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by

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June 2012

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Sustainable Development Planning: Allowing for Future Generations, Time and Uncertainty

ABSTRACT

The most widely accepted view of sustainable economic development is that it is economic development ensuring that each succeeding generation is no less well off than its predecessor. This mainstream approach, however, has several limitations. It can, for example, result in a development path being chosen in which at least some generations could be better off with none being worse off, that is a Paretian inefficient development path. The above mentioned criterion for sustainable development has been justified on the basis of Rawls' principle of justice, even though the Paretian inefficient case mentioned is inconsistent with this principle. Nonetheless, even if Rawls' principle is correctly applied to economic development choices, it is doubtful whether it would result in the most desirable social outcome. An alternative criterion is suggested. Apart from this, Rawls' principle is anthropocentric and influenced by implicit cosmic assumptions.

There are also several other philosophical and practical issues that need to be resolved in planning for sustainable development. These include how many future generations should be taken into account in undertaking planning for sustainable development? Should the welfare of each count equally or should less weight be put on the welfare of more distant generations than less distant ones? Is the latter necessary because of greater uncertainty about more distant events or because current generations only feel empathy for their children and grandchildren? Issues involving these matters have, for example, been raised by Herman Daly and by David Pearce. A related matter is what role should discount rates play in planning for sustainable development. For example, is the use of a low or zero social discount rate appropriate in sustainable development planning? Even the application of zero discount rates to human welfare may fail to result in the choice of an optimal development path. Dealing with the presence of uncertainty about future events (which tends to increase for predictions further into the future) remains a major challenge for sustainable development planning. How should this uncertainty be allowed for? Furthermore, it is necessary to

consider the implications of bounded rationality for the processes involved in sustainable development planning, and this aspect is also discussed.

Keywords: coefficient of concern for future generation, discounting, intergenerational equity, Rawls' principle of justice, sustainable development, time horizons.

1. Introduction

The view that sustainable economic development is desirable has become widely accepted in recent decades. Sustainable development is generally recognized as the type of economic development that lasts. However, in practice this is an imprecise development goal. It fails to distinguish adequately between the desirability of the different economic development paths that are possible and to assess the economic sacrifice that current generations should make to benefit future generations. Furthermore, one needs to consider the willingness of current generations to make such sacrifices (if they are required to do this) to benefit future generations and how many future generations should be (or are) taken into account in adopting policies to achieve sustainable development. This has implications for the time-period for which it is rational to develop plans and policies to achieve sustainable development.

Taking into account these challenges, this chapter discusses the concept of sustainable economic development based primarily on Rawls' principle of justice (Rawls, 1971), and then presents an alternative criterion for determining a desirable path of economic development. Then the practice in economics of discounting the predicted utilities (levels of well-being) of future generations is examined. Is, for example, this an appropriate method of allowing for the limited concern of current generations for the welfare of more distant generations? Will lowering this discount rate increase the likelihood of more sustainable or desirable development paths being chosen? Subsequently, the implications of the limited concern of present generations for distant generations and of uncertainty for development planning are discussed. How does and how should this affect the planning horizon? What implications should it have for the nature of plans and their detail?

2. Concepts of Sustainable Economic Development and Rawls' Principle of Justice

The most widely quoted definition of sustainable development is that of the World Commission on Environment and Development (WCED). It stated that:

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED World Commission on Environment and Development, 1987, p.43).

At first glance, this definition makes sustainable development look to be very desirable because it seems that the needs of everyone are satisfied by it. However, a little consideration reveals problems.

Firstly, needs are not defined. Presumably needs are not wants or desires because a basic tenet of economics is that available resources are insufficient to meet the wants or desires of everyone. If 'needs' only refers to 'basic needs', several unresolved issues arise. At present, millions of people globally remain in poverty and are unable to meet their basic needs. Should, therefore, the first step globally be to lift them out of poverty before giving too much attention to the ability of future generations to meet their needs? To what extent should those who are able to more than fulfill their basic needs make sacrifices to help the existing poor and benefit those who otherwise might be poor in the future? Once the possibility is raised that some of the better off members of the world community are likely to have to make economic sacrifices to attain sustainable development, it is likely that the support of many of them for realizing sustainable development will wither. This is evident, for example, in relation to support for carbon taxes intended to reduce the economic burden of global warming on future generations. In any case, the WCED definition of sustainable development is of limited practical value.

