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# Economics and Sustainability

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## ABSTRACT

Economics exists as a discipline that governs one of the three pillars (with society and the environment) of sustainability. Traditional economic analysis has addressed some issues within the relatively new field of sustainability. The subfield of sustainability economics offers a normative approach to applying the tools of economics to sustainability problems. Systems theory offers further opportunities in this regard. The current work reviews some relevant work within the literature of sustainability economics and other applicable sources with a focus on the future of economics in sustainability research and applications.

Key words: Economic sustainability, economic inequality, systems theory, consilience.

## Introduction

What is the role of economics in sustainability? At first glance, this seems to be an odd question. As one of the three pillars of sustainability (with environment and society), one might assume the question is rhetorical. Further reflection suggests differently. Economics simultaneously is treated as a separate entity, a part of an integrated whole, and as a hybrid of the two extremes.[1]

Often referred to as "the dismal science", economics in appropriate use is *positive* in nature. Investigations are mathematical or empirical, and subject to confirmation or refutation by data. Economic analysis exists independent of ethics and moral philosophy. One can find economic "truth" in assessments of relationships between variables. With respect to public policy, economic analysis can establish policy/outcome links. However, whether a given policy *should* be undertaken is beyond the purview of economics.[2]

Sustainability is intrinsically *normative,* as ethics is a fully integrated component.[3] This is not to imply that economists eschew normative statements, only that in doing so they are not speaking on behalf of economics qua economics. This oft-overlooked subtle distinction is key in understanding the role(s) of economics in sustainability inquiry. Throughout the article, the issue of ethics/moral philosophy will arise with respect to sustainability. While economics and ethics/moral philosophy are distinct domains, they can be used together in policy analysis. Some[4] refer to this mixture as "normative economics". However, when referring to economics in this article, "economic analysis" is strictly *positive*.

Economics offers substantial foundational concepts and methodology which can be applied in sustainability studies. Conversely, sustainability presents opportunities to fine-tune many economic tenets. The current work serves to present a brief introduction to the main themes of the treatment of economics in sustainability literature, as well as indicate additional areas in which economics can contribute to the scholarly endeavors of sustainability.

## Economics as a Discipline

The term "economics" is used in many contexts. To avoid confusion, when referred to herein "economics" indicates the *discipline* of economics. A typical introductory textbook definition of economics is "the study of the allocation of our limited resources to satisfy our unlimited

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[1] Herman Daly, *Beyond Growth: The Economics of Sustainable Development* (Boston: Beacon Press, 1996), 1-5.

[2] David Hausman and Michael McPherson, *Economic Analysis, Moral Philosophy, and Public Policy*, (London: Cambridge Press, 2006), 6-7.

[3] Stefan Baumgartner, "What is Sustainability Economics?", *Ecological Economics* 69, no. 3 (2010), 446.

[4] Hausman and McPherson, *Economic Analysis, Moral Philosophy, and Public Policy*, 6-7.

wants".[5] More generally, economics is a science of decision-making. Macroeconomics is the study of the economy as a whole. Microeconomics is the study of the behavior of households and firms.[6]

As a social science, subjects of study within economics often overlap with those of other social sciences such as geography, political science, psychology, and sociology. One example is economic inequality, a topic of much interest in the sustainability literature.[7] Economic analysis focuses on measurement of income and wealth inequality, and relationships between many variables and inequality. Minimal attention is given with regard to whether a given level of inequality is "good or bad", or what impacts changing levels have on the environment.

A crucial distinction is the aforementioned positive character of economics. When used in policy analysis, economics may be used to determine relationships between differing policies and outcomes. Cost/benefit analyses and the general investigation of tradeoffs are useful in evaluating policy options. In short, economics is *descriptive*. However, *advocacy* for a given policy requires establishing what outcomes are *desired*. Is economic growth the objective? Is a higher level of income/wealth equality preferred? These questions are beyond the realm of economics *qua* economics. They require value judgments, and therefore fall within the purview of ethics.

Sustainability requires value judgments, and is *prescriptive*.[8] As an analysis tool, economics can be used to determine what policies are most efficacious to achieve the ends as indicated by sustainability/ethics. Using the example of income inequality, economic analysis could be used to establish the policies/political systems that tend to accomplish the objectives associated with sustainability, i.e., lowering the level of economic inequality. Specifically, the measurement of economic inequality, political variables, and methodology assessing relationships between them are functions of economic analysis.[9]

## Sustainability

As with economics, "sustainability" has many uses. In general, a practice is sustainable if it can continue indefinitely. However, when discussed as a burgeoning discipline, it has been more specific in nature and focused on the sustainability of humans on earth. On March 20, 1987, the Brundtland Commission of the United Nations defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to

[5] Robert Sexton, *Exploring Economics* (4th Ed.) (Mason: Thomson-Southwestern, 2008), 962.

