Data-driven insights into the strategic operations of social enterprises: Identifying improvement and betterment paths

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Chapter 1

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Abstract

In the operations management literature, the theory of performance frontiers has introduced the concept of asset and operating frontiers to explore the performance of production units. By doing so, the theory helps understand when trade-offs between several dimensions of performance may or may not occur and identify improvements and betterment paths, i.e., direct and indirect performance improvement paths towards higher performance levels. Even though this theory is validated and very relevant for managing strategic operations, it still lacks of empirical implementations, especially beyond the manufacturing sector, due to the challenge of defining metrics allowing either the assessment of the asset and operating frontiers or the characterization of the improvement and betterment performance paths. The objective of this paper is to illustrate how the Data Envelopment Analysis approach can be used to support the implementation of those concepts in general and more specifically in the context of a case study in the service business involving mass service enterprises. In doing so, the paper not only validates and extends the theory of performance frontiers to a new domain of applicability, but as the case study focuses on microfinance institutions, it also contributes to the debate on the trade-off between the financial and social activities of these service businesses. Empirical results show that simultaneous increases in financial sustainability and outreach to the poor of the microfinance institutions are possible when they are located on an operating frontier far away from their asset frontier. Otherwise, trade-offs are more likely to occur when they are operating close to their asset frontier, meaning that new financing technologies or infrastructure are needed to expand the asset frontier and create more balance between the financial and social activities of microfinance institutions.

Keywords: performance frontiers theory, asset frontiers; operating frontiers; betterment paths; improvement paths; data envelopment analysis; service businesses; microfinance; trade-off

Introduction

In the Operations Management literature, Schmenner and Swink (1998) introduce the theory of performance frontiers based on the concept of an asset frontier formed by the structural choices made by a company-investment in plants and equipment and on the concept of operating frontiers defined by choices management makes in operating plants. The background of this development lies upon a debate concentrated on whether firms can achieve excellence in performance on a limited number of dimensions - the trade-off concept (Skinner, 1969) - or firms are capable of becoming leaders across several competitive criteria - the cumulative capabilities concept (Ferdows and De Meyer, 1990). Schmenner and Swink (1998) point out that firms whose operating frontiers are close to the asset frontier operate under the law of trade-offs, while firms far away from the asset frontier operate under the law of cumulative capabilities; suggesting that both trade-offs and cumulative capabilities can coexist in a relationship between capabilities. They also introduce the concepts

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of performance improvement and betterment. The former refers to moving towards an operating frontier by simultaneously increasing all performance dimensions, while the latter refers to higher performance by moving towards a new operating frontier through some trade-offs among performance dimensions. These concepts were extended by Vastag (2000) to a between-firm analysis where a firm's operating frontier is viewed as a unique resource having the potential to provide a sustainable competitive advantage.

While these authors discuss different approaches to understanding operations trade-offs and performance, they do not explicitly address how these improvements are made. Indeed, given a current operating frontier and a bettered operating frontier, how do firms or plants move from one to the other? Could a firm put into place some kind of programs or supporting tools allowing a direct movement from the current operating frontier to the new operating frontier in a single step? Or, as suggested by Clark (1996) and Hayes and Pisano (1996), should betterment first occur on the current operating frontier, followed by an effort to move the firm or plant to a higher operating frontier through improvement? What determines the choice of a performance improvement path?

Based on empirical findings, Laprè and Scudder (2004) showed that firms close to their asset frontier face trade-offs if they want to reach out higher performance and thus, betterment is the best option, while firms far away from their asset frontier are able to improve all dimensions of performance simultaneously and improvement through a direct path towards a higher operating frontier can be implemented. These findings empirically confirm the validity of the theory developed by Schmenner and Swink (1998): firms closer to their asset frontier are more subject to trade-offs than firms with a large amount of operational slacks. Thus, the theory of performance frontiers provides us with an understanding of when trade-off or complementarity in the various dimensions of performance can be expected to apply. Any predictions of higher performance levels must take into account the relative positioning of the production units in regards to both other units, and operating and asset frontiers. However, while the definitions and concepts provided by Schmenner and Swink (1998) can help strategic managers to evaluate performance of their firms or plants and to plan actions for reaching out higher levels of performance as well as a sustainable competitive position, they need metrics that characterize proximity of a firm or a plant to both their performance frontiers and their competitors.

The objective of this paper is to show how a Data Envelopment Analysis (DEA) framework, based on the selection and extension of existing DEA models, can be used to characterize the operating and asset frontiers, to identify the position of each production unit to those frontiers, and to provide an evaluation of their performance. Furthermore, this DEA framework evaluates potential increases in performance resulting from different improvement paths and, as such, can provide useful information helping managers in the selection of the best option for increasing their performance, taken into account their current competitive position, their structure and technology, and their management policies. Finally, the DEA framework can also be used to identify when production units can gain higher performance through direct improvement path or when the trade-off concept is predominant implying that higher performance level can be reached out by betterment or indirect improvement paths.

Even though the theory of performance frontiers has been initially developed for manufacturing plants or firms, Laprè and Scudder (2004) showed its applicability to a service business located in the service factory quadrant of the service process matrix developed by Schmenner (1986, 2004). In this paper, we apply this theoretical framework to service businesses located in another quadrant of the matrix, namely the mass service quadrant. More specifically, our empirical illustration focuses on microfinance institutions for which the concept of trade-off between the financial and social components of their performance is really important, since it can directly be linked to their double mission of financial sustainability and outreach to the poor, and is currently subject to an intense debate in the literature (e.g., Cull et al., 2009; Hermes and Lensink, 2011; Quayes, 2015). We will show how the development of a DEA framework within the context of the theory of performance frontiers can provide metrics and guidance for managers in the selection of a performance improvement path as well as identify when trade-offs cannot be avoided and when all dimensions of performance can be increased simultaneously.

The rest of the paper is organized as follows. Section 2 provides an overview of the concepts of asset and operating frontiers in the manufacturing context. Section 3 presents different DEA models that can be used to provide metrics within the context of the theory of performance frontiers. Section 4 deals with an empirical application to service businesses and more especially, microfinance institutions. Finally, section 5 discusses our results and section 6 concludes.

Overview of the asset and operating frontier concepts in the manufacturing context

The theory of performance frontiers as developed by Schmenner and Swink (1998) addresses the multiple dimensions of factory performance and seeks to unify prior statements regarding trade-off (Skinner, 1969) and cumulative capabilities (Ferdows and De Meyer, 1990) concepts. Initially defined by Schmenner and Swink in the context of plants for evaluating within-firm performance, the approach has been extended to a between-firm level of analysis by Vastag (2000).

Following the trade-off concept, a productive plant or firm cannot simultaneously provide the highest levels, among all competitors or comparable productive units, of competitive priorities deriving from the business strategy of the firm or the plant as a whole. Indeed, Skinner (1996) describes a productive unit as a technologically constrained entity for which previous choices among various technologies imply constraints on the firm or plant's capabilities, forcing it to make trade-offs among the various dimensions of performance. Thus, the objective of productive units is then to focus their limited resources on achieving excellence in a few pre-selected performance dimensions and to maintain this position over time in order to outperform other productive units or competitors, mainly those that pursue excellence in many dimensions of performance. Thus, based on the trade-off concept, performance differences across different productive units result from their technical constraints.