A related definition of sustainable economic development is that it is development that enables the well-being of every future generation not to be less than that of its preceding generation As Tietenberg (2003, p.618) suggests, sustainable development: "generally requires that resource use by any generation should not exceed a level that would prevent future generations from achieving a level of well-being at least as great."

This criterion is frequently associated with Rawls' principle of justice (Rawls, 1971), namely that income should be equal for all unless inequality does not decrease the well-being of anyone. Actually, however, the requirements for sustainable development mentioned above are not exactly consistent with Rawls' criterion as is illustrated by Figure 1. There two possible development paths are shown. The possibility shown by the line marked **1** satisfies the rule that the well-being of each succeeding generation be not less than that of its predecessor but the curve **2** does not. However, from a Paretian and Rawlsian point of view, development path **2** is to be preferred to **1** because no generation is worse off if it is followed and all future generations are better off. Note that t_o corresponds to the present and t_n is the end of the time-horizon for considering sustainable development.

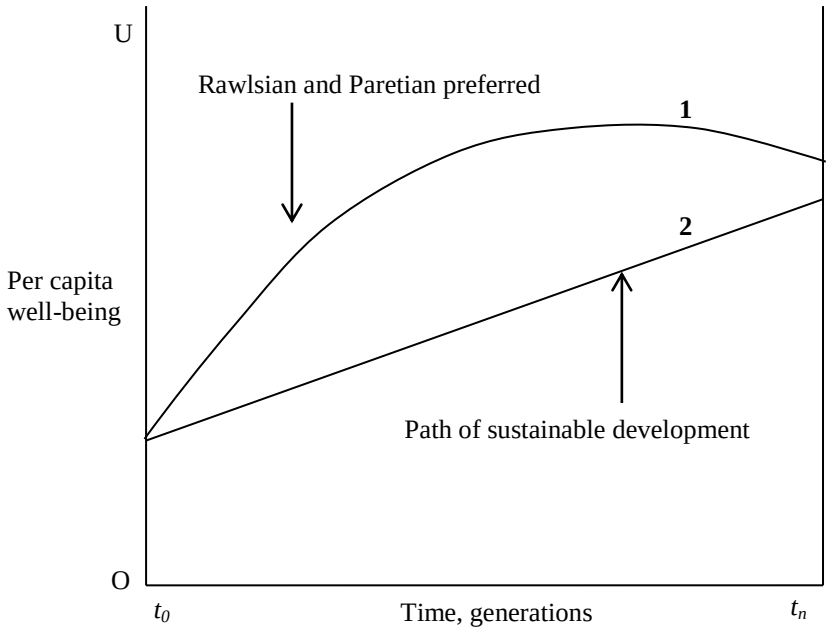

Figure 1: An illustration of conflict between Rawls' principle of justice and a commonly used economic criterion for sustainable economic development, namely that sustainable economic development is development that ensures that no future generation is worse-off than its predecessor.

However, what is the situation if current generations have to make some sacrifices in order to increase the well-being of future generations? Consider the situation illustrated in Figure 2. Again two possible development paths are shown: a linear one marked **1** and a second one

marked **2**. In this particular case, the variable on the X-axis is consumption per capita, C, not well-being, U. In order to proceed along path **2** it is necessary for current (early generations) to consume less than if path **1** is followed but later generations have a much higher consumption level as a result. Should the earlier generations make such a sacrifice? They may choose to do so for altruistic reasons. If so path **2** is socially optimal. If they are however, forced to reduce their consumption to achieve path **2** doubts might be raised about whether this is socially desirable. Nevertheless, some totalitarian regimes (for example, the Soviet Union under Stalin and China under Mao) may have attempted to follow such policies in the past, albeit often with disappointing results.

