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Unraveling the veil of fuzziness: A thick description of sustainability economics

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Abstract: This article provides a thick description (Geertz, 1973) of sustainability economics. Baumgärtner and Quaas (2010a, b) have proposed as an alternative to ecological economics the new field of sustainability economics, which has triggered various replies. The purpose here is to order and to review these contributions. Building upon a literature review of sustainability economics, the paper argues that the concept currently has more of a fuzzy and declamatory character. The rhetoric (McCloskey, 1998) of sustainability economics contains general issues of sustainability economics, externalities and the capability approach. The article argues that it is currently not clear how the solutions for science and policy proposed by sustainability economics differ from those of ecological economics. Efforts should be directed towards further development of the theory and the operationalization of sustainability principles. The systemic view of co-evolutionary development, social learning and sustainability economics' normative underpinning merits more consideration in the debate about sustainability economics.

Keywords: Sustainable Development, Ecological Economics, Sustainability Economics, Externalities, Efficiency, Capability Approach

JEL-Classification: B59, Q50, Q56, Q57

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1. Introduction

Economists contributing to sustainable development have gathered until now under the "big tent" of ecological economics (Howarth, 2008; Spash and Ryan, 2012). Proposals to build a new tent, known as sustainability economics, are currently under discussion. This article provides a thick description of the construction plan for such sustainability economics and examines what its relationship to ecological economics is.

Ecological economics has been dealing with sustainability and socio-ecological interactions for a quarter of a century. Historically, the roots of ecological economics can be traced back even further (Martinez-Alier, 1990; Røpke, 2004, 2005; Spash, 1999). The institutionalization of ecological economics has contributed to the operationalization of principles of sustainability (Daly, 1990; Howarth, 2007; Sneddon et al., 2006). Its journals, international and regional societies, professorships and chairs, and degree and study programs evince an active field relevant for both science and policy. Paradoxically, ecological economics "did much better than the object of its study,"[1] (Hirschman, 1981, p.1) the transformation of lifestyle, consumption, and production patterns towards more sustainable, just, and inclusive development.

Despite the establishment of ecological economics over the past 25 years, it is difficult to provide a precise definition; paradoxically, it seems easier to define what is beyond its scope. When taking a closer look at the literature one identifies a scattered field difficult to classify: diverse methodologies, diverse ontologies, diverse topics, and diverse values coexist under a big tent. Inter- and transdisciplinary approaches (Brandt et al., 2013; Jahn et al., 2012; Max-Neef, 2005) as well as "methodological pluralism" (Norgaard, 1989) structure the field. Ecological economics is the confluent of two complementary, consilient streams from the natural science side - thermodynamics, physics, ecology, biology, and related disciplines – and from the social sciences - economics, sociology, psychology, political sciences and related disciplines.[2]

Yet, there have always been debates about what ecological economics is and how it should evolve (see for example Barkin et al., 2012). Many argue, for example, that the social sciences part of

[1] This is in analogy of Hirschman's analysis of the rise of development economics in the 1940s and 1950s. Hirschman states that the field of development economics was performing well, while the economic development in many countries was not.

[2] I particularly thank one of the anonymous reviewers for her description of ecological economics: "The first stream focuses a lot on the physical limits of the earth and ecosystems (seemingly objective), whereas the second focuses a lot on justice (values, subjective) and human or organizational behavior. Both streams can also be characterized by the methods they tend to use. And both streams need each other in the end because they both have their limits in explaining the ecological sustainability problems on earth and deriving suggestions for solutions to these problems."

ecological economics should be further developed (Anderson and M'Gonigle, 2012; Funtowicz and Ravetz, 1994; Spash, 2011; Spash, 2012).

Most recently a vivid conversation has been triggered by the proposal of Baumgärtner and Quaas (2010a) to build a new tent of "sustainability economics". Their contribution towards a redirection of the field under the new label "sustainability economics" has triggered a debate in the literature. Thus far there has been no review of the debate, its contributions and arguments. This article fills this gap and seeks to better understand the differences between ecological and sustainability economics based on the underlying theory and content behind the labels. The different conceptions of sustainability economics are not consistent with one another. Sustainability economics currently has more of a fuzzy and declamatory character. Here, I take a look behind the veil of fuzziness, which blurs the lines between ecological, sustainability, and environmental and resource economics. Furthermore, it is not clear how the solutions for science and policy proposed by sustainability economics would differ from those proposed by ecological economics. Sustainability economics is promising in many domains and could serve to strengthen the social sciences contributions (Palsson et al., 2013), but specifications of concepts are currently lacking. The intention of this article is examine what theoretical field, such as ecological and sustainability economics, can contribute best to achieve sustainable development.

Geertz (1973) has proposed to study a science through the work its practitioners do: "If you want to understand what a science is, you should look in the first instance not at its theories or its findings, and certainly not at what its apologists say about it; you should look at what the practitioners of it do." (p.5) Sustainability economics is a field in development. Since practitioners' results of the proposed sustainability economics are not available yet, we have to content ourselves with an analysis of the discipline's theoretical underpinnings, proposed in the discussion. The aim of this article is thus to provide a thick description (see Geertz, 1973) on the rhetoric (see McCloskey, 1998) of sustainability economics.

The search for the literature review was conducted with the databases Scopus and EconLit (search term "sustainability economics"): Eliminated from the results were hits where both terms appeared together consecutively (i.e. "…sustainability: economics…"). Search results of review articles of the book "Understanding sustainability economics" by Peter Söderbaum (2008a) were also excluded. The scope of this review has been limited to publications in English.

