

Chapter 20

Complexity of Measuring Advertising Efficiency: An Application of DEA Method in Turkey

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Abstract The aim of this research is to measure the efficiency of advertising expenditures on sales revenue of businesses that are traded on BIST in Food, Beverage and Tobacco Sector by data envelopment analysis. According to that, 22 businesses' 'Advertising Expenditure' and 'Net Sales Revenue' data for the years between 2009–2013 are gathered and they are respectively determined as 'input' and 'output' data. As a result, AEFES, BANVT and SKPLC coded businesses are ascertained as absolute efficient for all years. It is also found that CCOLA, DARDL, KENT, KERVT, TBORG and ULKER coded businesses' advertising budgets remains idle.

20.1 Introduction

Today, brand perception created by advertising strategies has become one of the most important factors because of the characteristic similarities of the rival products. It is observed that impact of advertising expenditures on sales revenue and sector advertising elasticity rises especially under conditions of emotion oriented purchase decisions and/or intensive brand competition.

Marketing, Selling and Distribution Expenses is defined as 'various expenses related to marketing, selling and distribution functions of a business' commodities and services [2, p. 188] and *Advertising Expenditures* are given as footnote information under this account. Therefore, detailed information about this expense cannot be reached and the measurement of direct impact of advertising expenditures on

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sales revenue creates a chaotic and complex situation. However, indirect impact can be evaluated by analyzing the concept of advertising expenditures and advertising budget strategies carefully.

Within this context, the purpose of this research is to measure the performance of advertising expenditures on sales revenue of businesses that are traded on BIST in the Food, Beverage and Tobacco Sector by DEA. According to that, effects of advertising expenditures on sales revenue, conducted methods to measure this effect and theoretical base of data envelopment analysis are explained first, and then advertising performance within and between businesses of sector are analyzed.

20.2 Effects of Advertising Expenditure on Sales Revenue

Advertising expenditure identified under the Marketing, Selling and Distribution Expenses is one of the most significant factors that impacts sales revenue. However it does not appear in the footnote information by a common term in Turkey. It can be titled as *advertising expenditures*, *advertising and publicity expenditures*, *advertising or marketing expenditures* and etc. Since there is no commonly accepted word as an account term, measurement of the direct impact of advertising expenditures on sales revenue brings out significant complexity. However it seems possible to measure the advertising expenditures' indirect impact by means of analysis of advertising budget strategies of businesses.

Businesses can utilize various methods for setting advertising budget. Comparing with others, the competition and percentage of sales are the most preferred methods.

The first method enables businesses to avoid unnecessary competition of advertising and overwhelming expenses. But also, it may lead to miss the opportunities to increase their market share. In addition, there is no sufficient proof whether the method decreases the competition [7, 30].

Thomas Kamber [21] compared the change of sales, profits and market shares of businesses, which decrease, stabilize or increase the advertising budget in the recession period. As a result, he found significant growth on sales, profits and market shares of businesses, which stabilize and increase advertising budget in the prevailing and following periods.

On the other hand, the second method suggests determining the advertising budget depending on a certain percentage of sales revenue or profit. The data of sales revenue or profit can be generated from previous year's statements or prevailing year's pro forma statements. This method can make easier to find out the effects of advertising expenditures on sales, profit and market share [30]. However, the perception of sales revenue as a cause of advertising instead of a result might be dangerous. It can lead businesses to unnecessarily increase or decrease the advertising budget related to change of sales [7]. It may be more convenient to think that daily sale is a function of the past and prevailing advertising activities [30].

Kristian S. Palda [35], Russell S. Winer [48], Kamber [21], Tellis and Tellis [42] and many other researchers state that there is a strong and positive correlation

between advertising expenditures and sales revenue including economic recession periods. Moreover, it is indicated that advertising expenditures have a strong impact on sales in the short term-for a year- and also decreasingly growing impact on sales in the long term-more than a year.

20.2.1 Methods Used for Measuring the Effects of Advertising Expenditures on Sales Revenue

The most widely used method is the historical analyses for measuring the effects of advertising on sales. This method based on an assumption that relation between previous years' advertising expenditures and sales revenue presents a similar tendency for following years. Within the context of this method, correlation and regression analyses can be conducted. Roland S. Vaile [46], Palda [35], Winer [48], Kamber [21] has found positive relation between advertising expenditure and sales revenue.

