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Marketing productivity and profitability of Indonesian public listed manufacturing firms

An application of data envelopment analysis (DEA)

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Abstract

Purpose – This research tries to fill a gap in research and to suggest a rigorous quantitative approach to benchmarking marketing productivity. Data envelopment analysis (DEA) is useful in identifying the best-performing units to be benchmarked against as well as in providing actionable measures for improvement of a company's marketing performance.

Design/methodology/approach – This study applied the DEA approach to aid traditional benchmarking activities and to provide guidance to managers, and to evaluate the productivity and efficiency of manufacturing firms listed at the Indonesian Stock Exchange as a result of their marketing activities. The time period observed is 2001-2007. The total number of manufacturing firms observed is 94.

Findings – The evidence shows that on average, this industry experienced total productivity decline by over the observation periods, mainly due to deterioration of managerial efficiency.

Originality/value – The paper compares public listed manufacturing firms in Indonesia.

Keywords Benchmarking, Indonesia, Manufacturing industries, Process efficiency, Public sector organizations

Paper type Research paper

1. Background

Various methods of measuring marketing productivity proposed in previous research indicate the strategic function of marketing in the firm and absolutely related to the firms performance (Rust *et al.*, 2004b). In response to the pressure on marketers to demonstrate their value to the firm, there have been several high-profile calls for more research in the area of marketing performance measurement (MPM) and several conceptual and empirical research papers (Donthu *et al.*, 2005; Lukas *et al.*, 2005; Rust *et al.*, 2004b).

Furthermore, there have been regular calls for marketing practitioners to develop and enhance their ability to account for marketing's contribution to firm performance (Ambler, 2003; Bolton, 2004). An assumption underlying these related academic and practitioner concerns is that developing and applying MPM ability leads to both greater status for marketing at the board level (Webster *et al.*, 2005) and improved firm performance (Morgan *et al.*, 2002). However, to date, the relationship between MPM ability and either firm performance or marketing's stature within the firm has not been demonstrated empirically.

Benchmarking: An International Journal
Vol. 17 No. 6, 2010
pp. 842-857

1463-5771
DOI 10.1108/14635771011089755

Marketers' inability to account for the function's contribution to firm performance is recognized as a key factor that has led to marketing's loss of stature within organizations (Kumar, 2004; Lehmann, 2004; Webster *et al.*, 2005). This is reflected in increased demand for greater accountability (Doyle, 2000; Morgan *et al.*, 2002; Rust *et al.*, 2004b). In addition, there have been several high-profile calls for more research in the area of MPM. Most notably, MPM topics have been consistently listed as one of the Marketing Science Institute's research priorities since 1998 until now.

MPM is the assessment of "the relationship between marketing activities and business performance" (Clark and Ambler, 2001). Since the problem in question is the inability to account for marketing activities, our specific interest is in marketing's ability to assess this relationship. Given that the goal of MPM research is to demonstrate the value of the marketing activities, in line with the work of Rust *et al.* (2004a), our focus is on marketing not as the "underlying products, pricing, or customer relationships" (Rust *et al.*, 2004b) but rather as the "marketing activities" themselves, which we define as marketing communication, promotion, and other activities that represent the bulk of the typical marketing budget.

MPM research can be divided into three research streams: measurement of marketing productivity (Morgan *et al.*, 2002; Rust *et al.*, 2004b), identification of metrics in use (Barwise and Farley, 2003; Winer, 2000), and measurement of brand equity (Aaker and Jacobson, 2001; Ailawadi *et al.*, 2002). Rust *et al.*(2004a) build on the work of Srivastava *et al.* (1998) to describe a "chain of marketing productivity" that extends from marketing activities to shareholder value. Nevertheless, there is a need to strengthening previous research through reinventing marketing productivity measurement that enables in boosting the strategic function of marketing discipline.