The thick description of sustainability economics consists of an overview of the discussion (Section 2). The publications about sustainability economics are analyzed with regard to the relationship between ecological and sustainability economics, the environment as a limiting factor, weak or

strong sustainability and the criterion of justice (Section 3). In addition, the analysis of the article with regards to two specific patterns of the discussion, efficiency and externalities, allows to assess the relationship between sustainability and ecological economics (section 4). Sustainability economics for the moment is a proposal that requires more specifications, while at the same time providing perspectives for a larger inclusion of social sciences, concludes this article (section 5).

2. Sustainability economics in discussion

The discussion on sustainability economics has arisen only very recently, even though the term had previously appeared in earlier contributions. This discussion was triggered by Baumgärtner and Quaas (2010a). According to Baumgärtner and Quaas (2010b) "sustainability economics is defined as aiming towards both justice and efficiency with respect to human–nature relationships over the long-term and inherently uncertain future" (p.2057). In short: economics is extended by considerations of justice, by long-term thinking and by the acknowledgement of uncertainty. Their proposition has led to a conversation about the nature of sustainability economics. To structure the debate, this review has identified three main topics around which the articles can be clustered: sustainability economics (2.1.), externalities (2.2.), and the capability approach (2.3.) (see Table 1). Contributions in which sustainability economics was mentioned before the article by B&Q are also taken into account (2.4.).

Insert Table 1 around here

2.1. General contributions to sustainability economics

Baumgärtner and Quaas (2010a) specify "sustainability economics" through four core areas (p.446):

1. Subject focus on the relationship between humans and nature.
2. Orientation towards the long-term and inherently uncertain future.
3. Normative foundation in the idea of justice, between humans of present and future generations as well as between humans and nature.
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.

The foundation of this proposed sustainability economics is the normative idea of sustainability, with efficiency as a secondary goal. The authors argue that the efficient use of scarce resources requires a normative justification. They identify as such a normative goal "the satisfaction of the needs and

wants of individual humans" in the long and uncertain run (ibid., p.447). In addition, dimensions of justice – within and between generations but also towards nature – are included. However, a further specification of these criteria is missing. Baumgärtner and Quaas (2010a) also provide an ontology ("What is the Human Being? What is Nature? What is the Economy?") and specify research areas for sustainability economics in the last part of their paper.

Following this initial article, two contributions by Bartelmus (2010) and van den Bergh (2010), as well as a reply by Baumgärtner and Quaas (2010b), started the conversation. Bartelmus (2010) argues for the monetarization of ecosystem services in integrated accounting systems. Monetarization is proposed since "only monetary valuation provides the measuring rod for comparing the significance of environmental services with that of economic activity" (p.2054). Sustainability economics has, for Bartelmus (2010), the potential to bridge normative (sustainability) and positivist (economic)[3] perspectives.

Externalities are at the heart of the contribution by van den Bergh (2010) and will be treated in the next section. His contribution nevertheless contains some general remarks on sustainability economics that will be noted here. van den Bergh (2010) correctly remarks that Baumgärtner and Quaas (2010a) have failed to specify sustainability policy. In his view, integrated sustainability policy could serve as a transition device. He also argues for downscaling sustainability assessments, so that they are performed at the regional level.

In their reply Baumgärtner and Quaas (2010b) argue against monetary valuation. They call for more meaningful sustainability accounting and indicators. More elaborate green accounting mechanisms, the authors continue, can only be developed when the aim of "sustainable economic development" is defined. Baumgärtner and Quaas (2010b) reject externalities and propose refering to the concept of joint production and stocks. The definition given, however, does not reveal how these differ from externalities: "joint production means that along with the intended outcome of some action, (…) there are necessarily other effects which one may be aware of or not" that can be "material byproducts" or "immaterial changes".

Following this initial set of replies, other authors add comments in subsequent contributions. Söderbaum (2011) frames sustainability economics as a contested notion. He adds the perspective of

[3] Friedman, M., 1953. The methodology of positive economics. The Philosophy of economics: an anthology 2, 180-213. famously argues for economics as a positive science free from any normative content. Its goal is to make accurate predictions. Coase, R.H., 1995. Essays on economics and economists. University of Chicago Press., on the contrary, states: "Faced with a choice between a theory which predicts well but gives us little insight into how the system works and one that gives us this insight but predicts badly, I would choose the latter" (p.17). He argues for realism in assumptions "to analyse the world that exists, not the imaginary one that does not" (p.18).

economic pluralism to the debate and remarks that the scientist is herself a political actor via her choices of topics, her framing reality or her choice of certain methods. He also proposes to broaden the approach of economics, not relying solely on positivism in economics. According to Söderbaum, the preceding contributions "reflect different ideological orientations," with the common denominator that all "advocate some compromise between neoclassical economics and new thinking in sustainability terms" (2011).

2.2. Externalities as a core feature of sustainability economics

The discussion about sustainability economics focuses in subsequent contributions on the role of externalities. Here, van den Bergh (2010) argues that the initial conception of sustainability economics lacks the issue of externalities, which he sees central to sustainable development: "Without environmental externalities the problem of unsustainability vanishes. But sustainability does not require zero externalities in general. Zero externalities is not a realistic goal anyway, as externalities are a fact of life, due to scarce space and thermodynamics" (p.2051). Sustainability is achieved if all externalities are internalized according to this argumentation.

Common (2011) in a short comment rejects the prime focus on externalities because it cannot grasp the dynamics of complex adaptive systems: "the environmental externality internalization agenda does not, even at the level of principle, provide an adequate basis for deriving policies to deliver sustainability" (p.453). Furthermore, Common (2011) emphasizes that allocative efficiency does not guarantee sustainable development.