The other method is called as experimental method. In terms of this method, a series of markets, which have similar rate of advertising expenditure/sales, are chosen. Expenditure rates are reorganized as lower, same and higher for some specific markets in the testing period. At the end, changing of sales revenue is analysed for reorganized markets [7, 10, 30]. Different models also can be developed with the expansion of other related variables [30]. Clarke [14], Assmus et al. [5] and Bemmaor [8] also found positive impact of advertising expenditures on sales by conducted experimental models.

Previous researches, which have some limitations, present that consistent advertising expenditures affect sales revenue positively with a decreasingly growing rate in the long term [34]. *Cumulative Advertising Effects Theory* suggests that current advertising expenditures' additional impact on sales does not last only for the prevailing accounting term; it also continues for a longer time. On the other hand, there are some researches, which do not support the theory (e.g. [1, 14, 36]) although it is quite popular and widespread. For instance, *Current Advertising Effect Theory* defends that sales is a function of the current advertising expenditures and lasting effect of advertising cannot be totally loaded to previous years' advertising expenditures [47].

20.2.2 The Measurement of Advertising Expenditures' Performance by DEA

DEA method is recently used for analyzing the efficiency of advertising expenditures. DEA was introduced by Charnes et al. [12] and the main purpose of the model is the development of the best production curve without any limitations on production technology. DEA method is oriented to limits instead of central tendency.

In other words, it is focused on developing a linear rational plane, which involve marginal observed data rather than a regression plane, which adjust center of data.

DEA, which employs a kind of mathematical programming technique without dependence on parametric estimations, is accepted as a practical and simple method for measuring relative efficiency of a business. The main idea is the measuring efficiency of a decision-making unit relatively to another decision-making unit in the same industry. The limitation of the model is that all decision units should be over or under the efficiency limit. Efficiency limit of well-behaved observed points is set by means of linear programming and efficiency of all observations is measured relatively to that limit.

The units equal to one are valued as efficient whereas units lesser than one are valued as inefficient. The difference between one and the business's efficiency value represents that the same output can be maintained by lesser input according to the mentioned difference [49].

Another factor should be taken into consideration is related to the selection of the approach; whether input oriented or output oriented approach. Within the context of input oriented approach, minimum input is determined for producing specific quantity of output. On the other hand, output oriented approach is based on the idea of maximum output production with specific quantity of input. Solving of dual optimization problem results as the same efficient limit however some differences can be rarely occurred on inefficient units [49].

It should be decided whether returns to scale should be constant or variable. The constant returns to scale approach assumes that each of the decision-making units works at optimum scale and there is no inefficiency of scale. In the condition of some inefficient units' existence even though constant returns to scale is utilized, inefficiency of scale can only be viewed in the technical inefficiency and it is impossible to disaggregate. Briefly, efficiency under constant returns to scale is composed of both technical and scale efficiency. On the other hand, variable returns to scale approach assume that there is no inefficiency due to scale. According to that assumption, the source of the inefficiency is accepted as pure technical inefficiency and higher efficiency values are obtained comparatively to constant returns to scale approach. Efficiency values within both approaches are proportioned by the terms of measuring whether there is inefficiency due to scale [40, 43]. The mathematical method of DEA can be reached from many published researches such as the article of Tim J. Coelli [15].

Application of this method has been recently conducted in many researches ([3, 4, 6, 9, 11, 13, 16–20, 22–29, 31–33, 37–39, 41, 44, 45, 49, 50]). Most of them focus on the efficiency of production. Joachim Buschken [9], as one of the research on measuring the efficiency of advertising expenditures, assesses the advertising efficiency in German automobile industry by means of DEA. As a result, it is found that only 8 % of advertising expenditure remains idle. Similarly, Lou and Donthu [31] utilize DEA for analyzing the efficiency of 100 businesses, which expense higher advertising expenditures. According to the findings, it is stated that advertising expenditures are used efficiently and also sales revenue might be increased 20 %.

20.3 Method

The purpose of this research is to measure the technical efficiency values by DEA for analyzing the performance of 30 businesses that are traded on BIST in the Food, Beverage and Tobacco Sector between the years of 2009 and 2013. However 8 of 30 businesses' data is missing for several years since they are established later. Because of the nature of that research, panel data should be utilized and therefore all businesses should have the data for all years. Thus, the research sample is limited by 22 businesses. *Annual Advertising Expenditure* and *Net Sales Revenue* are respectively accepted as input and output variable. Accordingly, input and output oriented approaches are applied under the variable returns to scale assumption. In addition to that, advertising budgets of businesses are measured by *Annual Advertising Expenditure/Annual Sales Revenue* and it is used for finding out the advertising strategy of businesses. All gathered data is analysed by Win Deap 2.1 (developed by [15]) and IBM SPSS Statistic 21.