On the other hand, Ferdows and De Meyer (1990) consider that certain firms can lead their competitors in almost every dimensions of performance when performance improvements are pursued in a certain sequence. When improvements in certain capabilities are basic and enable improvements to be made more easily in other capabilities, the cumulative capabilities concept applies. In this case, competitive priorities are no more competing with each other, but are rather complement. Thus, based on the cumulative capabilities concept, certain dimensions of performance facilitate other dimensions of performance.

The trade-offs and cumulative capabilities concepts deal with the attainment of higher levels of performance across competitive criteria. Identifying whether two capabilities are in a trade-off or a cumulative capability situation is a key issue. Schmenner and Swink (1998) suggest that both trade-offs and cumulative capabilities can coexist in a relationship between two capabilities. Indeed, these authors, using the concept of performance frontiers, provide a unified framework within which both the trade-off and cumulative capabilities concepts can be analyzed. These authors explain that strategic choices are made differently if they affect either physical assets of the production units (i.e., the structural choices or quasi-fixed factors of production), or operating policies (i.e., the infrastructural choices or variables factors of production). Based on this distinction, they identify two types of performance frontiers on which the multi-dimensions of performance can be evaluated: The asset and operating frontiers.

The asset frontier is defined by the structural strategic choices and is only altered by new investments or innovation in the production process. The operating frontier is built upon all factors of production, i.e., both the structural and infrastructural strategic choices. Given the set of assets or structural factors the firm or plant has to work with, the operating frontier can be altered by changes in the management of the productive unit. Thus, when productive units use similar technologies based on similar physical assets, their performance differences are explained by different management choices among these units. Indeed, these units utilize similar production equipment and technology; they share the same asset frontier. While each productive unit's performance is ultimately bounded by its asset frontier, the operating frontier is defined by the management policies and procedures of the unit that bound the performance in short term. Thus, operating frontiers can be moved or changed either by adopting new management systems or by changing work attitudes and/or organizational learning, while the asset frontier can only be modified by innovation and investment in new equipment.

Based on previous definitions, Schmenner and Swink (1998) differentiate between two types of movement towards the operating frontiers: Improvement and betterment. First, improvement is defined as an increase in performance in some dimensions without degradation in any other dimensions; in a similar way as the definition of the Pareto optimality in the microeconomic theory. Improvement can be assessed through an increase in the efficiency of the production process by bringing performance up to a pre-determined standard or benchmark. Thus, improvement only focuses on removing inefficiencies in the production process without changing the structural and infrastructural strategic choices (i.e., quasi-fixed and variable factors of production). Conversely, betterment is defined as an alteration of the operating policies in a way that change the shape or position of the operating frontier without changing the asset frontier, only by means of trade-offs among some dimensions of performance. Once betterment has occurred and the operating frontier is moved outward, then improvement can be implemented to achieve the full potential of the new bettered operating frontier.

Finally, Schmenner and Swink (1998) explain that trade-offs are expected to be identify in a context where all the production units under evaluation use similar technologies and are operating near their asset frontier. If some units are far away from their asset frontier, and as well from their operating frontier, they face a multitude of inefficiencies and many slacks in resources are present. By using a resource rationalization program or by increasing production scale, inefficiencies can be removed and a more fully utilization of resources can be achieved. By using the cumulative capabilities concept and improvement of operations, the production unit can achieve higher performance levels and position itself on its operating frontier. Then, as the unit moves to its operating frontier, it begins to be constrained by the operating policies and procedures and no more improvement in one dimension of performance can be expected without degradation in another one. The trade-off concept applies at this stage. The unit must better its operating choices in order to achieve higher levels of performance. The engagement in betterment implies that the production unit aligns its management choices more effectively and completely with the capabilities of its physical assets by moving or shifting its operating frontier. In accordance with the cumulative capabilities concepts, the movement of frontier in a certain dimension may produce economies and leveraging effects for other dimensions of performance. Finally, once the production unit has resolved most of its inefficiencies through improvement and betterment, its operating policies and procedures are then aligned with its asset capabilities. The unit is now in a position where the limits of the technology begin to impose themselves and the trade-off concept again starts to take precedence over the cumulative capabilities concept.

The choice of where to locate for improving performance is an important decision for a firm or a plant. It will be determined by its business strategy, its current position within its industry, and potential opportunities offered by each new potential operating position. The Schmenner and Swink's approach implicitly assumes a direct improvement path towards the current or a bettered operating frontier is feasible, with an improvement in all dimensions of performance when the firm or the plant are far away from their asset frontier before any kind of betterment or trade-offs. However, Clark (1996) and Hayes and Pisano (1996) identify an indirect improvement path to reach out higher performance levels through first trade-offs on the current operating frontier, before improvement in all the new dimensions of performance towards the bettered operating frontier. Through this indirect improvement path, these authors assume that the firm first restructures its performance objectives by moving along its operating frontier and trading-off among the current performance dimensions, before moving to a new operating frontier by improvement in all the new performance choices of the firm at the same time. While this indirect path is longer, since it is based on a two-step process, it can be in some cases more effective in resource utilization if it optimizes the learning opportunities, putting the organization and the management of the firm in a more stable, albeit dynamic, improvement path towards the new operating frontier. However, little is known about improvement paths of firms (Clark, 1996). Can multiple dimensions of performance be improved simultaneously? Or should betterment (i.e., trade-offs) first occur along an existing operating frontier, followed by an effort to move the firm up to a new operating frontier by means of improvement? What determines the choice of an improvement path?

Thus, the theory of performance frontier as specified by Schmenner and Swmink (1998) provide us with an understanding of when trade-off or complementarity in the various dimensions of performance can be expected to apply. Any predictions of higher performance levels must take into account the relative positioning of production units with regard to others and to their operating and asset frontiers. However, while the definitions and concepts provided by Schmenner and Swink (1998) can help strategic planners to understand the performance of their operational units within a firm or relative to their competitors, they need metrics to characterize their proximity to performance frontiers, to plan actions for reaching out higher performance levels, and to maintain a sustainable competitive position. The next section aims at explaining how a Data Envelopment Analysis framework can be implemented for providing metrics and guidance to managers in both the identification of their positioning in regards to their asset and operating frontiers, and the characterization of potential improvement paths.

Methodology based on data envelopment analysis (DEA) models

Data envelopment analysis: Identifying top-performers and benchmarking goals

Data Envelopment Analysis (DEA) is a benchmarking process that can be implemented to assess how the scare resources of a firm or a plant are used. The traditional DEA model (Charnes et al., 1978) enables the identification of the most performing decision making units (DMUs) that can be used to benchmark against, but also of the less efficient ones on which managers should focus on. Furthermore, DEA allows the definition of measurable, attainable, and actionable goals for implementing a benchmarking process (Spendolini, 1992) to reach out higher performance levels. Indeed, DEA is an approach developed to measure efficiency of a DMU by providing an efficiency score that is viewed as its relative efficiency regarding all DMUs involved in the benchmarking process. Traditional DEA models divide the sample of DMUs under evaluation in two groups: efficient DMUs that receive a score of unity, and other DMUs that receive a score different from unity and are called inefficient by comparison to the former group. Based on the first group of DMUs, DEA identifies best performers or leaders that can be emulated. For each inefficient DMU, DEA produces a specific set of efficient units that can be used as benchmarks or role models for efficiency improvement. Depending on its size and scope, each DMU receives a different set of role models. The distance between a DMU and the efficient frontier provides the benchmarking goal for this DMU. By moving up towards the frontier, a DMU can become more efficient.

