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Commentary

The Sustainable Value approach: A clarifying and constructive comment

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ABSTRACT

Recently, the original benchmarking methodology of the Sustainable Value approach became subjected to serious debate. While Kuosmanen and Kuosmanen (2009b) critically question its validity introducing productive efficiency theory, Figge and Hahn (2009) put forward that the implementation of productive efficiency theory severely conflicts with the original financial economics perspective of the Sustainable Value approach. We argue that the debate is very confusing because the original Sustainable Value approach presents two largely incompatible objectives. Nevertheless, we maintain that both ways of benchmarking could provide useful and moreover complementary insights. If one intends to present the overall resource efficiency of the firm from the investor's viewpoint, we recommend the original benchmarking methodology. If one on the other hand aspires to create a prescriptive tool setting up some sort of reallocation scheme, we advocate implementation of the productive efficiency theory. Although the discussion on benchmark application is certainly substantial, we should avoid the debate to become accordingly narrowed. Next to the benchmark concern, we see several other challenges considering the development of the Sustainable Value approach: (1) a more systematic resource selection, (2) the inclusion of the value chain and (3) additional analyses related to policy in order to increase interpretative power.

1. Introduction

The Sustainable Value (SV) approach developed by Figge and Hahn (henceforth FH, 2004) gained considerable traction as evidenced by various applications at the firm level (e.g., Figge and Hahn, 2005, 2008; Kuosmanen and Kuosmanen, 2009a; Van Passel et al., 2007, 2009; Yu et al., 2009). The method integrates environmental, social and economic indicators into a monetary analysis based on opportunity costs. Eventually, this indicates how efficient a company uses its resources compared to a predefined benchmark. The measure intends to answer the question how much value a company would create with a predefined set of resources compared to the use of these resources by a benchmark.

FH (2005), Figge et al. (2006), Van Passel et al. (2007), Hahn et al. (2007), the ADVANCE-project (2006) and Yu et al. (2009) used the benchmark methodology of the original paper of FH (2004) in the calculation of SV. On the other hand, recent studies of Van Passel et al. (2009) and Kuosmanen and Kuosmanen (henceforth KK, 2009a) introduced productive efficiency theory in the SV calculation. This dichotomy concerning benchmark use culminated in an ardent discussion between KK (2009b) and FH (2009) in *Ecological Economics* Volume 69, Issue 2. Remarkably, KK (2009b) and FH (2009) framed this debate in a different manner. While the former claimed that the original SV approach did not distinguish the theoretical concept from the estimator, the latter defended their original approach arguing that this distinction was futile and, moreover, that KK (2009b) totally misspecified the problem as they drew on productive efficiency theory instead of the intended perspective of financial economics theory.

In this paper, we therefore intend to (1) shed light on the interesting debate on the SV approach and (2) provide concrete recommendations for its further development. The paper is structured as follows. Section 2 shortly describes the mechanism of the SV approach. In Sections 3 and 4 we illustrate the critique of KK (2009b) and the response of FH (2009), respectively. In Section 5, we discuss this difference of opinions and draw conclusions. Finally, we lay out constructive suggestions for further development of the SV approach in Section 6.

2. The Original SV Approach

Basing on eco-efficiency theory, FH (2004) developed the SV approach, a sustainability measure that integrates social, environmental and economic resource efficiencies into a monetary assessment. Put formally, the SV is calculated in the following way:

$$SV_i = \frac{1}{R}\sum_{r=1}^{R}\left(\frac{y_i}{x_{ir}} - \frac{y^*}{x_r^*}\right)x_{ir} \quad (1)$$

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where SV_i stands for the SV of company i, R for the amount of considered resources, y_i for the economic output of company i, y^* for the economic output of the benchmark, x_{ir} for the resource of company i and x_r^* for the resource of the benchmark.

The company i uses x_i resources to produce economic output y_i. In order to create SV, the company must have a higher economic output than the benchmark would create with the same amount of resources x_i. Concretely, at $x_i = x_i^*$, the benchmark would generate the economic output y_i^*. In this case, the SV thus equals y_i minus y_i^*. According to FH (2004), this company contributes to a more sustainable resource use at the benchmark level.

Figge et al. (2006) illustrate the explanatory power of the SV in an explanatory guide. First, the SV measures the value that has been created or destroyed because the firm has used a determined set of resources instead of the benchmark would create or destroy with the same set of resources. Second, the SV approach shows the value that could be gained if resources were reallocated from inefficient to efficient users. Moreover, the overall resource use remains constant at the macroeconomic benchmark level. FH (2004) therefore claims that the SV approach adheres to the strong sustainability paradigm. Finally, the SV approach integrates social, environmental and social resource efficiencies into one monetary measure.