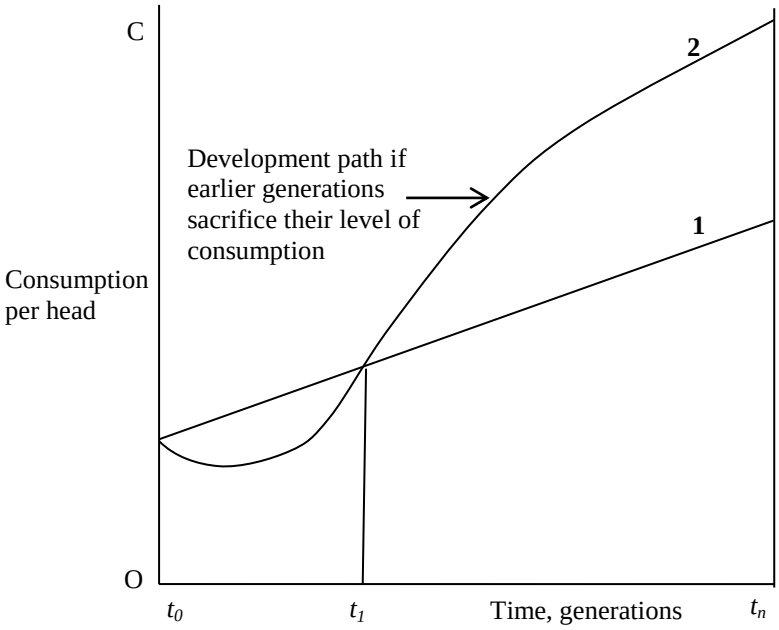

Figure 2: A case (path **2**) in which more distant generations can have a greater level of consumption than otherwise (path **1**) as a result of sacrifices by earlier generations. Path **1** is shown as rising but could be flat in which case the standard of living of more distant generations can only rise as a result of sacrifices by earlier generations.

Figure 3 shows a case in which the linear sustainable development path marked **1** is preferred to the path marked **2** if Rawls' criterion is applied. This is because Rawls assumes that choice is made 'behind a veil of ignorance' and that each yet-to-be born individual is uncertain about

when they will be born in the future. Hence, there is a **risk** for each unborn person that their well-being will be less if path **2** prevails rather than path **1**. All individuals existing in the period $t_2 < t < t_n$ will have a lower level of well-being if path **2** prevails rather than path **1**. Yet-to-be born persons are assumed by Rawls to be extremely risk-averse and to follow a maximin gain strategy of the type expounded in the theory of games.