The definition of the DEA model is in accordance with the concept of operating frontier defined by Schmenner and Swink (1998) as the maximum performance that can be achieved based on the plant's structural choices (i.e. the physical investments) and infrastructural choices (i.e. different management and learning processes). Furthermore, the concept of improvement defined by Schmenner and Swink (1998) is in accordance with the definition of DEA efficiency. Indeed, improvement is defined as increased performance in one or more of its dimensions without degradation in any other of its dimensions. It can be derived by increasing the utilization and efficiency of production process up to predetermined standards or benchmarks without changing physical assets and operating policies. Thus, DEA allows us to identity benchmarks at the sample level lying upon the highest operating frontier as well as potential improvements (i.e., inefficiencies in the production process) for all other observations in the sample.

Assuming that there are *J* DMUs converting *N* inputs into *M* outputs, that DMU_j (*j=1, …, J*) consumes $x_{nj} \geq 0$ of input *n* (*n=1,…,N*) to produce $y_{mj} \geq 0$ of output *m* (*m=1,…,M*) and that each DMU has at least one positive input and one positive output (Färe et al., 1994), the corresponding output-oriented DEA model is:

$$
\begin{aligned}
&\max_{\theta_o,\lambda_o} \quad \theta_o \\
&s.t. \sum_{j=1}^{J} \lambda_{jo} y_{mj} \geq \theta_o y_{mo} \qquad m = 1,\dots, M \\
&\quad \sum_{j=1}^{J} \lambda_{jo} x_{nj} \leq x_{no} \qquad n = 1,\dots, N \\
&\quad \lambda_{jo} \geq 0 \qquad j = 1,\dots, J
\end{aligned}
\tag{1}
$$

Model (1) attempts to equi-proportionally increase all outputs of DMU_o under expertise as much as possible, while not changing its current level of inputs. It evaluates the maximum level of outputs that should have been possible to produce based on the resources of DMU_o. DMUs for which $\theta = 1$ are efficient, while DMUs for which $\theta > 1$ are inefficient; meaning that there exists at least one observation in the sample or a combination of observations that would have been able to produce more from the same level of inputs. Thus, the optimal solution θ_o^* yields an efficient score for DMU_o and efficient DMUs that serve as role models are identified by the vector of weights: $\lambda_o^* = (\lambda_{1o}^*, \ldots, \lambda_{Jo}^*)$. When an efficient DMU is a role model for DMU_o, then the corresponding optimal value in the vector λ_o^* is positive; otherwise, the value is zero. Furthermore, model (1) is defined under an assumption of constant returns to scale, i.e., allowing an identification of inefficiency resulting from both management policies and scale of operations.

Context-dependent data envelopment analysis: Identifying current operating frontiers

One limitation of traditional DEA models in a process of benchmarking is to provide benchmarking goals that can be quite impossible to achieve in a single step by inefficient DMUs; especially, when the inefficient DMU is far away from the efficient frontier. In order to overcome this difficulty, the context-dependent DEA approach introduced by Seiford and Zhu (2003) evaluates the efficiency of each DMU taking into account its internal and external environment, i.e., its operating context and position. Using this methodology, it is possible to define a step-by-step efficiency improvement path for each inefficient DMU, to define role models for each efficiency level, and to establish a gradual action plan or roadmap with measurable, attainable, and achievable goals (Spendoloni, 1992) that may help inefficient DMUs to achieve their long-term efficiency target.

Following the approach developed by Schmenner and Swink (1998), the context-dependent DEA can be used for identifying current operating frontiers of all DMUs. In doing so, it will be possible to position each observation on its operating frontier and to evaluate how far they are from top-performers of the sample. As the context-dependent DEA use a radial evaluation of the performance of each observation, the movement between each operating frontier is based on simultaneous increases in all dimensions of performance without trade-offs. Thus, if the theory developed by Schmenner and Swink (1998) is empirically confirmed, we must find more opportunities of movement towards operating frontiers by means of improvement in all dimensions of performance for DMUs that are far away from the highest efficiency frontier, while for top-performers, those improvements are zero. Thus, the context-dependent DEA offers the possibility to identify the operating frontier of each DMU under evaluation and to define an action plan that directs an inefficient DMU to its overall efficiency target by means of a step-by-step performance improvement path.

Formally, the context–dependent DEA defines the set of efficient DMUs for which $\theta = 1$ with the traditional DEA model in (1) as S_{E1} and the set of all the J DMUs as S_{J1}. DMUs in the set S_{E1} define the efficient frontier of the set S_{J1}. The second-level efficient frontier is obtained after the removal of efficient DMUs forming the set S_{E1} from the set S_{J1} and the implementation of model (1) on the remaining DMUs that constitute the set S_{J2}. The remaining DMUs received a second-level efficiency score θ_{E2} evaluated relative to the frontier S_{E2}, the efficient frontier of the set S_{J2}. The same process is replicated on the set S_{J3} that is formed after the removal of second-level efficient DMUs in S_{E2} from the set S_{J2}, i.e., those with $\theta_{E2} = 1$. Using this process repeatedly, several sub-efficiency frontiers can be obtained.

Whereas the traditional DEA approach divides the set of DMUs into two groups as efficient and inefficient, the context-dependent DEA approach allows a clustering in which each DMU has the possibility to be efficient for its sub-cluster. This allows DMUs that would end far away from the efficient frontier S_{E1} to receive more achievable efficient sub-targets defined relative to the different sub-efficient frontiers that have been identified above their own efficiency group. While the efficient frontier S_{E1} serves as a long-term target for all inefficient DMUs, the context-dependent DEA approach allows the determination of short-term goals and a step-by-step efficiency improvement. This yields achievable objectives for inefficient DMUs and allows the characterization of benchmarking paths towards their long-term efficiency target. At each step, the context-dependent DEA provides the amount by which all outputs can be increased to reduce inefficiency and model roles that can be emulated.

Data envelopment analysis and capacity measurement: Identifying the asset frontier

The DEA model for capacity measurement developed by Färe et al. (1989) is based on the definition of capacity of Johansen (1968, p. 52) stating that "… the maximum amount that can be produced per unit of time with existing plant and equipment, provided that the available variable factors of production are not restricted"; a definition that is in accordance with the concept of asset frontier defined by Schmenner and Swink (1998) as the maximum performance that can be achieved based on the plant's structural choices, i.e. the physical investments. Thus, the DEA model for capacity measurement can be used for identifying the asset frontier of the sample of DMUs as well as improvements, i.e., simultaneous increases in all dimensions of performance, towards the asset frontier for DMUs that are on the highest operating frontier, i.e., receiving scores of unity, and that are considered as top-performers of the sample under expertise.

