



BENEFITS AND RISKS OF SATISFICING LEVELS FOR INPUT AND OUTPUT QUANTITIES IN EFFICIENCY ANALYSES FROM A CORPORATE SOCIAL RESPONSIBILITY PERSPECTIVE

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ABSTRACT

In efficiency analyses it is being regularly insinuated that it is desirable to realize a maximum ratio between the produced outputs and the used inputs. According to the concept of satisficing, however, activities can be assumed to be satisfactory if they meet a specific aspiration level. The concept of satisficing has been incorporated into efficiency analysis techniques through satisficing levels. In this paper, benefits and risks are being discussed that result from considering satisficing levels in efficiency analyses from the perspective of Corporate Social Responsibility.

Keywords: Corporate Social Responsibility (CSR), EATWOS, EATWIOS, Efficiency, Satisficing levels, Sustainable development.

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Contribution/ Originality

The present study is one of very few studies which discuss the application of satisficing levels for input and output quantities in efficiency analyses. The study adopts the comprehensive view of Corporate Social Responsibility in order to analyze the benefits as well as the risks of satisficing levels.

1. INTRODUCTION

Corporate Social Responsibility (CSR) is often operationalized in terms of a social (rather: societal), an ecological as well as an economic dimension or perspective (e.g. Bahadur and Waqqas, 2013; Forsman-Hugg *et al.*, 2013; Abro *et al.*, 2016) according to the so-called triple-bottom-line approach (Elkington, 1997). This approach is also embraced when considering Sustainable Development or Sustainability (e.g. Dyllick and Hockerts, 2002; Hutchins and Sutherland, 2008; Hall *et al.*, 2010; Manning and Reinecke, 2016). Many approaches to CSR seek to go beyond Sustainable Development by adding further dimensions (e.g. Dahlsrud, 2008; Forsman-Hugg *et al.*, 2013). In particular, a stakeholder dimension and a voluntariness dimension are additionally considered (Dahlsrud, 2008). The voluntariness dimension covers two aspects. Firstly, many definitions of CSR emphasize that companies take CSR actions on a voluntary basis (e.g. Dahlsrud, 2008; Jiraporn *et al.*, 2014). Secondly, the voluntariness dimension includes encouraging employee participation in volunteer programs (e.g. Munro, 2013; Chaudhri, 2016).

However, the effects of CSR on corporate efficiency and corporate (financial) performance have been analyzed extensively (e.g. Waddock and Graves, 1997; Porter and Kramer, 2002; Becchetti and Trovato, 2011; Tang *et al.*, 2012; Cavaco and Crifo, 2014; Kang *et al.*, 2016). Furthermore, the benefits and risks of satisficing levels in

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efficiency analyses have been already discussed from the perspective of sustainable development (Peters and Zelewski, 2016). The present paper adopts the more comprehensive view of CSR.

The concept of efficiency, that is commonly operationalized by means of an efficiency value as quotient of output types (results) and input types (use of resources) (e.g. Cooper *et al.*, 2006) is especially central to the ecological and economic perspective. For, non-efficient activities present *prima facie* a waste of resources. From the social perspective, however, measures for increasing the efficiency, like for example an input reduction in the form of personnel reduction without a simultaneous output reduction, can be very often classified as problematic. Moreover, through efficiency analyses, that encompass the measurement of efficiency as well as regularly the identification of potentials for efficiency increase, a negatively perceived pressure can ensue on all employees.

According to the concept of satisficing by Simon (1956;1972;1997) activities can – in contradistinction to the preference for a maximization of economic variables – be seen as satisfactory (“satisfying”) if they meet a specific aspiration level.

The integration of the concept of satisficing in efficiency analyses can, from the perspective of CSR for example, prove to be advantageous for softening the pressure possibly negatively perceived by the employees for “efficiency maximization”.