[6] Paul Krugman and Robin Wells, *Economics* (New York: Worth, 2006), G8-G9.

[7] Thomas Piketty, *Capital in the Twenty-First Century* (Cambridge: Harvard University 2013), 430-467.

[8] Baumgartner, "What is Sustainability Economics?", 446-447.

[9] David Weil, *Economic Growth* (Boston: Pearson/Addison-Wesley, 2009), 370-406.

meet their own needs."[10] Note that "development" clearly implies an economic component, as any development activities have inherent costs and benefits.

Sustainability often is characterized by "three pillars": social (people), environmental (planet), and economic (profit).[11] The pillars are viewed as intersecting, which indicates they are interdisciplinary. They also are multidisciplinary, as the tools of inquiry within many disciplines are applicable in sustainability scholarship.

As a pillar of sustainability, economics offers its aforementioned methodologies for investigation. With respect to the interdisciplinary aspect, the disciplines must merge in a manner to achieve satisfactory disciplinary progress. Using the example of economic inequality, economics and sociology are two disciplines actively engaged in study. One difference is the economic view of the economy and society as machines juxtaposed with the sociological view of the economy and society as organisms.[12]

## Economics in Sustainability Literature

The specificity of sustainability necessitates more particular areas of focus within economics, as well as between economics and other fields such as biology, climate science, ecology, ethics, geography, political science, psychology, and sociology. Areas such as ecological economics, environmental economics, and resource economics have renewed and expanded interests within this framework. One particular subdiscipline has emerged: sustainability economics.

A common theme of the research in economics within the sustainability framework is the concern for ignoring long-term costs of use of resources, as evidenced in environmental degradation incurred in obtaining and converting resources into salable products. Such themes have long existed in the literature. Malthus warned of overpopulation and concomitant economic/resource problems in 1798.[13] However, the move toward sustainable development has necessitated a much more focused effort toward using the tools of economics to investigate methods of economic growth that do not cause irreparable planetary damage. Sustainability economics emerged to specifically address this area of inquiry.

Baumgartner delineates key components of sustainability economics, noting four key attributes: "(1) subject focus on the relationship between humans and nature; (2) an orientation towards the long-term and inherently uncertain future; (3) a normative foundation in the idea of

[10] World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987), 40-41.

[11] Molly Scott Cato, *Green Economics* (London: Earthscan, 2009), 36-37.

[12] Paul Ormerod, *The Death of Economics* (London: Faber, 1994), 225.

[13] Robert Thomas Malthus, *An Essay on the Principle of Population as it Effects the Future Improvement of Society* (New York: W. W. Norton, 1976 [1798]), 1.

justice between humans of present and future generations, as well as between humans and nature; and (4) concern for economic efficiency, understood as non-wastefulness, in the allocation of natural goods and services, as well as their human-made substitutes and complements."[14]

Components (1), (2), and (4) may be accomplished using standard techniques of economic analysis. However, (3) introduces an ethical element (intergenerational fairness) that must be incorporated. The methodologies of economics may be applied to measure "equity" across generations, as well as investigate the effects of different policy decisions on future generations.

Baumgartner's exposition echoes parts of Toman. Specifically, Toman[15] addresses intergenerational fairness appealing to an augmented Rawlsian concept of justice.[16] The essence of Toman's position is that the current generation has an obligation to future generations with respect to the state of the environment, society, and economy. Toman also addresses resource substitutability, i.e., how nonrenewable resources are treated *vis a vis* renewable ones, and the effects of resources with no substitutes (such as clean water), and waste associated with the use of resources. A key question regards the level of robustness of the environment to the waste to be absorbed.

Baumgartner cites three fields of inquiry within sustainable economics: (1) interpretation, concretization, and operationalization of the normative vision of sustainability economics; (2) description and analysis of human-environment systems on multiple spatial scales over the long run under uncertainty; and (3) institutions, policy instruments, and governance.[17] Field (2) clearly falls within the purview of traditional positive economics, while (1) and (3) incorporate the normative component.

In a similar vein, Toman established a "safe minimum standard" threshold concept for resource use.[18] When the consequences of resource use are small and reversible, standard economic tradeoffs between a market allocation and a nonmarket (i.e., governmental directed) may be applied. However, as the consequences become larger and irreversible, the limits for use will be socially determined. Note the prescriptive public policy in this treatment. In any event, this problem in one sense reduces to constrained optimization—a methodology in place for decades in standard economics.[19]

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[14] Baumgartner, "What is Sustainability Economics?", 446.