Therefore, this paper aims to reinventing and investigate the marketing productivity and firms' profitability applying the data envelopment analysis (DEA) methodology. The first section describes background and motivation of the study. Second, explains a brief review of marketing productivity and benchmarking process. Third, consists of data and methodology, while analysis of findings, strategy implications, conclusions, and further research are presented in the next two sections.

2. Marketing productivity and firm efficiency

Marketing is the biggest discretionary spending area in most companies; it is also the area in which many companies wish they could devote even more resources to. Yet, there is no question that marketing dollars are often poorly used, sometimes even to the detriment of the business they are supporting. Marketing productivity problems can be traced to over-marketing (advertising, coupons, constant sales, too much reliance on internal sales forces, and over-built distribution systems), under-marketing or mis-marketing. While the measurement challenge remains a considerable one, we are more concerned here with some of the fundamental obstacles to the achievement of higher levels of marketing productivity. Some of these obstacles are within the marketing function and require a changed orientation to overcome. More of them are at the corporate level, where its long history of marginal performance has rendered marketing less influential and credible than it should be, given its vital role in engendering success in the marketplace. There is a belief that the push for productivity in marketing spending is inherently contradictory to creating and maintaining a market orientation. In other words, the belief is that being customer oriented means having to spend more on marketing.

As have discussed, this is not necessarily so. The mechanisms described should improve both customer loyalty as well as marketing productivity. Marketing spending should be opportunity driven; it should correlate with the size of the opportunity. Opportunity is usually not reflected in terms of simply dollars. For example, there is little opportunity for advertising to achieve an impact (and thus be productive) for a brand that already has a high awareness level and a high "ever tried" level. This requires that the marketing budgeting for a brand be decoupled from the current revenue level of the brand, and be coupled instead to the opportunity for revenue and profit growth that the brand presents.

Two fundamental mechanisms at the functional level are important (Sheth and Sisodia, 2002). First, marketing's focus must change from markets (aggregates) to customers (individuals). Second, marketing must explicitly define its objective as customer retention, as well as acquisition. Making these two changes requires a major shift in the way in which the marketing function is organized and managed.

The marketing function has long been viewed as inherently inefficient, given the nature of its objectives, domain, and tools. Measuring marketing efficiency and productivity was believed to be difficult, if not impossible. For example, in 1948, Nil Houston of the Harvard Business School wrote in his dissertation, "[...] a quantitative assessment of the efficiency of marketing cannot be made" (Houston, 1948).

Marketing productivity was the subject of considerable research in the accounting profession during the 1950s and 1960s. Schiff and Schiff (1994) conducted a thorough literature search on marketing cost analysis. They found that during the 1950s and 1960s, most cost accounting textbooks devoted a chapter to distribution costs, which covered many of the costs now regarded as marketing costs. More than 1,000 research articles were published during that time describing approaches to analyzing marketing costs, and techniques to measure profitability by product, channels of distribution, order size, geographic market areas, etc. A recent review of research published in the *Journal of Marketing* over its history identifies the 1946-1955 period as being characterized by the perspective of "Marketing as a Managerial Activity" (Kerin, 1996). The key thrusts of published research during that period were improvements in marketing institutions and system efficiency and the achievement of greater productivity of the marketing function. Productivity analysis focused almost solely on cost analysis; there were 28 articles published in the journal in this period that dealt with distribution cost analysis or functional cost accounting.

Marketing productivity has traditionally been viewed purely in terms of efficiency. The early emphasis in trying to improve marketing efficiency was predominantly attempt to minimize marketing costs. This was driven by the difficulty of adequate output measurement of marketing activities. In addition, it also due to an implicit belief that marketing activities do not create value in any tangible sense, and hence was marketing activities on which the minimum necessary amount of resources should be expended. Robert (1957) vigorously challenged this belief, and today, we have ample evidence that judiciously expended marketing resources can be tremendously productive.

