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Is a democratic–capitalist system compatible with a low-growth or steady-state economy?

Philip Lawn

School of Business Economics, Adelaide, Australia

Correspondence: Philip Lawn, School of Business Economics, GPO Box 2100, Adelaide, SA, 5001 Australia.
E-mail: phil.lawn@flinders.edu.au

Many ecological economists have called for a rapid transition to a low-growth and eventual steady-state economy. In response, a number of observers have questioned the capacity for a democratic-capitalist system to achieve such a goal. Others simply refute the suggestion that growth needs to be curtailed. It is argued in this paper that: (a) growth is eventually detrimental to human well-being and, as a consequence, a steady-state economy is a long-run necessity; (b) a steady-state economy can accommodate the requirements of a capitalist system; and (c) a would-be-government wishing to impose the macro constraints advocated by ecological economists to bring forth a steady-state economy is potentially electable. As such, there is no reason why a steady-state economy and a democratic–capitalist system should not thrive in each other's presence.

Keywords: democratic–capitalist system, limits to growth, steady-state economy
JEL classification: P16; Q20; Q43

1. Introduction

Ecological economists believe there are biophysical and existential limits to growth and have thus called for a rapid transition to a low-growth and eventual steady-state economy (Daly, 1973, 1977, 1996). While a number of observers have revealed themselves to be sympathetic to the ecological economic position, many question the capacity of a democratic–capitalist system to achieve such a goal (Olson, 1973; Heilbroner, 1974; Thurow, 1980; O'Connor, 1994; Luban, 1998). There are, however, a great number of commentators who are less kind to ecological economists. Such commentators openly refute the suggestion that growth needs to be curtailed

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(e.g. Beckerman, 1992). Doubts about the ecological economic position rest on the back of three generally held beliefs: first, that growth is desirable and can be sustained provided there is adequate substitution and resource-saving technological progress; secondly, both a low-growth economy (LGE) and a steady-state economy (SSE) are inconsistent with the imperatives of a market-based capitalist system; and thirdly, only an authoritarian regime could impose and maintain the macro-environmental constraints advocated by ecological economists.

The aim of this paper is to demonstrate, firstly, that a SSE is a long-run imperative, and secondly, that a LGE and eventual SSE are compatible with a democratic–capitalist system. To do this, a number of key questions are specifically addressed, namely:

- What is required for an economic system to operate sustainably and why does such a requirement necessitate an immediate transition to a LGE and the eventual transition to a SSE?
- Since the profit motive is central to a capitalist system, can profits (as well as high wages and income) be sustained in the presence of a SSE?
- Will private incentive and the desire to invest be stultified by a SSE?
- Is full employment an achievable macroeconomic objective in a SSE?
- Since a macro-environmental constraint on the rate of resource throughput is a likely steady-state requirement, is there any possibility of it being imposed by a democratically elected government, or is it only possible in the presence of an authoritarian regime?
- Is a national transition to a SSE possible in a globalised world economy?

2. The necessity of a low-growth and eventual steady-state economy

Before we can move on, it is first necessary to understand what ecological economists mean by a SSE. The first thing of note is that a SSE is comprised of a constant magnitude of physical goods maintained by a resource flow consistent with the regenerative and waste assimilative capacities of the natural environment. That is, the SSE is designed to be ecologically sustainable. Also constant in a SSE is the population of human beings. The second major characteristic of a SSE is that it need not be static, dull or stultifying. Through improvements in product design and a variation in the market allocation of the incoming resource flow over time, a SSE can be as dynamic as any economy. Moreover, qualitative improvement or 'development' can still be achieved provided consumed or worn out goods are replaced by new goods exhibiting higher benefit-yielding qualities. An increase in time devoted to leisure activities and a greater sense of purpose can also contribute to the development process in a SSE.

To consider in more detail why a SSE is a long-run necessity, one must begin with a concrete representation of the physical aspects of the economic process. Unfortunately, most assessments of the long-run desirability of growth are based on the circular flow model of the macroeconomy. This standard representation of the economic process depicts a pendulum movement between production and consumption within a completely closed and isolated system. In this model, the exchange value embodied in human-made goods flows from firms to households and is called the Gross Domestic Product (GDP). An equal value flows back to firms from households and is called the national income. Since the circular flow representation of the macroeconomy is that of an isolated system, there are no inflows of resources nor outflows of wastes. Totally overlooked or ignored is the 'throughput' of matter–energy that connects the circular flow of exchange value to the natural environment.

What if the economic process is viewed in terms of the physical goods required to experience the enjoyment of life? The focus of attention moves to the production and consumption of physical goods. Since both activities are physical transformation processes (production involving the rearrangement of matter–energy and consumption its disarrangement), it is the linear throughput of matter–energy that is now dominant and the circular flow of exchange value that is incidental. Regrettably, when it comes to the physical aspects of the economic process, most economists continue to view the macroeconomy from the perspective of a circular flow. As a consequence, it is erroneously believed that what is true of the abstract symbol that measures the exchange value of physical goods is also true of physical goods themselves (i.e. physical goods have the ability to circulate independently of the natural environment).

2.1 The linear throughput representation of the economic process

The deficiencies inherent in the circular flow representation of the physical aspects of the economic process are overcome by employing a linear throughput model of the macroeconomy (see Figure 1).

Unlike the circular flow model, the linear throughput model depicts the macroeconomy as a subsystem of the natural environment. To explain the linear throughput model further, five key magnitudes require elaboration. The first key magnitude, *natural capital*, constitutes the original source of all human endeavours. This is because natural capital is the only source of low entropy resources; it is the ultimate waste-assimilating sink; and it is the sole provider of the life-support services that maintain the habitability of the Earth. The second key magnitude is the *throughput of matter–energy*, i.e. the input into the economy of low entropy resources and the subsequent output of high entropy wastes. The throughput flow is the physical intermediary connecting natural and human-made capital.