20.4 Research Findings

Research findings are presented under the *Technical Efficiency Values of Businesses, Percentages of Annual Advertising Budgets of Businesses and the Sector, Improvement of the Inefficient Businesses* titles.

20.4.1 Technical Efficiency Values of Businesses

Under the output oriented assumption, efficiency values of 22 businesses and the average technical efficiency values of Food, Beverage and Tobacco sector (between the years of 2009–2013) are given in the Table 20.1.

The mean technical efficiency value of Food, Beverage and Tobacco Sector is found as .530 for the year of 2009. According to the measured index of mean technical efficiency, inefficiency rate is equal to $(1 - .530) = .470$ or 47 %. That rate can be also referred as the sector's inefficiency degree of source using. Moreover, it is seen that AEFES, BANVT, MERKO, SELGD, SKPLC and TATGD coded ones have the full efficiency (1.00) whereas the others are found inefficient. Sales revenues of these efficient businesses are respectively as 3,811,067,000 TL, 791,600,038 TL, 65,296,784 TL, 7,870,771 TL, 261,421,552 TL and 693,686,750 TL. Their advertising expenditures are also respectively 405,857,000 TL, 7,404,735 TL, 1,051 TL, 0 TL, 111,618 TL and 4,952,651 TL.

The mean technical efficiency value of Food, Beverage and Tobacco Sector is measured as .514 for the year of 2010. Within the context of mean technical efficiency index, inefficiency rate is equal to .486 or 48.6 %. Moreover, AEFES, BANVT, MERKO, SELGD and SKPLC coded businesses are valued as full

Table 20.1 Output oriented technical efficiency values of businesses in the food, beverage and tobacco sector under the variable returns to scale assumption

Businesses	2009	2010	2011	2012	2013
AEFES	1.000	1.000	1.000	1.000	1.000
BANVT	1.000	1.000	1.000	1.000	1.000
CCOLA	.936	.953	.986	1.000	1.000
DARDL	.119	.058	.060	.097	.060
ERSU	.059	.104	1.000	1.000	.305
FRIGO	.057	.109	.199	.307	.277
KENT	.561	.383	.400	.376	.300
KERVT	.197	.163	.178	.181	.158
KNFRT	.251	.435	.183	.218	.719
KRSTL	.164	.099	.118	.114	.384
MERKO	1.000	1.000	.907	.578	1.000
MRTGG	.594	.483	.492	1.000	.087
PENGD	.276	.273	.268	.253	.838
PETUN	.376	.375	.329	.325	.280
PINSU	.111	.120	.071	.093	.087
PNSUT	.574	.550	.539	.512	.440
SELGD	1.000	1.000	1.000	.686	.137
SKPLC	1.000	1.000	1.000	1.000	1.000
TATGD	1.000	.970	.668	.573	.463
TUKAS	.365	.337	.183	.197	.207
TBORG	.228	.176	.176	.236	.259
ULKER	.797	.718	.791	.923	.822
Sector mean	.530	.514	.525	.530	.492

efficient (1.000) whereas the others are not. Sales revenues of these efficient businesses are respectively as 4,168,793,000 TL, 1,002,379,302 TL, 66,635,246 TL, 8,215,953 TL and 286,847,421 TL. Their advertising expenditures are also respectively 449,321,000 TL, 8,432,089 TL, 28,377 TL, 0 TL and 290,315 TL.

The mean technical efficiency value of the sector is measured as .525 for the year of 2011. Inefficiency rate of the sector is equal to .475 or 47.5 %. AEFES, BANVT, ERSU, SELGD and SKPLC coded businesses are valued as full efficient (1.000). Sales revenues of these efficient businesses are respectively as 539,413,000 TL, 5,642,583 TL, 31,070,815 TL, 10,310,595 TL and 335,816,234 TL. Additionally, their advertising expenditures are also respectively 539,413,000 TL, 5,642,583 TL, 2,371 TL, 0 TL and 248,915 TL.