There is no one size fits all way to measure marketing productivity across industries, since the business and competitive context matters of a great deal. The variables that determine marketing productivity are very different both for new companies or products compared to a well-established firm and a mature product. Furthermore, a care must be

taken in measuring marketing productivity to ensure that the measurement do not yield spurious relationships. This can happen because of the multitude of factors that can impact upon the variables of interest. To avoid this, it is useful to consider multiple, independent indicators of efficiency and effectiveness. Multiple measures are also needed to understand marketing performance as it pertains to customer acquisition and retention of an individual, group, and market levels. While various conceptual and operational definitions of marketing productivity exist, there is no agreed upon definition. For example, Hawkins *et al.* (1987) defined marketing productivity as "relative market share times relative price divided by marketing outlays". Thomas (1984) identified two aspects of marketing productivity. The first relates to the management of the marketing mix. The second pertains to the efficiency of marketing spending. The overall productivity of marketing is clearly related to the way a firm manages both of these elements; it must develop a marketing mix appropriate to the segments that it seeks to serve, and then efficiently execute the specific marketing actions necessary to achieve the desired marketing objectives.

In other words, the firm must create the "right" product, set the "right" price for it, distribute it using the "right" distribution channels and the "right" number of outlets, and achieve the "right" level of informational and persuasive communication. Having defined the meaning of "right" in each of these contexts, it must then efficiently expend resources to achieve the desired results in each of the areas. The efficiency of these expenditures must be measured relative to competitors within its own industry, as well as relative to benchmarks established in similar industries.

Finally, we need to measure marketing costs and contributions on an annualized basis, as well as in terms of their long-term impacts. Since a firm must do the process of transformation from input into output, its productivity can be evaluated by measuring its efficiency. This can be understand because this transformation process involving many sources such as technology, labor, raw materials (for manufacturing firms), and so on. Therefore, efficiency is closely related to the production process in each firm (Farrel, 1957; Debreu, 1951; Koopmans, 1951).

There are some efficiency concepts which are commonly known. Modern efficiency measurement begins with Farrel (1957) who drew upon the work of Debreu (1951) and Koopmans (1951) to define a simple measure of a firm's efficiency which could account for multiple inputs. He proposed that the efficiency of a firm consists of three components: first, the technical efficiency which reflects the ability of a firm to obtain maximal output; second, allocative efficiency which reflects the ability of a firm to use the inputs in optimal proportions, given their respective prices; and third, the economic efficiency which is the combination between technical efficiency and allocative efficiency. Economic efficiency in implicit is a concept of least-cost production. For a certain levels of output, a firm is economically efficient if it uses resources with the most minimum cost per unit from the output. Therefore, a firm can be categorized as economically efficient if the firm can minimize its production cost to produce certain output with a certain technology level which is commonly used and has a valid market price.

Efficiency measure can be also used in benchmarking process, which commonly defined as: "a continuous, systematic process for evaluating the products, services, and work processes of organizations that are recognized as representing best practices for the purpose of organizational improvement" (Spendolini, 1992). Benchmarking experts

suggest multistep approaches to the process of benchmarking (Camp, 1995, 1998; Spendolini, 1992). There are three basic steps of benchmarking that analysts agree on, i.e.:

- *Step 1.* Identify the best performers.
- *Step 2.* Set benchmarking goals.
- *Step 3.* Implementation (Spendolini, 1992).

However, previous research described above led to the need for testing a rigorous methodology applying to the first two steps of benchmarking to enlightening the DEA method purpose, specially for measuring marketing productivity. This method should be able to identify a specific best-performing peer group to be used as a comparison group (or role model), and it should be able to assist managers in setting goals in specific areas. A benchmarking tool should have the ability to analyze multiple inputs and multiple outputs that may comprise productivity and provide feedback concerning areas for needed improvement. However, in order to be managerially relevant, a benchmarking technique should provide a single measure of overall efficiency or productivity that can be computed for every firm and compared with competitors.

