

Symposium

Introduction: sustainability and the measurement of wealth

How can we measure the wealth of nations? How can we know whether or not the actions of present generations will undermine the wellbeing of future generations? How can we tell whether the development of a country is sustainable or not? And how can we assess whether the natural and environmental resources of a country are being used in a way that will provide fair benefits across the same or future generations?

These are questions that have concerned economists since the 1970s and they remain, with even greater intensity, at the forefront of research and policy making. Concepts such as constant utility, non-declining utility, non-declining comprehensive wealth, or positive genuine savings have been associated with both the theoretical foundations and the empirical investigation of countries' sustainability. These questions have been the focus of numerous research papers and policy documents.

In the current period, with economic recession plaguing large areas of the world and the sustainability of debt being a major concern for numerous countries, the issue of intergenerational fairness – what kind of a situation we leave to future generations – is more relevant than ever. *Environment and Development Economics*, seeking to contribute to this ongoing discussion, is hosting a symposium centered around the paper 'Sustainability and the measurement of wealth', written by Kenneth Arrow, Partha Dasgupta, Lawrence Goulder, Kevin Mumford and Kirsten Oleson. In their paper, the authors – who are well-known participants in the ongoing discussion of sustainability – further advance the theory for defining sustainable economic development based on non-declining intergenerational wellbeing.

The authors link non-declining wellbeing to non-declining comprehensive wealth and positive shadow value of comprehensive investment; they extend the theory by incorporating total factor productivity into the comprehensive investment definition, and population change into the definition of comprehensive wealth. At the level of implementation, Arrow *et al.* show how to value capital stocks by deriving the appropriate shadow values for renewable and non-renewable resources, environmental capital, and human and health capital.

The model is then applied to the United States, China, Brazil, India and Venezuela, in order to estimate the sustainability criterion for each country. The results which are derived indicate the importance of health capital in the growth of comprehensive wealth. The authors also point out the

current limitations at the theoretical and empirical levels and indicate areas for further research.

Critical comments to the paper were invited from some of the economists who have made noteworthy contributions to the field at the theoretical, empirical and/or policy level.

Robert Solow, a pioneer in the field, offers his keen insights as well as his endearing humor. Solow points to the need for further research on issues such as the treatment of calendar time and health capital. Even more importantly, he highlights the need to understand the benefits and costs of moving from the older consumption-based approaches to an intergenerational wellbeing approach to sustainability.

Kirk Hamilton, who has played a leading role in the development of sustainability measurement, suggests that investment in health capital and capital gains on natural resources, as well as the relationship between CO₂ emissions and property rights, are issues that need to be further examined.

Anantha Kumar Duraiappah and Pablo Muñoz look at the sustainability issue from the perspective of how such a measure could be made usable by the United Nations. They stress the need for the United Nations to take a decisive role in providing support for the establishment of wealth accounts and the estimation of shadow prices across countries.

Sjak Smulders focuses on the role that shadow prices play in establishing the link between theory and empirical estimations. He discusses issues related to the time horizon corresponding to a sustainable path, and points to the need to further link sustainability with international spillovers and interdependencies.

Haripriya Gundimeda and Priya Shyamsundar examine the issue of sustainability in the context of India's growth and resource use and show how the framework proposed by Arrow *et al.* can be applied to natural forests in India. They also discuss the impact of changes in forest wealth on the poor.

This symposium aims not only to enhance the ongoing discussion of sustainability by presenting a comprehensive treatment of the issue through a theoretical framework coupled with an empirical application, but also to provide stimulus for further research. Some open questions have been identified by the participants in this symposium; the role of shadow prices and their estimation, for example, is a recurring issue in all of the commentaries.

The Arrow *et al.* paper along with the comments in this symposium could provide a solid foundation for further exploration of related issues that might also be considered to affect the sustainability criterion, such as deep uncertainties, or spatial interactions and spillovers associated with the evolution of capital stocks. We hope that this discussion will provide the impetus for additional development and productive research in the all-important area of sustainability.

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Editor