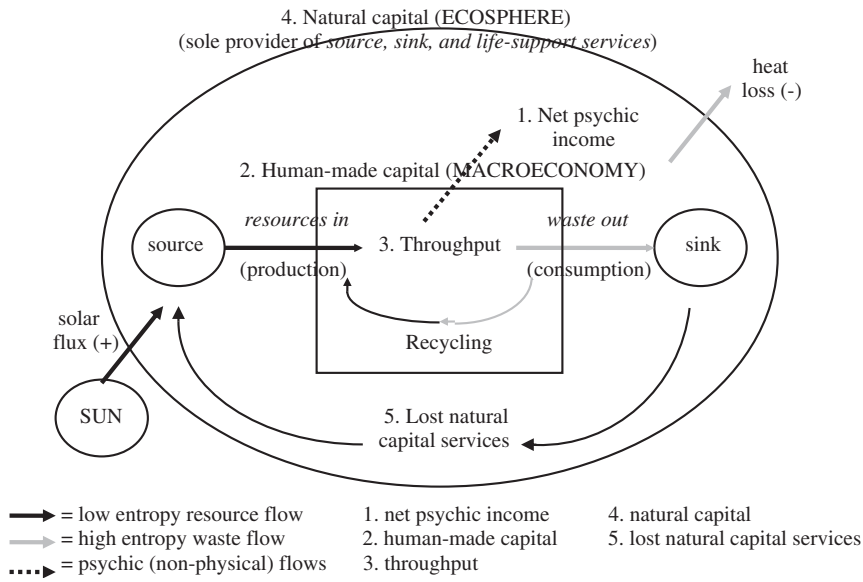

Figure 1 A linear throughput representation of the economic process.

Human-made capital is the third key magnitude and is needed for human welfare to be greater than it would otherwise be if the economic process did not take place. Conventionally, human-made capital is confined to producer goods such as plant, machinery and equipment. From a so-called ecological economic perspective, capital is interpreted in the Fisher (1906) sense as all physical objects subject to ownership that are capable of directly or indirectly satisfying human needs and wants. Hence, human-made capital refers to durable consumer goods as well as producer goods. Although not subject to ownership (other than by the individual who possesses productive knowledge and skills), labour can also be included as part of the stock of human-made capital.

The fourth key magnitude is a psychic rather than physical category. Contrary to some opinions, human well-being depends not on the rate of production and consumption, but on the psychic enjoyment of life (Boulding, 1966; Georgescu-Roegen, 1971; Daly, 1996). Fisher (1906) referred to such a flux as 'psychic income'. Most economists refer to the psychic enjoyment of life as utility satisfaction. Psychic income is the true benefit of all economic activity and has four main sources. The first source of psychic income comes from the consumption and use (wearing out) of human-made capital. The second source of psychic income is derived from being directly engaged in production activities (e.g. the enjoyment and self-worth obtained from work). A third source of psychic income comes

from non-economic pursuits, such as time spent with family and friends, volunteer work and leisure activities. Clearly, socio-economic factors, including institutional arrangements, are an integral part of the linear throughput model and should not be ignored when considerations are given to what contributes to both directly and indirectly to human well-being. The final source of psychic income flows from the natural environment in terms of its aesthetic and recreational qualities. It is true that this final source of psychic income does not come directly from economic activity. If anything, such activity tends to destroy rather than enhance such values. It is therefore better that these values be taken as a given and their subsequent destruction be counted as an opportunity cost of the economic process.

This last point reminds us that not all economic activity enhances the psychic enjoyment of life. Consumption of some portion of human-made capital can reduce the psychic enjoyment of life if consumers make bad choices or if needs and wants have been inappropriately ranked. In addition, while benefits can be enjoyed by individuals engaged in production activities, for most people, production activities are unpleasant. Unpleasant things that lower one's psychic enjoyment of life (e.g. noise pollution and commuting to work) represent the 'psychic outgo' of economic activity. It is the subtraction of psychic outgo from psychic income that leads to a measure of *net psychic income*—the fourth of our key magnitudes. Net psychic income is, in effect, the 'uncancelled benefit' of economic activity (Daly, 1979). Why? Imagine tracing the economic process from natural capital to its final psychic conclusion. Every intermediate transaction involves the cancelling out of a receipt and expenditure of the same magnitude (i.e. the seller receives what the buyer pays). Once a physical good is in the possession of the final consumer, there is no further exchange and, thus, no further cancelling out of transactions. Apart from the good itself, what remains at the end of the process is the uncancelled exchange value of the psychic income that the ultimate consumer expects to gain from the good plus any psychic disbenefits and other costs associated with the good's production.

The fifth and final key magnitude is the cost of *lost natural capital services* and arises because, in obtaining the throughput to produce and maintain human-made capital, natural capital must be manipulated and exploited both as a source of low entropy and as a high entropy waste absorbing sink. Perrings (1986) has shown that no matter how benignly human beings conduct their exploitative activities, the resultant disarrangement of matter–energy and inevitable coevolutionary feedback responses has deleterious impacts on the natural environment. Consequently, human beings must accept some loss of the free source, sink and life-support services provided by natural capital as some portion of the low entropy it provides is transformed into physical goods and returns, once they have been consumed, as

high entropy waste. In a similar way to net psychic income, lost natural capital services constitute the 'uncancelled cost' of economic activity. Why? Imagine tracing the economic process from its psychic conclusion back to natural capital. Once again, all transactions cancel out. What remains on this occasion is the opportunity cost of resource use or, more definitively, the uncancelled exchange value of any natural capital services sacrificed in obtaining the throughput of matter–energy to fuel the economic process.

In sum, the linear throughput model illustrates the following. Natural capital provides the throughput of matter–energy that is needed to produce and maintain the stock of human-made capital. Human-made capital is needed to enjoy a level of net psychic income greater than what would otherwise be experienced if the socio-economic process did take place. Finally, in manipulating and exploiting natural capital for the throughput of matter–energy, the three instrumental services that natural capital provides are, to some degree, unavoidably sacrificed.

The linear throughput model also shows that natural and human-made capitals are complementary forms of capital. Although technological progress embodied in human-made capital can reduce the resource flow required from natural capital to produce physical goods, for three related reasons, this does not amount to substitution (Lawn, 1999). First, technological progress only reduces the high entropy waste generated in the transformation of natural to human-made capital. It does not allow human-made capital to 'take the place of' natural capital. Secondly, because of the first and second laws of thermodynamics, there is a limit to how much production waste can be reduced by technological progress—100% production efficiency is physically impossible; there can never be 100% recycling of matter; and there is no way to recycle energy at all (Georgescu-Roegen, 1971). Thirdly, a value of one or more for the elasticity of substitution between human-made and natural capital is necessary to demonstrate the adequate long-run substitutability of the former for the latter. Yet the value of the elasticity of substitution derived from a production function obeying the first and second laws of thermodynamics is always less one (Lawn, 2003*a*). Thus, the production of a given quantity of human-made capital at all times requires a minimum resource flow and, therefore, a minimum amount of resource-providing natural capital (Meadows *et al.*, 1972; Pearce *et al.*, 1989, 1990; Costanza *et al.*, 1991; Folke *et al.*, 1994; Daly, 1996; Lawn, 2004*a*).