Bithas (2011) links the question of externalities to that of valuation. While rejecting monetary valuation, he argues for environmental accounts and the preservation of the integrity and resilience of ecosystems and their functions: "The preservation of environmental functions, services and infrastructure is the solution to intergenerational environmental externality. This should be designed in environmental terms which cannot be expressed through economic valuations" (p.1706). The paper introduces some of the core ideas of ecological economics – such as lexicographic preferences, non-monetary valuation and intergenerational resource allocation – to the debate.

Van den Bergh (2012), in a second statement to Common (2011), stresses his initial argumentation. He also argues that ecological economics is congruent with the notion of externality.

2.3. Opportunities and limits of the capability approach for sustainability economics

To the conversation on ecological economics, Ballet et al. (2011) add the capability approach as a fitting normative foundation for sustainability economics. The capability approach, developed by Amartya Sen, argues that freedom is essential for development. Amongst the set of potential

functionings, the capability structure in place determines which functionings can actually be achieved.

Ballet et al. (2011) claim that the capability approach allows one to proceed beyond the satisfaction of needs and wants, because it permits analysis of human-environment interaction and focuses more on the roles of justice, freedom and responsibility.

In answer to this first paper, Rauschmayer and Leßmann (2011) champion three advantages of the capability approach: a) its focus on justice and freedom, b) its agency out of commitments, and c) its function of embedding efficiency debates in the societal sphere. As to drawbacks of this approach, they formulate three arguments as well: i) the lack of a dynamic character, ii) the failure to link capabilities to sustainability assessments, and iii) the lack of specification of behavioral aspects. Rauschmayer and Leßmann (2011) see some potential for the capability approach to be applied in sustainability economics, but feel that it requires more development with regard to intergenerational justice.

Martins (2011) links the capability approach to the study of ontology and concludes that sustainability economics and the capability approach are complementary. The capability approach, to Martins (2011), "is however an incomplete framework, in the sense that it does not possess a theory of socio-economic processes" (p.4). The capability approach provides answers to the question of what human well-being is, but does not respond to "substantive issues within economic theory" (ibid.).

The contribution by Scerri (2012) adds a political theory perspective to the thread and relates the social dimension to ecology and ecosystem functioning[4]: "Rather than viewing ends as a technical problem of economic efficiency […] the approach reframes 'sustainability' as an ethico-moral problem of the social constitution of relationships within the ecosphere" (p.9). By addressing four dimensions – the ecological, economic, political and cultural domains – Scerri (2012) argues that one can rethink "what efficiency aimed at justice might look like from within the perspective of a disciplinary critique of unsustainable development" (ibid., p.8).

Birkin and Polesie (2013) introduce epistemic analysis as a tool for further theorizing sustainability economics and the capability approach. Following Foucault's classification of three epistemes – the Renaissance, Classical and Modern – they add a fourth and emerging one, the Primal episteme. While in their reasoning, ecological economics hints at the emerging episteme, sustainability economics is

[4] The link between the capability approach and ecosystem services has been made, for example, by Polishchuk, Y., Rauschmayer, F., 2012. Beyond "benefits"? Looking at ecosystem services through the capability approach. Ecological Economics 81, 103-111..

still rooted in the Modern episteme, since it is an economic (and monodisciplinary) research program. Birkin and Polesie (2013) see potential improvements through epistemic analysis in both sustainability economics and the capability approach: “But if we are to use the capability approach to develop sustainability economics, it is insufficient to focus only upon people. We need also to incorporate the natural world” (p.151). The emerging episteme, so their argumentation, can connect the natural world and the capability approach. In a more general way, Birkin and Polesie (2013) say that epistemic analysis “may be usefully applied to identifying the epistemological causes of unsustainable development in the Modern episteme” (ibid.).

Martins (2013), in a second contribution, links the capability approach to a more general research agenda on sustainability economics, well-being and an analysis of the history of economic thought. The article argues that notions such as “well-being, surplus, scarcity, and sustainable reproduction” can be specified via the capability approach.

Binder and Witt (2012) reject the inclusion of the capability approach in sustainability economics because Sen’s idea lacks a dynamic approach. A dynamic character, they argue, is nevertheless relevant for analyzing co-evolutionary processes. They also raise the point that preference endogeneity is a serious theoretical problem, making welfare economics an inappropriate tool for sustainable development policies. Since individual preferences change over time, they “provide no longer a coherent measuring rod for comparing the welfare in different states at different points of time” (p.722). The authors call for an evolutionary perspective of the capability approach.

2.4. Further articles on sustainability economics beyond the scope of the current debate

In the recent debate about sustainability economics, references to earlier contributions mentioning the term “sustainability economics” are present in some of the current discussion in this journal, but they are not complete. Munasinghe (2002), for example, has proposed the term “sustainomics” as a trans-disciplinary meta-framework for sustainable development. The literature review yielded as earliest result for the term sustainability economics an article by Walter (2002) in an article about ecology-based communities: “Sustainability economics is the study of the use of resources for the achievement of an ongoing high quality of life, individual and social, within a context of co-stewardship of natural and human communities” (p.84). He argues for the evolution of ecological economics, with the paradigm shift focusing more on stewardship and community capacities. Walter (2002) exposes a systemic understanding of sustainable development: “sustainability economics is the adaptability of human and natural communities in the face of environmental change, including the value of learning by doing, the importance of monitoring and assessment, and the need for stewardship and capacity enhancement” (pp.86-87). This systemic view of co-evolutionary

development, social learning and normative underpinning merits more consideration in the debate about sustainability economics.

Ayres (2008) also refers to sustainability economics. Here, however, it is implied that sustainability economics is somewhat equal to ecological economics with regard to the topic of energy: "Sustainability economics includes the problem of maintaining economic growth, while reducing pollution and/or its impacts, with special attention to the linked problems of energy supply (not to mention the supply other exhaustible resources), climate change and – most urgently – fossil fuel consumption" (p.281). Arguing from a thermodynamics perspective, Ayres (2008) challenges neoclassical economics and defines an interdisciplinary research field in which "economics as the science of resource allocation, occupies the central position, in some sense" (p.294).