3. The Critique of Kuosmanen and Kuosmanen (2009b)

KK (2009b) sharply criticise the SV approach as put forward by FH (2004). The rationale of KK is that FH do not draw a distinction between the theoretical concept and the estimator. According to KK, the theoretical concept of the SV should in fact be assessed in the following way:

$$SV_i = y_i - f(x_i) \tag{2}$$

where SV_i represents the SV of company i, y_i the economic output of company i, $x_i = (x_{i1} \ldots x_{iR})^T$ the vector of R resources the firm i uses with the production function of the benchmark technology $f(x_i) : \mathbb{R}_+^R \rightarrow \mathbb{R}_+$. Eq. (2) is very similar to Eq. (1), except for the fact that $f(x_i)$ allows for a flexible form contrary to the rigid, linear $(y^*/x_r^*)x_{ir}$ in Eq. (1).

KK argue that the SV_i in Eq. (1) must be seen as an estimator as it concerns "a rule, strategy, or formula for calculating the value of an unknown parameter of interest" (KK, 2009b, p. 236), and not the theoretical concept itself like in Eq. (4). For this reason, they define the FH's estimator of SV_i as $\widehat{SV}_i^{FH}$:

$$\widehat{SV}_i^{FH} = \frac{1}{R}\sum_{r=1}^{R}\left(\frac{y_i}{x_{ir}} - \frac{y^*}{x_r^*}\right)x_{ir} \tag{3}$$

This can be rearranged to:

$$\widehat{SV}_i^{FH} = y_i - \frac{1}{R}\sum_{r=1}^{R}\left(\frac{y^*}{x_r^*}\right)x_{ir} \tag{4}$$

According to KK, also the production function should also be specified with the estimator $\hat{f}$. Combining Eqs. (2) and (4) results in:

$$\hat{f}^{FH}(x) = \sum_{r=1}^{R}\beta_r x_r \text{ with } \beta_r = \frac{y^*}{Rx_r^*} \tag{5}$$

KK state that $\hat{f}(x)$ is a fundamentally flawed estimator of production function $f(x)$. First, this estimated production function is implicitly based on the unrealistic assumption of linearity with constant marginal opportunity costs. As the resources are thus perfectly substitutable, this violates the strong sustainability paradigm. Second, as $\hat{f}(x)$ also represents the estimated opportunity cost of x, an estimated opportunity cost independent on company properties that increases linearly with x is assumed. KK regard this as unlikely, as the opportunity cost of x should depend on a properly estimated production function that in general differs for each firm. Moreover, even if one makes the strong assumption of a linear production function using Eq. (3), the results are likely to become biased and inconsistent, as β_r is estimated by single data points. KK (2009b) present this shortcoming by conducting several Monte Carlo simulations and re-examining the results of the ADVANCE-project (2006).

4. The Response of Figge and Hahn (2009)

FH (2009) argue that the critique of KK completely misspecifies the underlying theory of the SV approach. Following the tradition of financial economics, FH (2004) developed the SV approach from the perspective of an investor. According to FH, two questions play a decisive role for investors as well as for policy makers regarding sustainability: the question *if* the resource should be used at all and the question *where* the resources should be allocated. As for sustainability measures, there exist many cost–benefit analyses attempting to answer the if-question. However, there were no sustainability measures tackling the where-question. The SV approach intended to fill in this gap by considering the allocation of environmental, social and economic resources. In addition, FH suggest that investors are basically risk averse. As a consequence, they will diversify their economic capital among many economic entities in uncertain circumstances. This implies that investors try to maximise their value added keeping economic, environmental and social capital constant from the overarching perspective of the investor and not from the viewpoint of the individual firm. FH note that the SV approach adheres to the paradigm of strong sustainability as the resources are held constant at the benchmark level.

According to FH, therefore, the benchmark should be chosen from the holistic position of the investor. Following FH, questions about the actual feasibility of SV creation for the firm, resulting in the selection of a firm-based benchmark should not be answered by the approach, as this addresses the how-question in which the individual firm searches for an optimal technology and not the where-question in which the risk averse investor tries to allocate its economic, environmental and social resources in an optimal way while at the same time coping with an uncertain environment. According to FH (2009), KK's concept of production functions and opportunity costs are thus futile and defined at the wrong level (at the firm level instead of the societal level), respectively.

Moreover, FH suggest a number of implications. First, they assert that there remains room for optimisation at the societal level even if efficiency is reached at the firm level. Second, they assert that the perspective of financial economics serves the necessities of sustainability assessment in a superior way than the viewpoint of productive efficiency analysis as (1) sustainable development is considered as a societal concept, (2) the pricing problem of economic, social and environmental resources is circumvented with the original SV approach and (3) the FH assumption that all firms face the same risk is less restrictive than the KK assumption that the use of resources is risk free.