[15] Michael Toman, "Economics and "Sustainability": Balancing Trade-offs and Imperatives", *Land Economics* 70, no. 4, (1994): 400-403.

[16] John Rawls, *A Theory of Justice* (Cambridge: Harvard University Press, 1971), 1-560.

[17] Baumgartner, "What is Sustainability Economics?", 448-449.

[18] Toman, "Economics and "Sustainability": Balancing Trade-offs and Imperatives", 405-409.

[19] Richard Bronson and Govindasami Naadimuthu, *Operations Research* (2nd ed.), (New York: McGraw-Hill, 1997), 1-215.

Costanza and O'Neill discuss ecological economics within a sustainability context. In particular, they offer the concept of ecological economics as a "transdiscipline", i.e., both interdisciplinary and multidisciplinary.[20] With respect to sustainability, several of the aforementioned themes are repeated. One important theme is the inability of any one discipline to handle the complete set of tasks necessary for solving the inherent sustainability problems.

On a larger scale, Ruth extends sustainability to the entire corpus of economics. He argues that if economics fails to adapt to the needs of other disciplines (as is necessary for sustainability, in his view) it will not sustain itself.[21] Issues such as the intertemporal effect of resource use/abuse; reconciliation with physical and biological sciences; the lack of independence between the economy, society, and the environment; and more relevance with phenomena in the real world rate as necessities in this work.

Guest is much narrower in scope, but addresses an important piece of the sustainability puzzle: sustainability *vis a vis* global climate change. Addressing leitmotifs such as long-term thinking[22] and irreversibility[23], he then moves into newer territories of natural capital and the need for global collaboration managing the "commons". The idea that the environment/nature is "capital" seems obvious. However, the economic literature rarely viewed it as such.

A theme that has emerged in the literature is environment as capital.[24] Specifically, capital can be defined as "a stock that yields a flow of valuable goods and services into the future".[25] Clearly, the environment yields many valuable resources. Water, fisheries, trees, and minerals are examples of nature's "assets". These cases illustrate the potential for business to profit not simply by exploiting nature, but by ensuring the continued existence of this capital.[26]

The issues of economic inequality and economic growth present another challenge for sustainability. Many factors affect income and wealth inequality, as well as economic growth,

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[20] Robert Costanza and R. V. O'Neill, "Ecological Economics and Sustainability", *Ecological Applications* 6, no. 4 (1996): 975-976.

[21] Matthias Ruth, "A Quest for the Economics of Sustainability and the Sustainability of Economics", *Ecological Economics* 56, no. 3 (2006): 335.

[22] Ross Guest, "The Economics of Sustainability in the Context of Global Climate Change: An Overview", *Journal of World Business* 45, no. 4 (2009): 328-330.

[23] Ibid, 331.

[24] M. J. Harte, "Ecology, Sustainability, and Environment as Capital", *Ecological Economics* 15, (1995): 157-158.

[25] Robert Costanza and Herman Daly, "Natural Capital and Sustainable Development", *Conservation Biology* 6, (1992): 38.

[26] Mark Tercek and Jonathan Adams. *Nature's Fortune* (Philadelphia: Basic Books, 2013), 165-187.

including technology, education, and system of governance.[27] Economic growth is necessary to improve living standards in growing populations. With respect to sustainability, there is a need for economic well-being for an appropriate number of people to be able to live above any required level of subsistence.

The need for a large percentage of the population meeting a reasonably high standard of economic well-being is no "utopian" goal. Appeal to Maslow's hierarchy of needs[28] suggests that people must meet the most basic needs before they can begin to pursue higher levels of self-actualization. Analogy to a nation is straightforward. Geographic entities must surpass a threshold for economic attainment before engaging in the endeavor of combatting environmental wellness and potential anthropogenic climate change.

Economic growth is a topic of interest within sustainability analysis. As mentioned in the previous paragraphs, a certain level of growth is needed to support and enhance a growing population. However, the growth should not be accomplished using environmental degradation if we wish to achieve a certain level of intergenerational fairness. Some see this as an apparent conflict. It is a conflict only if we ignore ethical considerations. As economic growth management is a policy issue, aforementioned decision-theoretic methods may be used to evaluate policy tradeoffs associated with different growth strategies, and ethics/moral philosophy establish the desired outcomes (incorporating concerns such as fairness within and across generations).

**Systems Theory/Consilience**

So far, the focus has been economics in its traditional forms as can be applied to sustainability research. Another approach is to note that economies are *systems*, as are societies and the environment. Systems theory (also referred to as systems science) views any system as possessing certain patterns, and seeks to analyze these patterns and glean principles that may apply to all systems.[29] Systems theory is interdisciplinary and multidisciplinary, as many disciplines study systems.