Formally, for each observation j ($j=1,\ldots,J$), the "… existing plant and equipment …" is defined as a sub-vector of the input vector x containing only the quasi-fixed factors identified in the Johansen (1968)'s and Schmenner and Swink (1998)'s definitions. While considering that the other production factors are variable, the vector x can be rewritten as: $x_j = (x_j^f, x_j^v)$, $j=1,\ldots,J$. The vector of quasi-fixed inputs x^f is assumed to contain N_f factors, while the vector of variable inputs x^v is assumed to be composed of (N-N_f) elements. Then, the output-oriented DEA model to be solved becomes (Färe et al., 1989):

$$
\begin{aligned}
&\max_{\theta_o^C,\lambda_o^C} \quad \theta_o^C \\
&s.t. \sum_{j=1}^{J} \lambda_{jo}^C y_{mj} \geq \theta_o^C y_{mo} && m=1,\ldots,M \\
&\quad \sum_{j=1}^{J} \lambda_{jo}^C x_{nj}^f \leq x_{no}^f && n=1,\ldots,N_f \\
&\quad \lambda_{jo}^C \geq 0 && j=1,\ldots,J
\end{aligned}
\qquad (2)
$$

Model (2) attempts to equi-proportionally increase all outputs of DMU_o under expertise as much as possible while not changing its current level of quasi-fixed inputs; the level of variable inputs being unrestricted. The new efficiency score provides a measurement of the performance of each observation to the asset or technology frontier without being constrained by the management of current operations.

Non-radial data envelopment analysis: Identifying betterment

The Russell efficiency measure developed by Färe and Lovell (1978) allows for non-proportional output expansion; meaning that trade-offs can be observed between the different dimensions of performance. Trade-offs can be considered as an alternative to a simultaneous improvement of all the performance criteria by focusing more on some dimensions at the detriment of others. Thus, the non-radial DEA measure can be used for evaluating increase in performance through betterment as suggested by Schmenner and Swink (1998), i.e. by moving upward and changing the shape of the operating frontier. As the different dimensions of performance are evaluated using several measures (or outputs) per dimension, the original Russell efficiency model initially developed by Färe and Lovell (1978) is extended in order to evaluate trade-offs between dimensions of performance and not trade-offs between measures (or outputs) used in each dimension of performance.

Formally, assume that there are D dimensions ($d=1,\ldots,D$) of interest for evaluating the performance of firms or plants, with M_d being the number of measures used for evaluating the performance dimension d. We have $\sum_{d=1}^{D} M_d = M$, where M is the number of outputs in the DEA model, i.e., the total number of measures used for assessing all performance dimensions. Then the extended Russell efficiency model can be defined as follows:

$$\max_{\theta_o^B,\lambda_o^B} \quad \frac{1}{D}\sum_{d=1}^{D}\theta_{do}^{B}$$

$$\begin{aligned} s.t. \sum_{j=1}^{J}\lambda_{jo}^{B}y_{dmj} &\geq \theta_{do}^{B}y_{dmo} & m&=1,...,M_d,\ d=1,...,D \\ \sum_{j=1}^{J}\lambda_{jo}^{B}x_{nj} &\leq x_{no} & n&=1,...,N \\ \lambda_{jo}^{B} &\geq 0 & j&=1,...J,\ k=1,...,K \end{aligned} \tag{3}$$

Model (3) attempts to non-proportionally increase all performance dimensions of DMU_o under expertise as much as possible while not changing its current level of inputs. The new efficiency score provides a measurement of performance in each of its different dimensions for each observation; enabling us to identify potential trade-offs between these dimensions. Indeed, while an observation staying at its current position will receive a score of unity for all the efficiency measures θ_{do}^{B} ($d=1,...,D$), those for which trade-offs can increase performance will receive score above unity when an improvement is possible in a certain dimension and a score under unity when a reduction is necessary in another dimension for reaching out higher levels of performance.

Non-radial data envelopment analysis: Identifying indirect improvement paths

The non-radial DEA approach can also be used for identify the indirect improvement paths suggested by Clark (1996) and Hayes and Pisano (1996). These authors consider as an alternative to a simultaneous improvement of all the competitive criteria of performance, the possibility that a DMU first changes its position on its current operating frontier through trade-offs, before a simultaneous improvement of its performance in all its dimensions to reach out a new operating frontier, located at a higher level of performance. In order to identify those indirect improvement paths, we first need to evaluate potential trade-offs on current operating frontiers that can increase performance in some dimensions and reduce performance in others. For doing so, the extended Russell efficiency measure defined in (3) is evaluated for each set of DMUs on their current operating frontier as identified by the context dependent DEA approach (see section 3.2).

$$\max_{\theta_o^T,\lambda_o^T} \quad \frac{1}{D}\sum_{d=1}^{D}\theta_{do}^{T}$$

$$\begin{aligned} s.t. \sum_{j\in S_{Ek}}\lambda_{jo}^{T}y_{dmj} &\geq \theta_{do}^{T}y_{dmo} & m&=1,...,M_d,\ d=1,...,D \\ \sum_{j\in S_{Ek}}^{J}\lambda_{jo}^{T}x_{nj} &\leq x_{no} & n&=1,...,N \\ \lambda_{jo}^{T} &\geq 0 & j&\in S_{Ek},\ k=1,...,K \end{aligned} \tag{4}$$

where S_{Ek}, $k=1,...,K$, are the different operating frontiers identified by implementing the context-dependent DEA approach.

Thus, model (4) attempts to non-proportionally increase all performance dimensions of DMU_o under expertise as much as possible while not changing its current level of inputs and its current operating frontier. The new efficiency scores provide a measurement of performance in each of its dimensions for each observation, enabling us to identify potential trade-offs between these dimensions on their operating frontier. Indeed, while an observation staying at its current position will receive a score of unity for all the efficiency measures θ_{do}^{T} ($d=1,...,D$), those for which trade-offs on their operating frontier can increase performance will receive score above unity when an improvement is possible in a certain dimension and a score under unity when a reduction is necessary in another dimension for reaching out higher level of performance.

Empirical application to service businesses

Case study: The MC² network of microfinance institutions in Cameroon

Our case study deals with the network of community growth mutual funds called '*Mutuelles Communautaires de Croissance'* or *MC²* in Cameroon. The objective of this network of microfinance institutions (MFIs) created in 1992 is to fight against poverty by the means of mobilization of savings and resources in rural communities and provision of loans. All people from a rural community are targeted, including the urban elite originated from it that provides an important share of financial resources necessary to launch and maintain a mutual fund. This is justified by the will to strike the financial balance. Most of the loans focus on productive activities. However, these MFIs can also grant social loans (school expenses, rehabilitation of houses, marriage, funerals, etc.). When they are able to generate enough revenues from their saving and microcredit activities, they also invest in economic and social community projects such as the construction of health centers or schools.

Following the definition of the service process matrix (Schmenner, 1986), those microfinance institutions (MFIs) are high labor-intensive businesses with relatively little plant and equipment and considerable worker time, effort, and cost. They also have a middle degree of interaction and customization of their service. Indeed each loan is defined in accordance with the project of the applicant, but the procedure for granting is quite standardized. In order to become member of an MC², a membership fee has to be paid (2,500 FCFA)[2], at least 10 shares[3] have to be subscribed, and a minimum amount of 1,000 FCFA[4] per month has to be saved. As the entrance fee (membership, shares, and minimum saving) can be high for individual people, the group membership is an alternative allowed to share the weight of the access cost. Then, after a waiting period of observation that varies between six to twelve months, a new member can introduce a request for a loan. Most of the loans focus on productive activities, but those MFI also grant social loans that very often allow people not to resort to the usurer or to urgently sell their assets as well as loans for economic and social community projects. The latter type of loans can require more interaction and customization with members than in the case of loans for productive activities.