3. Data and methodology

This research is using DEA method of Malmquist Productivity Index to analyze the comparison among public listed manufacturing fims in Indonesia. The time period which observed is from year 2001 to 2007. The total number of manufacturing firms observed is 94. After categorizing into minimum eight firms sample in one industry sector, remained 55 firms from five industry sectors: food and beverage, apparel and other textile products, plastics and glass products, automotive and allied products, and pharmaceuticals. It was assumed that each industry group is homogeneous that enabling to apply the DEA method.

The data used in this research are obtained from the web site of Indonesia Stock Exchange (Bursa Efek Indonesia). This research focuses on firms in the high-technology industry, i.e. public listed manufacturing firms in Indonesia. These firms are chosen because of the recognition that within this sector, marketing has been under intense pressure to demonstrate its contribution to its performance. There are two primary reasons for this pressure.

First, high-tech companies tend to have more of an engineering orientation than a marketing orientation, and thus top management tends to be more skeptical about the value of marketing (Davies and Brush, 1997). Second, during the period we studied (early 2000s), the sector experienced the collapse of the "technology boom," which led to sharply increased scrutiny of marketing activities (Mohr and Shooshtari, 2003).

Charnes *et al.* (1978) first proposed DEA as an evaluation tool to measure and compare a decision-making unit's (DMU) productivity. Outside of marketing, DEA has been used extensively in such areas as production (Banker and Maindiratta, 1986), school performance (Charnes *et al.*, 1981), and evaluating maintenance units of the US Air Force (Charnes *et al.*, 1985), etc. A literature survey by Seiford (1996) offers a few hundred published articles that use DEA.

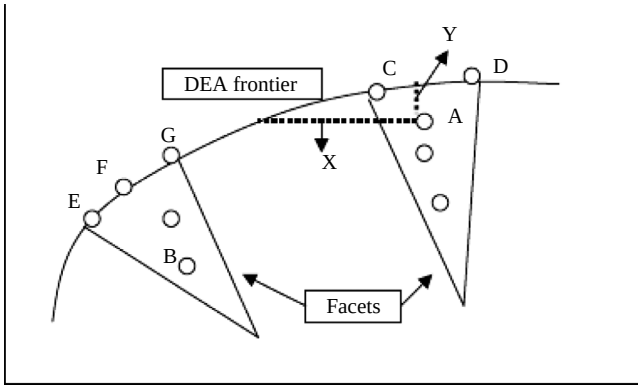
Charnes *et al.* (1985) first suggested applying DEA to gain insights into efficiency of marketing efforts. Since then, there have been attempts at making DEA a mainstream tool for marketing practice. Kamakura *et al.* (1988) used DEA to measure welfare loss and market efficiency. Mahajan (1991) investigated operations in the insurance

industry by comparing 33 different companies. Parsons (1990) examined DMUs within a single company to identify the most efficient units. Boles *et al.* (1995) applied DEA to evaluate relative performance of salespeople and conclude that the analysis might prove useful in mentoring and training of sales force based on the best practices of the most efficient salespeople. Kamakura and Ratchford (1996) evaluated multiple retail stores for their efficiency using DEA and translog cost function estimation, whereas Donthu and Yoo (1998) compared the results obtained using DEA and regression.

DEA is a method for mathematically comparing different DMUs productivity based on multiple inputs and outputs. The ratio of weighted inputs and outputs produces a single measure of productivity called relative efficiency. DMUs that have a ratio of 1 are referred to as efficient given the required inputs and produced outputs. The units that have a ratio < 1 are less efficient relative to the most efficient unit. Since the weights for input and output variables of a DMU are computed to maximize the ratio and then compared to similar ratios of best-performing DMUs, the measured productivity is also referred to as relative efficiency. See Seiford (1996) for a more technical description of DEA.

While regression produces an "average" line across all DMUs, DEA produces an efficient frontier that encompasses the best performers. While DMUs above the regression line appear to be performing better than average, they are not performing as well as the best performers or most productive DMUs on the efficient frontier.