5. Discussion and Conclusion

The calculation of the SV seems straightforward as it merely is the difference between the economic output of a company and the economic output of what the benchmark would create with the same amount of resources. In their original paper, FH (2004) proposed a twofold interpretation of the SV. On the one hand, the SV reflects in monetary terms the overall resource efficiency of the concerned company compared to a predefined benchmark in which the total amount of resources is kept constant. This viewpoint originates from the theory of financial economics. In this case, one takes the

perspective of an investor who wants to find out the performance of a firm in terms of overall resource efficiency compared to the portfolio of all considered firms with a limited, scarce amount of resources. As a result, the average return on resources can be regarded as a valuable benchmark alternative such as in Eq. (1). We then interpret the SV as an *investor's* measure: while we do not seek concrete policy advice to reallocate resources in an optimal way, we solely want to have an overview of how the resources are distributed compared to the portfolio as a whole. FH (2009) define this as the where-question and reject the notion of estimated production functions put forward by KK (2009b).

On the other hand, FH (2004) suggest that the SV at the same time also precisely reflects the financial transfer from more efficient resource users to less efficient resource users if the latter would give up excess resource use. The critique of KK implementing productive efficiency theory is in this regard reasonable. If one aspires to construct a *prescriptive* tool implementing some kind of feasible reallocation scheme, it is absolutely necessary to consider the impact of a change of resource combination on the economic output. In other words, an accurate estimation of the production function is required. Benchmarks determined through productive efficiency analysis do take into account the relation between a change in resource use and the economic output. Following this rationale, it is relevant to explore *how* a firm could allocate its resources. In our opinion the how-question as postulated by FH could however be more precise. We do not agree with the claim of FH that the how-question concerns the individual firm level, boiling down to an issue of production technology choice, instead of the societal level. The implementation of productive efficiency theory presupposes a common production technology choice, as one intends to estimate a production function of the benchmark identical for each company. Although the resource efficiency of the benchmark could vary in accordance with the economic output, the production function of the benchmark estimated at the individual firm level per definition coincides with the societal level. Therefore, the argument of FH that the use of production functions in SV applications means a stance away from the allocative perspective is in our opinion also inaccurate. Although the ambition of applying the SV approach as a prescriptive tool does not necessarily imply an embracement of the perspective of financial economics, it still envisions a distributional mechanism of financial compensation. Adhering to the paradigm of financial economics, one searches in the original methodology proposed by FH (2004) "where environmental and social resources *should* be allocated in order to achieve an optimal overall return" (FH, 2009, p. 249, emphasis added). We may define the SV calculation with the introduction of production theory by KK (2009b) as an indication "where environmental and social resources *could* be allocated in order to achieve an optimal overall return". Even if the difference between the application as an investor and a prescriptive tool strips down to the notion of feasibility, both interpretations of the SV thus concern an allocative matter.

In conclusion, we find the recent debate on the SV approach utterly confusing. Initially, FH (2004) themselves argue that the SV (1) is a monetary measure that compares the overall resource efficiency of the concerned company to a predefined benchmark in which the total amount of resources is kept constant and (2) at the same time also exactly represents the financial compensation that more efficient resource users would pay to less efficient resource users if the latter would forego the excess resource use. In other words, they claim in their original paper that the proposed SV methodology can be used as both an investor's and a prescriptive measure. Although the original SV methodology is useful for the objectives of an investor taking a financial economics perspective, we put forward that the introduction of production efficiency theory is imperative for prescriptive goals. The SV equivalence is thus only correct if the benchmark production function increases linearly. KK (2009b) effectively attack the implicit strong assumption of a linear production function in the original methodology conducting several Monte Carlo simulations and re-examining the results of the ADVANCE-project. Nevertheless, they do not recognise the fact that the original SV measure promises two largely incompatible objectives as the original SV methodology still holds if it is used as an investor's measure. FH (2009) rightly claim that the statistical tests of KK (2009b) are not relevant if one takes the investor's perspective following the paradigm of financial economics. However, FH (2009) moreover state that the SV approach never intended to answer the how-question. Despite a rather inaccurate definition of this how-question, FH (2009) mean that they never intended to apply the original SV approach as a prescriptive tool creating some sort of reallocative scheme. This is incorrect as evidenced by their original contribution of 2004. We note that FH (2004) implicitly hinted at the difficulty of using linear production functions for investor's as well as prescriptive purposes[1].

6. Recommendations for Further Development of the SV Approach

The mainstream research on sustainability indicators focused on burden-oriented measures internalising externalities, and relative measures. While the former require complicated and assumptive pricing procedures, the latter lack the possibility of integrating environmental, social and economic factors. FH (2004) handily overcame these problems introducing the concept of opportunity costs with the SV approach. In this way, FH for the first time framed the debate on resource use from a distributional perspective. Notwithstanding the current controversy surrounding the SV approach, we want to accentuate this merit and see many possibilities for its further development.

