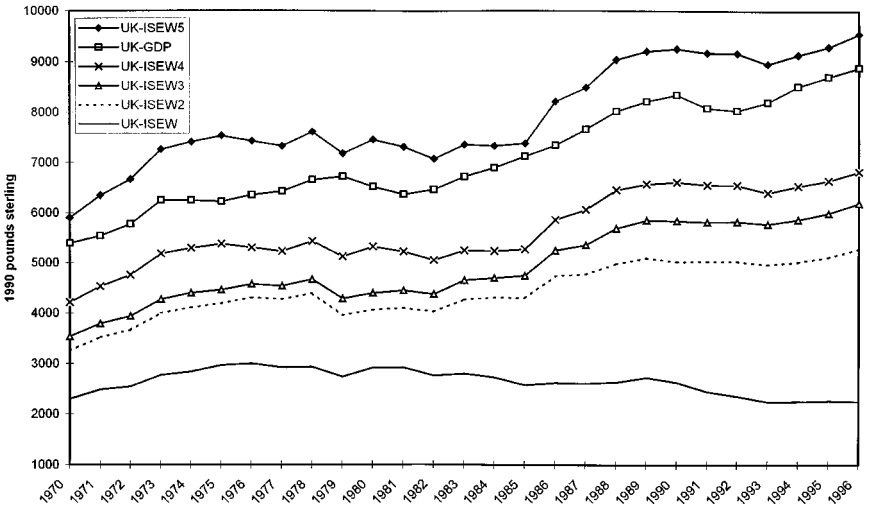

Figure 2. Sensitivity analysis for UK-ISEW.

Jackson et al. (1997). Again more for illustrative purposes, UK-ISEW5 takes account of the beneficial effects of technical progress which raises UK-ISEW4 by 40% and lies above UK-GDP in every year.

To conclude, with different assumptions about weighting of the income distribution, the corrections for the depletion of non-renewable resources and long-term environmental damage and the inclusion of the positive effects of human capital formation and technical progress, one gets a completely different picture of a society's welfare and achievement of sustainability.

GNP/GDP IS NOT AN INDICATOR OF WELFARE

Sometimes one gets the impression, however, that the constructors of ISEW-measures are not bothered very much by the subjectivity of the numbers they produce, as becomes clear in the following quotation taken from Cobb and Cobb (1994, p. 252): "The point is rather that when the GNP functions politically as a welfare measure, it should not be allowed to masquerade as a measure that is somehow more objective than alternative ways of determining well-being."

It has to be conceded that Herman Daly, one of the first proponents of an ISEW, is aware of the many criticisms that can be raised

against the ISEW. At the same time, however, he claims that it is a much better indicator of welfare and sustainability than GNP and is thus justified: "Of course we had to make many arbitrary judgements, but in our opinion no more arbitrary than those made in standard GNP accounting – in fact less so. (...) We have no illusions that our index is really an accurate measure of sustainable economic welfare. ... We did not offer the ISEW as the proper goal of economic policy – it too has flaws. If GNP were a cigarette, then the ISEW would be that cigarette with a charcoal filter" (Daly, 1996, p. 97f.). Similarly, Stockhammer et al. (1997, p. 33) argue that "the ISEW seems qualified to kick GDP from the throne as leading indicator for economic policy" while acknowledging that "it is not ready to usurp that throne".

The proponents of an ISEW rightly argue that GNP rests on highly artificial and dubious assumptions as well, e.g. in valuing public services at factor costs and ignoring household labour. And it is definitely a very bad indicator of welfare, especially in an inter-temporal context encompassing future generations.[12] It takes little account of the contribution of natural capital to economic activity and welfare and of the reverse impact of the economy on the environment. Sometimes it is directly misleading as an indicator of welfare, e.g. when higher expenditures for the clean-up of rising pollution are counted as an increase in GNP. The same holds true when the liquidation of a capital stock, be it natural or not, is counted as an addition to value although capital consumption will eventually lead to economic decline. Also, it makes no attempt whatsoever to value environmental externalities. This is to be conceded.

But it has to be kept in mind that GNP/GDP was never supposed to be an indicator of welfare and that it fulfils quite well the function it was supposed to accomplish when it was established after the Second World War: To provide an indicator for macroeconomic stabilisation policy of the economic activity in a country (Hamilton et al., 1994, p 7), i.e. an indicator of the total output produced by the economy.[13] The revised system of national accounts states this with unambiguous clarity: "Neither gross nor net domestic product is a measure of welfare. Domestic product is an indicator of overall production activity" (United Nations, 1993, p. 41). And "total

welfare could fall even though GDP could increase in volume terms" (ibid., p. 14).