Based on these observations, the MC² network can be located in the mass service quadrant of the matrix, with a possibility of evolution towards the professional service quadrant each time interaction with consumers and/or customization of the service increase.

Using the extension of the service process matrix provided by Schmenner (2004), the same classification applies. MFIs of the MC² network can be considered as entities for which the relative throughput time between the service request and the service provision is relatively high. Indeed, the selection procedure for granting a loan is usually quite long. After a waiting period of observation that varies between six to twelve months, a new member that introduces a request for a loan has to be first interviewed by the local manager. Then, the borrower has to submit guarantees that can be objects having value only within the community. One or two other members of the mutual fund have to give their endorsement. Eventually, he has to wait for a formal approval by the credit committee that most often held four times a year. Otherwise, the variation in the service can be considered at the middle level. Indeed, each borrower has a different request and a different history within the MFI, implying a provision of loans framed by the granting procedure that varies according to each applicant.

Variables section for DEA models

The specification of what is an input and what is an output is crucial for the DEA efficiency measurement process. In our specific case, the selection is determined by our understanding of what a microfinance institution does. As we look at the allocation of scare resources to provide outputs aiming at having an impact on the financial sustainability of MFIs and on poverty reduction through their outreach to the poor, the production process of an MFI is defined as illustrated in Figure 1.

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[2] 2,500 FCFCA: around US$5.

[3] 10 shares cost FCFA 10,000: around US$20.

[4] 1,000 FCFCA: around US$2.

Figure 1. Inputs and outputs for DEA efficiency measurement and Performance dimensions

For evaluating the financial performance of MFIs, we consider the production approach in which inputs are transformed into loans and savings (Berger and DeYoung 1997). Inputs are assets (material capital), equities (financial capital), personnel costs, and other operating expenses. As MFIs also have to focus on poor population that cannot access the formal financial system, we consider that those inputs are also used to provide social outputs together with financial outputs. The social performance dimensions most commonly used in the literature are the breadth of outreach, evaluated by the number of clients, and the depth of outreach, measured by the number of the poor and women served by the MFI. The number of the poor is evaluated by the Poverty indicator developed by Gutiérrez-Nieto et al. (2009). The number of women is used to measure the impact of microfinance institutions on women empowerment. Indeed, it has also been proved that reaching and empowering women not only promote gender equality, but also poverty reduction through the common recognition that women more often invest loans in productive activities or in improving family welfare than men, who consume rather than invest loan funds. Table 1 provides descriptive statistics of DEA inputs and outputs. The data set contains 52 MFIs from the MC² network in Cameroon having more than five years of activity in 2009 (see, Piot-Lepetit and Nzongang (2014) for further details).

Table 1. Descriptive statistics of DEA inputs and outputs (52 MFIs in 2009)

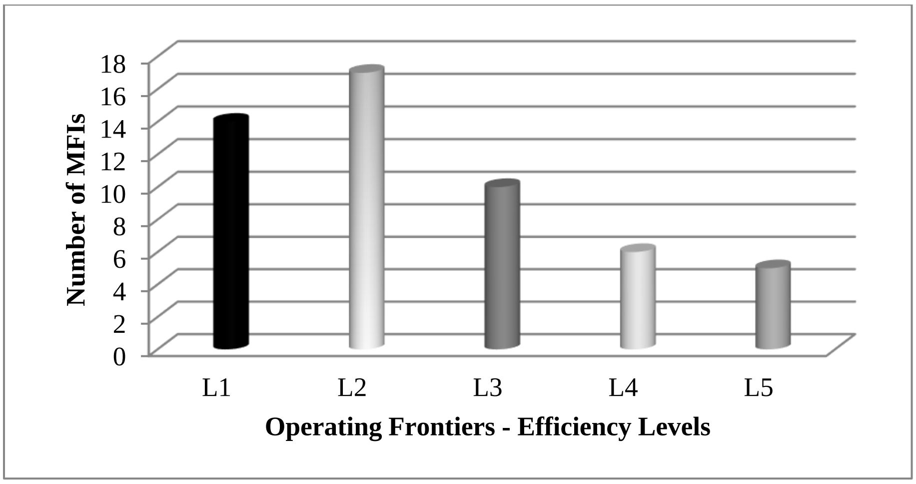
Variables	*Units*	*Mean*	*Std-Dev*	*Minimum*	*Maximum*
Inputs					
Assets	FCFA 1,000	527,518	345,637	54,845	1,503,059
Equities	FCFA 1,000	135,649	75,486	24,901	375,334
Personnel costs	FCFA 1,000	5,454	2,922	1,511	16,222
Operating costs	FCFA 1,000	13,977	9,965	2,376	46,006
Outputs					
Financial performance					
Loans	FCFA 1,000	176,458	130,698	19,420	61,353
Savings	FCFA 1,000	395,288	293,904	24,987	1,299,370
Social performance					
Breadth: # of clients	number	1,961	1,063	282	5,184
Depth: # of the poor	number	1,362	896	0	4,784
Depth: # of women	number	480	294	35	1,625

Note: FCFA 1,000: around US$2

Results

Identification of current operating frontiers

Results provided by the context-dependent DEA approach (see, section 3.2.) are presented in this section. The improvement path is a step-by-step approach towards a long-term efficiency target, identifying improvements for MFIs in both their management policies and the scale of their activity. Results show that there are five efficiency levels in the data set. The distribution of MFIs in these efficiency levels is illustrated in Figure 2. First-level efficient DMUs are those identified with the traditional DEA model defined in (1) that can be considered as the top-performers of the sample, while DMUs in sub-efficiency levels are composed of MFIs that become efficient after the removal of previous efficient MFIs.



Note: MFIs - Microfinance institutions

Figure 2. Distribution of MFIs by operating frontier

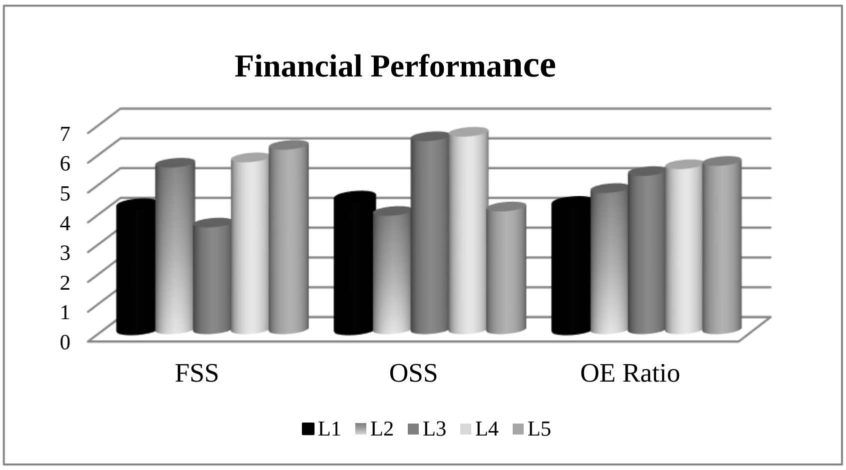
As explicitly shown in Table 2, MFIs that are in the fifth-level of efficiency, i.e., the operating frontier that is the farthest from the top-performers' operating frontier, and therefore the farthest from the asset frontier, are among the youngest, with none of them being more than nine years old. For other operating frontiers, the distribution of MFIs is similar to that of the sample; except for MFIs in the fourth-level that are also younger. Otherwise, the number of MFIs in the West province is higher than that in other provinces for the L2, L3, and L5 operating frontiers, but to an extent that is similar to the difference at the sample level between both groups of provinces. For the L4 operating frontier, no difference exists, while for the highest operating frontier (L1) more MFIs belong to other provinces. To summarize, the main difference between operating frontiers that can be pointed out is the youngest age of MFIs in the fifth- and fourth-efficiency levels, i.e., those that are far away from top-performers of the sample. Thus, MFIs that are in the last two efficiency groups and that need longer improvement paths are among the most recently established ones.