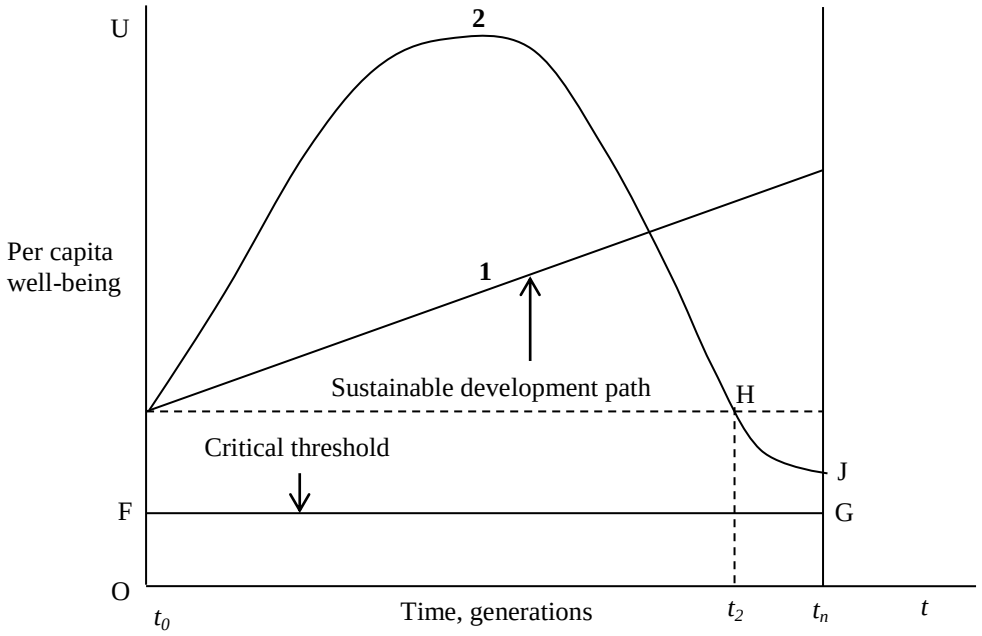

Figure 3: A case in which Rawls' criterion results in development path **1,** the sustainable development path, being preferred to path **2**. However, Roy's safety-first principle can result in path **2** being preferred. This is so in the case illustrated.

Despite the fact that Rawls' criterion rejects path **2** in favour of path **1**, this may not be the socially preferred choice because individuals are probably not as risk-averse as suggested by Rawls (1971). For example, each individuals' (mathematical) expected well-being when path **2** is chosen may be considerably in excess of that when path **1** is chosen, and levels of well-being above OF may not cause considerable hardship. On the other hand, if there is a risk of the well-being of individuals falling below a critical level OF (because curve **2** declines even further than shown), then development path **2** might be rejected. In other words, a safety first criterion may be adopted (Roy, 1952, Tisdell, 1962). Tisdell (1999) considers the possibility, and also points out that Rawls' criterion assumes a particular cosmology; for example,

human-beings are not reincarnated. Rawls' criterion is also anthropocentric. Consequently, no attention is given to ecocentric ethics, for example.

It may also be that in practice current generations have little concern for distant generations and are most concerned about the sustainability of development in their life-time, and about the welfare of their children and their grandchildren. This matter will be considered later.

Furthermore, it cannot be assumed that sustainable development can always be achieved. Certainly if the aim is to maximize the discounted present value of the per capita utility function, the maximum of this value may occur for a development path that exhibits lack of sustainability (Dasgupta and Heal, 1979, Pearce, 1998, Ch. 5).

3. Discounting, the Span of Concern for Future Generations, Uncertainty and Time

As pointed out by Pearce (1998, p.71), most of the theory of economic growth discounts future levels of utility or well-being and Pearce remarks that this is odd because "when tomorrow comes, we shall experience the same feelings as today". An implicit reason for this may be that there is less concern on the part of current generations about the utility of generations that exist further into the future than for earlier generations. However, this is an odd way of allowing for decreasing concern of present generations for generations living further into the future because it involves a regular form of discounting. In practice, this regularity might not exist even if present generations have less concern for distant generations compared to their own generation and nearby generations.

Note that lowering the discount rate **on utilities** will give more weight to the utilities of distant generations and make for development decisions supporting more sustainable economic growth. As Pearce (1998, p.73) points out: "The higher [is this] discount rate the more is sustainable development at risk from deliberate planning of 'optimal growth'. The lower the discount rate the less is the risk." However, even if the rate at which the flow of utility is discounted is zero, this approach to 'optimal growth' can result in unsustainable economic growth and result in the well-being of some future generations falling below acceptable levels when there is no need for this to occur (see Tisdell, 2011). In Figure 3, for example, suppose that development path **2** falls below G in the interval $t_2 < t < t_n$ after it

passes through point H. Given the construction of the relationships shown in Figure 3, the sum of the area under path **2** exceeds that under path **1**. Therefore, path **2** is preferred given the utility maximisation rule of optimal economic growth theory. However, this violates the condition (discussed in the previous section) that the well-being of no future generations should fall below an acceptable level, if an alternative development possibility exists which makes this deprivation necessary.

Pearce (1998, pp. 70-71) also raises the subject of the degree of concern of present generations for future generations and states: "Casual observation indicates that people care for at least their children and grandchildren. Few probably look much further than that." In fact, the time-horizon of people may be not much more than a hundred years into the future, including concern for themselves. All parents invest in their children and some may invest in their grandchildren. These are, however, essentially private decisions and because of free-riding problems, there may be under investment in social investments benefitting future generations (compare Margolis, 1957).