It was not the economists, but the politicians and the journalists who interpreted GNP wrongly as an indicator of welfare. To be correct, there was some debate among economists by the time the national accounts were built up, but as Cobb and Cobb (1994, p. 20) admit, "those who wanted to measure production won out over those who believed that the national accounts should measure welfare". That is not to say that economists are completely innocent as concerns the misinterpretation of GNP. Although they have usually not supported the misinterpretation of GNP as a welfare indicator, it is true that they are devoted to provide measures against a downfall in GNP or, better, for triggering higher growth in GNP.[14] Also, in dealing with complex issues such as global warming, they occasionally equate welfare with consumption growth which is loosely represented by GNP (see, for example, Nordhaus, 1991). In this respect, Cobb and Cobb (1994, p. 250) are right in saying that "as long as GNP is treated by economists as the 'central framework' (. . .), political leaders and the media will continue to view the GNP as a measure of welfare." But what should the ensuing conclusion be? My argument is that it would be a mistake to conclude that we are in need of an alternative single indicator of welfare and sustainability. This reasoning is spelled out in detail in the concluding section. Let us first look at another criticism of the ISEW, however.

METHODOLOGICAL INCONSISTENCIES

The authors of ISEWs commit the mistake of methodological inconsistency in two respects:

1) Contrary to what their authors think, the ISEW *cannot* at the same time function both as an indicator of current welfare *and* an indicator of sustainability, i.e. the capacity to provide non-declining welfare over time. This is because the ISEW consists or should ideally consist of items that should only be included in an indicator of current welfare or only in an indicator of sustainability. I have argued already that while distributional inequality might be important for current welfare, its link to sustainability is rather weak. Another example for an item that should ideally be included

in a welfare measure but not in an indicator of sustainability is leisure time. The ISEWs usually neglect the valuation of leisure time because doing so "would so totally swamp all other figures in such an index as to make every other aspect of welfare trivial by comparison" (Cobb and Cobb, 1994, p. 275) – at least if leisure time is valued by an average wage rate, as is commonly done. Cobb and Cobb (1994, p. 275) realise, however, that there "is no particular reason within economic theory" for not including leisure time in a welfare indicator. But the valuation of leisure time has no direct link whatsoever to sustainability. An increase in the wage rate or a decrease in working hours would raise the valuation of leisure time, but would not increase the capacity to provide future welfare.

Reversely, there are many items that are relevant for a sustainability but not for a welfare indicator. The depletion of non-renewable resources and long-term environmental damage due to CO_2-emissions, while diminishing sustainability, does not affect current welfare.

The lesson is that one needs at least two indicators to measure two related, but distinct entities. Doing otherwise leads to methodological inconsistencies.

2) The ISEW does not fulfil the objective it was originally constructed for. It has been proposed by "ecological economists" who are in favour of a "strong" version of sustainability (Daly, 1992, 1996; Daly and Cobb, 1989). Strong sustainability has been developed as an opposing critique to "weak sustainability" which assumes that natural capital is perfectly substitutable through other forms of capital (Solow, 1974, 1993a,b; Hartwick, 1977, 1990). Weak sustainability requires keeping the *aggregate total value* of man-made capital and natural capital at least constant to ensure non-declining welfare over time. Natural capital can be safely run down as long as enough other forms of capital are built up in exchange. Strong sustainability instead calls for keeping *both* the *aggregate total value* of man-made, natural and other forms of capital *and* the *total value of natural capital itself* at least constant.

The proponents of strong sustainability have postulated some management rules as a kind of rule of thumb to put their concept into practice. Those rules are:

- Use renewable resources such that its stock does not deteriorate. That is: Harvest at maximum the maximum sustainable yield.
- Decrease the use of non-renewable resources as far as possible and replace their use with renewable resources (subject to the first rule, of course).
- Maximise the efficiency of resource use and the recycling of resources.
- Use the environment as a sink for pollution such that its natural absorptive capacity does not deteriorate over time.

Strictly speaking, as the management rules make clear, proponents of strong sustainability want even more than keeping the total value of natural capital at least constant. What they want, in effect, is keeping the total value of three sub-categories of natural capital constant: first the aggregate of renewable resources, second the aggregate of renewable and non-renewable resources and third the aggregate of pollution-absorbing-capacity.

What is really surprising, however, is that the ISEW does not explicitly distinguish sub-indices for different forms of total capital (e.g. man-made and natural capital) and different forms of natural capital (e.g. renewable and non-renewable resources), but eventually computes one overall index only. This meshing together of values from natural and other forms of capital amounts to a conceptual break since the heart of the concept of strong sustainability demands that natural capital itself and even sub-categories of natural capital are held constant. Ironically, the ISEW does *not* measure strong sustainability, but weak sustainability at best since it assumes perfect substitutability among different forms of capital![15]

CONCLUSIONS AND POLICY IMPLICATIONS

For policy purposes concerning welfare and sustainability it would be important to have relevant and reliable indicators. Unfortunately, the weaknesses of the foundations on which the ISEW rest discredits its policy relevance.

