STUDIA UBB NEGOTIA, LVIII, 1, 2013, pp. 5 - 21
(RECOMMENDED CITATION)

MEASURING ROMANIAN LARGE FMCG RETAIL CHAINS EFFICIENCY DURING THE PERIOD ECONOMIC CRISIS BETWEEN 2006-2011

MONIKÁ-ANETTA ALT[1]

ABSTRACT. The purpose of this study is to measure Romanian large FMCG retail chains' efficiency during the period of 2006-2011. The sample contains 27 large retail chains. For the purpose of this analysis, the Data Envelopment Analysis (DEA) method was used. The DEA model includes three variables, namely two inputs (fix assets and the average number of employees) and one output (turnover). The results of the DEA analysis show a medium level of efficiency in the Romanian FMCG market during the period of the economic crisis. The mean score of technical efficiency varied between 0,732 and 0,575. Two retailers were selected as benchmarks: the French hypermarket Carrefour and the German discounter Penny Market. The well performing companies' market penetration and development strategies are briefly discussed. This study seems to be the first one to apply performance measurement by means of DEA in the Romanian large FMCG retail chain during the crisis period.

Keywords*: big retail chains, FMCG, hypermarket, supermarket, efficiency, Data Envelopment Analysis*

JEL: M31

1. Introduction

The development of the Romanian retail sector starts in 1990, during the same time of the transition to the market economy. The retail sector became the first private sector in the economy. In 1998, 95% of the retailers

[1] Lecturer,PhD., Faculty of Economics and Business Administration, Babeş-Bolyai University Cluj-Napoca, monika.alt@econ.ubbcluj.ro

had private majority. During the 90' the market was dominated by traditional retailers, however modern retail formats like supermarket, cash and carry and mall appeared as well (La Fourmi in 1992, Mega Image in 1994, Metro Cash& Carry in 1996, Bucureşti Mall in 1999). The competition between traditional and modern retail format started after 2000 when new retail formats such as hypermarket, discounter and do-it-yourself stores entered the Romanian market (Profi in 2000, Carrefour in 2001, Praktiker and Bricostor in 2002).

Substantial expansion of the modern retail format starts in 2003 when the investment in retail per total Romanian investment increased from 11% in 2002 to 14% in 2003. The level of this indicator was maintained at 15% until 2008 when the economic crisis started (NSI, 2010). Between 2005 and 2008, the number of hypermarkets in Romania has exploded, with the entrance of the German retailer Kaufland and Real (Popescu, 2010). The Romanian accession to the European Union in 2007 boosted the development of the modern retail formats. The number of imported products grew significantly. The Romanian modern retail market is divided between German and French investors. The economic crisis which started in 2008 affected the retail sector significantly because of the decrease in consumption. The survival of the retail companies was difficult. Thus the performance measurement in a changing environment and intense competition has become very important in the retail sector.

The main objective of this study is to analyze the efficiency in the Romanian retail sector during the crisis period. In order to have a better understanding of the phenomenon, data was collected both before and after the economic crisis during the period between 2006 and 2011. This research focused only on big FMCG retail chains.

The paper is organized in five sections, as follows. First section represents a literature review regarding efficiency measurement in retailing using Data Envelopment Analysis (DEA). Second section represents the research methodology: the applied DEA model, the used input/output variables and sample. In the third part the research results are presented. In the fourth part the results are discussed and managerial implications are recommended. Finally, last section contains a conclusion.

2.Efficiency measurement in retailing using DEA

In efficiency measurement in retailing, Data Envelopment Analysis (DEA) is a widely used technique. The literature review revealed 17 studies in this field of retailing since 1995. These research studied were conducted mostly in a developed economy with a high competitive environment (USA, Chile, Portugal, Spain, UK and Romania). The main objectives, the research methodologies and the results are shortly presented.

Donthu et. al. (1998) studied the efficiency of 24 outlets of a fast food restaurant chain during the period 1990-1992, using DEA and regression analysis. The model was based on four inputs (store size, store location, store manager experience and promotions) and two outputs (sales and customer satisfaction).

Thomas et. al. (1998) enriched the literature with individual store efficiency measurement in USA. 552 outlets were included in the sample. Restricted DEA, CRS, output oriented model was applied with five inputs (labor, experience, location, related costs and internal process) and two outputs (sales and profit). The results outline the critical success factor for each store.