2.2 When is growth desirable (economic) and undesirable (uneconomic)?

A great advantage of the linear throughput model over the circular flow model is that it prompts one to ask the following questions: 'How big can the macroeconomic subsystem grow before the throughput of matter–energy required to maintain it can no longer be ecologically sustained?' And: 'How big should the

macroeconomic subsystem grow before economic welfare begins to decline and growth itself becomes uneconomic?'

Barring technological progress, Figure 2 indicates the eventual undesirability of growth as the physical scale of the macroeconomic subsystem expands. The uncancelled benefits (UB) curve in Figure 2a represents the net psychic income yielded by a growing macroeconomy. The characteristic shape of the UB curve is attributable to the law of diminishing marginal benefits, which, barring technological improvements, is equally applicable to the total stock of wealth as it is to individual items.

The cost of increasing the physical scale of the macroeconomy is represented in Figure 2a by the uncancelled cost (UC) curve. It represents the free source, sink and life-support functions lost in the process of transforming natural resources into physical goods. The shape and nature of the UC curve is attributable to the law of increasing marginal costs—a reflection of the rapid increase in costs arising from the macroeconomy growing relative to a finite natural environment. The UC curve is vertical at S_S to denote the *maximum sustainable* scale, i.e. the largest macroeconomic scale a nation can maintain at the maximum sustainable rate of throughput for given levels of human know-how. For any particular macroeconomic scale,

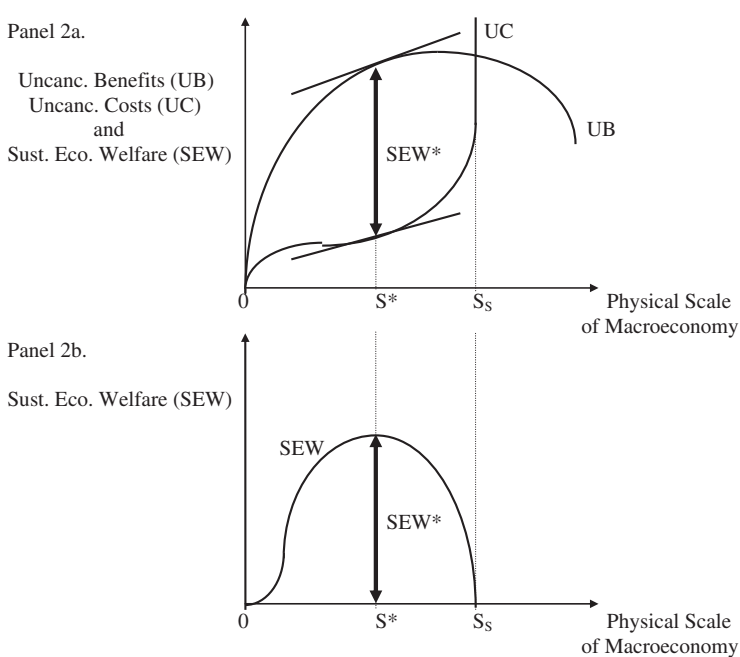

Figure 2 The changing sustainable economic welfare from a growing macroeconomy (adapted partly from Daly, (1977, p. 28).

sustainable economic welfare is measured by the difference between the UB and UC curves. Sustainable economic welfare is represented by the SEW curve in Figure 2b and is maximized at a macroeconomic scale of S*. This makes S* the *optimal* macroeconomic scale.

Figure 2 demonstrates that growth is a desirable macroeconomic objective only in the early stages of a nation's development process. Continued physical expansion of the macroeconomic subsystem, which is equivalent to moving along the UB and UC curves, eventually leads to a decline in sustainable economic welfare. Figure 2 also shows that an economic limit to growth is likely to precede any ecological limit. This suggests that growth is likely to become economically undesirable prior to becoming ecologically unsustainable.

2.3 Technology and sustainable economic welfare

It is impossible to totally ignore the role that technological progress plays in the development process. Advances in efficiency-increasing technological progress can beneficially shift the UB curve upwards and the UC curve downwards and to the right. For example, superior product design, a more equitable distribution of income and wealth (Robinson, 1962), a greater focus on non-consumption activities, and an improved organization of human beings in production-related activities (thereby reducing the cost of commuting, crime and unemployment) can enhance the net psychic income associated with a particular macroeconomic scale. By shifting the UB curve upwards and increasing the vertical distance between it and the UC curve, efficiency-increasing technological progress augments the sustainable economic welfare enjoyed by a nation's citizens. Better still, it achieves this without the need for macroeconomic expansion. Unquestionably, the steady-state economy need not, as some believe, preclude human development.

The UC curve can be shifted downwards and to the right by way of increased rates of recycling, greater product durability, reduced production waste, boosting the productivity of natural capital, and decreasing the ecological impact of natural capital exploitation. Again, beneficial shifts of the UC curve increase a nation's sustainable economic welfare. Moreover, and unlike shifts in the UB curve, technological advances that shift the UC curve increase a nation's maximum sustainable scale. That is, they allow a larger macroeconomy to be sustained by a rate of throughput consistent with the ecosphere's regenerative and waste assimilative capacities. Thus, small growth spurts are ecologically permissible *provided the macroeconomy is currently no larger than its maximum sustainable scale*. Unfortunately, few countries appear to be in such an advantageous position. Evidence provided by Wackernagel *et al.* (1999) suggests that the ecological footprint of most nations has exceeded their biocapacity. The majority of the world's macroeconomies already appear to have surpassed the equivalent of S_S in Figure 2.