As Thage (1989, pp. 319 and 329) observes, even the NNP, which subtracts depreciation of man-made capital from GNP and is therefore closer to a welfare concept than GNP, is hardly used

nationally or internationally due to the uncertainty about the estimates of depreciation of man-made capital. For many developing countries no NNP-figures are available at all. Instead, the GNP (that is: without depreciation of man-made capital) is used widely, even in contexts where use of NNP would theoretically be appropriate, e.g. in studies of value addition within industries. Thage concludes that adding further correction terms to arrive at an indicator of welfare would be politically irrelevant: "Nobody would pay any attention if a further reduction of this concept was made" (Thage, 1989, p. 329). This might be too strong a conclusion, but doubts remain about the policy relevance of an ISEW-measure that necessarily rests on arbitrary assumptions and can be shown to be invalid as a reliable indicator for welfare and sustainability.

Daly (1996, p. 115) acknowledges the difficulties in constructing a better indicator of welfare, but sees the ISEW justified by preferring "even the poorest approximation to the correct concept" to "an accurate approximation to an irrelevant or erroneous concept" while at the same time conceding that "the mere existence of any numerical index of welfare is a standing invitation to the fallacy of misplaced concreteness" (ibid., p. 98). Similarly, Sheng (1995, p. 10f.) in a study for the World Wide Fund for Nature calls for integrating "environmental ad resource values into the core" of the current system of national accounts until the system itself together with "its indicators such as GDP are completely abolished".

Richter (1993, p. 308), on the contrary, suggests that instead of constructing a dubious alternative welfare indicator all activities should be devoted to facilitate the proper interpretation of GNP. Personally, I doubt whether one could succeed in preventing policy-makers and the general public from misusing GNP as a welfare indicator. Now, that the welfare interpretation of GNP has become absolute folklore and a common place it might be too late to start warning against a misinterpretation of GNP. But that is not an argument in favour of constructing another measure that requires even more carefulness in interpretation. Richter (1993, p. 309) is right in arguing that "if national accountants have failed to inform decision makers and the broad public about the scope and limits of the indicators they provide, can they really hope that the users will avoid the crucial problems of misinterpretation in the case of an intellectually

much more demanding expanded system which comprises observed facts and sophisticated model results?".

The problem with the ISEW is not so much the imperfections of its components – in some way or other every social indicator is imperfect. The problem rather is that it promises to measure something, namely current welfare and sustainability, that cannot reliably be measured in one indicator.

I suspect that the reason why so much effort is put into attempts to measure an ISEW is an understandable but misplaced desire to arrive at a single number and at a clear-cut indicator for current welfare and sustainability. With appropriate assumptions one can always produce some figures. In doing so, researchers fall into the trap of misplaced concreteness: their desire for a single clear-cut indicator is so strong that, consciously or not, they repress the insurmounting problems of arriving at the "correct", and not just any, number. They ignore that current welfare and sustainability are entities much too complex that they could be dealt with by a single indicator. As Common (1993, p. 10f.) rightly notes: "Indeed, it could be argued that the pursuit of such a measure is counterproductive, in so far as it mis-represents the nature of the sustainability problem." Richter (1994, p. 218) therefore calls attempts to construct alternative welfare indicators futile "shadow boxing" that waste scarce time and resources.

In the end, sticking to GNP and warning against misinterpreting it as an indicator of welfare for me seems to be the best conclusion one can draw. That is not to say that further research and effort should not be undertaken to improve existing and develop new indicators of welfare. A whole set of indicators are existent already, many of which have been published and extensively discussed in this journal. What should be abolished, however, is the misplaced and misleading belief that there can be one single indicator that measures both current welfare and sustainability and commands enough general agreement to brush away GNP in the attention of policy makers and the public. Carson and Young (1994, p. 112) – one the Director, the other Chief Statistician of the Bureau of Economic Analysis of the U.S. Department of Commerce – are right in arguing that "a single-dimension aggregate measure of sustainable welfare will be of little direct use in guiding, shaping, or choosing among government poli-

cies because the factors determining welfare cannot be reduced and combined into a single measure that would command widespread agreement and acceptance. In this respect, a measure of welfare differs from the GNP."

As concerns the welfare impact of environmental changes, even one of the major pioneers of deriving a theoretically correct measure of sustainability admits that "we will have to continue relying on physical and other special indicators to a large extent in order to judge the performance of the economy with respect to the use of environmental resources" (Mäler, 1991, p. 1). As concerns sustainability, Robert Solow (1993b, p. 180), on whose work the concept of weak sustainability is based upon, realises that "sustainability is an essentially vague concept, and it would be wrong to think of it as being precise, or even capable of being made precise. It is therefore probably not in any clear way an exact guide to policy". This conclusion is shared by Norgaard (1994, p. 22) who states that "it is impossible to define sustainable development in an operational manner in the detail and with the level of control presumed in the logic of modernity", and by Folke and Kaberger (1991, p. 289) who state that "it is not meaningful to measure the absolute sustainability of a society at any point of time".