Any DMU inside the efficient frontier may use DEA for benchmarking. The DMUs on the efficiency frontier are the best-performing peers that need to be emulated. Essentially, DMUs on the frontier are the industry leaders who are most efficient. Hence, the first step in benchmarking is achieved by using the DMUs on the frontier as the role models. A DMU that is not efficient and is inside the frontier can choose efficient DMUs on the frontier that operates within its scope (or facet/cone) as role models. Hence, depending on the size and scope of a DMU, each DMU will have a different set of role models. For example, in Figure 1, the unit A can use units C and D as role models to become efficient. At the same time, for unit B, units E, F, and G are the more appropriate role models.



Source: Donthu *et al.* (2005)

Figure 1.
DEA facets

The distance between a DMU and the frontier provides the goals for benchmarking. For example, in Figure 1, unit A can become efficient by moving towards the frontier by a distance X horizontally (reduce input expended by X) or by moving towards the frontier by a distance Y vertically (increase output produced by Y) or a combination of both. Such measurable and actionable goals satisfy the requirements of Step 2 of the benchmarking process. In other words, a DMU becomes productive by moving towards the frontier. In addition, since productivity is the ratio of output to input, a DMU can become productive by increasing output or decreasing input. While this example has only one input and only one output for simple graphical illustration, DEA can accommodate multiple inputs and multiple outputs for productivity computation and benchmarking.

In suggesting that DEA be used for benchmarking marketing productivity, we are assuming that being efficient (or being most productive) and wanting to emulate efficient firms is the goal of all firms. This may not always be the case. For example, being efficient may not be the goal of a niche player in certain markets. However, for the vast majority of the firms, being efficient and emulating market leaders is a goal, and for these firms, benchmarking using DEA should be desirable. The famous example of competitive benchmarking is Xerox's success in benchmarking Canon's design and production processes that allowed Xerox to recapture its market share in the photocopiers market (Camp, 1995). Others such as, Ritz-Carlton Hotels' customer service and American Express' customer relationship building practices are considered the best and are copied not only in the hospitality and credit card industries, but in a wide variety of other industries as well (Hiebeler *et al.*, 1998).

Following Luo and Donthu (2006), this study applies the DEA-Malmquist to examine the marketing communication productivity (MCP) of Indonesian manufacturing firms. In this case, we first define MCP as the conversion ratio of marketing communication inputs to outputs, which requires a logical identification of the multiple inputs to multiple outputs. The study by Luo and Donthu (2006) used two main input categories: advertising media spending and sales promotion expenditures. Advertising media spending includes three dimensions: expenditures in broadcast, print, and outdoor. As for outputs, they specify three outputs of MCP-sales level, sales growth, and corporate reputation, because marketing communication expenditures influence these outcomes simultaneously.

Productive firms as a whole represent the so-called best-practice frontier that dynamically benchmarks each firm's MCP in the transformation of inputs into outputs (Fare *et al.*, 1992; Luo, 2004). To calculate MCP from t to t + 1 for each firm, Malmquist (1953) initially developed dynamic models to assess the total factor productivity (TFP) of general economic activities over time. Later, Fare *et al* (1992, 1994) constructed the time-series linear programming (or (DEA-based) Malmquist Productivity Index.

To the best of our knowledge, the literature has provided no time-series applications of the DEA-based Malmquist approach to measure and value the various components of MCP (for technical details and numeric examples of DEA, see Horsky and Nelson, 1996; Luo and Donthu, 2005; Murthi *et al.*, 1996). The Malmquist approach is well suited for measuring MCP and tracking its changes over time because of its methodological advantages.

First, it can estimate the productivity of marketing communication expenditures "without a priori information on tradeoffs among inputs and outputs" (Chen and Ali, 2004, p. 239). This is advantageous because the function of market responses to

advertising and promotions is conflicting and inconclusive (Strong, 1925; Vakratsas and Ambler, 1999). In addition, some advertising expenditures are intended to promote corporate brands, whereas others are intended to increase sales revenue, and still others aim for a little bit of both. Therefore, without prior knowledge about which part of the advertising and marketing expenditure produces which part of the outputs, the Malmquist approach is very suitable.

