Study of Competitiveness for the Representative Companies in the National Domestic Dairy

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To study the competitiveness of a company we use several indicators $I_1, I_2, \ldots, I_n$ *that can be expressed numerically. We note* E_1 *the company whose competitiveness we want to evaluate. It can action several markets, but we will focus onone of them, where it competes with the companies* $E_2, E_3, \ldots, E_m$. *Firstly, we aim to achievethe firms'hierarchy operatingon that marketwithELECTREmethod. Then we willsee how toobtainthe classification of thesecompaniesbased on competitiveness'index method.*

Keywords: *competitiveness, classification, Electremethod,competitiveness'index method*

JEL Classification: *C02, C38, C43*

Introduction

Prior to a discussion of the two classifications obtained below, we dedicate the followings to a comparative analysis for the methods applied: ELECTRE method and method of competitiveness'index.

ELECTRE method provides good results in multi criteria decision. For some aggregations and comparisons required by the algorithm are necessary uniform criteria, which is done by transforming the recorded values of indicators of the companies in utilities.

Also the utilities of indicators have a comparative feature, since the scale of values includes only the values recorded for the companies concerned, and not related to standard values.The method is complex: the first phase is

achieved by comparing the companies by concordance indices; to assume that a firm is dominant for another, it is necessary that the opposition to this choice, the risk must be quite low, which means the discordance index to be limited, finally, after setting all the relations of domination, the tie breaker is upon the number of firms dominated. This mechanism of laborious classification assures a better accuracy for results.

The competitiveness'index method provides good results for the analysis of competitiveness. Method means to assign one value to each enterprise. This value, even if it does notrequirea complicatedcalculation, is representing properly the recorded values for all indicators with their shares (coefficients of importance). Competitiveness index value is a measure of competitiveness' degree of the company. Also noted that competitiveness index method, is outstanding by its natural way of evaluating the level of competitiveness.

In general, the classifications obtained by the two methods may differ, but not too much, which happens in this case. This does not mean that the two classifications exclude one to another.

They are obtained based on different criteria, so that they complement each other and must be considered together.

Competitiveness index aggregates utility's values for all indicators. It representslevel of competitiveness without highlighting the results'values for each indicator. In this method, the low results for one or more indicators for a company don't influence good scores on other indicators. Therefore, such a classificationis based on quantitative criteria.

Classification by ELECTRE method has qualitative aspects. This time, the values for each indicator enter into play separately. Therefore, if for a company the values obtained for a limited number of indicators (enough, perhaps only one) are very unfavorable, even if for several indicators are very favorable, then some indices of discordance have high values, which determine the company not to be able to dominate the companies corresponding to these indices and classifies it ina lower position.

Methodology

For this study, we consider the most important suppliers of dairy products in Romania, companies rated inTop 10 dairy suppliers by turnover:

- SC Danone P.D.P.A. - E_1;
- Whiteland Import - Export - E_2;

- SC Friesland Romania - E_3 ;
- SC Napolact S.A. - E_4 ;
- SC Albalact S.A. - E_5 ;
- SC Hochland Romania - E_6 ;
- SC Delaco Distribution S.A. Brasov - E_7 ;
- SC Dorna Lactate S.A. - E_8 ;
- SC Milk Industrialization Mures - E_9 ;
- SC Trd. Tnuva Romania Dairies SRL - E_{10} .

Would be preferableto analyze the competitiveness of these companies based more a complete set of indicators. The lack of data determined us to dwell on the following economic indicators that characterize sufficiently the competitiveness of companies:

N_{2009} =number of employees in2009 - I_1 ;

CA_{2009} =net turnoverin 2009- I_2 ;

P_{2009} =net profit/net lossin2009 - I_3 ;

$R_{2009/2008} = \frac{CA_{2009} - CA_{2008}}{CA_{2008}}$ = exchange rateofturnover in2009 compared to2008 (relative variation of turnover)- I_4 ;

$r_{2009} = \frac{P_{2009}}{CA_{2009}}$ =net profit ratein 2009 (share of net profit in turnover)- I_5 ;

$Q_{2009} = \frac{CA_{2009}}{N_{2009}}$ =labor productivityin 2009- I_6 .