Keh and Chu (2003) contributed to the international literature proposing distributing service as an intermediate output variable. According to them, the output of the retail firm could be defined as a set of explicitly priced market goods accompanied by distribution service that are implicitly priced (accessibility, assortment, assurance of product delivery, product information and ambience). The sample contained 13 outlets of a chain of grocery stores in USA. The data was collected from 1988-1997. In the end the relationship between raw Input (labor, capital) and final output (sales) was also studied.

Barros and Alves (2003) proved the importance of outlets efficiency measurement at Portuguese hypermarkets and supermarkets. The ratio between two outputs (sales and profit) and five inputs (employees, cost of labor, cash out points, stock and other costs) shows that 37% of outlets operated at high level of pure technical efficiency in 2000. Output oriented, variable return on scale DEA model was used.

Rachford (2003) incorporated measures of services and breadth of assortment into a time series (1959-1995) study of productivity change in 54 retail food stores in USA. Cost efficiency and DEA model was applied.

Barros and Alves (2004) continued their study on the Portuguese retail market by using Malmquist productivity index for 1999-2000 years. Later Barros (2006) extended his analysis with DEA VRS output oriented and Tobit regression model at the period 1998-2003. The results show a high efficiency level of hypermarkets and supermarkets activity in comparison with other sectors. It was also found that larger retail groups are, on average, more efficient than the smaller retailers, and that national retailers are on average more efficient than regional retailers. The efficiency drivers are market share, number of outlets and location. The regulation found to have a negative effect on efficiency.

In Spain, Rubio et. al. (2006) studied for the first time the efficiency of intermediaries. The data was collected from 100 supermarkets during 1995-2001. The output oriented DEA model was applied for three inputs (employees, outlets, capital) and two outputs (sales and profits). The results reveal a high level of inefficiency in the Spanish retail sector.

Mateo de F. et. al. (2006) applied a new dynamic DEA model at 35 department stores in Chile in 2000 and 2001. Concepts like adjustment, cost adjustment, dynamic DEA, path of adjustment, adjustment period and appraisal period are used. Five inputs (sales person labor, cashier labor, sales general expense, marketing expense and store location) and on output (gross sales) are analyzed.

Rubio and Mas-Ruiz (2007) continued the Spanish retail sector efficiency analyses. The DEA and Malmquist productivity index were applied for one input (capital) and two outputs (sales revenue and operational results) during 1995-2003 years. The results show a slight increase in average annual productivity among the firms analyzed.

Moreno (2008) studied hypermarkets efficiency with data envelopment analysis (DEA) in Spanish retailing. In particular, the influence of the Retail Trade Act of 1996, by means of which the Spanish state transferred authority to concede licenses for opening commercial establishments to the regions. The analysis is based on a DEA model that allows for the evaluation of categorical variables in DEA in cross-section data. The findings suggest the existence of three different production frontiers in relation to the markets' regulation process where the hypermarkets operate; high, medium and low regulation.

Yu and Ramanathan (2008) applied for the first time productivity analysis using DEA for the UK retail sector. Economic efficiencies of 41 retail companies working in the UK between 2000 and 2005 were examined in this study using three related methodologies: data envelopment analysis (DEA), Malmquist productivity index (MPI), a bootstrapped Tobit regression model. Three inputs (number of employees, total assets and shareholders' funds) and two outputs variables (turnover and profit before taxation) were used in the efficiency model.

Mostafa (2009) measure the relative efficiency of the US 45 specialty retailers and food consumer stores using cross-sectional data for the year 2007. The DEA CRS and VRS model was applied for two inputs (employees and assets) and three outputs (revenue, market value and earnings per share). The results indicate that the performance of several retailers is sub-optimal. The author highlights the economic importance of encouraging increased efficiency throughout the retailing sector in the USA.

Moreno and Sanz-Triguero (2011) continued Spanish retail sector efficiency analyses in 12 different non-specialized retail sectors, 1997-2007. The main contribution of this research is in applying a new methodology in the retail productivity and efficiency measurement. Data envelopment analysis stochastic (order-m) and bootstrapping Malmquist index with two inputs (employees, square meters) and one output (sales) was used. The results show a high level of inefficiency in most of the sectors analyzed over the period of analysis.