In the last two decades the concept of satisficing was integrated in efficiency analysis techniques (e.g. Cooper *et al.*, 1996; Peters and Zelewski, 2006). Concerning this, two different approaches exist. The first approach consists in the advancement of the technique “Data Envelopment Analysis” (DEA) (Charnes *et al.*, 1978; Cooper *et al.*, 2006; Cook and Zhu, 2014). Thus, beyond the “classic” deterministic DEA models stochastic DEA models have been developed under the designation of “satisficing DEA”, in which case aspiration levels for efficiency values can be defined (e.g. Cooper *et al.*, 1996; Cooper *et al.*, 2006;2011). This approach has been widely studied in operations research literature (e.g. Udhayakumar *et al.*, 2011; Charles and Kumar, 2014; Tsolas and Charles, 2015). The second approach is the “Efficiency Analysis Technique With Output Satisficing” (EATWOS) (Peters and Zelewski, 2006) as well as its extension, the “Efficiency Analysis Technique With Input and Output Satisficing” (EATWIOS) (Peters *et al.*, 2012). In case of EATWOS and EATWIOS so-called satisficing levels can be predefined – like in some multicriteria decision making techniques (e.g. Goal Programming) – on the one side for outputs only and on the other side both for inputs and outputs, respectively. If a satisficing level is being specified for an output, this means that an output quantity, that is identical to this satisficing level, is being rated as equally good as an output quantity that is higher than the satisficing level (e.g. Peters and Zelewski, 2006). However, if a satisficing level is being determined for an input, this implies that an input quantity, that is identical to this satisficing level, is being rated as equally good as an input quantity that is lower than the satisficing level (e.g. Peters *et al.*, 2012).

In the paper at hand, the approach – underlying EATWOS and EATWIOS – is regarded, which has been taken up in recent specialized literature (Bansal *et al.*, 2014; Özbek, 2015a;2015b;2015c;2016; Kumar *et al.*, 2016; Peters and Zelewski, 2016). Benefits and risks are being discussed that result out of the consideration of satisficing levels in efficiency analyses from the viewpoint of CSR.

2. REPRESENTATION OF DECISION MAKING UNITS (DMUS) BY INPUTS AND OUTPUTS

Efficiency analysis techniques enable – beyond a simple calculation of an efficiency value as a quotient out of one output type and one input type – the consideration of several output types (e.g. sales revenue, production volume, quality level, and a corporate’s ecological or social reputation) and several input types (e.g. costs, fuel consumption, water consumption, working hours, and data as a special case of an input type due to the “production” of knowledge in social networks). In efficiency analyses organizational units (e.g. branch banks, branches of a trading enterprise, factories of an industrial enterprise, hospitals, hotels, power plants, schools, sports teams, and

universities) or objects (e.g. production aggregates) are being used – in place of activities – as objects to be analyzed. These objects are being regularly – especially within the DEA technique – referred to as “Decision Making Units” (DMUs) (Charnes *et al.*, 1978). The DMUs use the same input types (in the following shortly referred to as “inputs”) in order to produce the same output types (in the following shortly referred to as “outputs”) (e.g. Charnes *et al.*, 1978; Cooper *et al.*, 2006). Thus, a DMU is being represented by the used quantity or the used value of every input type (input quantities) and the produced quantity or the produced value of every output type (output quantities) in a period of time.

Since the output types as well as the input types are being regularly measured in different dimensions, neither the output quantities of different output types nor the input quantities of different input types can be simply added for the determination of efficiency values for the DMUs. Instead, the quantities or values of the output types in the numerator of the efficiency value as well as the quantities or values of input types in the denominator are being multiplied with importance weights (e.g. Cooper *et al.*, 2006).

Normally, low input quantities (e.g. low costs, low fuel consumption) are being seen as desirable while high output quantities (e.g. high sales revenues, high quality levels) are being aimed at (e.g. Dyckhoff and Allen, 2001). On the one hand, however, also ecologically or socially undesirable outputs exist as so-called “bad outputs” or “nogoods” (e.g. garbage, waste and emissions, especially noise and greenhouse gas emissions, or new and “highly sophisticated” financial products which threaten the stability of financial markets) in which case low output quantities are being considered to be desirable and, on the other hand, ecologically or socially desirable inputs exist (like for example garbage in a waste incineration plant or the employment of refugees as an actual case of “corporate social responsibility” in the European Union) in which case high input quantities are advantageous (Dyckhoff and Allen, 2001). For the consideration of ecologically or socially undesirable outputs and ecologically or socially desirable inputs in efficiency analyses numerous approaches have been developed in specialized literature – especially for the DEA technique (Dyckhoff and Allen, 2001; Scheel, 2001; Davutyan and Bilsel, 2014; Mulwa, 2014). The description of these approaches would go beyond the scope of the paper at hand. Therefore, in the following analysis on the basis of EATWOS and EATWIOS only that approach is being regarded which treats ecologically or socially undesirable outputs as inputs and ecologically or socially desirable inputs as outputs.