2.4 Limits to the beneficial shifts of the UB and UC curves

Many would point to efficiency-increasing technological progress as a gateway to perpetual growth and an associated rise in sustainable economic welfare. Nothing, however, could be further from the truth. Scope for technological advances that beneficially shift the UC curve is considerably limited. For example, the first and second laws of thermodynamics forbid a 100% recycling rate of waste materials, 100% production efficiency and the recycling of energy altogether. Both laws also ensure that nothing is eternally durable. Secondly, it is impossible to indefinitely increase the productivity of natural capital. Regardless of how well natural capital is managed, the productivity of a one-hectare area of land could not be increased to meet the eating and waste assimilating requirements of a million people. Thirdly, at least some of the ecosphere's instrumental functions are always lost as a consequence of its exploitation (Perrings, 1986). In view of these limitations, which, according to some ecological economists, are fast approaching (e.g. Ayres and Ayres, 1999), it is clear that an upper limit exists on the maximum sustainable scale of macroeconomic systems. In other words, there is an inevitable biophysical limit to growth. It is because of this that ecological economists believe the transition to a SSE is a long-run necessity.

What about limits to beneficial shifts of the UB curve? This is a more complex issue because service, as a psychic rather than physical magnitude, can theoretically grow forever. Having said this, there are two things worthy of consideration. First, there is a probable limit on humankind's capacity to experience service—a person can, after all, only be so happy. Secondly, service does not exist independently of physical goods. For example, accounting services cannot be provided by an imaginary accountant working in an imaginary office typing away at an imaginary desk on an imaginary computer. It is, therefore, wrong to believe that services can be increased by shifting the economic process away from traditional manufacturing industries to the tourism, financial and information technology industries. Quite simply, manufacturing industries are required to maintain the human-made capital from which services can be enjoyed. More importantly, the belief that natural resource reliance can be reduced by making the transition towards so-called 'service industries' is a fallacy (Lawn, 2001).

For argument sake, let us assume that the UB curve can be shifted upwards indefinitely. In view of the fast approaching limits to beneficial shifts of the UC curve, a nation's progress will depend entirely upon whether it is able to shift its policy focus towards qualitative improvement (development) and away from quantitative expansion (growth). Clearly, a steady-state economy is not only a long-run necessity, it constitutes a macroeconomic prerequisite for continuing national development.

2.5 Empirical evidence

Empirical evidence is now surfacing to support the ecological economic position. Disconcertingly, it appears that almost all countries are performing poorly in terms of

achieving sustainable development. How and in what way? To begin with, green alternatives to GDP have been developed to measure the welfare impact of a growing macroeconomy (i.e. the benefits and costs of economic activity). Initially referred to as the Index of Sustainable Economic Welfare (ISEW) but often labelled the Genuine Progress Indicator (GPI), these alternative indicators effectively measure the vertical distance between a nation's UB and UC curves.[1] In almost every instance where the ISEW and GPI have been calculated (see Figure 3 for six examples), the sustainable economic welfare of the nation in question began a downward trend in either the 1970s or early 1980s (Max-Neef, 1995; Jackson and Stymne, 1996; Lawn and Sanders, 1999; Lawn, 2003*b*). There is, therefore, a strong suggestion that the macroeconomies of many developed nations have grown beyond their optimal scale.

Secondly, as mentioned earlier, ecological footprint assessments of most of the world's nations reveal that the majority have an ecological footprint in excess of their biocapacity (i.e. they have an ecological deficit). Table 1 reveals that most of the world's nations have an ecological footprint in excess of their biocapacity (i.e. have an ecological *deficit*). This is of great concern because it suggests that most macroeconomies have grown well beyond their optimal scale and are now exceeding their maximum sustainable scale. Although trade has been mooted as a possible means of enabling surplus countries to export ecological capacity to deficit countries, Table 1 indicates that the world, as a whole, is in ecological deficit by the tune of −0.7 hectares per person (average global footprint of 2.8 hectares/person compared with the average global biocapacity of 2.1 hectares/person). Indeed, the resource flow of 1.3 earths is necessary to sustain the world's consumption of food, forestry products and energy resources. As such, the world's stock of natural capital is being eroded (Wackernagel *et al.*, 1999). Although trade could potentially

[1] Both the ISEW and GPI are indexes comprised of a range of benefit and cost items related to the economic process. The list of items used to compile the indexes has varied over time, usually in response to emerging data sources or a change in the valuation technique used to calculate some of the items. The following is a list of the items used to calculate the GPI for the US for the period 1950–1995, and is typical of the list used in these such studies (Redefining Progress, 1995): private consumption expenditure (+); index of distributional inequality (+/−); personal consumption expenditure weighted either up or down in line with changes in the index of distributional inequality (+); cost of consumer durables (−); services yielded by consumer durables (+); services yielded by roads and highways (+); services provided by volunteer work (+); services provided by non-paid household work (+); public expenditure on health and education counted as personal consumption (+); cost of noise pollution (−); cost of commuting (−); cost of crime (−); cost of underemployment (−); cost of lost leisure time (−); cost of household pollution abatement (−); cost of vehicle accidents (−); cost of family breakdown (−); net capital investment (+/−); net foreign lending/borrowing (+/−); cost of lost farmland (−); cost of resource depletion (−); cost of ozone depletion (−); cost of air pollution (−); cost of water pollution (−); cost of long-term environmental damage (−); cost of lost wetlands (−); cost of logged old-growth forests (−). The GPI equals the sum of all positive (+) and negative (−) items and is measured in monetary values.