Currently there are no empirical measures of the coefficients of present generations' concern for future generations, but these coefficients could be virtually zero after 100 years. Another reason why the concern of current generations is likely to be truncated is that great uncertainty exists about the consequences for more distant generations of today's decisions about resource use and this uncertainty seems impossible to eliminate. Therefore, for planning purposes, time-horizons are likely to be shortened. Pearce (1998, p.78) suggests that "sustainability is a perfectly legitimate concern if there is a real risk that it cannot be achieved over a 'reasonable' time horizon, but it ceases to be a concern if the time horizon is distant". The problem is that predictions about economic collapse in the far distant future may be little believed and individuals may be optimistic that a solution will be found before that far off time.

Of course, it may be very difficult in practice to measure the degree of concern that present generations feel for future generations. Surveys asking individuals to provide information about this degree of concern may give biased results. Nevertheless, they might reveal some worthwhile information. Alternatively, these coefficients might be revealed by the actions taken by current generations to sustain the well-being of future generations. In democratic

societies, these coefficients of concern have important implications for the level of support for public policies which affect the welfare of future generations.

This does not, however, imply that the empirical coefficients of concern of present generations for future generations are morally appropriate. It is likely that less concern is shown for future generations than would be morally appropriate.

4. More on the Truncation of Planning, the Coefficient of Concern and Uncertainty

A factor which limits the attention of current generations to the needs of more distant generations is the bounded rationality (Simon, 1957, Tisdell, 1996) of current generations. Improving knowledge about the requirements of future generations is not costless and there are limits to the extent to which this knowledge can be improved. Most of us have no idea of how many descendants we shall have in 200 years' time or more. Furthermore, as time progresses, our genetic material in our descendants becomes diluted but on the other hand, can become more widespread. Does this mean that given the selfish gene theory of Dawkins (2006), we are likely to have less interest in protecting that genetic material further into the future? The fact is that we have no knowledge of how many persons will inherit our genetic material and who they might be. This may limit our concern for them.

It seems clear that the coefficient of concern for future generations is on the whole highest for family members, especially one's children and to a lesser extent one's grandchildren. This is reflected in the codes of most societies which place legal responsibilities on parents to take care of their children. This duty of care and responsibility is further reinforced by community attitudes. As for grandchildren, grandparents may feel some responsibility for them but it is not a legal responsibility, because their care and development rests primarily with their parents.

The above raises several issues. First, it is clear that in practice responsibility for care of future generations involves a division of responsibility. This division is probably reflected in differences in coefficients of concern and in practical measures to assist future generations by those from earlier generations. Furthermore, the degree of concern and involvement about the

future of offspring depends on their ages and is greatest when they are dependent on other family members.

If it is true that practical concern for future generations is limited to near descendants, does this mean that sufficient provision is made for the attainment of sustainable development? While it does mean that members of every generation are cared for during their formative years (for instance, protected and provided with human capital), responsibility for doing this is divided within families and in time. However, this may result in the neglect of investments assisting **many** future generations (not just the next one or two) as well as inadequate public investment in the supply of collective or public goods (compare Margolis, 1957) able to sustain the welfare of more distant generations. Thus, some economic failures are liable to occur if concern for future generations is limited to families and is restricted serially to succeeding generations. Nevertheless, this system does involve some care being taken of every generation and has played a major role in the survival of *Homo sapiens* and in its increasing population. Nevertheless, the mechanisms involved in caring for future generations are primarily private family ones which may be reinforced by the policies of the state, for example, the provision of free or subsidised education. These state policies often reflect the goals of families. The shortcoming of this system is that it tends to neglect investment in the supply of public goals or collective goods able to benefit more distant generations. These include, for instance, the retardation of or stopping of global warming, the conservation of biodiversity and of natural environments.