It is observed that SELGD coded business is efficient without any allocated advertising budget (0 TL) in 2009, 2010 and 2011. The reason of this efficiency may depend on model's measuring relative efficiency.

The mean technical efficiency value of Food, Beverage and Tobacco Sector is .530 in 2012. According to the measured index of mean technical efficiency, inefficiency rate is equal to $(1-.530) = .470$ or 47 %. AEFES, BANVT, CCOLA, ERSU, MRTGG and SKPLC coded businesses are evaluated full efficient (1.000) whereas the others are inefficient. Sales revenues of efficient businesses are respec-

tively as 4,319,725,000 TL, 1,261,068,037 TL, 3,819,302,000 TL, 26,392,425 TL, 5,028,161 TL and 401,772,270 TL. Their advertising expenditures are also respectively 742,789,000 TL, 9,392,514 TL, 367,713,000 TL, 3,914 TL, 0 TL and 232,772 TL. MERTGG coded business is found full efficient without any allocated advertising budget like SELGD's efficiency values in 2009, 2010 and 2011. On the other hand, the efficiency value of SELGD is measured as 68.6 % in 2012 despite the allocated 533 TL advertising budget.

The mean technical efficiency value of sector is equal to .492 in 2013. According to the measured index of mean technical efficiency, inefficiency rate is equal to 49.2 %. AEFES, BANVT, CCOLA, MERKO and SKPLC coded businesses are found full efficient (1.000). Their sales revenues are 9,195,773,000 TL, 1,655,406,636 TL, 5,186,445,000 TL, 73,798,054 TL and 62,748,470 TL respectively. The advertising expenditure of them is also 1,008,841,000 TL, 8,357,439 TL, 443,849,000 TL, 39,045 TL and 1,518 TL.

As a result, AEFES, BANVT and SKPLC coded businesses are measured as efficient between the years of 2009 and 2013. The highest mean technical efficiency values of sector are seen in the years of 2009 and 2012 whereas the lowest value is occurred in 2013. In addition to that, the mean technical efficiency value of Food, Beverage and Tobacco Sector is tending to decrease in 2010 and 2013. The mean technical efficiency value of Sector is lesser than 1.000. It signifies that advertising expenditures could not generate the highest sales revenue or prevailing sales revenues could be generated by lesser advertising expenditures. Briefly, it is referred advertising expenditures remain idle. Because of that result, input oriented relative technical efficiency values of businesses are also analyzed. They are presented in Table 20.2.

According to values in Table 20.2, MRTGG coded business is measured as full efficient in 2011 in addition to results of output oriented DEA analyze.

20.4.2 Percentages of Annual Advertising Budgets of Businesses and the Sector

Advertising budget strategy is thought as a significant indicator for assessing the effect of advertising expenditure on sales revenue. Within this context, the rate of *Annual Advertising Expenditure/Annual Sales Revenue* is measured depending on the *Percentage of Sales* budget method. The mean of annual advertising expenditures of businesses, the mean of annual sales revenue and the rate of Annual Advertising Expenditure/Annual Sales Revenue are given in Table 20.3.

According to the Table 20.3, the advertising expenditures of businesses equal to 7.7 % of sales revenues in 2009. This rate measured as 7.9 % in 2010, 8.2 % in 2011, 9.3 % in 2012 and 8 % in 2013. It is seen that the increase of advertising budget continues up to 2012 and it begins to fall in 2013. The rates of annual advertising expenditure/annual sales revenue of each business are presented in Table 20.4.

Table 20.2 Input oriented technical efficiency values of businesses in the food, beverage and tobacco sector under the variable returns to scale assumption

Businesses	2009	2010	2011	2012	2013
AEFES	1.000	1.000	1.000	1.000	1.000
BANVT	1.000	1.000	1.000	1.000	1.000
CCOLA	.910	.931	.980	1.000	1.000
DARDL	.002	.003	.005	.015	.019
ERSU	.000	.029	1.000	1.000	.101
FRIGO	.000	.031	.022	.122	.053
KENT	.130	.058	.037	.043	.061
KERVT	.006	.008	.009	.010	.093
KNFRT	.010	.302	.079	.169	.017
KRSTL	.006	.032	.010	.029	.005
MERKO	1.000	1.000	.834	.484	1.000
MRTGG	.014	.001	1.000	1.000	.607
PENGD	.019	.132	.191	.206	.533
PETUN	.057	.135	.045	.032	.140
PINSU	.000	.009	.007	.007	.036
PNSUT	.190	.239	.127	.117	.126
SELGD	1.000	1.000	1.000	.144	.029
SKPLC	1.000	1.000	1.000	1.000	1.000
TATGD	1.000	.956	.370	.256	.250
TUKAS	.029	.079	.033	.026	.119
TBORG	.007	.009	.007	.007	.087
ULKER	.674	.493	.603	.855	.661
Sector mean	.366	.384	.426	.387	.361