In the Romanian market, retail sector efficiency was studied using DEA by Alt and Dabija (2010) for hypermarkets in the period 2006-2007 and by Alt (2012) for do-it-yourself stores in 2007-2010.

3. Research Methodology

3.1. Data Envelopment Analysis model

The Data Envelopment Analysis (DEA) method is a linear programming technique that can be used to measure the relative performance of a homogenous group of firms that produce multiple outputs with multiple inputs. The relative performance means to compare each firm to the best performer (not to the average). The concept of DEA was developed by Charnes, Cooper and Rhodes (CCR) in 1978 based on Farrell's paper "The measurement of productive efficiency" from 1957.

According to Farrell (1957) the productive efficiency (named also economic efficiency or overall efficiency) has two components: technical efficiency (TE) and allocative efficiency (AE named also price efficiency - PE). The technical efficiency reflects the ability of firms to obtain the maximum output to a given set of inputs. The allocative efficiency or price efficiency refers to the ability of firms to use inputs in optimal proportion, given their respective input prices.

Productive efficiency has two orientations: input and output orientation In case of input orientation, the productive efficiency refers to producing a given output by using the minimum possible amounts of inputs. In case of output orientation, the productive efficiency refers to producing the maximum possible output using a given amount of inputs.

Charnes, Cooper and Rhodes (1978) transposed the technical efficiency concept in a linear programming method. According to them "the efficiency of any Decision Making Units (DMU) is obtained as the maximum of a ratio of weighted outputs to weighted inputs subject to the condition that the similar ratios for every DMU be less than or equal to unity."

In 1981, Charnes, Cooper and Rhodes (1981) have improved the definition of DMU's efficiency taking into consideration the slack issues:

a) In case of input orientation: a DMU is inefficient if there are any possibility to cut down inputs quantity without raising quantity for any other input variables and maintaining the same outputs quantity.

b) In case of output orientation: a DMU is inefficient if there are any possibility to raise any output quantity, without raising input quantity or cut down other output quantity.

While in the first period of DEA analysis the model of constant return on scale was mostly used later the variable return on scale (VRS) was considered more proper to reflect the reality. The variable return on scale assumes that an increase in inputs does not result in a proportional change in the outputs.

In this paper output orientation VRS DEA model was applied. In case of retailer's efficiency analyses the output orientation is more proper because the objective of retailer is to increase their output. The used mathematical model is presented bellow.

There is a sample of N firms (DMUl, l = 1,... N) producing M outputs (Y1n, Y2n,...,YMn) with K inputs (X1n, X2n ,... XKn). The used variables have to be non-negative. For each DMU l, l = 1,..., N, a measure of a ratio of all outputs over all inputs can be obtained, such as u' Yl / v' Xl,, where u is an Mx1 vector of outputs weights and v is a Kx1 vector of inputs.

This involves findings values for u and v, such that the efficiency measure of the i-th DMU is maximized.

The efficiency of one DMU1 is calculated:

$$\frac{u' * Y_1}{v' * X_1}$$

The maximum efficiency for DMUl is calculated:

$$\max \frac{\sum_{r=1}^{s} u_r y_{rl_1}}{\sum_{i=1}^{k} v_i X_{il_1}} = h;$$

None of the DMU could be more efficient that 100%, subject to:

$$\frac{\sum_{r=1}^{s} u_r y_{rl}}{\sum_{i=1}^{k} v_i X_{il_1}} <= 1,\ l = 1,...,N;\ \ ur, vi \geq 0;\ r = 1..s;\ i = 1...k;$$

The optimal weights are obtained resolving the linear programming equation. One DMU is efficient if h = 1 and is inefficient if h<1. In other words, one DMU is efficient when no other DMU is capable of producing a higher output from the same input (output oriented).

Each DMU is evaluated regarding to the efficient frontiers and will get an efficient score relative to the best performance. Each DMU which are situated on the efficient frontier are efficient in terms of DEA, the others are inefficient and they get an inefficient score.

This study is based on three variables. Input variables used are fix assets and average number of employees. Fix assets and employees are essential in the retail activities. The output variable is represented by turnover.

For the efficiency measurement in this study, DEAP software was used. DEAP (2008) software was developed by Professor Tim Coelli from the University of New England, Australia, and it is specialized for measuring product efficiency.