Illge and Schwarze (2009) report from a survey of sustainability researchers on the different paradigms for analyzing sustainable development from an economic point of view. Under the umbrella of sustainability economics they identify an "ecological economics school of thought" and a "neoclassical environmental view." A further specification of the nature of sustainability economics is lacking. The definition provided by the authors is simply that sustainability economics deals with "issues of sustainability and economics" (p.595) without further theorizing.

Another series of contributions to the debate on sustainability economics comes from Peter Söderbaum (Söderbaum, 2007a, b, 2008a, b). Here, sustainability and ecological economics are characterized as synonymous: "Ecological Economics can be defined as economics for sustainable development or more simply 'sustainability economics'. This may include neoclassical environmental economics but is broader in scope and has partly emerged as a criticism of neoclassical economics" (Söderbaum, 2007b). Institutional political economics is proposed as an alternative paradigm to neoclassical economics.

The book by Bartelmus (2013) on sustainability economics provides an introduction, which deals with sustainable development and economics in a more general way. Both Bartelmus (2013) and Söderbaum (2008a) are interested in describing economics and policies for sustainable development. For Bartelmus (2013): "Sustainability economics encompasses micro- and macro-concerns of sustaining economic growth and development" (p.1). Instead of pluralism in the discipline of economics, the focus here is directed towards "integrative environmental and economic analysis and policy" (Bartelmus, 2013p.124).

Finally, Bretschger (2010) proposes "sustainability economics" in a neoclassical conception. He defines sustainability as "long-run development which is characterized by non-decreasing living standards, a protection of crucial natural resources, and low risks of economics and ecological crises"

(p.187). What exactly sustainability economics is, remains unclear in this article. The employed model in the paper, however, is based on resource economics and growth theory, i.e. the standard economists' tools within a neoclassical framework.

3. Analysis of the debate about sustainability economics

Many of the contributions are short commentaries rather than elaborate research articles, which demonstrate that there is an active, ongoing discussion about the emerging topic of sustainability economics. How this new tent labeled sustainability economics should look like, has been described above. In this section I examine specific "tent poles" of sustainability economics to highlight areas where specifications of these poles are missing:

- Unclear relationship between ecological and sustainability economics (3.1)
- The lack of specifying a limiting environmental factor (3.2)
- Weak vs. strong sustainability remains unclear (3.3)
- Criteria of justice remain unspecified (3.4)

Of course, sustainability economics is a concept the early state of development (i.e. its r-phase). Thus, future sustainability economists must specify and operationalize many concepts mentioned in this subsection in specific contexts and applications. Yet, the fundamental issue here is that there is little indication given, how to select such criteria. Since remaining unclear about some of these fundamental issues bears the risk to lead to unsustainable outcomes in formulating policy recommendations. Sustainability economics can build upon a rich body of literature used in ecological economics. The question in this stage of development, however, is which ones will be chosen.

3.1. Unclear relationship between ecological and sustainability economics

The relationship between ecological economics and sustainability economics remains unclear. For some, sustainability economics is a combination of environmental and resource with ecological economics (Baumgärtner and Quaas, 2010a), for others ecological economics is a subset of sustainability economics (Scerri, 2012). Yet another group (Common, 2011; Scerri, 2012; Söderbaum, 2011) seems to suggest that both terms are interchangeable.

Baumgärtner and Quaas (2010a) are not clear where to situate sustainability economics: ecological economics research that does not focus on economic efficiency is not sustainability economics (p.449), sustainability economics is a "related academic field" (p.447) to ecological economics, it is at the "intersection between ecological economics and resource and environmental economics"

278 (p.449), and "sustainability economics reestablishes the focus on the original idea of ecological
279 economics" (Baumgärtner and Quaas, 2010bp.2056).

280 Ecological economics and neoclassical economics share some elements, due to the historical
281 evolution of ecological economics out of neoclassical economics (Martinez-Alier, 1990; Røpke, 2004,
282 2005; Spash, 1999). I follow Daly (1992) in his analysis that the special feature of the ecological
283 economics' conceptual approach to sustainability is the attempt to integrate neoclassical economics
284 and (market) allocation as a minor part of an encompassing conceptual construction. Economics is
285 embedded in society and the biosphere – the analysis focuses on the assurance of an ecological
286 compatible scale of (economic) activities and – given this – a just distribution of the inter- and
287 intragenerational use of ecological resources.

288 Positing sustainability economics as the link between environmental and resource, and ecological
289 economics is delicate because it assumes that both fields are compatible. Yet, if ecological economics
290 is defined in contrast to neoclassical economics (Carpintero, 2013; Gowdy and Erickson, 2005), it
291 cannot be compatible with environmental/resource economics by definition.