SV practitioners should consider which research goal they attempt to pursue. As Van Passel et al. (2009) put forward, the benchmark choice is indeed essential, but must always be measured up to the initial decision situation and research question. If one, on the one hand, aims to use the SV approach as an investor's tool giving a clear overview of company performances concerning overall resource efficiencies, the average return on the resources may be a correct benchmark. If one, on the other hand wants to apply the SV approach as a prescriptive tool creating some sort of reallocation scheme, an implementation of productive efficiency theory could be appropriate. In the latter case, we need a sufficient amount of data points in order to estimate the production function of the firms. Note that also other alternative benchmark definitions could be worked out into more detail. Policy targets, even in the case of regional reallocation, could in addition be valuable in the SV approach[2]. The use of marginal products can be another promising track. In this way, resources can be weighted with relative marginal products of the firms (reflecting the marginal willingness to pay for an extra unit of resource). In conclusion, we advocate a pragmatic standpoint instead of an

[1] FH (2004, p. 179) stated the following in a footnote with regard to a figure in which they presented the SV calculation for the single impact case: "The curves are given as lines as we assume that eco-efficiency, i.e. the amount of value created per impact added remains unchanged independent both of the level of value creation and resource consumption. In other words for the sake of ease and comprehensibility we assume constant marginal products per EIA [Environmental Impact Added]." Clearly, this assumed constant eco-efficiency can be interpreted as an assumed linear production function.

[2] The benchmarking of policy targets remains a political procedure in which many international stakeholders participate. Rametsteiner (in press) suggest that we must be aware of the fact that the development of sustainability indicators has an inherently normative character, bound to social science as well as political reality. Through a democratic process key stakeholders try to find common ground also taking into account issues not related to efficiency such as equity, the composition of the economic entity, and the historical and current resource allocations. In reality, this predominantly comes down to the creation of distinct regional benchmarks (e.g., the EU-15 targets in the Kyoto Protocol are in reality reallocated into negotiated national targets).

argument whether a financial economics perspective or productive efficiency analysis paradigm should prevail.

As the current debate on the SV approach is concentrated on the benchmark choice, we accordingly restricted our discussion. Nonetheless, in our opinion, the current ardent debate on the SV approach inclines to impoverish towards an *exclusive* focus on the benchmark choice, while the concept of the SV approach still enriches the sustainability assessment debate by concentrating on the value of resources instead of the burden.

Recognising the danger of a debate solely focused on benchmark development, we want to call attention to other key challenges in the light of future studies with the SV approach. First, the indicators should be selected in a more systematic way. As the SV approach is founded on eco-efficiency theory, it is restricted to resources and the minimisation of the intensity hereof. Even though FH claim that the SV method adheres to the three-pillar approach inventorying environmental, social and economic resources, not every resource could be assessed in an ample, adequate and/or applicable way. Concretely, there are much more relevant environmental than social data. Furthermore, the aspired resource minimisation implies suitability for negative rather than positive externalities. In reality this results in a considerable weighting towards environmental resources in all past SV studies. In general, we consequently recommend a structured resource choice. Niemeijer and de Groot (2008a,b) present interesting insights from this point of view proposing a conceptual framework for the selection of environmental indicators.

Second, as mentioned briefly by Van Passel et al. (2007), we should find a way to overcome the difficulty that the SV approach does not take into account other companies in the value chain. Fundamentally, there remains a problem that companies with a high SV could achieve their positive score by buying up cheap goods from firms with a low SV in the pre-chain and thereafter selling them at high prices (Schmidt and Schwegler, 2008). We should as a consequence additionally consider the value chain in order to fully attribute the SV to the responsibility of the concerned company. The most popular method to include the value chain is the Life Cycle Assessment (a recent state-of-the-art can be found in Finnveden et al., 2009). This measure assesses the resource use of a product from cradle to grave. Nonetheless, it focuses on the product and not on the production at the firm level as in the SV approach. Schmidt and Schwegler (2008) recently developed a recursive ecological indicator system that does concentrate on the company level. Therefore, some sort of implementation of this approach in the SV methodology could provide useful new insights.

Third, the allocative resource-based perspective is the biggest strength of the SV approach, but also its limitation; in general no sustainability measure can grasp the inherent complex nature of "sustainability". In most studies the SV approach is for this reason used as a black-box in which we do not explore *why* certain companies have a higher SV than other. As a result, the emphasis of the concerned studies is rather on the ranking than on the interpretation of the results. In the light of policy advice, however, explanatory power is indispensable. In fact, the results of the SV methodology can be linked to policy models to analyse the impact of different policy measures on the sustainable value creation of firms. Therefore, we advocate additional comprehensive analyses and complementary applications of other sustainability measures (e.g., Ecological Footprint and Cost–Benefit Analyses) in order to offer more fine-tuned policy recommendations.

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