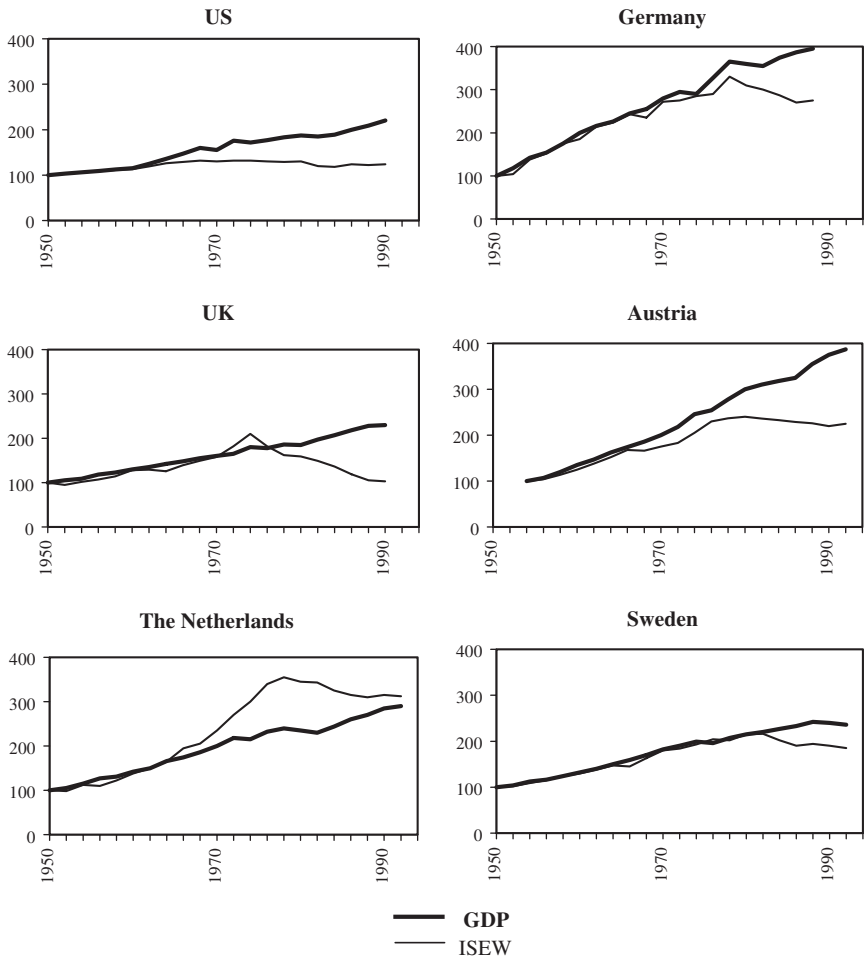

Figure 3 Comparison of GDP and ISEW for the US, Germany, UK, Austria, the Netherlands and Sweden (Jackson and Stymme, 1996).

facilitate the more efficient use of the world's resources, it is unlikely to be enough to permit the countries already in ecological deficit to sustain their current levels of economic activity into the future.

2.6 How does a nation achieve a LGE and eventual SSE?

There are many things that need to be done to make the transition to a SSE and it is patently impossible to discuss them all in this paper. I will therefore focus on one of the most important policy initiatives. Above all else, achieving a LGE and eventual SSE requires the throughput of matter–energy to be no greater than the regenerative

Table 1 Ecological footprint of 52 nations as at 1997 (35 nations in ecological deficit)

	Ecological footprint (hectare/capita)	Available biocapacity (hectare/capita)	Ecological surplus (+) or deficit (−)
Argentina	3.9	4.6	0.7
Australia	9.0	14.0	5.0
Austria	4.1	3.1	−1.0
Bangladesh	0.5	0.3	−0.2
Belgium	5.0	1.2	−3.8
Brazil	3.1	6.7	3.6
Canada	7.7	9.6	1.9
Chile	2.5	3.2	0.7
China	1.2	0.8	−0.4
Colombia	2.0	4.1	2.1
Costa Rica	2.5	2.5	0.0
Czech Republic	4.5	4.0	−0.5
Denmark	5.9	5.2	−0.7
Egypt	1.2	0.2	−1.0
Ethiopia	0.8	0.5	−0.3
Finland	6.0	8.6	2.6
France	4.1	4.2	0.1
Germany	5.3	1.9	−3.4
Greece	4.1	1.5	−2.6
Honk Kong	5.1	0.0	−5.1
Hungary	3.1	2.1	−1.0
Iceland	7.4	21.7	14.3
India	0.8	0.5	−0.3
Indonesia	1.4	2.6	1.2
Ireland	5.9	6.5	0.6
Israel	3.4	0.3	−3.1
Italy	4.2	1.3	−2.9
Japan	4.3	0.9	−3.4
Jordan	1.9	0.1	−1.8
Korean Republic	3.4	0.5	−2.9
Malaysia	3.3	3.7	0.4
Mexico	2.6	1.4	−1.2
Netherlands	5.3	1.7	−3.6
New Zealand	7.6	20.4	12.8
Nigeria	1.5	0.6	−0.9
Norway	6.2	6.3	0.1
Pakistan	0.8	0.5	−0.3
Peru	1.6	7.7	6.1
Philippines	1.5	0.9	−0.6

Table 1 Continued

	Ecological footprint (hectare/capita)	Available biocapacity (hectare/capita)	Ecological surplus (+) or deficit (−)
Poland	4.1	2.0	−2.1
Portugal	3.8	2.9	−0.9
Russian Federation	6.0	3.7	−2.3
Singapore	6.9	0.1	−6.8
South Africa	3.2	1.3	−1.9
Spain	3.8	2.2	−1.6
Sweden	5.9	7.0	1.1
Switzerland	5.0	1.8	−3.2
Thailand	2.8	1.2	−1.6
Turkey	2.1	1.3	−0.8
UK	5.2	1.7	−3.5
USA	10.3	6.7	−3.6
Venezuela	3.8	2.7	−1.1
World	2.8	**2.1**	**−0.7**
	2.8÷2.1 = 1.3 Earths		

Note: Hectares per capita expressed in terms of world average yield in 1993.
Source: Wackernagel *et al*. (1999, pp. 386–87).

and waste assimilative capacities of the natural environment. Once this is recognized, we are naturally led to a very important question—that is, can we rely upon the market to ensure ecological sustainability or do we need to go outside the market domain and impose a throughput constraint on the macroeconomy? It is here, again, where ecological economists are at odds with the mainstream position. Ecological economists believe markets are unable to ensure ecological sustainability because resource prices can only provide information about the scarcity of one resource relative to another; for instance, the scarcity of oil relative to coal. But sustainability is a question of the *absolute* scarcity of the very non-substitutable stuff that sustains the economic process—namely, low entropy matter–energy—and no amount of relative scarcity information can render the market effective at ensuring the sustainable rate of natural resource use (Howarth and Norgaard, 1990; Norgaard, 1990; Bishop, 1993; Daly, 1996; Lawn, 2002*a*). Hence, ecological economists believe that, to achieve ecological sustainability, it is necessary for a quantitative constraint to be imposed on the incoming resource flow, preferably by an appropriate government authority.