Second, unlike regression techniques that use one output at a time (Caves *et al.*, 1982), Malmquist models are not limited by the number of outputs, which is desirable for measuring MCP because marketing communications can achieve multiple outcomes (i.e. visible outcomes, such as sales, and invisible outcomes, such as reputation) at the same time.

Third, the time-series nature of Malmquist modeling offers an advantage for benchmarking MCP because advertising and sales promotion expenditures have lagged and carryover effects; outcomes may unfold over a long period in the marketplace (Fare *et al.*, 1992).

The input variables used in this study are equity and marketing expenses, while output variables are market share and sales growth. The computer program DEAP Version 2.1 which was written by Tim Coelli is used to construct DEA frontiers for the calculation of technical and cost efficiencies and also for the calculation of Malmquist TFP indices. Finally, the application of Malmquist DEA methods of panel data to calculate indices of TFP change, technological change, technical efficiency change, and scale efficiency change (Figure 2).

4. Findings

Results of this study find that during a seven-year period of the productivity growth of manufacturing firms were mostly due to technological change. In addition, this implies that firms in this sector experienced decline in technical efficiency. Furthermore, from 94 manufacturing firms, firm number 71 (GDYR) from automotive and allied products sector has the highest TFP score compared to the others with 1.796 Malmquist index or it has an increase of 79.6 percent in total factor production. This is caused by an increase of 66.5 percent in technical efficiency and increase of 7.8% in technological growth. This finding supported by the data from the company that the firm increases their technical efficiency by increasing their production capacity by operating in the maximum capacity.

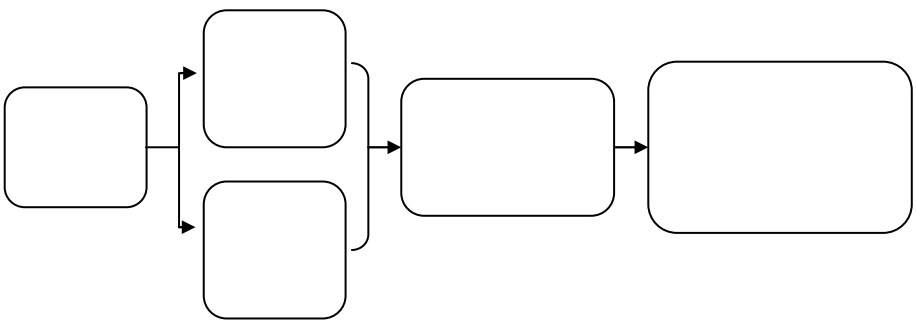


Figure 2.
Marketing productivity methodology flow

Table I shows that the highest Malmquist index of technical efficiency (effch) is on year 3 from automotive and allied products sector with 5.388, while the highest mean of effch is on automotive and allied products sector with 1.015 Malmquist index. The result shows that in terms of technical efficiency, automotive and allied products sector has the highest technical efficiency mean score which means it is the most efficient marketing productivity sector.

The highest Malmquist index of technology (techch) is on year 2 from automotive and allied products sector with 8.431 indexes. The highest mean of techch is on food and beverage sector with 0.994 Malmquist index. The result shows that from the five sectors, food and beverage has the highest technology efficiency (techch) mean score among others even though the mean of techch among five sectors is not different significantly and has the value < 1 which indicated that all five sectors are experienced a decrease in technology efficiency for the allover period (Tables II and III).

The highest Malmquist index of TFP is on year 4 from apparel and other textile products sector with 1.906 index. The highest mean of techch is on automotive and allied products sector with 0.972 Malmquist index. The result shows that from the five sectors, automotive has the highest total factor production efficiency mean score among others even though the mean of TFP among five sectors have the value $<$ one which indicated that all five sectors are experienced a decrease in total factor production for the allover period.