Table 20.3 The rate of annual advertising expenditures/annual sales revenue of businesses in food, beverage and tobacco sector

Year	The mean of annual advertising expenditures (TL)	The mean of annual sales revenues (TL)	Annual advertising expenditures/annual sales revenue (%)
2009	40,804,096.59	532,448,234.14	7.663
2010	46,148,441.68	581,698,166.73	7.933
2011	54,861,635.73	669,625,469.68	8.193
2012	66,695,648.00	715,925,853.91	9.316
2013	83,573,373.27	1041,394,944.00	8.025

According to Table 20.4, all businesses expense advertising expenditure lesser than the mean of sector advertising budget rate excluding AEFES, CCOLA and ULKER in 2009. CCOLA and ULKER coded businesses are not efficient though they allocate advertising budget over the sector trend (see Tables 20.1 and 20.2). In the year of 2010, all businesses set advertising budget below the sector trend with exception of AEFES, DARDL, KERVT and ULKER coded businesses. Only AEFES is found as efficient in that group. In the year of 2011, all businesses with the exception of AEFES, CCOLA, KENT, TBORG and ULKER set advertising

Table 20.4 The rates of annual advertising expenditure/annual sales revenue of each business in food, beverage and tobacco sector (%)

Businesses	Annual advertising expenditure/annual sales revenue (%)				
	2009	2010	2011	2012	2013
AEFES	10.65	10.78	11.33	17.2	10.97
BANVT	.94	.84	.51	.74	.50
CCOLA	10.07	9.84	10.22	9.63	8.56
DARDL	5.95	13.44	7.29	2.26	9.26
ERSU	3.74	1.21	.01	.01	.07
FRIGO	3.78	.78	.32	0.16	.15
KENT	4.34	8.84	8.69	8.63	7.66
KERVT	5.85	11.39	7.73	5.41	4.22
KNFRT	.16	.12	.58	0.26	.15
KRSTL	.21	.97	.58	0.48	.64
MERKO	.00	.04	.05	.09	.05
MRTGG	.00	.02	.00	.00	.05
PENGD	.74	.41	.27	.23	.22
PETUN	3.61	2.19	3.38	2.96	3.23
PINSU	4.97	5.17	7.38	7.41	5.73
PNSUT	2.82	2.61	2.92	4.34	3.83
SELGD	.00	.00	.00	.01	.51
SKPLC	.04	0.10	.07	.06	.00
TATGD	.71	.79	1.13	2.05	1.93
TUKAS	1.05	1.00	1.75	1.97	2.29
TBORG	5.43	9.79	9.45	7.88	5.17
ULKER	10.30	10.77	9.73	8.03	7.88

budget below the sector rate. Similar to the previous year, AEFES is found efficient but the others' advertising budgets remain idle. In the year of 2012, all businesses excluding AEFES and CCOLA allocate advertising budget below the sector rate and both businesses are evaluated as efficient by DEA. It is figured out that all businesses except AEFES, CCOLA and DARDL set budget lesser than the sector trend in the year of 2013. In this case, DARDL coded business is classified as having an idle budget due to inefficiency value in DEA.

20.4.3 Improvement of the Inefficient Businesses

According to analyses, it is realized that some businesses are inefficient for generating sales revenue depending on their advertising expenditure and they also do not follow the sector trend. Input and output oriented DEA analysis values are ascertained for developing suggestions to improve efficiency of allocating advertising budget of inefficient businesses. These values express the additional sales revenue that businesses should generate and the over-allocated advertising

Table 20.5 Additional sales revenues that businesses should generate for improving their efficiency values (TL)

