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Analysis

Generous Sustainability☆

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ABSTRACT

I define "*generous sustainability*" as a combination of two conditions: neither instantaneous maximin utility nor attainable maximin utility should decrease over time. I provide a formal definition and study applications to a Climate Economy with bounded and with unbounded growth. Generosity is shown to require that GHG emissions are limited to levels that do not cause irreversible system damages if some group of people systematically value these systems.

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1. Introduction

"We deserve to do more than just survive; we deserve to thrive."
(Kathy Jetnil-Kijiner)[1]

"Progress without destruction is possible"
(Chico Mendes)[2]

Avoiding regress, or even disaster, is a core element of various concepts of sustainability in the literature, but it is not enough. This paper presents a concept of sustainability that gives more weight to the best possible future, evaluating current actions by their consequences for that potential future.

In economic theory, sustainability is defined and measured in very different ways (Fleurbaey, 2013). One approach formalizes sustainability (or more precisely "sustainedness") as an ex-post condition on the utility sequence, for example as in the requirement that generations' utility should be non-decreasing with time (Pezzey, 1997). A second line of analysis frames sustainability in terms of the (intergenerational) welfare function that society should maximize when allocating its resources over time. Chichilnisky (1996, 1997) interpreted sustainability as a non-zero weight given to the interests of the very-far future generations. Zuber and Asheim (2012) present a utilitarian perspective on sustainability, requiring the weights given to generations in intergenerational allocation choices to decrease with increasing generation's utility levels. Llavador et al. (2011) maximize the utility level that is consistent with a predetermined constant growth rate of utility. A third approach to sustainability formalizes the concept as 'something that must be conserved for the very long run' (Solow, 1993). Martinet (2011) and Cairns and Martinet (2014) define sustainability as non-decreasing maximin utility (defined in detail below). The advantage of the last approach is that sustainability defined this way can be ascertained without making a precise prediction about the future generations' decisions, since only their possibility set matters (Fleurbaey, 2013).

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[1] A poem to my Daughter, Kathy Jetnil-Kijiner addressing the United Nations Climate Summit Opening Ceremony, 24 September 2014, New York. The poem speaks of the future of the people living on small islands.

[2] Chico Mendes was a rubber tapper in the Amazon and a campaigner for the sustainable exploitation of the rain forests. The quote is part of the closing lines of a speech at 6th December 1988, in Sao Pablo. Chico Mendes was born 1944 and died 22nd December 1988, shot by the son of a local rancher.

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Approaches towards sustainability differ fundamentally by use of their method, but they share an underlying concern. Some proponents of sustainability fear that, if unprotected, future generations will find themselves in an unfavorable environment. Other sustainability proponents worry that future generations, if unprotected, will be worse off than those living in the past and today. The concern for a poor future outcome is explicit in the well-known definition of sustainability given by the World Commission on Environment and Development, as development that meets the needs of the present, without compromising the ability of future generations to meet their own needs (WCED, 1987).[3] In contrast, Jetnil-Kijiner calls the United Nations Summit to provide her child with the possibility to thrive. The request marks an important deviation from a minimalistic sustainability concept. She calls society for a positive contribution to the development of the future prospect (cf. Gerlagh and Sterner, 2013). While it is essential to protect the future against poverty and to ensure that the future can meet its basic needs, and avoiding small risks of total disaster is very important, it is not enough. Most integrated assessment models and many observers believe we have the potential to achieve a bright future for society with many decades, possibly centuries, of growth.[4] This harbours the potential for eradication of poverty and of a future where people on average enjoy a better life than today. This is the bright future we stand to (partly) lose with climate change. In such a context, it is overly non-restrictive to limit the content of the term "sustainability" to meaning "no worse than today" (Llavador et al., 2011).

The last century has shown a world with a robust and steady per capita income growth of about 2 per cent per year. We see developing countries rapidly catching up, *and* the high-income countries continuing their progress. Whereas the developing countries gain from institutional changes, the frontier economies gain from continued progress of technology and knowledge; human ingenuity continues to contribute to economic prosperity. We can do better in the future as compared to the past: to eradicate poverty, improve education worldwide, bring more equal chances for all world citizens including closing the gender gap, and make a better place. In this essay I make a small step to interpret the call for contributing to a better future in a formal framework. I will define a perspective labeled generous sustainability or generosity, which requires that we preserve two opportunities: to conserve a utility level that can be sustained forever, but also to preserve the best achievable world, that is, generosity protects the maximal potential of future generations to thrive.