3. BENEFITS AND RISKS OF SATISFICING LEVELS FOR CSR

Satisficing levels for outputs can be prespecified in efficiency analyses in order to consider the fact that an output quantity at the level of the satisficing level is being regarded as satisfactory or sufficient. Therefore, it does not affect the efficiency value of a DMU in a positive way if an output quantity is being realized above the satisficing level.

From the social perspective, satisficing levels for outputs provide opportunities to soften the pressure on employees, to maximize the efficiency through the realization of sales revenues or through the production of material goods or services above the satisficing level. Central to this is, however, that the exact level of the satisficing level is being communicated to the employees before the beginning of a period of time, for which an efficiency analysis shall be conducted, so that the employees can orient their working behavior – like for example their working speed – to the satisficing level. When satisficing levels are not being communicated a priori, however, the risk exists that the motivation of those employees, that contributed to the achievement of an output quantity above the satisficing level, is being impaired. For, these employees had no possibility to adjust their working behavior and the part of the output quantity above the satisficing level does not lead to a higher efficiency value. From the economic perspective such satisficing levels can prove to be advantageous if employees are less often

absent due to illness and the company becomes more attractive as an employer to potentially new employees, because of the lessened pressure.

If DMUs, that could achieve output quantities above a satisficing level in a period of time, produce only an output quantity at the amount of the satisficing level, it can result in temporal scopes or slacks. From the voluntariness perspective these slacks can be regarded as beneficial because employees can use them to volunteer in companies' CSR activities or to participate in external volunteer programs (e.g. ecological projects or projects of supporting refugees). Moreover, from the social perspective these slacks can be classified as opportunities since the employees can use them, for example, for further qualification or for working on their own ideas. This way, it is possible that satisficing levels serve as an instrument for providing scopes for the purposes of cultivating emergent strategies in sustainably managing companies (Peters and Zelewski, 2011). From the ecological as well as economic perspective, these slacks possibly present risks since they are connected to a consumption of resources – like for example energy and personnel costs (Peters and Zelewski, 2011) without them being confronted with increased output quantities. If employees use these slacks for the further development of own ideas – for example for new products or for more resource-efficient production methods – innovations can result that prove to be positive in the long run from the ecological, social or economic perspective (Peters and Zelewski, 2011).

Furthermore, in case of a production of output quantities maximally up to a satisficing level, increasing returns to scale (“economies of scale”) will be possibly not realized that would be achieved in case of higher output quantities above the satisficing level. Therefore, from the economic as well as ecological perspective the risk exists that a higher efficiency probably will not be achieved and thus resources will be wasted.

Also, satisficing levels can be set for outputs if the efficiency of investment alternatives shall be analyzed as a basis for investment decisions and if it shall be avoided that an “oversized” investment alternative will be chosen. If, for example, the efficiency of different wind power plants is being measured in case of an investment decision, but – because of a limited allowed feed-in capacity – only a limited amount of electric energy can be fed in the power supply, it offers itself to choose the maximally allowed feed-in capacity as satisficing level for the output “installed capacity” (Peters *et al.*, 2012).

Satisficing levels can be also prespecified for outputs through which quality measures are being included in efficiency analyses. Bansal *et al.* (2014) have analyzed the efficiency of suppliers that supply PET preforms for producing bottles to a company that makes as well as distributes bottles with drinking water, and have specified a satisficing level for the share of the accepted PET preforms.

Satisficing levels through which it is being taken into account in efficiency analyses that a specific average quality level is being regarded as satisficing, can prove to be advantageous from the ecological as well as from the economic perspective. For, if the exceeding of an average quality level given as satisficing level does not have a positive effect on the efficiency value, no incentive exists on the input part to use more resources in order to realize a quality level above the satisficing level.