Table I.
Firms' technical efficiency based on year and firms' sector

Year	All firms	Food	Apparel	Plastic	Auto	Pharma	55 firms	Best sector
2	0.225	0.734	0.899	1.059	0.167	0.974	0.166	Plastic
3	3.788	1.758	0.745	0.696	5.388	0.964	4.28	Auto
4	0.769	0.453	0.981	1.303	1.708	0.896	0.775	Auto
5	0.952	2.135	0.98	1.047	0.833	1.069	0.919	Food
6	1.159	0.942	1.518	0.982	1.105	1.079	1.397	Apparel
7	0.719	0.711	0.767	0.613	0.772	0.808	1.018	Pharma
Best year	3	5	6	4	3	6	3	Auto year 3
Mean	0.897	0.971	0.953	0.92	1.015	0.96	0.947	Auto

Source: DEA data processing

Table II.
Malmquist index summary of annual means

Year	All firms	Food	Apparel	Plastic	Auto	Pharma	55 firms	Best sector
2	4.191	1.493	0.613	0.711	8.431	0.781	6.003	Auto
3	0.284	0.605	1.579	2.011	0.169	1.312	0.242	Plastic
4	1.295	2.109	1.944	0.647	0.638	1.02	1.354	Food
5	0.959	0.456	0.985	0.864	0.917	0.737	0.972	Apparel
6	1.074	1.433	0.8	1.184	1.069	1.574	0.901	Pharma
7	0.805	0.777	0.625	0.648	0.866	0.52	0.535	Auto
Best year	2	4	4	3	2	6	2	Auto year 2
Mean	1.041	0.994	0.988	0.922	0.958	0.926	0.986	Food

Source: DEA data processing

The relation between ROA and TFP

Although we do not continue the research based on the Stage 2 Luo and Donthu methodology (valuing MCP by using regression with Tobin's q), we try to plot the relation among TFP score and return on asset (ROA) which the data is available to use. ROA formula is equal to net income divided by total asset.

Figure 3 found that firms which have TFP score greater than one are categorized as efficient firms. There are 44 efficient firms according to the criteria. Almost all firms are spotted closely between the TFP score of zero until two. Only four firms are having the TFP score greater than two. The greater the TFP score, the greater the ROA value. It means that TFP score has the positive relation with the ROA score. The more efficient a firm can be, the greater its financial performance also.

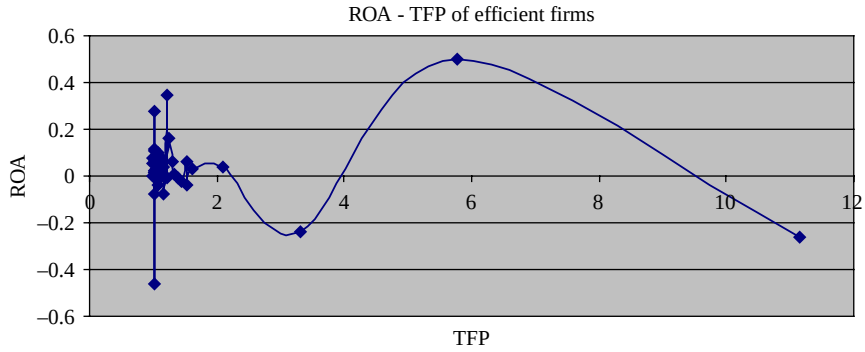
Figure 4 also found that firms which have TFP score < one are categorized as inefficient firms. There are 50 inefficient firms according to the criteria. The relation between TFP score of inefficient firms and their ROA score is scattered and no pattern can be identified.

As discussed previously, DEA method is a non-parametric approach and differs from the regression approach. Since DEA allowed multiple outputs, so the curve will not be similar like the regression line.