292

293 *Insert Figure 1 around here*

294

295 I propose to structure this conceptual fuzziness by comparing ecological, sustainability, and
296 environmental and resource economics on three axes. Figure 1 shows the degree to which these
297 three fields respond to Solow- and Holling-sustainability (see Common and Perrings, 1992), and
298 interdisciplinarity. Ecological Economics scores high on Holling-sustainability and interdisciplinarity,
299 less on Solow-sustainability. Environmental and Resource Economics is very strong on Solow-
300 sustainability, but less about Holling-sustainability and interdisciplinarity. Sustainability economics is
301 in-between the two, which takes up the argument of Baumgärtner and Quaas (2010a) on the
302 bridging function between ecological and environmental and resource economics. Baumgärtner and
303 Quaas (2010a) reference Holling's conception of sustainability in their definition of research field 2
304 for sustainability economics, but tend towards a Solow conception of sustainability.[5]

305 Solow-sustainability and Holling-sustainability demarcate different approaches. Second, the
306 demarcation between monodisciplinarity and interdisciplinarity approaches illustrates a further
307 distinction. Solow-sustainability argues for the substitutability of natural capital with built capital

[5] The authors make explicit reference to Solow when they state that sustainability economics takes from environmental and resource economics the approach of inter- and intragenerational justice.

within the framework of neoclassical economics. Yet, this approach is not well suited to sustainable development questions: “Since they [Solow-sustainability assumptions] ignore the fact that the human economy is an integral part of a materially closed evolutionary system, models constructed on the basis of such assumptions are necessarily blind to the dynamic implications of this fact” (Common and Perrings, 1992). Holling-sustainability, in contrast, relies on the resilience and evolution of ecosystems in interaction with social systems. Here a systemic perspective of complex adaptive systems is proposed as the analytical framework (Holling and Sanderson, 1996).

In contrast to environmental and resource economics, the sustainability economics framework embraces interdisciplinary features since Baumgärtner and Quaas (2010a) refer to justice criteria, and ontological questions (“What is the Human Being? What is Nature? What is the Economy?”) that cannot be captured solely with a traditional or mainstream economic framework. Also, in their proposed research fields, sustainability economics questions are beyond the exclusive scope of economics. An even more interdisciplinary approach is characterized by ecological economics (Baumgärtner et al., 2008). Birkin and Polesie (2013), for example, argue for a pluridisciplinary approach, also Söderbaum (2011) suggests including a multitude of “alternative paradigms in economics” (p.1019).

Given the complexity of interactive, dynamic and adaptive systems, a mono-disciplinary approach relying solely on the framework of economics is insufficiently complex, failing to lead to sustainability transformations (Beckenbach, 2001; Foxon, 2006; Foxon et al., 2012; Holling, 1994). Ecological economics seeks to combine natural and social sciences, taking into account the requirements of complex adaptive systems (Beckenbach, 2001).

Beyond disciplinary and interdisciplinary cooperation, the relationship between science and society is also increasingly addressed. The problem-solving orientation and the aim of achieving societal transitions towards sustainability have led to the development of transdisciplinary research. Transdisciplinarity has thus become an important structural feature of ecological economics’ practices (Brandt et al., 2013; Jahn et al., 2012; Max-Neef, 2005; Scholz, 2011). The current debate about sustainability economics does not position itself towards transdisciplinarity or the inclusion of different forms of knowledge such as tacit person-based knowledge.

3.2. The lack of specifying limiting environmental factors

In the discussion about sustainability economics, a limiting environmental boundaries – such as carrying capacity (Wackernagel et al., 2002), safe minimum standard (Ciriacy-Wantrup, 1963) or resilience (Holling, 1973) – is lacking. Baumgärtner and Quaas (2010a) mention in their research field #2 of sustainability economics concepts for such a limiting environmental factor, but do not further

specify them: “thresholds, critical loads, tipping points, carrying capacity, and limited resilience in social, environmental and coupled human–environment systems” (p.448) are listed.

Passet (1979) describes, for example, the economy as an embedded system in society, which itself is embedded in the biosphere. Within the aims of sustainable development there are limiting factors for both the economy and society: the ceiling consists of planetary boundaries while a lower limit can be defined along social development criteria.

Boulding (1966) has coined the image of “spaceship earth” in contrast to the conventional and exploitative “cowboy economy,” which is briefly mentioned by van den Bergh (2010). This lack of a limiting factor in sustainability economics causes difficulty in identifying sustainable development pathways. Sustainability economics does not specify which elements are to be conserved for future generations and to what extent substitutability among capital stocks is possible. However, these specifications are key elements for the operationalization of sustainability principles (Howarth, 2007).

The conception of limiting environmental factors for economic development and the maintenance of resilience (Holling, 1973) is strongly present in ecological economics. Common and Perrings (1992), for example, formulate a general principle along which criteria of sustainable development can be specified: “An ecological economics approach requires that resources be allocated in such a way that they do not threaten the stability either of the system as a whole or of key components of the system” (p.31). This has also consequences for managing the environment and external effects according to Holling (2001), p.404: “the era of ecosystem management via incremental increases in efficiency is over. We are now in an era of transformation, in which ecosystem management must build and maintain ecological resilience as well as the social flexibility needed to cope, innovate, and adapt.”

If sustainability economics remains unclear about criteria such as scale and limiting environmental boundaries, the proposed set of fairness and justice considerations bears the risk that it leads to adverse effects, i.e. un-sustainability.

3.3. Weak vs. strong sustainability remains unclear

Operationalization criteria for sustainable development require a specification of substitutability rules among different forms of capital (Lerch and Nutzinger, 2002): Weak sustainability assumes perfect substitutability of natural and built capital, whereas strong sustainability insists on limited substitutability. The opposition of weak and strong sustainability mirrors also opposing worldviews about the environment and technological progress. Weak sustainability assumes that technological

progress and innovation will be achieved in time to overcome environmental limits. Strong sustainability tenants are less optimistic about technological solutions.

Sustainability in the economic conception is often defined as a constant intertemporal level of welfare (see for example Arrow et al., 2004). Weak sustainability was initially associated mainly with economic growth theory with exhaustible resources but has been applied in a broader sense (Cabeza Gutés, 1996). In contrast, ecological economics argues for strong sustainability, i.e. non-substitutability of natural and built capital, because as Ayres et al. (2001) state: "it is increasingly clear that the criteria for weak sustainability, based on the requirements for maintaining economic output, are inconsistent with the conditions necessary to sustain ecosystem services of the natural world" (p.156).