How might the resource constraint best be instituted? Since allocative efficiency is important in terms of minimizing resource wastage and facilitating beneficial forms of technological progress, a system of tradeable resource use permits stands as a

viable policy option (Lawn, 2000*b*). The system would operate along similar lines to the following. Having estimated the sustainable rate of resource throughput, a government authority would auction off a limited number of resource-use permits to the highest bidders. A restriction on the number of permits imposes the necessary constraint on the rate of resource throughput. A permit would grant the possessor the right to purchase a portion of the permissible resource flow from resource sellers. The auctioning process would be undertaken every year to allow the government authority to vary the number of permits in line with novel changes in the environment's regenerative and waste assimilative capacities. This would mean that a permit would expire at the end of each year even if unused. To maintain competitive markets, there would be a limit on the number of permits any single individual, firm or organization could purchase. All permits could be resold to another individual or firm so long as the buyer was not already in possession of the maximum permissible quota of permits. The premium paid for a permit by resource buyers' serves as a throughput tax to facilitate the efficient allocation of the incoming resource flow. Finally, the revenue raised from permit sales can be redistributed to the poor and those directly harmed by depletion/pollution activities.

3. Profits, incentive, and investment in a steady-state economy

Assume, for a moment, that ecological economists are correct—there is an urgent need to make the long-run transition to a SSE and, in order to initiate the shift, a quantitative throughput constraint must be imposed. Given the failure of socialism (in the sense of state control of all means of production), can development still be achieved in the context of a capitalist system? There are a number of things we know about capitalism that are necessary for it to endure and succeed. To begin with, the rate of profit must increase in order to sustain investment levels (Heilbroner, 1974). Secondly, a capitalist system requires an incentive structure that rewards effort, thrift and innovation. Thirdly, capitalism must be responsive to changing consumer demands. It is this reason why capitalism and markets largely go hand-in-hand. Fourthly, a capitalist system must be supported by a cultural commitment to expressive individuality (Luban, 1998). Without it, capitalism is retarded in terms of its ability to initiate and respond to change. Finally, a key element of capitalism is an ethos of economic advancement (Heilbroner, 1974). This is an interesting requirement in the sense that an economic system based on an ethos of economic advancement need not guarantee advancement in the future. Moreover, should the economic system fail to do as required of it and by it, it may ultimately collapse. It has already been pointed out that many capitalist countries appear to be experiencing a decline in sustainable economic welfare as their macroeconomies surpass the optimal scale. For all we know, the growth which has served capitalism well in the past and which many observers believe to be a capitalist imperative could prove to be capitalism's Archilles' heel.

In view of these capitalist imperatives, where do the LGE and SSE stand in relation to them? Heilbroner (1974) has argued that a low-growth or, more particularly, a stationary capitalist system is subject to a falling rate of profit because of the inevitable evaporation of investment opportunities. Thus, in the absence of an expansionary frontier, a deflationary spiral of incomes and mass unemployment would beset a SSE. O'Connor (1994) provides implicit support for Heilbroner by arguing that an insufficient level of profits would be generated by an economic system involving little more than maintenance of the *status quo*. Furthermore, since profit in a capitalist system functions as an incentive to expand, profit and growth constitute the means and ends of one another. It is this reason, according to O'Connor, why various and often opposing macroeconomic theories all have one thing in common—they presuppose a capitalism that cannot stand still. Capitalism must either expand or contract and any prolonged failure to achieve the former leads to the system's demise.

While I agree with the mechanics of what Heilbroner and O'Connor say, the weakness in their argument lies in the belief that a SSE is a static system. Both observers appear to arrive at this view by falling into the same trap as Olson (1973)—that a steady-state policy involves freezing the composition of output which, as Luban (1998) adds, results in the loss of occupational mobility and choice. But, as we have seen already, a SSE is not necessarily a stationary economy devoid of development potential. By improving both the quality of goods we produce and the manner in which we organize ourselves in the course of producing them, we can continue to realize our development aspirations in the presence of a constant physical quantity of human-made capital (i.e. positively shift the UB and UC curves in Figure 2). This allows for a more rapid rate of profit growth and the expansion of investment opportunities. In doing so, the potential for higher incomes and wages is maintained, as are the prospects for economic advancement and occupational mobility. Clearly, profits, incentive and investment are not jeopardized by a long-run transition to a SSE. Indeed, profits and investment opportunities would rise in a SSE of this type because, at present, growth is bringing about the decline in sustainable economic welfare as macroeconomies exceed their optimal scale. Unwittingly, a growing proportion of the incoming resource flow is now being allocated towards preventative and rehabilitative measures rather than welfare-enhancing activities (Lawn, 2000*a*). In addition, the depreciation of natural capital is increasing throughput costs. It is highly likely, therefore, that growth will limit future investment opportunities.

4. Full employment in a steady-state economy

Whilst profits, wages and incomes can rise in a SSE, is it possible for economic rewards to bypass a significant portion of a nation's citizens because of an inability

of a SSE to guarantee sufficient employment levels? In other words, is full employment, which is proving difficult to procure in a high-growth economy, be a more distant macroeconomic objective in a SSE? There are a variety of factors that contribute to unemployment. The impacts of all but one apply equally in both a high-growth economy and a SSE. The one factor that causes greatest unemployment concern is the impact of declining private investment. As we have just seen, investment levels need not fall and could well be higher in a SSE. There is, as a consequence, no reason to believe that the unemployment scourge should worsen during the transition from a high-growth economy to a SSE (unless a country has well exceeded its maximum sustainable scale and faces the prospect of a drastic macroeconomic reduction in the short-term).

While on the subject, we should consider briefly some of the policies that ecological economists are promoting to achieve full employment in a SSE (Lawn, 2002*a*). The most popular is a policy referred to as 'ecological tax reform' (ETR). ETR is a revenue-neutral policy designed to tax 'bads' and to reduce the tax impost on 'goods'. By 'bads' I refer to resource depletion and pollution generation, both of which we would prefer less of, yet are often subsidized by growth-obsessed governments. By 'goods' I mean profits, income, wages and employment, all of which we would prefer more of. The earlier discussed system of tradeable resource-use permits assists in the taxing of resource throughput. A reduction in tax rates on the above 'goods' helps to encourage value-adding in production while also inducing employer substitution towards labour. This increases employment levels. While ETR would in no way achieve full employment by itself, it certainly can alleviate much of the unemployment problem while simultaneously achieving a range of other crucial objectives.