Business	2009	2010	2011	2012	2013
AEFES	0	0	0	0	0
BANVT	0	0	0	0	0
CCOLA	165,531,482	134,879,168	47,420,146	0	0
DARDL	599,827,364	769,365,367	771,388,309	431,730,103	1,562,909,224
ERSU	294,750,924	263,271,502	0	0	46,360,972
FRIGO	793,398,386	134,653,582	105,367,091	65,905,538	51,143,473
KENT	395,891,595	767,761,847	847,659,985	969,941,402	1,366,110,648
KERVT	647,063,238	909,548,476	977,848,581	1,051,654,446	1,413,548,966
KNFRT	163,469,008	43,415,228	289,073,106	263,944,948	23,346,707
KRSTL	140,922,315	202,621,196	156,402,662	170,052,107	77,202,899
MERKO	0	0	5,936,528	46,358,472	0
MRTGG	4,700,241	5,403,509	5,240,119	0	57,581,277
PENGD	222,416,606	210,896,598	215,328,661	252,844,966	16,503,166
PETUN	511,787,161	587,729,404	782,694,019	865,486,193	1,233,681,858
PINSU	439,695,311	506,079,054	1,038,636,307	973,631,392	1,154,297,775
PNSUT	357,255,469	472,883,902	556,691,127	692,155,888	1,029,315,621
SELGD	0	0	0	2,489,901	65,990,481
SKPLC	0	0	0	0	0
TATGD	0	24,160,572	377,763,500	556,077,752	918,557,365
TUKAS	243,063,988	245,844,160	456,255,302	478,999,909	526,334,235
TBORG	626,666,312	885,736,024	1,001,642,864	1,051,782,989	1,319,671,199
ULKER	395,074,353	597,248,610	473,976,478	194,134,933	596,244,978

expenditure that businesses should reduce for improving their efficiency values. Tables 20.5 and 20.6 respectively summarize these values. Accordingly, relevant strategic suggestions are given for each business.

According to Table 20.4, it is observed that CCOLA and ULKER coded inefficient businesses set advertising budget over the sector average in 2009. Therefore reduction of advertising budget is recommended. Table 20.6 shows the reduction amount of advertising budget (21,843,721 TL for CCOLA and 52,134,457 TL for ULKER) in order to keep prevailing efficiency level of both businesses.

According to Table 20.4, CCOLA, DARDL, KENT, KERVT, TBORG and ULKER coded inefficient businesses set advertising budget over the sector average in the year of 2010. Similarly, in order to prevent idle advertising expenditures, these businesses should have respectively identified advertising budget as 18,780,468 TL, 6,296,709 TL, 39,633,300 TL, 28,979 TL, 18,346,134 TL and 83,160,419 TL being lesser than prevailing year's budgets.

In the year of 2011, CCOLA, KENT, TBORG and ULKER coded inefficient businesses are determined as having advertising budget over the sector average. According to Table 20.6, the reduction amounts of advertising budget are respectively 6,944,217 TL, 47,330,596 TL, 20,102,995 TL and 69,409,227 TL for keeping prevailing efficient level.

Table 20.6 Over-allocated advertising expenditures that businesses should reduce (TL)

Business	2009	2010	2011	2012	2013
AEFES	0	0	0	0	0
BANVT	0	0	0	0	0
CCOLA	21,843,721	18,780,468	6,944,217	0	0
DARDL	479,592,593	6,296,709	3,582,975	1,029,800	9,016,948
ERSU	69,196,750	359,479	0	0	13,470
FRIGO	667,283	124,873	81,899	40,181	27,166
KENT	19,080,346	39,633,300	47,330,596	48,161,596	42,008,959
KERVT	9,241,811	28,979	16,203,348	12,437,085	10,107,787
KNFRT	86,472	28,270	345,031	160,919	87,108
KRSTL	58,941	209,862	119,485	101,733	308,958
MERKO	0	0	4,803	28,263	0
MRTGG	68	1,083	0	0	982
PENGD	614,390	285,694	174,204	154,152	86,798
PETUN	10,475,529	6,687,557	12,394,465	11,925,350	13,285,883
PINSU	2,719,901	3,538,654	5,785,952	7,342,628	6,070,973
PNSUT	10,984,928	11,464,548	16,614,515	27,854,940	27,107,300
SELGD	0	0	0	456	51,722
SKPLC	0	0	0	0	0
TATGD	0	274,914	5,385,051	11,388,185	11,481,607
TUKAS	1,424,726	1,149,523	1,726,463	2,246,584	2,768,230
TBORG	9,970,134	18,346,134	20,102,995	25,421,694	21,779,545
ULKER	52,134,457	83,160,419	69,409,227	27,191,619	73,536,345

Surprisingly, none of the inefficient businesses defined advertising budget over the sector average in 2012. Thus, the insufficient sales revenues in spite of idle advertising expenditures cause inefficient values. It is recommended that they might consider revising strategies of advertising, media and public relations for developing their efficiency values. Table 20.5 states the amounts of sales revenues that should have been additionally generated by the inefficient businesses in order to be identified as full efficient.