Yet, we also need to confront the optimist future view with history, which shows the side effects of worldwide economic progress (Victor et al., 2014). The economic successes of the rapidly emerging countries, the new world middle class, are accompanied by an unprecedented rise in resource use and greenhouse gas emissions. We need to develop a concept of sustainability that supports economic progress, while at the same time, sustainability has to take serious the protection of the scarce environmental resources. Generosity is more demanding relative to comparable concepts that require the maintenance of opportunity (Cairns and Martinet, 2014; Fleurbaey, 2013; Martinet, 2011), but it is not too demanding. It does not require huge savings to increase wealth of a future generation that is richer than the present, as zero-discounting does (Nordhaus, 1997).[5] Generosity is also less demanding than Llavador et al. (2011), who impose an exogenous constant growth rate of utility. The core concept of generosity is the preservation of resources that are essential to future utility. Chico Mendes, cited above, captures the idea through a remarkably modest statement, which we will formalize below.

Before going into the formal analysis, an illustrative example may clarify the core of the concept and conclusions of this paper. Assume that a country's income can grow by a factor five in hundred years time. Furthermore, assume that the country has large forest areas that can profitably be harvested, offering substantial economic gain over the first decades. But cutting the forests also irreversibly destroys part of the supporting ecosystems, and all future generations after some time, say after 2050, will regret. What are the principles that govern the social (il)legitimacy for cutting the forests? The typical sustainability concepts do not consider the loss of the forests as problematic, unless the regret for biodiversity loss exceeds the benefits from income growth, that is, unless utility actually declines. Azar and Schneider (2002) sketch a similar dilemma for climate change, showing that in most models the cost of climate protection is equivalent to one year of economic growth, while damages may be irreversible. Yet, classic sustainability paradigms consider 'small' costs and irreversible damages as insufficient conditions for conservation; they demand nature's preservation only if there is a potential catastrophe, or if the lost environmental resources are non-substitutable (cf. Neumayer, 2007).[6] Generosity sets out some principles that may provide guidelines; it asks whether there is a future where citizens, whose income in the very long run has continued to increase, consider themselves uncompensatably worse off without the forests and climate conservation as compared to the situation with conservation. If an action irreversibly deteriorates the prospects of a stream of future citizens without bounds, while there is no other group of future citizen whose prospects are permanently improved by that action, then that action conflicts with generosity.[7] Restated, if progress is possible without the irreversible destruction of some resources, and if these resources are uncompensatably valued by some group of people in each period (defined precisely in the subsequent sections), generosity stipulates that progress with conservation is always preferred over progress complemented by destruction, also if the latter leads to faster income growth.

In the next section I define generosity formally and as succinctly as possible. Yet the main aim of this manuscript is not to lay down a strict formal analysis, but to broaden our conceptual perception of a sustainable future and its practical conditions in, for example, the climate change debate. Therefore, the subsequent section applies the concept to a simple climate-economy model without and with unbounded growth. I then briefly discuss a natural extension of generosity to the context of uncertainty and intra-generational inequality. The last section discusses the context-dependence of sustainability, specifically I discuss the context under which generosity is more, or less, relevant as principle.

2. Generosity

To set the stage, we use a simple set up. We consider state variables x_t, and utility u_t. Time is discrete, starting at $t = 1$. An action is a choice $(x_t, x_{t+1}) \in \Gamma$ where Γ is convex and supports stationarity: for all $x_t : (x_t, x_t) \in \Gamma$. Actions result in utility $u_t = u(x_t, x_{t+1})$,

[3] Chichilnisky's (1996, 1997) sustainable welfare function is the outlier, giving positive weight to the far-future welfare, independent of the past or of any constraints on utility.

[4] Neumayer (1999, Sections 3.2 & 3.4) and Pezzey and Burke (2014) point out that such beliefs remain beliefs, in that they cannot be usefully falsified.

[5] See Gerlagh and Liski (2017) for a discussion of the connection between capital savings and climate policy.

[6] Note that Azar and Schneider (2002) also provide no principles that can be used to convert the observation of low abatement costs and irreversible damages into an argument for climate conservation (Gerlagh and Papyrakis, 2003).

[7] The future cannot be compensated if damages are irreversible and non-substitutable. The term irreversible should not be taken literally as in mathematics; it's meaning is constrained by our imagination of a meaningful period. Similarly, in the formal analysis, we let the index for time and generations run to infinity. It might be argued that, over billions of years, all changes that the current generation makes will wash out.

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