The second policy initiative is the move towards a more flexible industrial relations system. There have been many instances around the world where modifications aimed at increasing the flexibility of industrial relations systems at the national level have inadvertently or surreptitiously led to the erosion of workers' wages and conditions of employment. May I say from the outset that ecological economists are not in favour of such changes. But they do support socio-economic modifications that not only guarantee appropriate minimum standards of pay and working conditions, but (a) permit easier income–leisure choices, and (b) increase labour productivity via more harmonious workplace relationships, horizontal decision-making structures, and incentive-based means of remuneration (Weitzman, 1984; Estrin, 1986; Blandy and Brummitt, 1990). While the latter facilitates increases in value-adding and the maintenance efficiency of human-made capital, the former, particularly if money incomes are rising, allows workers with a negative income elasticity of labour supply (backward-bending labour supply curve) to reduce their working hours and increase their welfare. This, in turn, allows work to be shared, thereby reducing unemployment.

Support for the final policy initiative is not shared by all ecological economists. It involves what some economists have referred to as a Job Guarantee (JG). The JG is a policy whereby the government acts as a buffer stock employer to continuously absorb unemployed labour displaced by the private sector (Mitchell and Watts, 1997). JG employees are paid the minimum award wage in order to set a wage floor for the economy. Spending by the government on the JG increases (decreases) as jobs are lost (gained) in the private sector. In doing so, the JG achieves 'loose' full employment.

One major concern expressed about the JG is its potential to exert inflationary pressure. Ecological economists also worry that the increase in government spending accompanying the JG could push the macroeconomy beyond its optimal scale, or worse still, beyond its maximum sustainable scale. I believe these legitimate concerns can be adequately dealt with and full employment can be arrived at in a SSE (see Lawn, 2002*b*). Unfortunately, a full explanation cannot be given in this paper. Nonetheless, it should be apparent that mass unemployment need not be the inevitable outcome of a transition to a SSE and that, with appropriate policy measures in place, a low rate of unemployment if not full employment can be successfully achieved.

5. Are democracy and the steady-state economy compatible?

It has already been shown that initiating the transition to a SSE is likely to require the imposition of a quantitative throughput constraint. There are a number of other macro constraints that ecological economists believe are necessary but will not be discussed in this paper (e.g. population growth control measures). Like the previously discussed tradeable resource use system, all essentially involve a policy approach based on macro control and micro flexibility (Daly, 1977; Costanza *et al.*, 1997; Lawn, 2000*a*). Given the lack of macro controls at present, ecological economists must consider whether any society is capable of imposing appropriate macro constraints through the conscious intervention of the electorate rather than by convulsive changes forced upon it.

For a variety of reasons, many observers believe not. Luban (1998), for example, argues that the notion of a SSE stands in stark contrast to the view of every democratic politician that national economies must grow robustly and that low or no growth is political suicide. Moreover, Luban, following Olson (1965), suggests that interest groups benefiting most from a high rate of growth would strenuously lobby against a proposed transition to SSE. In doing so, they would constitute an insurmountable hurdle in a democratic system. Luban, therefore, concludes that the transition to a SSE is impossible for all but an authoritarian government to manage.

Heilbroner's (1974) views concur almost entirely with those of Luban. Heilbroner is convinced that only socialism could administer the adaptation of an

industrial society to a SSE. Heilbroner comes to this conclusion on the basis that no would-be-government in a liberal democracy would entertain the idea of limiting its citizens to the well-being obtainable from its present volume of output. Heilbroner makes another interesting observation—the present inertial momentum of the high-growth economy is so great that the transformation to a SSE would be prohibitively costly, particularly in terms of lost jobs. The capacity of any democratic system to initiate a shift to a SEE would thus be exceeded in the sense that no substantial voluntary diminution of growth is remotely conceivable at this point in time.

Certainly, while both interest group obstruction and the impact of structural adjustment is cause for trepidation, other concerns are based on falsehoods. That is, the transition to SSE does not involve putting a ceiling on material output and its composition; a constant stock of human-made capital does not imply a limit to the well-being of a nation's citizens; and, despite claims that a 2–3% rate of growth is necessary to prevent unemployment from rising, high unemployment need not accompany a SSE. To recall, the transition to ecological sustainability requires the self-imposition of a resource constraint which, depending on the proximity of the limits to technological progress, induces a natural transition from a high-growth economy to a LGE and eventually to a SSE. In other words, a macro constraint is imposed at the input end of the economic process, not the output end. Facilitated by a variation in the market allocation of the incoming resource flow, growth is permitted for some time along with a change (improvement) in the composition of output. An attempt to impose a macro constraint at the output end, which is both unnecessary and undesirable, is virtually impossible by means other than the firm fist of an authoritarian regime. It is no wonder that, to some observers, democracy appears incompatible with a SSE.

The aforementioned does not, however, confirm that democracy and a SSE are compatible. To consider this issue in more detail, we need to briefly examine the relationship between the political dimension and human nature. This is important because, as Heilbroner (1974) has correctly pointed out, coercive political power is only successful if it is accepted by those over whom it will be exercised. One cannot have coercive political power without political obedience. A central feature of human existence is the shaping of one's adult personality by the period of dependence and development in early life. Traces of the conditioning process that occurs as a child passes from infancy to adolescence can be clearly found in the traits of obedience and one's capacity for identification. Of particular interest to us is the role played by the political function in providing a sense of psychological security—something made possible by recreating the subordination to which one's extended period of dependency has accustomed them (Heilbroner, 1974). Thus, in times of great anxiety or predicament, we can expect the pressure of political movements to push in the direction of authority, not away from it.

In view of this, there are a number of things we need to take into consideration. They include: (a) since acquiescence to greater authority is only likely to accompany a sense of crisis, to what extent are humankind's current circumstances perceived as perilous?; (b) given that a SSE embraces the notion of identity towards human beings of all races, religions and generations, to what extent can we expect a sense of identification to extend beyond its current primitive boundaries?; and (c) since an excessive level of superordination would render democracy and the SSE incompatible, what form would the political authority required to initiate a transition to a SSE most likely take? According to Heilbroner (1974), the myopia that confines the vision of the present generation to the short-term does not augur well in terms of convincing people of the dilemma we currently face and the urgency with which we need to act. Nor does it promise much in terms of identification with the needy and posterity.