The 10 companies registered the following values for the Indicators considered above:

Table 1: Top 10 suppliers of dairy products by turn over in 2009

No crt	Company	N_{2009} (I_1)	CA_{2009} (I_2) (millions lei)	P_{2009} (I_3) (millions lei)	$R_{2009/2008}$ (I_4) (%)	r_{2009} (I_5) (%)	Q_{2009} (I_6) (millions lei /employee)
1	S.C. Danone P.D.P.A. (E_1)	709	434,6	27,24	2,79	6,27	0,6130

2	Whiteland Import – Export (E_2)	423	372,87	1,99	10,48	0,53	0,8815
3	S.C. Friesland Romania (E_3)	674	284,41	1,2	-10,64	0,42	0,4220
4	S.C. Napolact S.A. (E_4)	389	233,28	21,06	-3,44	9,03	0,5997
5	S.C. Albalact S.A. (E_5)	559	225,98	26,04	18,59	11,52	0,4043
6	S.C. Hochland Romania (E_6)	353	204,77	6,62	-5,33	3,23	0,5801
7	S.C. Delaco Distribution S.A. Braşov (E_7)	375	188,54	7,36	2,29	3,90	0,5028
8	S.C. Dorna Lactate S.A. (E_8)	746	155,36	-15,04	11,35	-9,68	0,2083
9	S.C. MilkIndustrializationMures (E_9)	386	119,32	-2,14	-15,06	-1,79	0,3091
10	S.C. Trd. Tnuva Romania Dairies S.R.L. (E10)	294	89,93	-95,57	0,92	-106,27	0,3059

To study the competitiveness of firmswe usethe method ELECTRE and method competitiveness'index.

The application of these methods requires firstly transforming the values of indicators obtained by the companies R_j (TableTop 10suppliersof dairy products by turn over in 2009) in utilities using linear interpolation.

Because for all the indicators we considered that the most favorable values are the biggest ones, utilities'determination is performed using formula $u_j = \frac{R_j - R_{\min}}{R_{\max} - R_{\min}}$, $i = 1,2,...,m$. This implies the following table:

Table 2: Matrix utilities

I_j / E_i	I_1	I_2	I_3	I_4	I_4	I_6
E_1	0,9181	1,0000	1,0000	0,5305	0,9554	0,6012
E_2	0,2854	0,8209	0,7944	0,7590	0,9067	1,0000

E_3	0,8407	0,5642	0,7880	0,1314	0,9058	0,3174
E_4	0,2102	0,4159	0,9497	0,3453	0,9789	0,5814
E_5	0,5863	0,3947	0,9902	1,0000	1,0000	0,2911
E_6	0,1305	0,3332	0,8321	0,2892	0,9296	0,5523
E_7	0,1792	0,2861	0,8381	0,5156	0,9353	0,4375
E_8	1,0000	0,1898	0,6557	0,7848	0,8200	0,0000
E_9	0,2035	0,0853	0,7608	0,0000	0,8870	0,1497
E_0	0,0000	0,0000	0,0000	0,4749	0,0000	0,1450

Source: Tablefrom thesitewww.revista - piata.ro, restructured andfilled inby the author.

Next we have to decide the importance of each indicator, which means to determinethe indicators' coefficients of importance. In this respect, after consulting several specialists about coefficients of importance of indicators, the following values were obtained:

Table 3: Coefficients of importance

Economic indicators I_j	I_1	I_2	I_3	I_4	I_5	I_6
Coefficientsofimportance K_j	0,07	0,10	0,16	0,22	0,19	0,26

Analyzing the table above, we note the big values attributed to the coefficient of importance of rate of exchange inturn over and to coefficient of importance of labor productivity. The first of the two indicators expresses the evolution of the company in time, which implies the high value of the coefficient of importance which corresponds to-0.22.The second indicator, in some way ssynonymous with competitiveness is even more important, reason

for which has the highest coefficient of importance-0.26.The high importance of this indicatoris justified by the fact that the overall objective of the Operational Sectorial Program the Economic Competitiveness Growth(P.O.S. C.C.E.) is the productivity growth of Romanian companies in order to reduce productivity gaps with the EU average, the target is an average annual increase in productivity per employee with about5.5%, which allows to achieve a level of about 55% of the EU average in 2015.