The discussion about weak or strong sustainability appears in some contributions, but it remains unclear where sustainability economics should be situated. van den Bergh (2010) criticizes the fact that the sustainability economics proposal does not make reference to strong or weak sustainability. Sustainability economics should, in his opinion, address these contrasting views. By arguing for the adoption of resilience and panarchy theory, he indirectly argues for strong sustainability in sustainability economics. For Bartelmus (2010) weak sustainability refers to environmental economics, while strong sustainability refers to ecological economics. Where to situate sustainability economics is unclear here. To Baumgärtner and Quaas (2010b), sustainability economics includes both weak and strong sustainability. This is coherent to their argumentation of including both neoclassical and ecological economics. However, sustainability economics based on weak sustainability (Lerch and Nutzinger, 2002) bears the risk that outcomes and policy recommendations lead to unsustainable lifestyle, production and consumption patterns.

3.4. Criteria of justice remain unspecified

The criteria of justice for sustainability economics have not been specified and there is no clear guidance for choosing a particular theory of justice. Such criteria can refer to distributive, procedural, retributive or restorative justice, each of which leads to a different outcome. Baumgärtner and Quaas (2010a) do not concretize justice criteria. This, however, runs the risk that unsustainable criteria in unfair processes can be chosen. If one holds to the normative idea of sustainability, then the justice principles derived from the World Commission on Environment and Development – with its inter- and intragenerational principle and its overriding priority to serve the essential needs of today's poor – provide a sufficient starting point. A more concrete formulation of justice principles is given for example by Pearce (1987) in his attempt to couple ecological economics to Rawlsian principles of justice (Rawls, 1999 [1971]) with intergenerational considerations and thermodynamics.

He concludes that sustainability as intergenerational fairness is achieved only by “ecologically bounded economies” (p.17). This provides yet another argument, this time based on the justice dimension, for defining boundaries in which sustainable development paths are possible.

4. Focusing on efficiency and externalities

Building upon the general remarks, this section further specifies efficiency (4.1.) and externalities (4.2.). The focus on efficiency is chosen because it is relevant for the formulation of policy analysis (Bromley, 1990) and a “tent pole” of sustainability economics. Externalities, their systemic character and solutions for internalization or reduction of environmental and social disruptions provide a second prism for analyzing sustainability economics.

4.1. The notion of efficiency reveals tensions between economics and equity

Baumgärtner and Quaas (2010a) define efficiency as “non-wastefulness, in the use of scarce resources”. A more concrete efficiency criterion is neither specified in this contribution nor precisely dealt with in the subsequent conversation. Efficiency can refer to ex ante conditions or ex post outcome. It can also be defined on the micro, meso, or macro level. Finally, it can address adaptive or allocative principles (North, 1995). All these criteria lead to very different outcomes and therefore cannot remain unspecified. The definition of concrete sustainable development paths requires that concrete criteria of efficiency be defined.

The efficiency definition most probably intended by proponents of sustainability economics is the Pareto efficiency, or the Potential Pareto Improvement principle. This seemingly value neutral position nevertheless implies value decisions. A very fundamental critique stems from the link between efficiency and fairness: “When applying Pareto optimality as a criterion, distribution must either be defined as a noneconomic problem or circumvented by presuming the distribution to be optimal at the outset” (Vatn, 2002, p.151). Neither of these solutions is valid, because distribution is a problem for economics (especially when it comes to sustainable development) and current wealth distribution within and between generations is far from optimal. The concept of Pareto efficiency carries the risk that it might clash with justice criteria: Pearce (1987) has shown that Pareto efficiency considerations and justice within and between generations are likely to conflict.

Furthermore, the sharp line between efficiency (economic sphere) and equity (ethical and political sphere) is also blurred: “The oft suggested conclusion that efficient resource markets are sufficient to ensure a socially desirable intertemporal resource allocation is theoretically unfounded” (Howarth and Norgaard, 1990). Douglas North concedes in addition, “It is exceptional to find economic markets that approximate the conditions necessary for efficiency” (North, 1995, p.20). There is thus doubt

438 that a sole focus on efficiency will bring about optimal development pathways (see also Common,
439 2011).

440 Neoclassical economics in its treatment of efficiency runs into argumentative difficulties, as shown by
441 Vatn and Bromley (1997), p.137: "The problem of circularity relates to the fact that standard
442 externality theory draws conclusions about what is an efficient rights structure on the basis of
443 reasoning that actually presupposes this structure as given." Sustainable development is, however,
444 about changing these structures towards more social justice, more environmental protection and
445 decent income and equal opportunities.

446 Possible solutions to this dilemma can include at least two options. First, a different notion of
447 economic efficiency can be conceived. In such a conception, instead of allocative efficiency, efficiency
448 could include an economic, social and ecological dimension. The heuristic of "panarchy" (see Holling,
449 2001) can be a good starting point for defining alternative efficiency notions. Second, efficiency
450 analysis can be maintained but with a minor role. Instead of the first analytical step, efficient
451 allocation of scarce resources comes into play after considerations of scale and justice (see Table 3).
452 An overriding priority is given to the assurance of an ecologically compatible scale of activities and a
453 just distribution of the inter- and intragenerational use of ecological resources. Many of these ideas
454 have already been developed in ecological economics.

455 **4.2. Externalities as real environmental disruptions and social costs**

456 This section argues that externalities can be conceived as correlates of how the economy is organized
457 and that they are more complex than economic theory assumes. More important than internalization
458 is a systemic reduction of environmental disruption and social costs. In ecological economics,
459 coevolutionary thinking can provide space for a new conception of externalities.