Convinced that a transition to a SSE is only possible following a long-travelled route down a self-destructive path, Heilbroner holds out little hope of appropriate macro constraints being imposed by a democratically elected government. Without wanting to deny the possible eventuation of Heilbroner's conclusion, I am somewhat more optimistic. Why? To begin with, much of the present myopia is based on the erroneous belief that, should a crisis transpire, its deleterious impact will not be felt for some time to come. Yet, if the empirical evidence of an existing decline in sustainable economic welfare is reasonably accurate (Figure 3), the negative consequences of 'excessive' growth are already upon us. The lack of widespread understanding of a viable alternative to growth—namely, a qualitatively improving SSE—is also a contributing factor. Clearly, greater knowledge of both the true current picture and the welfare benefits of making the transition to a SSE now would go a long way towards overturning the myopia obstacle.

As for the lack of identity most people have with posterity and many of their living contemporaries at home and abroad, a further ray of hope exists. Ironically, it comes from Heilbroner (1974) himself. Heilbroner believes a sense of identification can extend beyond its current modest domain provided self-preservation becomes a primary human goal. This can become a possibility by again communicating the alarming empirical evidence and the existence of a viable alternative to a high-growth economy. Also required is a broad understanding of the complex interrelations between countries—for example, the ecological impact that one nation's activities can have on other countries and that achieving sustainable development requires as much tolerance and cooperation as it does intra and international competition.

One cannot ignore, at this point, the probable role played in the democratic process by the interest groups benefiting most from a high rate of growth. They would undoubtedly thwart attempts to move to a SSE. But they would not necessarily have everything their own way. The logic of interest group formation can, in principle, be counteracted (Taylor, 1987). For instance, it has been shown that a shared and mutually transparent commitment to a particular cause, no matter how

drastic the means to achieving it might seem, can lead to the formation of organized groups able to counteract special interest groups whose sole aim is to protect their distributive share of wealth and/or power. Should the urgency with which the transition to a SSE is required become apparent, there is no reason why growth-oriented interests could not be overpowered. This certainly would not be a simple or straightforward task in a growth-obsessed world, but democracies have survived very difficult transitions and circumstances in the past (Luban, 1998). In addition, we are quite possibly talking about self-preservation and the forces it would generate cannot be underestimated.

We now come to the last of the questions raised in this section of the paper—that is, what form would the political authority required to bring about a SSE most likely take? While it would clearly entail coercion in the form of currently non-existent macro constraints imposed and policed by relevant government authorities, it would continue to preserve much of the current institutional and legal framework that serves to protect individual self-expression, the right to private ownership, and the market mechanism. Polemically, it is my belief that there would be fewer legislative constraints in a SSE because a policy approach based on macro control and micro flexibility would rid us of the increasing pervasiveness and number of growth-induced or 'scale-related' externalities. The rise of small, issue-based political parties in many democratic countries is an indicator of how much political action is now devoted to internalizing the many scale-related externalities that, following a transition to a SSE, would rapidly vanish.

In sum, a would-be-government wishing to initiate the transition away from a high-growth economy is democratically electable provided enough people can be convinced of the crisis we already face, the desirability of a SSE, and the preservation of currently-enjoyed freedoms.

6. Globalization and the steady-state economy

Since achieving sustainable development requires acknowledgment of complex interrelations and the need for international cooperation, can a country go it alone and successfully initiate the transition to a SSE? If it would have been a difficult task 30 years ago, it is now undoubtedly more so given the globalized nature of the world economy. Many ecological economists are concerned that, to a considerable degree, globalization renders government policy impotent at the national level. By globalization, ecological economists mean the integration of many national economies into one single global economy through free trade and free capital mobility (Daly, 1996). This permits the bypassing of many institutions and laws existing within the nation state for economic purposes. Moreover, the economic principle governing international trade switches from comparative advantage to the less desirable principle of absolute advantage (Daly, 1996; Lawn, 2004*b*). Why the latter? One of

the forgotten premises underpinning the comparative advantage argument for international trade is the relative immobility of capital, a situation almost non-existent today (Ricardo, 1817; Daly and Cobb, 1989). While gains from specialization and trade can still emanate from a global economy governed by the law of absolute advantage, there is no guarantee that each country will benefit from free trade in the same way they do under comparative advantage (Lawn, 2004*b*). The mere threat of losses at the national level forces governments to abandon many policy measures that, while potentially improving working conditions, distributional equity and environmental standards, put domestic producers at a competitive disadvantage due to the concomitant rise in production costs.

Not for one moment do ecological economists believe a country should respond by isolating itself from the rest of the world. However, ecological economists would prefer an arrangement referred to as 'internationalization'. Internationalization is a global economic environment within which national economies exist as separate and autonomous entities tied together in recognition of the importance of international trade, treaties, and alliances (Daly, 1996). In an internationalist world, the many institutions and laws existing within the nation state impinge on economic activities for the purposes for which they were intended—that is, to facilitate an efficient economy, a sustainable use of natural resources, and a just and equitable distribution of income and wealth. Accordingly, the fundamental unit of concern is the nation state. In addition, the people residing within each nation are viewed as a community of citizens rather than a collection of individual consumers. Unlike a globalized world, international trade is governed by the economic principle of comparative advantage.

To consummate an internationalist arrangement, it is necessary to restrict the international mobility of capital. An IMPEX system of foreign exchange rate management has been put forward as a possible means of doing this (Lawn, 2004*b*, 2004*c*). The details of the system will not be outlined here; however, it is another example of a macro control-micro flexibility approach to policy. An internationalist arrangement would also be strengthened by having the Bretton Woods institutions operate in line with the charter upon which they were originally conceived—that is, to serve the interests of their members, which are nation states (Lawn, 2004*c*).

In the minds of ecological economists, the transition to a SSE will be exceedingly difficult to initiate in a globalized world economy. Consequently, the move to an internationalist arrangement needs to be given central prominence when communicating the desirability of the SSE and the urgency with which the high-growth objective needs to be abandoned.

7. Conclusion

The need to make the transition to a SSE should not pose a threat to continuing human development. To the contrary, it would arrest the current decline in

sustainable economic welfare that appears to be the result of macroeconomic growth beyond the optimal scale. Although the transition to a SSE requires the imposition of macro constraints, the potential for continuing high profit rates and investment plus the preservation of individual self-expression, private ownership, and the market suggest that a democratic–capitalist system and a SSE are entirely compatible. Indeed, the greatest threat to democracy, capitalism and international peace may well prove to be humankind's obsession with growth.

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