Year	94 firms	Food	Apparel	Plastic	Auto	Pharma	55 firms	Best sector
2	0.944	1.096	0.551	0.753	1.406	0.761	0.997	Auto
3	1.076	1.063	1.177	1.401	0.912	1.265	1.035	Plastic
4	0.996	0.957	1.906	0.843	1.089	0.914	1.05	Apparel
5	0.913	0.973	0.965	0.904	0.764	0.787	0.893	Food
6	1.244	1.349	1.215	1.164	1.182	1.699	1.259	Pharma
7	0.579	0.553	0.479	0.398	0.668	0.42	0.544	Auto
Best year	6	6	4	3	2	6	6	Apparel year 4
Mean	0.934	0.965	0.941	0.848	0.972	0.889	0.934	Auto

Source: DEA data processing

Table III.
Malmquist index summary of annual means (TFP)



Source: Microsoft excel data processing

Figure 3.

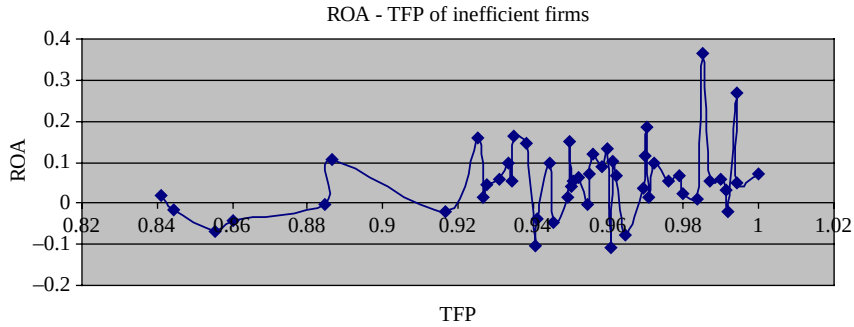


Figure 4.

Source: Microsoft excel data processing

5. Conclusions

The conclusions which are resulted from this research are as follows. First, the period of year 6 (2005-2006) is the period when the value of TFP change of 94 manufacturing firms and 55 manufacturing firms is at its maximum score compared to the other periods.

Second, from the five industry sectors above, based on year period, the TFP score all determined by technological efficiency. This means that between technical efficiency and technological efficiency, the later factor became a dominant factor in determining the marketing productivity efficiency score among manufacturing firms in Indonesia. PT Goodyear Indonesia is the most efficient firm in manufacturing industry in terms of utilizing its marketing inputs (equity, and marketing expense) into marketing outputs (sales growth, and market share). Its TFP score is more determined by its technical efficiency.

Third, automotive sector has the largest TFP score and also technical efficiency score. Otherwhile, food and beverage sector has the largest technology score even though it < one and the scores among five sectors are not significantly different.

Fourth, firms which have TFP score greater than one are categorized as efficient firms. There are 44 efficient firms according to the criteria. There is positive relation between the value of TFP of efficient firms and their ROA which indicates that high marketing productivity efficiency is contributing to the high financial performance. Firms which have TFP score < one are categorized as inefficient firms. There are 50 inefficient firms according to the criteria.

Suggestions

For the manufacturing firms in Indonesia, this research's results can give the big picture that manufacturing industry in Indonesia generally still lack of marketing productivity efficiency. The TFP score is still greatly determined by technology factor rather than technical efficiency.

For the next research, there are some suggestions: first, the limitations from published annual report about marketing-related expenditure. Commonly the firm just generalize the expense into one account, marketing expense. To get more detailed, accurate, and marketing-specific data, the researcher should do the field survey to improve the data accuracy. Second, this research only limit the method on the utilization of DEA method of Malmquist Productivity Index. For the next research, other methods of efficiency measurement should be used such as parametric approach

with using stochastic frontier approach method. And the last, the next reasearch is expected to be able to combine the utilization of efficiency measurement by using parametric and non-parametric approaches, not only using one single methodology.

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