However, the rate of net profit and net profit/net loss have slightly lower shares compared with the indicators mentioned earlier, but considerably higher than the turnover and, especially, the number of employees. Net incomeis an important indicator that show show effective the economic activity is, but its size depends on the company's development policy, the share of income for investment.For these reasons, to the rate of net profit and net profit/net loss were associated average coefficients of importance, relative to the shares givenrange.

We have the information necessary to calculate indices of competitiveness, but to apply the ELECTRE method must also determine the concordance indices and discordance indices. With these indices the companies are classified using the algorithm presented.

Determinationof concordance index betweenthe companies E_g and E_h noted $C(E_g, E_h)$, is based onformula $C(E_g, E_h) = \sum_{j \in J_{gh}} K_j$, $g = 1,2,\ldots,m$, $h = 1,2,\ldots,m$, $g \neq h$, $J_{gh} = \{j \in \{1,2,\ldots,n\} / u_{gj} \geq u_{hj}\}$

So we obtainthe table of concordance indices:

Table 4: Matrixof concordance indices

E_h / E_g	E_1	E_2	E_3	E_4	E_5	E_6	E_7	E_8	E_9	E_{10}
E_1	-	0,52	1,00	0,81	0,59	1,00	1,00	0,71	1,00	1,00
E_2	0,48	-	0,93	0,65	0,36	0,65	0,65	0,71	1,00	1,00

E_3	0,00	0,07	-	0,17	0,43	0,17	0,17	0,71	1,00	0,78
E_4	0,19	0, 35	0,83	-	0,36	1,00	0,78	0,71	1,00	0,78
E_5	0,41	0,64	0,57	0,64	-	0,74	0,74	0,93	1,00	1,00
E_6	0,00	0,35	0,83	0,00	0,26	-	0,36	0,71	0,93	0,78
E_7	0,00	0,35	0,83	0,22	0,26	0,64	-	0,71	0,93	1,00
E_8	0,29	0,29	0,29	0,29	0,07	0,29	0,29	-	0,39	0,74
E_9	0,00	0,00	0,00	0,00	0,00	0,07	0,07	0,61	-	0,78
E_0	0,00	0,00	0,22	0,22	0,00	0,22	0,00	0,26	0,22	-

Discordance'index between two companies E_g and E_h is calculated by formula $D(E_g, E_h) = \begin{cases} 0, \text{dacã } u_{ig} \geq u_{ih}, \forall\, j \in \{1,2,\ldots,n\} \\ \max\limits_{j \in I_{gh}} \{|u_{ig} - u_{ih}|\}, \end{cases}$ $g = 1,2,\ldots,m$, $h = 1,2,\ldots,m$, $g \neq h$, $I_{gh} = \{j \in \{1,2,\ldots,n\} / u_{ig} < u_{ih}\}$,

Results the following table:

Table 5: Matrixof discordance indices

E_h / E_g	E_1	E_2	E_3	E_4	E_5	E_6	E_7	E_8	E_9	E_0
E_1	-	0,3988	0,0000	0,0235	0,4695	0,0000	0,0000	0,2543	0,0000	0,0000
E_2	0,6327	-	0,5553	0,1553	0,3009	0,0377	0,0437	0,7146	0,0000	0,0000
E_3	0,4358	0,6826	-	0,2640	0,8686	0,2349	0,3842	0,6534	0,0000	0,3435