NOTES

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1 The difference between GNP and GDP is that GDP includes output produced by foreigners within a country and excludes output produced by nationals abroad. The difference is usually quite small. Whenever I speak of GNP in the following, strictly speaking it should read GNP/GDP.

2 For an overview of early attempts to provide a monetary welfare indicator see Eisner (1988).

3 The updated UK-study, e.g., made frontpage headline news (Jackson et al. 1997, foreword).

4 Man-made capital here means produced capital as defined in the conventional system of national accounts.

5 The idea behind letting the costs accumulate over time is as follows: Cobb and Cobb (1994, p. 74) "imagined that a tax or rent of $0.50 per barrel-equivalent had been levied on all non-renewable energy consumed during that period and set aside to accumulate in a non-interest-bearing account (. . .). That account might

be thought of as a fund available to compensate future generations for the long-term damage (. . .).”

[6] A simple thought experiment shows that Jackson et al.’s (1997) method *must* be wrong. With a marginal cost of £11 per tonne of carbon and a carbon content of 0.13 tons per barrel of oil (Poterba, 1991, p. 75), cumulative damage of CO_2-emissions would amount to about £28 per barrel of oil over a period of only 20 years, if for simplicity discounting is ignored for a moment. If damage from burning a barrel of oil was really so high, then the government should even think about an outright ban for the use of oil! Clearly, multiple counting leads to absurdly high damage costs.

[7] Note that this figure for marginal social costs per tonne of carbon emitted is at the upper bound (or even beyond) of available estimates (see Fankhauser, 1995, pp. 58–72; IPCC, 1996, p. 215). This stands in marked contrast to Hochreiter et al.’s (1995, p. 450) assertion that their method excludes the possibility of damage overestimation.

[8] Strictly speaking, Hotelling rents are defined in terms of marginal costs. The more readily available average costs are used as a proxy to marginal costs. Note that the value of resource depletion is higher with average than with marginal costs which gives the US-ISEW2 graph a downward bias.

[9] In Neumayer (1998) it is argued, however, that only part of Hotelling rents should count as capital depreciation in accordance with the so-called “El Serafy”-method. I use the World Bank’s method of subtracting total Hotelling rents here nevertheless, because it invariably produces a bigger correction term for resource depletion than the “El Serafy”-method. This is to be welcomed since I want to be rather conservative in changing assumptions from the ISEW-computations: If it can be shown that the correction for resource depletion using the World Bank’s method leads to differing conclusions than using Cobb and Cobb’s (1994) method, this result woud be strengthened if the “El Serafy”-method was used instead of the World Bank’s method.

[10] For more detail on the data see World Bank (1997b) and Kunte et al. (1997).

[11] Counting all current education expenditures (including teachers’ salaries, expenditures on textbooks etc.) as contributions towards increasing the stock of human capital is likely to overestimate this item somewhat. Hence, the US-ISEW4 graph is somewhat biased upwards.

[12] However, Daly’s (1996, p. 112) claim that GNP bears no closer relation to welfare than the stock of gold bullion did in the age of mercantilism is vastly overdrawn. As Beckerman (1995, p. 108f.) rightly retorts: If this was true, why do people almost always migrate towards countries with a higher GNP and rarely vice versa? Also, as Dasgupta (1990) and Dasgupta and Weale (1992) show, at least in poor countries GNP is highly correlated with basic indicators of the quality of life such as life expectancy, infant mortality, adult literacy and indices of political and civil rights.

[13] It has to be conceded, however, that it does so rather imperfectly in developing countries where, often, much of the economic activity in the so-called informal sectors is not taken into account. Also, mainly only marketed economic activ-

ity is included since domestic and personal services produced and consumed by members of the same household or provided without payment are omitted. In addition, economic activity in the black market is by its very nature not included in GNP/GDP.

[14] Note, however, that this concern can be justified by the close link between changes in GNP and government revenue, employment etc., i.e. without recourse to welfare.

[15] Jackson and Marks (1994, p. 35), the authors of the early UK-study, acknowledge the limitedness of the index they compute: "On the other hand, a level of welfare which burdens future generations with a polluted environment, depleted resources, and social disintegration, cannot be said to be sustainable, even if it is measured at a lower value than the wealth that created it. (...) It is not our contention therefore that the UK-ISEW reflects a level of welfare intended to ensure the future sustainability of the economic and social system. (...) Rather, we suggest that the ISEW should be regarded only as a *de minimus* indicator of the sustainability or unsustainability of past actions, and not as any kind of insurance policy against the future."

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