The above observation suggests that collective (government) action is needed to achieve 'acceptable' levels of provision of collective resources, especially natural capital to enable future generations to achieve an acceptable standard of living. At the present time, however, there is still great difficulty in determining what and how much natural capital needs to be conserved for this purpose. Pearce (1998, pp. 84-85) argues that, in particular, action is needed to conserve irreplaceable capital, mainly natural capital. As Pearce then points out, there is legitimate debate about which natural assets should be conserved. Nevertheless, he states "it seems clear that it should include biodiversity and the basic biogeochemical cycles that support life," (Pearce, 1998, p. 85).

Unfortunately, this only partially resolves the issue because the social costs of conserving some components of biodiversity can be high and today, changes in biodiversity do not

merely consist of losses but also include human additions to the stock of items comprising biodiversity (Tisdell, forthcoming). Furthermore, while Pearce favours application of the precautionary principle, initially proposed by Ciriacy-Wantrup (1968), as a way of helping to decide on what core (natural) capital needs to be conserved, the precautionary principle is subject to a variety of interpretations (Tisdell, 2010) and the safe minimum standard approach is incapable (in several circumstances) of providing a definitive solution to conservation problems, for example, about which species should be conserved (Hohl and Tisdell, 1993, Tisdell, 1990).

5. Concluding Comments

Weaknesses have been identified in the concept of sustainable economic development based on the use of Rawls' principle of justice. However, in some cases, this principle has been incorrectly applied. This is because Rawls qualified his equality principle. Rawls allows that inequality in the income or well-being between generations can be optimal if it is to the advantage of all. An alternative to Rawls' principle making use of the safety-first principle and expected gain was proposed. It was argued that maximising the summation of the discounted value of utility (measuring the well-being) of future generations is not an appropriate method for assessing the desirability of alternative development paths, even though it has been widely used in the development of theories of optimal economic growth. Furthermore, even if a zero discount is applied, this approach does not yield acceptable results.

Pearce (1998) suggested that attention should be given to the span of concern of current generations about the well-being of future generations. He suggests that this concern may only be present for a couple of generations consisting of the children and the grandchildren of those involved. This is a factor that may result in the horizon for planning sustainable development being shortened. In addition, uncertainty and bounded rationality may contribute to reducing the span of time for which development planning is undertaken.

Concern for future generations may be primarily limited to family members and this concern and responsibility for future generations is divided within families. It was argued that while this process assists future generations, it is subject to some failures, such as failure to supply

sufficient long-lasting capital that will benefit many generations, and that failure is likely to occur in the supply of collective or public goods which can play an important role in sustaining economic well-being. Identifying critical or core types of (natural) capital that need to be preserved to benefit future generations has proven to be a difficult task and as yet, such types of capital are not well identified. Nevertheless, efforts to identify such capital are important.

A major concern is that the consumption of natural capital and its transformation into man-made capital will eventually stymy the sustainability of economic development. In earlier times, this was not a problem for humankind. In the Stone Age, the Bronze Age and beyond human beings were converting natural resources into man-made capital and increasing their levels of consumption. This benefitted early generations and also has been a benefit to succeeding generations (see Tisdell, 2005, Ch. 11). However, with this increasing conversion of natural capital into man-made capital and growing consumption of natural resources with the passage of time, with the loss of some irreplaceable natural capital and with human induced environmental changes, it becomes increasingly relevant to ask for how long and in what respects this process can continue without impoverishing future generations?

Given modern concerns about the sustainability of economic growth, David Pearce's view that more attention should be given to the coefficient of concern of current generations about the well-being of future generations is worthy of more attention. Nevertheless, this concern raises the question of whether humans are or should only be concerned about the future of human beings and their welfare. It ignores questions about whether humankind has an obligation to help conserve nature independently of its consequences for human welfare. If this ecocentric consideration is important, then clearly it will call for greater nature conservation than would otherwise occur if only the future well-being of humans is taken into account, as is illustrated in Tisdell (2005, Ch. 11). In fact, ecocentric ethics can be very powerful forces favouring nature conservation and may incidentally also benefit future generations of human beings.

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