Table 1. Number of stores for each retail chain in the period 2006-2011

	Retail Name	Investors	Type	First Store	2006	2007	2008	2009	2010	2011
1	Alimentara	Ro.	Sup.	1991	0	15	12	6	0	0
2	Luca	Ro.	Sup.	1991	15	16	16	16	16	13
3	Oncos lmpex	Ro.	Sup.	1991	15	16	20	29	26	25
4	Agricola International	Ro.		1992	25	18	28	21	11	38
5	La Fourmi	Lebanese	Sup.	1991	14	14	14	0	0	0
6	Annabella	Ro.	Sup.	1992	0	21	21	23	26	34
7	Mega Image	Belgian	Sup.	1994	16	21	40	50	58	94
8	Unicarm	Ro.	Sup.	1994	0	11	24	24	48	66
9	Billa Romania	Ge.	Sup.	1999	21	27	34	35	47	56
10	Profi Rom Food	Pol.	Disc.	2000	27	41	47	63	73	107
11	Carrefour Romania	Fr.	Hyp./Sup.	2001	7	32	37	42	51	67
12	Trident Trans Tex	Ro.	Hyp.	2001	3	4	3	4	4	0
13	Penny Market, Penny Market XXL	Ge.	Disc.	2001	25	45	62	73	98	126
14	Angst	Ro.	Sup.	2002	25	31	26	22	24	20
15	CDE R Interex	Ro.	Sup.	2002	9	10	11	13	13	11
16	Diana Com	Ro.	Sup.	2002	0	0	0	0	11	17
17	Cora - Romania Hipermarche	Fr.	Hyp.	2002	3	3	3	3	8	7
18	Pic	Ro.	Hyp.	2004	2	4	4	0	0	0
19	Univers'all Trading Romania	Ro.	Hyp.	2005	5	0	0	0	0	0
20	Kaufland Romania	Ge.	Hyp.	2005	15	29	39	35	55	73
21	Plus Discount Romania	Ge.	Disc.	2005	0	28	28	6	28	0
22	Auchan – MGV Distri-Hiper	Fr.	Hyp.	2006	1	5	10	26	7	7
23	miniMax Discount	Ro.	Disc.	2006	0	11	17	28	41	51
24	Real - Hypermarket Romania	Ge.	Hyp.	2006	4	13	20	21	27	22
25	Lidl Romania	Ge.	Disc.	2010	0	0	0	0	22	130
26	Mic.ro	Ro.	Sup.	2010	0	0	0	0	182	659
27	Spar	Dutch	Sup.	2006	0	14	0	0	0	0

3.2. The sample

The sample definition was a challenging process. First, the differences between the modern retail types (hypermarket, supermarket, discounter) are not very clear perception by customers. Secondly, the different types of retailers are in direct competition for customers. Third, the sample should be homogenous in order to apply DEA model. According to these reasons, the sample contains all types off retailers which are big enough to be considered direct competitors.

The sample contains the most important FMCG retail chains in Romania. All hypermarkets were included in the sample. In order to obtain a homogenous sample, only large supermarkets and discounters chains were tested. Retailers with more than 10 stores were considered big chains. The two cash&carry stores (Metro and Selgros) wasn't included in the analyses because their main activity is focusing on B2B even if they serve final consumers too.

During the studied period of 2006-2011 totally 27 retailers were studied however the number of sample varied in each year. Some retailers went bankrupt (Univers'all, Trident, Pic, Mic.ro), some retailers were purchased (La Fourmi, Plus), some retailer entered on the Romanian market (Minimax Discount, Lidl, Mic.ro), some retailers others developed their chains becoming big retailers (Alimentara, Anabella, Unicarm, Spar, Diana Com) and other retailers decreased their store number under 11 (Alimentara, Spar) during the studied period (Table No. 2).

The Romanian retail market is shared between German, French and Romanian investor. However, Belgian, Poland and Dutch investors are also present. The most important Romanian retailers (Luca, Oncos, Agricola, Unicarm and Angst) have started their activity with producing meat. Pic has both en gross and retail activities. Trident performs on transportation and retail.

4. Research Results

The performance measurement on do-it-yourself market was run separately for each year, from 2006 to 2011. The data was collected on the Romanian Ministry of Finance website (2012). The descriptive statistics of the studied variables are presented in Table 3. Unfortunately there were cases of missing data: Spar did not have available data for 2008; Pic retailer did not have available data in 2009; Plus Discount did not have available data regarding the number of employees in 2008, 2009 and 2010. In order not to exclude Plus Discount from the sample in the specified years it was estimate that the numbers of employees are same like in 2007.