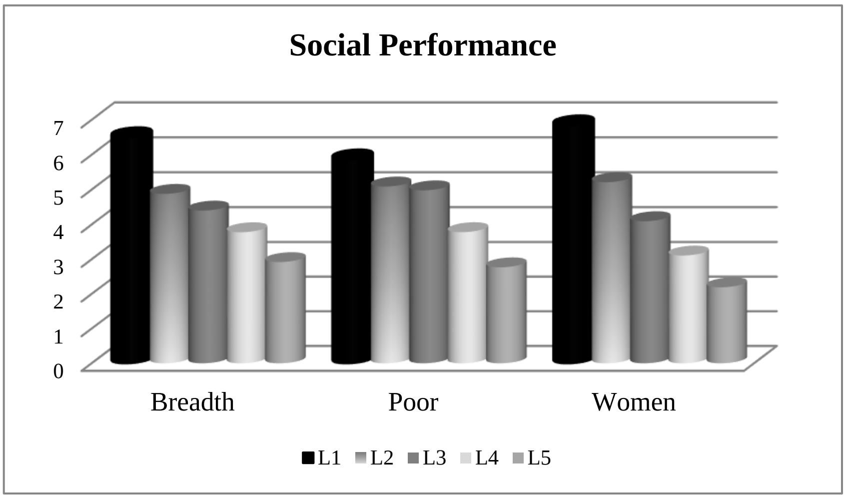
Table 2. Distribution of MFIs by operating frontier and by age and location in Cameroon

Operating frontiers	**MFIs**	**Age**					**West province**		**Other provinces**	
	#	*Mean*	*Std-dev*	*Min*	*Median*	*Max*	*#*	*%*	*#*	*%*
L1	14	11.6	3.9	5	11	18	6	21.4	8	33.3
L2	17	10.6	3.8	6	10	17	10	35.7	7	29.2
L3	10	11.7	3.8	5	12.5	17	6	21.4	4	16.7
L4	6	9.5	4.1	5	9	15	3	10.7	3	12.5
L5	5	7	1.4	5	7	9	3	10.7	2	8.3
Total	*52*	*10.6*	*3.8*	*5*	*10.5*	*18*	*28*	*53.8*	*24*	*46.2*

Note: MFIs - Microfinance institutions

Figure 3 provides additional descriptive information on MFIs according to their current operating frontiers. Regarding MFIs belonging to the first three operating frontiers, financial performance decreases as they move closer to the top-performers' operating frontier (L1). This is mainly due to higher write-off and provision expense ratios in comparison to those on other operating frontiers. For those on L1 and L3, it also results from a low financial self-sufficiency (FSS) ratio, while for those on L2 a low operational self-sufficiency (OSS) ratio is observed. On the other hand, social performance increases with efficiency in both its breadth and depth components, i.e., the number of clients and the number of the poor and women. Thus, a mission drift towards more social activities and less involvement in the financial activity is found for these MFIs. Finally, top-performers are found to be the most involved in the outreach to the poor. These MC^2 are able to reach out more poor clients as well as more women. On L1 and L2 operating frontiers, the number of women is higher than in other operating frontiers.





Notes: FSS - Financial self-sufficiency ratio; OSS - Operational self-sufficiency ratio; OE ratio - Operating expense ratio; Breadth - Number of clients

Figure 3. Description of the financial and social performance dimensions by operating frontier

MFIs on the L4 and L5 operating frontiers have a high financial self-sufficient (FSS) ratio; those on L5 having the highest FSS ratio by comparison to other operating frontiers. As these MFIs are the youngest (see, Table 2), this result points out that they have concentrated their activity on their financial component rather than on their social one, i.e., they have been more involved in managing the robustness of their financial activity than in developing their client portfolio in direction of the poor and women. This result is not so surprising, since the primary objective of MFIs belonging to the MC² network is to become independent of subsidies by the end of the fifth year of activity. Thus, their first target after their launching is, as a consequence, financial viability. Confirming the last comment, we found that MFIs on L5 have the highest average loan of all operating frontiers; the average amount of the loans served by MFIs on L5 is the highest of the sample. The average loan size is considered as an indicator of the depth of outreach to the poor. The lower the average loan size is, the more committed with poverty reduction MFIs are. This result points out a trade-off towards the financial dimension of performance for MFIs on L5 due to a too intense focus on their financial sustainability at the beginning of their activity.

To summarize, our description of the sample by operating frontier showed that the social dimension of performance improves by moving upward towards top-performers, while the financial dimension tends to decrease, showing a potential trade-off or mission drift (Cull et al., 2009) in regards to the social dimension of their activity as efficiency increases. Conversely, the youngest MFIs, that are the farthest from top-performers, face a mission drift in regards to the financial dimension of performance due to a high focus after their launching on their financial sustainability in order to become independent from subsidies.

Improvement paths: simultaneous increases in all performance dimensions

Table 3 provides improvement paths identified by means of the context-dependent DEA approach. From the operating level L5, an improvement until the top-performers' operating frontier L1 implies an average increase of 37% in all outputs. By implementing a step-by-step improvement, an increase of 5% at the first step, of 11% at the second step, of less than 7% at the third step, and of 14% at the last step is suggested; providing more realistic and implementable goals for simultaneously increasing all outputs. As showed in Table 3, the increase in outputs suggested at each step of improvement paths is between 5 and 15%, rather than between 6 and 37% by means of a single step approach as usually implemented by the traditional DEA model.

For observations on the first operating frontier (L1), no improvement path can be suggested by using the context-dependent DEA approach. Indeed, those observations are scored at unity and are considered as top-performers of the sample. In order to evaluate potential improvements for these MFIs, the capacity DEA model defined in (2) is used. The model evaluates how far they are from their asset frontier. As it can be observed at the bottom of Table 3, top-performers still have room for increasing simultaneously all their outputs by almost 9%.

Table 3. Improvement paths from current operating frontiers to top-performers

Operating Frontiers	**Improvement paths**	**Efficiency: Mean**	**Inefficiency: %**
	L5 to L1	*1.3703*	*37*.03
L5	L5 to L4	1.0495	4.95
	L4 to L3	1.1118	11.18
	L3 to L2	1.0685	6.85
	L2 to L1	1.14059	14.05
	L4 to L1	*1.3026*	*30.26*
L4	L4 to L3	1.0549	5.49
	L3 to L2	1.1459	14.59
	L2 to L1	1.1018	10.18
	L3 to L1	*1.2115*	*21.15*
L3	L3 to L2	1.0802	8.02
	L2 to L1	1.1313	13.13
L2	*L2 to L1*	*1.0634*	*6.34*
Asset Frontier	**Improvement path**	**Efficiency: Mean**	**Inefficiency: %**
L1	*L1 to AF*	*1.0877*	*8.77*

Note: AF – Asset Frontier

Betterment paths: performance increases by reshaping operating frontiers

While previous sections describe improvement paths, i.e., simultaneous increases in all performance dimensions, we now focus on betterment paths (Schmenner and Swink, 1998). Betterment occurs when changes implemented for reaching out higher performance imply moving upward and at the same time reshaping current operating frontiers, i.e., by trading-off some dimensions of performance. Betterment can be evaluated by using a non-radial DEA model as defined in (3). As shown in Table 4, for MFIs far away from top-performers, i.e., those located on operating frontiers L3 to L5, the change in the shape and location of their current operating frontier provides higher possibilities for increasing performance by comparison to directly moving upward to an higher operating frontier by improvement, i.e., a simultaneous increase in all performance dimensions without trade-offs. However, in those cases, betterment implies a higher effort than improvement, and depending on the situation of an MFI and its ability to expand its performance criteria in short-term, betterment in a single step can be difficult to implement.