In the year of 2013, it is seen that solely DARDL coded inefficient business set advertising budget over the sector average. According to Table 20.6, DARDL might conserve efficiency value in the condition of setting its advertising budget 9,016,948 TL lesser.

Briefly, it is advocated that inefficient businesses (2009–2013), which set their advertising budget over the sector average, should revise related strategies such as advertising budget, media and public relationship for improving their efficiencies.

On the other hand, in the year of 2009 DARDL, ERSU, FRIGO, KENT, KERVT, KNFRT, KRSTL, MERKO, MERTGG, PENGD, PETUN, PINSU, PNSUT, TUKAS and TBORG coded businesses; in the year of 2010 ERSU, FRIGO, KNFRT, KRSTL, MERTGG, PENGD, PETUN, PINSU, PNSUT, TATGD and TUKAS, in the year of 2011 DARDL, FRIGO, KERVT, KNFRT, KRSTL,

MERKO, PENGD, PETUN, PINSU, PNSUT, TATGD and TUKAS; in the year of 2012 DARDL, FRIGO, KERVT, KNFRT, KRSTL, MERKO, PENGD, PETUN, PINSU, PNSUT, SELGD, TATGD, TBORG, TUKAS and ULKER; in the year of 2013 all businesses except AEFES, BANVT, CCOLA, DARDL, MERKO and SKPLC found inefficient and they also set their advertising budget under the sector average. It is proposed to increase their sales revenues by means of improving sales promotion techniques and related sales strategies while reducing their advertising expenditures (see Table 20.5 for additional sales revenue that each business should generate for improving their efficiency values).

20.5 Conclusion and Suggestions

Within the context of this research, the efficiency of advertising expenditures on sales revenues of businesses that are traded on BIST in the Food, Beverage and Tobacco Sector is measured by data envelopment analysis (DEA). It has been seen that the complexity of measuring direct impact of advertising expenditures on sales revenue can be eliminated by means of this method.

Research findings are organized in three dimensions. The first dimension includes values of output oriented DEA. According to results of this dimension, efficiency values of AEFES, BANVT and SKPLC coded businesses are found full efficient, with the value of (1.00) for all years. Amount of the generated sales revenue of SELGD in the years of 2009 and 2010 and MRTGG in the year of 2011 are also found efficient though no advertising budget is allocated. This result might be regarded quite surprising and interesting. In the sector perspective, it is determined that advertising budgets have remained idle with respect to the mean technical inefficiency values of Food, Beverage and Tobacco Sector for all years.

In the second dimension, input oriented DEA findings are given. In addition to output oriented DEA's results MRTGG coded business is also defined as efficient in 2011.

In the last dimension, advertising budgets are identified inconvenient according to the percentages of sales method by using annual sales revenue and annual advertising expenditure data. Therefore advertising budget strategies of inefficient businesses are analysed comparatively to the sector average. According to that CCOLA, DARDL, KENT, KERVT, TBORG and ULKER are the businesses which, set advertising budget over the sector average. It is observed that these businesses' advertising budgets remain idle. Rest of the businesses in the sector generates insufficient sales revenue while setting advertising budget under the sector average. Under these circumstances, reduction of the advertising budget according to values of input oriented DEA is recommended to the businesses such as CCOLA, DARDL, KENT, KERVT, TBORG and ULKER which have advertising expenditures over the sector average. Additionally, revising of sales promotion techniques and strategies related to advertising and media is also recommended to the businesses such

as ERSU, FRIGO, KNFRT, KRSTL, PENGD, PETUN, PINSU, PINSUT and TUKAS, which have advertising expenditures under the sector average.

As a conclusion, it is suggested that the efficiency values of businesses in Food, Beverage and Tobacco Sector could be advanced. These results may also produce some useful insights to investors and practitioners who want to enter Turkey market. Especially, businesses that found efficient may attract more interest of hedge investors.

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