From the 27 companies included in the study in the whole period, 14 companies constitute the core of the sample which is present in each year. In other words, 51% of the studied companies were stable in the studied period, they meet the requirement of the research sample or they have available data.

Table 2. Summary of descriptive statistics

	No. of employees	Fix Assets (EUR)	Turnover (EUR)	Studied Companies
2006				
MIN	301	3.204.561	13.438.936	19 chains
MAX	3.775	205.632.610	439.444.452	
MEAN	1.282	36.113.156	93.180.208	
SD	1.028	58.248.248	109.692.562	
2007				
MIN	56	635.528	1.162.887	23 chains
MAX	5.896	339.821.286	586.870.394	changes from 2006:
MEAN	1.672	45.384.722	127.883.993	- went out: Univers'all
SD	1.602	81.579.050	155.883.409	entered: Alimentara, Anabella, Unicarm, miniMax, Spar
2008				
MIN	52	688.355	1.308.999	22 chains
MAX	7.760	538.657.614	844.538.972	changes from 2007:
MEAN	2.156	71.559.661	179.188.871	- went out: Spar
SD	2.351	128.935.445	231.275.169	
2009				
MIN	47	1.505.336	1.469.222	21 chains
MAX	8.258	655.785.552	967.243.205	changes from 2008:
MEAN	2.221	82.325.497	210.532.849	went out: La Fourmi, Pic
SD	2.563	154.614.204	284.817.864	entered: Spar
2010				
MIN	74	602.075	18.906	23 chains
MAX	9.993	755.976.604	1.037.980.406	changes from 2009:
MEAN	2.158	82.601.975	203.477.815	went out: Alimentara, Spar
SD	2.646	157.369.434	293.738.503	entered: Diana Com, Lidl Romania, Mic.ro
2011				
MIN	61	567.390	983.865	21 chains
MAX	10.493	832.598.780	1.241.378.437	changes from 2010:
MEAN	2.582	96.273.985	244.965.277	went out: Trident,
SD	2.623	179.736.546	325.777.381	Plus Discount
2012	changes from 2010: - went out: Pic, Mic.ro			

The efficiency analysis using DEAP software provides the following data about each DMU: technical efficiency score, types of return on scale, slacks, peers, peers weights and input targets.

The technical efficiency scores are presented in Table 4. Beside the technical efficiency in term of variable return on scale (VRS), the efficiency in terms of constant return on scale (CRS) and scale efficiency (SE) were also calculated.

Table 3. DEA analysis results for the period 2006-2011

	Retail Name	TE, VRS in 2006	TE, VRS in 2007	TE, VRS in 2008	TE, VRS in 2009	TE, VRS in 2010	TE, VRS in 2011
1	Alimentara	-	1	1	1	-	-
2	Luca	1	0,324	0,54	1	0,371	0,552
3	Oncos lmpex	0,329	**0,194**	**0,19**	**0,219**	**0,218**	0,337
4	Agricola International	**0,206**	**0,191**	**0,195**	**0,24**	**0,204**	**0,265**
5	La Fourmi	1	**0,27**	**0,263**	-	-	-
6	Annabella	-	0,483	0,42	0,385	0,398	0,440
7	Mega Image	0,429	0,399	0,372	0,366	0,433	0,462
8	Unicarm	-	0,389	0,384	0,390	0,326	0,343
9	Billa Romania	0,954	0,929	0,817	0,696	0,623	0,602
10	Profi Rom Food	1	0,614	0,632	0,618	0,539	0,619
11	Carrefour Romania	**0,292**	1	1	1	1	1
12	Trident Trans Tex	1	**0,297**	0,303	**0,282**	1	-
13	Penny Market, Penny Market XXL	0,517	1	1	1, CRS-1, SC-1	1, CRS-1, SC-1	1, CRS-1, SC-1
14	Angst	0,95	0,378	0,365	0,432	0,388	0,432
15	CDE R Interex	1	0,644	0,708	0,759	0,981	0,594
16	Diana Com	-	-	-	-	1	1, CRS-1, SC-1
17	Cora - Romania Hipermarche	0,411	1	1	1	0,896	0,818
18	Pic	1	**0,259**	0,308	-	1	1
19	Univers'all trading Romania	0,53	-	-	-	-	-
20	Kaufland Romania	0,884	0,811	0,775	0,849	1	1
21	Plus Discount Romania	1	0,985	**0,090**	**0,036**	0,63	-
22	Auchan - MGV Distri-Hiper	0,402	0,411	0,546	0,798	0,743	0,731
23	miniMax Discount	-	1	1	1	1, CRS-1, SC-1	0,937
24	real,- Hypermarket Romania	0,402	0,577	0,741	0,741	1	0,998
25	Lidl Romania	-	-	-	-	**0,02**	0,812
26	Mic.ro	-	-	-	-	**0,141**	**0,139**
27	Spar	-	0,316	-	1	-	-
	Mean	**0,732**	**0,586**	**0,575**	**0,658**	**0,610**	**0,671**