Table 4. Betterment vs. improvement paths by operating frontier

Operating Frontiers	**Improvement Paths**		**Betterment Paths**	
	Paths	**Efficiency**	**Financial**	**Social**
L5	L5 to L4	1.0495	1.2605	1.1685
L4	L4 to L3	1.0549	1.4096	1.2072
L3	L3 to L2	1.0802	1.7032	1.2745
L2	L2 to L1	1.0634	1.9874	1.0054
Asset Frontier	**Improvement Path**		**Betterment Path**	
	Path	**Efficiency**	**Financial**	**Social**
L1	L1 to AF	1.0877	1.9627	1.0731

Note: AF – Asset Frontier

For MFIs that are on the highest operating frontiers, i.e., on L2 or L1, results from betterment, clearly point out that the increase in the financial performance implies a reduction of the possibility of increasing their social dimension, by comparison to that evaluated by means of improvement (model 2). Thus, even though all dimensions of the performance can be increased by betterment, a trade-off is also observed towards the financial dimension at the expense if the social one.

Direct vs. indirect improvement paths

In this section, results from the non-radial DEA model defined in (4) are presented and compared to those from the context-dependent DEA model (see, section 3.2). This allows us to compare increases in performance that can result from a movement on the current operating frontier through trade-offs among some performance dimensions, before moving up to a new operating frontier, also called indirect improvement path by Clark (1996) and Hayes and Pisano (1996), with those resulting from a direct improvement path towards a higher operating frontier.

Table 5. Direct vs. indirect improvement paths by operating frontier

Operating Frontiers	Direct Improvement Paths		Indirect Improvement Paths		
	Paths	**Efficiency**	**Paths**	**Financial**	**Social**
L5	L5 to L4	1.0495	on L5	1.0403	1.1301
L4	L4 to L3	1.0549	on L4	1.2671	1.0915
L3	L3 to L2	1.0802	on L3	1.4357	1.2496
L2	L2 to L1	1.0634	on L2	1.5924	0.9327
Asset Frontier	**Direct Improvement Path**		**Indirect Improvement Path**		
	Path	**Efficiency**	**Path**	**Financial**	**Social**
L1	L1 to AF	1.0877	on L1	1.5742	0.9619

Note: AF – Asset Frontier

As shown in Table 5, for the lowest operating frontier L5, a movement on the current operating frontier can provide similar performance increases of the financial performance as that possible with the direct upward movement, i.e., an improvement in all performance dimensions. However, due to the trade-offs between performance criteria, an additional increase in the social dimension for MFIs on L5 is identified. For MFIs on L3, the indirect movement clearly provides higher possibility of increases in performance. However, as the expected changes are high, they can be difficult to achieve in a single step for those MFIs. Finally for MFIs on L2 and L1, an indirect improvement path implies a trade-off between the two dimensions of performance. They can increase their financial performance, but, at the same time, they have to reduce their social performance.

Discussion

Data envelopment analysis and the theory of performance frontiers

The theory of performance frontiers as developed by Schmenner and Swink (1998) and extended by Vastag (2000) provides managers with a clear understanding of when trade-offs between capabilities may occur. Indeed, the theory suggests that a firm or a plant that operates near its asset frontier will be able to capture greater benefits from a trade-off among the various dimensions of its performance in absence of any kind of structural or technological changes. Conversely, firms or plants that are far away front their asset frontier benefit more from simultaneous improvements in all performance criteria aiming at improving their operating efficiency. Thus, the theory suggests the need for managers, in order to archive higher performance levels, to consider their position relative to their operating frontier, to other operating frontiers, and also to their asset frontier. Indeed, their current position and technological limits influence any kind of performance improvement initiatives, either in its extent or its direction. Thus depending on their location, different benchmarking processes should be implemented and different solutions should be suggested in order to maintain or increase performance (Schmenner and Swink, 1998).

A traditional process benchmarking can support improvements towards higher operating frontiers for firms or plants far away from their asset frontier, while a focus benchmarking is needed for firms or plants near their asset frontier. This latter aims at selecting capabilities on which a firm or a plant could focus on in order to increase its performance and sustain its competitive advantage, before implementing a technology benchmarking aiming at expanding or changing the asset frontier. Thus, the theory of performance frontiers provide a framework helping firms or plants at developing action plans for maintaining or increasing their performance and competitive advantage. However, as pointed out by Schmnener and Swink (1998), for doing so, they need metrics to both assessing their proximity to the operating and asset frontiers, and characterizing the movement and change in the shape of their performance frontiers.

Indeed, several options for increasing performance are possible. Through improvement, firms or plants can move towards a higher operating frontier without changing its shape, by an equi-proportional increase in all performance dimensions. When during the upward movement, the shape of the operating frontier is changed by altering operating management and policies, betterment is implemented, involving trade-offs between some dimensions of performance. However, another option suggested by Clark (1996) and Haynes and Pisano (1996) is first to move on the current operating frontier by trading-off some of the performance criteria before moving upward to a higher operating frontier through improvement. Finally, for top-performers, two options are possible: An improvement or a trade-off of performance dimensions towards the asset frontier, in absence of any structural or technical changes.

The Data Envelopment Analysis (DEA) framework has already been suggested to support benchmarking activities and provide guidance to managers (Cook et al., 2014; Donthu et al., 2005). There are three basic steps in a benchmarking process, analysts agree on, that are: (i) Identifying top performers, (ii) Setting goals, and (iii) Implementing recommendations (Donthu et al., 2005). In this context, traditional DEA models can be usefully used for objectively identifying the most performing units to be benchmarked against as well as in setting goals for efficiency improvements. Indeed, DEA is a non-parametric approach that considers multiple resources used to generate multiple products or services simultaneously. It produces an efficient frontier consisting of a set of top-performers or industry leaders that can be emulated. Hence, the first step of a benchmarking process is achieved by using frontier units as role models. Then, the distance between each observation and the efficient frontier provides measurable, attainable, and actionable goals (Spendolini, 1992); satisfying the requirement of the second step of a benchmarking process. Based on the first two steps of benchmarking, DEA can be considered as a diagnostic tool, aiming at providing metrics that characterize the proximity to an efficiency frontier. It does not prescribe any strategy for developing action plan and guiding performance improvement of a firm or a plant. However, by implementing a DEA benchmarking process within the framework of the theory of performance frontiers, it becomes possible to identify several improvement paths and to provide metrics to managers in order to help them in the selection of the best option for their firm or plants.