460 Societal transformations towards sustainable development require a systemic reduction of
461 environmental and social stresses. Economic theory conceptualizes such pressures as externalities:
462 "The notion of externality merely conveys the idea that human interactions or interdependencies
463 extend beyond formal markets characterized by prices and exchange" (van den Bergh, 2010, p.2048).
464 Externalities, i.e. those side effects not taken into account in market processes, can be of harmful or
465 beneficial character and are not necessarily limited to environmental costs. Coase (1960), for
466 example, defines externalities as consequences that inflict harm on another person – an
467 environmental component is absent in this definition.

468 Faced with externalities, economists argue for the internalization of external costs (van den Bergh,
469 2010, 2012). The internalization process serves first and foremost to correct for allocation problems:

it serves to reinstall an optimal equilibrium in market processes and an optimal level of pollution. The dynamics of cumulative effects are, for instance, not taken into consideration (see Pearce, 1976). Economists are less concerned about the real reduction in environmental damages or the increase in benefits such as ecosystem services. Their focus is to reach equilibrium solutions for social welfare.

Kapp (1970) criticized economic analysis because it failed to consider the embeddedness of the economy in society and the biosphere: "economic theory continued to treat allocation, production, exchange and distribution as if they occurred in an essentially closed and autonomous 'economic' sphere with only minor effects on man's natural and social environment" (p.841).

Externalities can be seen as a structural element of the current market process resulting from the nature of market structures. Kapp (1952) for example argued that externalities are not "external" to the market process but an inherent feature of it. He proposed a different set of notions around social costs "because 'externality' implies that uncompensated side effects are exceptional rather than pervasive, incidental rather than systemic" (Swaney and Evers, 1989, p.8). Only through mechanisms such as externalities and "cost-shifting" does the current economic and societal structure prevail (see also Altvater, 1992). According to Kapp (1970) environmental disruptions and social cost are not market failures, but a failure of market systems. Vatn and Bromley (1997) thus speak of externalities as a "market model failure": the problem is the current market model and how the economy is organized, not the market *per se*.

To address the structural and systemic causes of external effects and cost-shifting procedures is therefore necessary, rather than achieving the correct equilibrium in a stylized economic model. The structural character of externalities challenges equilibrium economics: "contrary to the analytical promises of neoclassical equilibrium price theory, there is no reference point in relation to which any costs can be regarded as 'external'" (Beckenbach, 1994, p.94).

A further problem with externalities when confronting theory with reality is the way in which environmental and social costs are conceptualized. For economists, a pollution function is complete and continuous. Any marginal unit of pollution simply accumulates and pollution control is undertaken with a cost-benefit angle (Spash, 2010). This treatment of pollution and social costs is, however, too simplistic: discontinuity, non-linearity, cumulative and spatio-temporal effects as well as bounded rationality are all challenges to the economist. In complex adaptive systems, externalities are less easy to capture (Levin, 1998). Tools developed by economists should adapt to these challenges: "any attempt to treat the quantitative and qualitative relationships by assuming constant rates of environmental disruption can only give rise to a simplistic and hence inadequate and false

view of the problem, particularly as far as the formulation of criteria for action is concerned" (Kapp, 1970, p.838).

Consequently, the aim of internalizing externalities should be a systemic reduction of environmental disruption and social cost. For this, technological and social innovation is required. Hourcade et al. (1992) stress, for example, that attempts at internalization should result in changing development pathways: "The core of the matter is less the problem of internalizing the external costs with a given toolbox of pre-existing antipollution techniques than to trigger a new innovative dynamic" (p.227). Next to socio-ecological indicators and environmental policy, Kapp also proposed strategic technological development (Berger, 2008). Social innovations can complement such technological solutions.

A new definition of externalities can rely, for example, on ideas of coevolutionary development, which conceptualize the complex interaction between social and environmental systems (Kallis and Norgaard, 2010; Norgaard, 1984; Norgaard, 1988). Here, the aim of an economic approach to sustainable development is to enhance resilience: "The preservation of environmental functions, services and infrastructure is the solution to intergenerational environmental externality. This should be designed in environmental terms which cannot be expressed through economic valuations" (Bithas, 2011p.1706).

5. Conclusion

The debate about sustainability economics has triggered many contributions in the literature. Thus far, these have tended to be commentaries rather than contributions to theory development or case studies of practical application. Such work remains to be done in the future. The systemic view of co-evolutionary development, social learning and sustainability economics' normative underpinning merits more consideration. Given the disparity and fuzziness of the various contributions, this article proposes to classify the contributions into three threads: sustainability economics in general, externalities and the capability approach.

The vivid debate about sustainability economics has been fruitful and promising. It has triggered various contributions, which enrich the debate about ecological economics. Whether ecological economics will evolve to sustainability economics is up for discussion. The current formulation of sustainability economics has some serious shortcomings with regards to sustainable development transformations. Currently, there is no application of the concept of sustainability economics to a specific context that would allow to see how this label is put into practice and what difference to ecological economics are yielded.

534 The thick description of sustainability economics revealed that there are many aspects where it is not
535 clear what sustainability economics strives to and which underlying criteria will be chosen. For if the
536 fundamental concepts of sustainability are not chosen carefully, it bears the risk that unsustainable
537 development patterns will be chosen. Efforts should thus be directed towards further development
538 of the theory and the operationalization of sustainability principles

539 Rather than creating new tents, it is perhaps more productive to stabilize and extent the conceptual
540 and methodological, epistemological and ontological poles of our big tent, ecological economics.