DEA analysis shows a medium level of efficiency in FMCG retail market in Romania during the crises period. The mean score of technical efficiency was between 0,732 and 0,575. After at slow decrease until 2008 a slow increase could be seen.

In 2006, 37% (Luca, La Fourmi, Profi, Trident, Interex, Pic and Plus) from the studied chains had the score of TE one and they are located on the efficient frontier. In 2007, 22% (Alimentara, Carrefour, Penny Market, Cora and miniMax) from the studied chains are efficient in terms of TE. In 2008, 23% (Alimentara, Carrefour, Penny Market, Cora and miniMax) are located on

the efficiency frontier. In 2009, 33% (Alimentara, Luca, Carrefour, Penny Market, Cora, miniMax and Spar) had the score of TE one. One of them, Penny Market is efficient in all three terms off TE (VRS, CRS and SE). In 2010, 35% (Carrefour, Trident, Penny Market, Diana Com, Pic, Kaufland, miniMax and Real) are located on the efficiency frontier. Two of them (Penny Market, miniMax) are efficient in all three terms off TE (VRS, CRS and SE). In 2011, 24% (Carrefour, Penny Market, Diana Com, Pic and Kaufland) had the score of TE one. Two of them (Penny Market, Diana Com) are efficient in all three terms off TE (VRS, CRS and SE).

The efficient company produced the maximum possible outputs (turnover) for the given level of inputs (fix assets and the number of employees). Those companies who were efficient in terms of CRS were operating at the most productive scale size (SE=CRS/VRS).

There is no one company which is efficient during each year of the studied period. There are two companies (Carrefour, Penny Market) which achieved efficiency in five consecutive years and there is one company (miniMax) which achieved efficiency in four consecutive years.

According to our analysis the less efficient companies, with TE scale lower than 0,3: were Agricola and Carrefour in 2006; were Oncos, Agricola, La Fourmi, Trident and Pic in 2007; were Oncos, Agricola, La Fourmi and Plus in 2008; were Oncos, Agricola, Trident and Plus in 2009; were Oncos, Agricola, Lidl and Mic.ro in 2010; Agricola and Mic.ro in 2011.

Agricola had low performance at all the studied period. It was followed by Oncos which had low performance for four year. This low performance of Agricola and Oncos could be explained with the fact that these companies are meat producer and retailer in the same time. A big amount of fix assets is necessary for the production process. In comparison with other retailers their amount of fix assets are bigger and looked inefficient.

The data for the inefficient companies can be interpreted as follows:

- a TE score of 0,265 for Agricola in 2011 indicates that this company should increase its turnover by 73,5% using the same input;
- to improve its efficiency, Agricola had to follow in 71,7 % the model of Penny Market input/output combination's and in 28,3% the model of Pic.
- Agricola has big amount of fix assets.

The same analysis could be made for each inefficient company.

Because of the changes of the sample size, longitudinal analysis of technical efficiency was not performed. It is not possible to compare the score of TE for Carrefour in 2006, with the score of TE in 2007, or 2008, or 2009, or 2010, or 2011. The TE score should be interpreted relative to the sample in each year. However, the comparison of rank orders of companies in different years may be meaningful. All efficient companies in terms of DEA are marked with ranking one. Inefficient chains are numbered consecutively (presented in Table 4).