The consideration of average quality levels in the sense of output-related satisficing levels has a particularly great meaning from the economic point of view. They can expand the conventional DEA technique, that suffers from its focus on purely quantity-based efficiency analyses, by an additional quality dimension. This would be for example of great interest from the social perspective in order to assess the efficiency of single universities or whole (e.g. national) higher education systems not only by means of input and output quantities from a purely economic point of view, as it is often the case at the moment within such DEA-based efficiency analyses, but also to secure the observance of quality standards that are being regarded as desirable in higher education from the social perspective.

In efficiency analyses satisficing levels can be also prespecified for inputs in order to illustrate that input quantities that are below a satisficing level do not have a positive effect on efficiency values. From the voluntariness

perspective satisficing levels for inputs, like e.g. the number of employees or the hours worked, can be seen as beneficial since their application can result in temporal slacks. For instance, employees can use this time to volunteer in CSR activities. Also from the social perspective satisficing levels for inputs can be regarded as desirable in a DMU. For, through such a satisficing level possible pressure to lower the number of employees or the hours worked below the satisficing level is being softened. Furthermore, the observance of understandings in collective agreements – like for example the stipulation of a minimum staffing per shift – can be taken into account in efficiency analyses through such satisficing levels (Peters *et al.*, 2012). The inadmissible lower deviation of a satisficing level in the amount of the minimum staffing is then not being honored by a higher efficiency value.

If ecologically undesired outputs are being considered in efficiency analyses as (ordinary) inputs and for these undesired outputs satisficing levels are being prespecified, the satisficing levels can prove to be very problematic from the ecological perspective. For, it may be economically rational from a company's perspective to prespecify a legal maximum value as satisficing level in case of an ecologically undesired output – like emissions. However, emission values below the satisficing level do not have a positive effect then on the efficiency values.

If ecologically undesired inputs are being included as (ordinary) outputs in efficiency analyses and are being prespecified for these satisficing levels, this can be disadvantageous from the ecological as well as the economic perspective. For example, the consumption of garbage can – as far as the focus is being put on the part of the input and possible emissions have an influence as undesired outputs in the overall assessment – be regarded as ecologically advantageous. Also from the economic perspective, the consumption is to be rated as positive, since no costs are being incurred for the waste disposal. However, the incentive disappears through the establishing of a satisficing level, to spend waste amounts above the satisficing level, since these waste amounts, then, do not lead to a higher efficiency value.

From the stakeholder perspective it is crucial to inform stakeholders about the application of satisficing levels. Stakeholders should be enlightened about the benefits and risks of applying satisficing levels in order to cultivate trustful relationships with socially oriented and ecologically oriented stakeholders. Moreover, shareholders must be informed of the financial effect satisficing levels may have on their compensation. It may be necessary to convince the shareholders that potential long-term impacts of the application of satisficing levels could be more beneficial than short-term output maximization (e.g. Porter and Kramer, 2002).

4. CONCLUSION

Based on the preceding explorations it becomes evident that satisficing levels in efficiency analyses provide benefits not only for the ecological dimension but particularly for the voluntariness and social dimension. Especially the simultaneous consideration of satisficing levels as well as for inputs and outputs within an efficiency analysis – as it is possible in EATWIOS – can result in temporal slacks. On the one hand, these slacks may be used for CSR activities. On the other hand, they offer the opportunity to soften any pressure on employees. However, it is to be taken into account here: the more input quantities are below a satisficing level for inputs and the more output quantities are above a satisficing level for outputs, the lower is the discriminating power of the efficiency analysis.

Also from the ecological, social and economic perspective some opportunities for positive effects (benefits) in the sense of CSR result out of the utilization of satisficing levels in efficiency analyses. However, the risk exists that satisficing levels are going to be used for organizing efficiency analyses in a way that DMUs, which rather do not act on behalf of CSR, receive a higher efficiency value by tendency. Therefore from the stakeholder perspective the benefits and risks of satisficing levels need to be taken into account in the CSR communication strategy (e.g. Golob and Podnar, 2014; Habel *et al.*, 2016).

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