The idea of an economy behaving similarly to a biological system is not new. Gary Becker won the Nobel Prize for Economics for his work applying biological principles to

[27] Weil, *Economic Growth*, 380-387.

[28] Abraham Maslow, "A Theory of Human Motivation," *Psychological Review*, 50 (1943): 370-375.

[29] Lars Skyttner, *General Systems Theory: Problems, Perspective, Practice* (second ed.), (Singapore: World Scientific Publishing Co., 2008), 1-5.

economic problems. Part of Becker's work drew on the evolutionary biology of E. O. Wilson.[30] Wilson advocated for a "unity of knowledge" called "consilience", a blending of the disciplines for finding these patterns that cross the previously assumed boundaries of fields.[31] Two areas noted within both systems theory and consilience are chaos and complexity.

The economy, environment, and society are not simply examples of systems, but interacting systems that are interdependent on each other (i.e., they are not *closed* systems). Events such as the 9/11 attacks and Hurricane Katrina affected the economy. Similarly, poverty and crime are linked. Actions taken to ameliorate economic conditions in developing countries can have deleterious effects on ecosystems. Failing to improve these economies can create analogous problems within the social fabric. The view of systems freed from the bondage of traditional disciplinary parameters seems appropriate for the future of the field of sustainability. That said, the *methodologies* of the disciplines remain highly useful tools for inquiry. An example is cost/benefit analysis with cost and benefit metrics derived from environmental science, human geography, and sociology.

## Resolving Apparent Conflicts

The question that remains regards how we as humans can meet the seemingly disparate objectives of meeting a sufficient level of economic growth while maintaining social stability and environmental robustness for future generations. Can economic growth and environmental health coexist? Essentially, many see a tradeoff between the needs for economic well-being and the avoidance of harming the environment.

The "answer" is that there is no easy answer. Were such a solution obvious, the apparent dilemmas would not exist. However, two facts are encouraging. On a micro-level, individual firms are embracing the concept of environment as capital. Examples include Coca-Cola, Unilever, and Xerox.[32] On the scholarly side, as academic inquiry eschews the traditional "silos" and embraces interdisciplinary and multidisciplinary approaches (such as systems theory), progress previously unimaginable becomes palpable. As an inventory of inquiry methods, economics has much to offer in this new milieu.

Hausman and McPherson present a compelling case for the integration of economics and ethics with respect to policy decisions. They specifically address environmental protection and global climate change.[33] Economic analytic techniques may be used to assess policy/consequence relationships and ethical premises, while moral philosophy integration

[30] Gary Becker, *The Economic Approach to Human Behavior* (Chicago: University of Chicago Press, 1978), 290-293.

[31] E. O. Wilson, *Consilience: The Unity of Knowledge* (New York: Knopf, 1998), 8-9.

[32] Tercek and Adams, *Nature's Fortune* (Philadelphia: Basic Books, 2013), 74.

[33] Hausman and McPherson, *Economic Analysis, Moral Philosophy, and Public Policy*, 285-289.

allows policy-makers to formulate normative economic strategies to solve problems. In this sense, economics and ethics have a symbiotic and synergistic relationship. This "normative economics" is critical as the world addresses the future of issues such as dwindling resources, climate change, health, and poverty.

## Future Inquiry

Given the relative nascence of the field of sustainability, much of the corpus is in development. New research continues to offer directions for future inquiry. Much of the investigation either addresses issues previously considered within the purview of economics, or uses economic methodology. Tailoring future research within economic journals to concentrate on sustainability challenges will benefit both economics as a discipline and sustainability science.

Sustainability is *normative* at its core, while economics is *positive*. Economics is useful in evaluating tradeoffs and establishing links between decisions and consequences. Determining which outcomes are desired is within the purview of ethics/moral philosophy. Once desired outcomes are established, economic analysis is applicable for reaching an informed decision regarding policy applicability/efficacy. As sustainability challenges often are accompanied by potential policy decisions, the tools of economics offer an important resource for resolution.

Potential areas for further inquiry include 1) applied comparative policy analysis, 2) enhanced resource valuation methods, 3) assessment of the costs of economic inequality, and 4) rigorous studies regarding the tradeoffs between long-term (economic and population) growth and environmental and ecological wellness. Each of the above topics benefits from interdisciplinary collaborations, especially area 4) tradeoffs.

In general, sustainability research offers rich opportunities to the next generation of researchers educated on economic methodology. Whether future inquiry is considered within economics or is subsumed by a broader "field" is irrelevant. The tools of economics always are available for any analysis/investigation in sustainability studies. As previously noted, this is necessary not only for the economics of sustainability, but for the sustainability of economics.

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