It was the objective of this paper to show how DEA could be used to provide metrics and relevant information to managers in their benchmarking process within the framework of the theory of performance frontiers. Indeed, the use of the traditional DEA model (Charnes et al., 1978) allowed us to identify the operating frontier of top-performers and to provide improvement goals for other firms towards this efficiency frontier through a simultaneous increase in all performance criteria. Then, a context-dependent DEA approach (Seiford and Zhu, 2003) was implemented to identify current operating frontiers of each firm in the sample in order to characterize potential step-by-step improvement paths towards the highest operating frontier by means of equi-proportional increases in all dimensions of performance. For top-performers, the implementation of a capacity DEA model (Färe et al., 1989) allowed us to identify the asset frontier and to measure potential improvements towards this technological frontier. Finally, a non-radial DEA model (Färe and Lovell, 1978) was extended and used for identifying trade-offs towards a better operating frontier or on the current operating frontier. By using these different DEA models within the context of the theory of performance frontiers, we were able to provide metrics and directions for the third step of a benchmarking process concerning the implementation of recommendations emerging from the analysis of the current position of a firm or a plant as well as to suggest potential performance improvements paths for reaching out a better position and sustaining a competitive advantage.

The theory of performance frontiers in the service industry

While developed in the context of the manufacturing sector, the theory of performance frontiers was applied by Lapré and Scudder (2004) to the U.S. airlines industry, a service business located in the service factory quadrant of the service process matrix (Schmenner, 1986, 2004), i.e. a service facing low-labor intensity and low interaction and customization of the service (Schmenner, 1986) or low to middle throughput time and low variation in the provision of the service (Schmenner, 2004). Their main findings empirically confirm the validity of the Schmenner and Swink's theory of performance frontiers for this type of service businesses. Indeed, they found that airlines closer to their asset frontier have to make trade-offs. Simultaneous improvements in both cost and quality are not observed for these companies, while they are possible for airlines farther removed from their asset frontier.

This paper considers another type of service businesses that is located in the mass service quadrant of the service process matrix. Indeed, financial service businesses face high-labor intensity and low to middle interaction and customization of their service (Schmenner, 1986), or middle to high throughput time and low to middle variation in the provision of their service (Schmenner, 2004). Our results also empirically confirm the validity of the performance frontiers developed by Schmenner and Swink (1998). Besides, we were able to characterize various improvement paths suggested in the literature: direct paths through improvement and betterment (Schmenner and Swink, 1998) and indirect paths (Clark, 1996; Hayes and Pisano, 1996). By proving metrics for each improvement path, the approach developed in this paper can be useful to managers in their selection of the most relevant option for their firm or plants, given their specific productive context as well as the effort needed to reach out a higher performance frontier.

Furthermore, the theory of performance frontier was applied to a specific case of service businesses: the microfinance institutions (MFIs) that provide financial services – mainly, loans and savings – to the poor and low income people excluded from conventional financial service. With an objective of poverty alleviation, MFIs lend small amounts of money – microcredits – to individuals or groups of individuals in condition of social exclusion and who have no recourse to traditional sources of finance. So, MFIs face a double bottom-line (Yaron, 1994). Indeed, MFIs do not operate in the same way as traditional banks that only face a single bottom-line: being financially sustainable. They also have to serve poor people. However, a mission drift (Cull et al. 2009) that is a trade-off between financial viability and outreach to the poor has been observed. Some authors have shown that possibilities of achieving financial sustainability while serving the poor and staying in line with the social mission of microfinance exists (e.g., Piot-Lepetit and Nzongang, 2014; Quayes, 2015). But, a trade-off between the financial and social performance of MFIs may also emerge, moving away microfinance either from their mission of financial sustainability by failing to address the widely demanded financial services in rural and poor markets in a cost-effective way (Hermes et al., 2011) or from their social mission of serving the poor in order to maintain or to achieve financial viability by serving wealthiest clients or people at the border of the poverty line (Schreiner, 2002). The trade-off debate in the microfinance literature is intense and no clear answers have yet emerged (Hermes and Lensink, 2011).

Our empirical results showed that the trade-off and mission drift issues in microfinance are far more complicated than expected first. Indeed, depending on the position of MFIs relative to others, and the distance towards higher operating frontiers and the asset frontier, a trade-off can be or not the best option for improving their performance, without any changes in their operating policies and technological structure. MFIs located far away from the asset frontier have more room for simultaneously improving their financial and social performance, while those that are closer to the asset frontier face a trade-off. Thus, our empirical results provide elements feeding the debate on trade-offs between financial sustainability and outreach to the poor in microfinance, showing that this issue should be considered in regards to both the current position of MFIs in their sector and the possibilities of evolution in short to long-term of these MFIs. Indeed, it will determine their potential improvement paths and accordingly, their ability to increase their financial and social performance with or without trade-offs.

Conclusion

The objective of this paper was to show how a Data Envelopment Analysis (DEA) framework is able to provide metrics needed for implementing the theory of performance frontiers and guiding managers through the characterization of potential improvement paths: direct through improvement or betterment and indirect through trade-offs on the current operating frontier before improvement. Using a context-dependent DEA model we were able to identify current operating frontiers of each firm as well as top-performers of the sample. We also characterized potential improvements in performance through a simultaneous increase in all its dimensions. Based on a DEA model for measuring capacity, it was possible to identify the asset frontier of the sample. Finally, by means of non-radial DEA models, we were able to assess potential trade-offs among the different dimensions of performance, either through a direct improvement path by betterment or an indirect improvement path by first moving on the current operating frontier before moving upward to a higher operating frontier.

The case study dealt with microfinance institutions (MFIs) that face a double-bottom line: financial sustainability and outreach to the poor and are concerned by a potential mission drift or trade-off towards either the financial or social components of their activity. Results showed that the mission drift is dependent of the location of their operating and asset frontiers. MFIs far away from top-performers face a trade-off towards the financial dimension of their performance, while the opposite applies for top-performers. As the operating frontiers of MFIs that are between the top and least performing ones move upward and become closer to the asset frontier possibilities of simultaneous increases in both dimensions of performance decrease and the best option progressively switches towards a trade-off: an expansion of the financial component of their activity at the detriment of the social one. Thus, this paper contribute to the current debate on trade-offs between financial sustainability and outreach to the poor in the microfinance industry by showing that simultaneous increases in both components of their performance are possible, but decrease as MFIs move upward towards an efficient operating frontier closer to their asset frontier. In this latter case, a trade-off most often applies and provides a better option for reaching out higher performance levels.

Besides, the empirical application focuses on service businesses located in the mass service quadrant of the service process matrix. We found that mass service firms with an operating frontier far away from their asset frontier can improve their performance through a simultaneous increase in all dimensions more easily than those closer to the asset frontier. In the latter case, the law of trade-offs is more frequent; meaning that they have to focus on some dimensions at the detriment of others to maintain or improve their performance. Thus, the paper empirically validates the theory of performance frontiers from the operations management literature. This theory was first designed for the manufacturing industry. Results showed that it also applies quite well to service businesses and, more especially, to mass service firms. Even though further empirical studies focusing on other quadrants of the service process matrix are necessary, this study confirms the validity of the theory of performance frontier for analyzing the performance of firms, identifying when trade-offs apply or not, and characterizing potential improvement paths helping managers to design and implement action plans for reaching out higher performance levels.

Disclaimer

None

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