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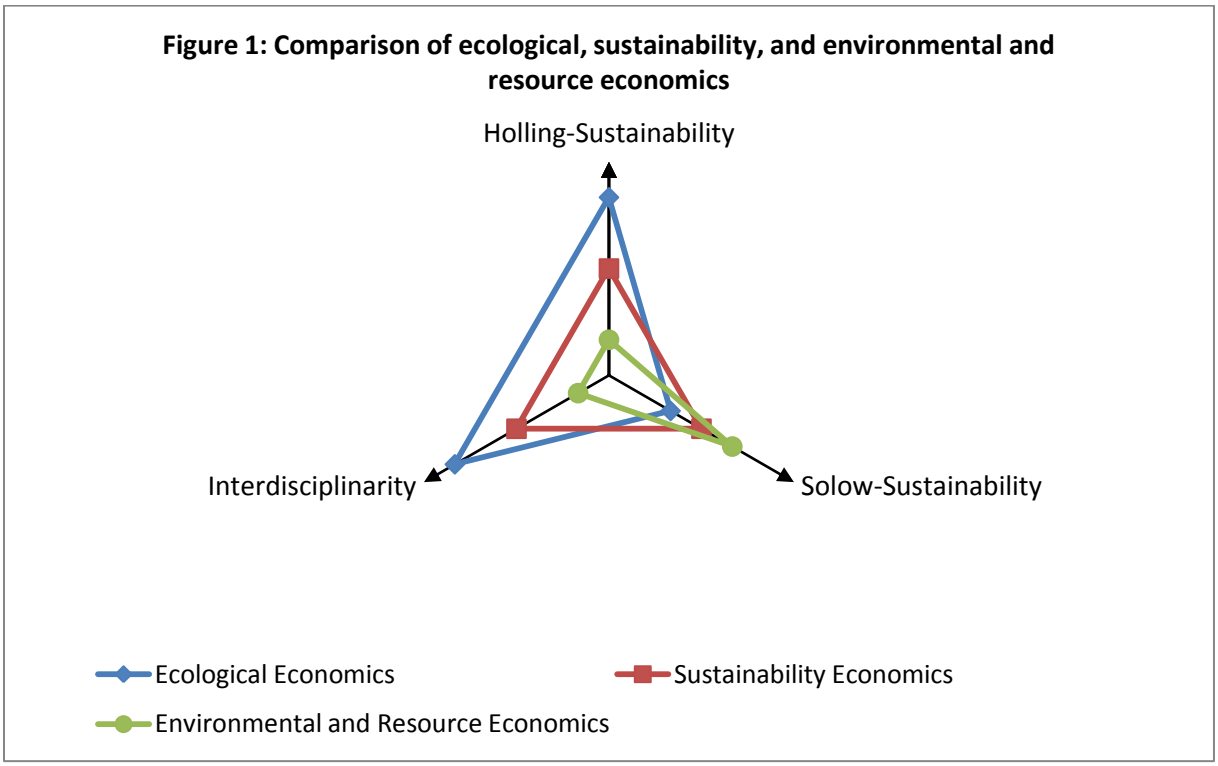
Tables and Figures

Table 1: Contributions to the debate on sustainability economics

Category	Author(s)/Year	Title	Reply to
Sustainability economics apart from recent debate in Ecological Economics	**Walter (2002)**	Economics, ecology-based communities, and sustainability	
	Söderbaum (2007a)	Science, ideology and development: Is there a 'Sustainability Economics'?	
	Söderbaum (2007b)	Towards Sustainability Economics: Principles and Values	
	Ayres (2008)	Sustainability economics: Where do we stand?	
	Söderbaum (2008a)	Understanding sustainability economics: towards pluralism in economics	
	Söderbaum (2008b)	10th Anniversary Focus: From mainstream 'environmental economics' to 'sustainability economics'. On the need for new thinking	
	Illge and Schwarze (2009)	A matter of opinion—How ecological and neoclassical environmental economists think about sustainability and economics	
	Bretschger (2010)	Sustainability economics, resource efficiency, and the Green New Deal	
	Bartelmus (2013)	Sustainability Economics: An Introduction	
Sustainability economics	**Baumgärtner and Quaas (2010a)**	What is sustainability economics?	
	Bartelmus (2010)	Use and usefulness of sustainability economics	Baumgärtner & Quaas 2010a
	Baumgärtner and Quaas (2010b)	Sustainability economics — General versus specific, and conceptual versus practical	Van den Bergh 2010, Bartelmus 2010
	Söderbaum (2011)	Sustainability economics as a contested concept	Baumgärtner & Quaas 2010a, Van den Bergh 2010, Bartelmus 2010
Externalities	**Van Den Bergh (2010)**	Externality or sustainability economics?	Baumgärtner & Quaas 2010a
	Common (2011)	The relationship between externality, and its correction, and sustainability	Van den Bergh 2010
	Bithas (2011)	Sustainability and externalities: Is the internalization of externalities a sufficient condition for sustainability?	Van den Bergh 2010
	Van Den Bergh (2012)	What is wrong with "externality"?	Common 2011
Capability Approach	**Ballet et al. (2011)**	A note on sustainability economics and the capability approach	Baumgärtner & Quaas 2010a
	Rauschmayer and Leßmann (2011)	Assets and drawbacks of the CA as a foundation for sustainability economics	Ballet et al. 2011
	Martins (2011)	Sustainability economics, ontology and the capability approach	Ballet et al. 2011

	Scerri (2012)	Ends in view: The capabilities approach in ecological/sustainability economics	Ballet et al. 2011, capabilitiy approach
	Birkin and Polesie (2013)	The relevance of epistemic analysis to sustainability economics and the capability approach	Capability approach and Sustainability economics
	Martins (2013)	The place of the capability approach within sustainability economics	Capability approach
	Binder and Witt (2012)	A critical note on the role of the capability approach for sustainability economics	Capability approach

Figure 1: Classification of environmental and resource, sustainability, and ecological economics.



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