Table 4. DEA rankings for 6 periods

YEAR 2006	YEAR 2007	YEAR 2008	YEAR 2009	YEAR 2010	YEAR 2011
1. Interex	1.Alimentara	1.Alimentara	1. Penny Market	1. Penny Market	1. Penny Market
1. La Fourmi	1. Carrefour	1. Carrefour	1. Alimentara	1. miniMax	1.Diana Com
1. Luca	1. Penny Market	1. Penny Market	1. Luca	1. Carrefour	1. Carrefour
1. Pic	1. Cora	1. Cora	1. Carrefour	1. Trident	1. Pic
1. Plus	1. miniMax	1. miniMax	1. Cora	1. Diana Com	1. Kaufland
1. Profi	2. Plus	2. Billa	1. miniMax	1. Pic	2. real
1. Trident	3. Billa	3. Kaufland	1. Spar	1. Kaufland	3. miniMax
2. Billa	4. Kaufland	4. Real	2. Kaufland	1. Real	4. Cora
3. Angst	5. Interex	5. Interex	3. Auchan	2. Interex	5. Lidl
4. Kaufland	6. Profi	6. Profi	4. Interex	3. Cora	6. Auchan
5. Univers'all	7. Real	7. Auchan	5. Real	4. Auchan	7. Profi
6. Penny Market	8. Annabella	8. Luca	6. Billa	5. Plus	8. Billa
7. Mega Image	9. Auchan	9. Annabella	7. Profi	6. Billa	9. Interex
8. Cora	10. Mega Image	10. Unicarm	8. Angst	7. Profi	10. Luca
9. Auchan	11. Unicarm	11. Mega Image	9. Unicarm	8. Mega Image	11. Mega Image
10. Real	12. Angst	12. Angst	10.Annabella	9. Annabella	12.Annabella
11. Oncos	13. Luca	13. Pic	11.Mega Image	10. Angst	13. Angst
12. Carrefour	14. Spar	14. Trident	12. Trident	11. Luca	14. Unicarm
13. Agricola	15. Trident	15. La Fourmi	13. Agricola	12. Unicarm	15. Oncos
	16. La Fourmi	16. Agricola	14. Oncos	13. Oncos	16. Agricola
	17. Pic	17 Oncos	15. Plus	14.Agricola	17. Mic.ro
	18. Oncos	18. Plus		15. Mic.ro	
	19.Agricola			16. Lidl	

Source: own research

The recession period was passed by retailers in different ways. We identified six group of companies. (1)There are only one hypermarket (Carrefour) and one discounter (Penny Market), both international chains which maintained their position on the efficiency frontier during 2007-2011. The recession period did not affect them in terms of efficiency. (2)There is one group of retailers (Alimentara, Cora and miniMax) which were efficient almost all the studied period but they lost efficiency in the end. (3)There is another group of companies which reached the efficiency frontier or increased their efficiency (Diana Com, Kaufland, Lidl and Real). These companies take advantage of the recession period. (4) Another group of companies (Oncos, Agricola, Unicarm, Annabella, Angst, Mega Image, and Profi) passed the recession period maintained their ranking on a relative constant level. Four of these companies are meat producer with a retailer chains. (5) The last group of companies (Interex, Luca, Trident, Pic, Plus, Spar, Billa and Auchan) was hard effect by the recession period, their rankings varying between the first and the last company. (6)There are some outlier like La Fourmi and Mic.ro.

The first group is interesting for benchmarking and case study model because they maintain their position on the efficiency frontier during 2007-2011. Carrefour and Penny Market strategy are presented in the discussion part.

5. Discussion and managerial Implication

This paper presents the results of a benchmarking study on FMCG retail market in Romania in the period 2006-2011, using Data Envelopment Analysis. The concept of performance is very complex. Although a multiple variable model with two inputs (fix assets, number of average employees) and one output (turnover) has been used in this study, the model reflects a simple representation of the complex reality. For instance, variables such as the elements of the marketing mix have an important role in companies' performance.

The results of DEA reveal that the Romanian FMCG retail market had a medium technical efficiency score between 0,732 and 0,575 during the recession period. The DEA model generates the efficient frontier and compares each company to the frontier. Furthermore, the model generates the optimal target inputs value for inefficient companies, which is important managerial information.

According to the efficiency analysis the French hypermarket Carrefour and the German discounter Penny Market should be considered benchmark for other retailer. Their strategy is presented bellow.

Carrefour marketing strategy

Carrefour is the first hypermarket which entered in the Romanian market in 2001 in Bucharest. In the first part Carrefour operate in the Romanian market under a franchise (Bonoiu, 2006).

After the Romanian accession to the European Union in 2007, Carrefour changes the slow penetration development strategy to an intensive one. The control of the hypermarket was taking over by the Carrefour Group from the franchiser (Bonoiu, 2006). Carrefour opened a supermarket format too on the brand Carrefour Market (Popescu, 2007 (d). The number of stores rose from 7 in 2006 to 32 in 2007. Carrefour took over Univers'all's hypermarket from Bucharest (Popescu, 2007 (b)) and Artima's supermarkets. The accession to the European Union brought the abolition of customs duties. Carrefour rose the number of imported products with 25% (especially for own brands Tex). The logistics for the imported product is supported by an own logistic center. However outsource logistic service are also used (Popescu, 2007 (c)). In the same year, Carrefour's travel agency established a partnership with Blue Air low cost airline company for turnovering tickets.

At the end of 2008, Carrefour wasn't affected by the crisis. In 2009, Carrefour continued the expansion strategy opening a new retail format, small hypermarket under Carrefour Market brand (Popescu, 2009). Instead of an aggressive promotion strategy the turnovers decreased in 2010 (Popescu, 2010). The supermarket chain was developed further. Carrefour Market was rebranded in Carrefour Express. In 2011, Carrefour, gave the franchise for Carrefour Express to Angst retailer.

In 2011 Carrefour operates 65 stores (25 hypermarkets and 42 supermarkets). According to turnover Carrefour is the second hypermarket on the Romanian Market being exceeded only by Kaufland. On the hypermarket market Carrefour are competing with Real, Kaufland, Cora and Auchan. On the supermarket market the direct competitor are Billa, Spar and Interex.

Penny Market Marketing Strategy

Penny Market is part of a Rewe Group company which operates on the Romanian market three retail formats: supermarket (Billa), cash&carry (Selgross) and discounter (Penny Market and XXL Mega Discount). Rewe Group is present on the Romanian market since 1999. Penny Market was the last division brought by Rewe Group on the Romanian market in 2005 (Popescu, 2007 (a)).

The first Penny Market store was opened in Timișoara. It was followed by 15 new stores in the same year. Penny Market applyed an intensive penetration strategy opening between 9-28 stores per year. In 2007 the XXL mega Discount was rebranded to Penny Market XXL. Like Carrefour, Penny Market established also a partnership with Blue Air low cost airline company because of the similar target segment (Popescu, 2007 (e)).

In 2008 and 2009 despite the crises, the development strategy continued but slower. Penny Market opend 17 new stores in 2008 and 11 new stores in 2009. During this period Penny Market resume network expansion for Penny Market XXL too. During the crisis period the discounter were the only operators in the food trade that continued their expansion startegy. (Popescu, 2008).

In 2011 Penny Market operats 126 stores being the second largest retail chain in the Romanian market after Lidl with 130 stores. According to turnover Penny Market is the biggest discounter on the Romanian Market. Penny Market is competing with Lidl, Profi and minMax Discount.

6. Conclusions

The Data Envelopment Analysis is a widely used method in performance measurement using the multiple variables in the retail sector. The Romanian big FMCG chain market performance measurement was based on three

variables (fix assets, number of employees and turnover). The results of DEA reveal that the Romanian studied market in the recession period had a medium technical efficiency score between 0,732 and 0,575. Two retailers were selected for benchmark: the French hypermarket Carrefour and the German discounter Penny Market.

However the presented analysis gave a good reflection of the retail market in the crisis period some limitation of the research should be mentioned also. The availability of accurate and relevant data is a challenge for this kind of research. The homogenity of the sample is another limitation, because the romanian retailer's main activity is production or transportantion not retailing. In the same time the geographic distribution of the stores is different. Smaller retailer has only a regional cover of the market not a national on.

The future research could include more different input/output variables, especially different marketing variables such as promotion, customer satisfaction, marketing expenses and distribution services. The application of another DEA model or doing a longitudinal study using Malmquist Productivity will be possible when the data for all retail chains form the sample are available for the whole period of research. The performance measurement could also be detailed at the store level for large retail chains. Finally, a detailed marketing mix analysis for retailers (product assortment, service, price strategy, communication strategy, store location and store design) in the case of each company could explain better the key success factors.

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