E_4	0,7079	0,4186	0,6305	-	0,6547	0,0000	0,1703	0,7898	0,0000	0,1296
E_5	0,6053	0,7089	0,2544	0,2903	-	0,2612	0,1464	0,4137	0,0000	0,0000
E_6	0,7876	0,4877	0,7102	0,1176	0,7108	-	0,2264	0,8695	0,0730	0,1857
E_7	0,7389	0,5625	0,6615	0,1439	0,4844	0,1148	-	0,8208	0,0243	0,0000
E_8	0,8102	1,0000	0,3744	0,5814	0,3345	0,5523	0,4375	-	0,1497	0,1450
E_9	0,9147	0,8503	0,6372	0,4317	1,0000	0,4026	0,5156	0,7965	-	0,4749
E_0	1,0000	0,9067	0,9058	0,9789	1,0000	0,9296	0,9353	1,0000	0,8870	-

The algorithm establishing relations of domination, has disadvantages related to the time of execution, repeated crossing of matrix of concordance indices and matrix of discordance indices and successively decreasing the concordance limit.

Therefore, to achieve dominance relationships between firms, we use another algorithm,which isf aster and more efficient and which, moreover, can bee as ilyimplemented in aprogramming soft. Thus, the companies'ranks are established directly using concordance and discordance indices[1].

We consider two firms E_g and E_h. If E_g is higher ranked than E_h, which means $C(E_g, E_h) \geq p$ and $D(E_g, E_h) \leq 1 - p$, where $0 < p \leq 1$,we note p_1 the maximum value of acceptability p. It can be shown that for limit determination, p_1 we have:

- if $C(E_g, E_h) + D(E_g, E_h) \geq 1$, then $p_1 = 1 - D(E_g, E_h)$;
- if $C(E_g, E_h) + D(E_g, E_h) < 1$, then $p_1 = C(E_g, E_h)$.

To validate ranking relationship, is necessary, as I said earlier, $p_1 > p^*$.

We note p_2 the maximum value of acceptability limit when E_g is lower

1 Manole S.D., Petrişor A.I., Tache A., Pârvu E., 2011, GIS assessment of development gaps among Romanian administrative units, Theoretical and Empirical Researches in Urban Management, Volume 6 Issue 4, November 2011, p. 5 – 19

ranked than E_h . To obtainthe limit p_2 we have:

- if $C(E_h, E_g) + D(E_h, E_g) \geq 1$, then $p_2 = 1 - D(E_h, E_g)$;
- if $C(E_h, E_g) + D(E_h, E_g) < 1$, then $p_2 = C(E_h, E_g)$. Once determined p_1 and p_2 ,the following conditions exist:

1. if $p_1 > p_2$ and $p_1 > p^*$, then E_g dominates E_h ;
2. if $p_2 > p_1$ and $p_2 > p^*$, then E_h dominates E_g ;
3. So, there is no dominancerelationshipbetween the two companies

In conclusion, in determining dominan cerelations we do so: for $g = \overline{1, m-1}$ and for $h = \overline{g+1, m}$ is determined p_1 and p_2 asearlier; comparing p_1, p_2 and $p^* = 0{,}2$ we reach one of the situations 1), 2) or 3) from above, which leads correspondingly to $E_g \succ E_h$, $E_h \succ E_g$ or to the absenceof a relationship ofdomination.Using the above algorithm, we find the following relations of domination:

Table 6: Domination Relations

Company E_i	Domination relations of the company E_i
E_1	$E_1 \succ E_2$, $E_1 \succ E_3$, $E_1 \succ E_4$, $E_1 \succ E_5$, $E_1 \succ E_6$, $E_1 \succ E_7$, $E_1 \succ E_8$, $E_1 \succ E_9$, $E_1 \succ E_{10}$,
E_2	$E_2 \succ E_3$, $E_2 \succ E_4$, $E_2 \succ E_5$, $E_2 \succ E_6$, $E_2 \succ E_7$, $E_2 \succ E_8$, $E_2 \succ E_9$, $E_2 \succ E_{10}$
E_3	$E_3 \succ E_8$, $E_3 \succ E_9$, $E_3 \succ E_{10}$
E_4	$E_4 \succ E_3$, $E_4 \succ E_6$, $E_4 \succ E_7$, $E_4 \succ E_9$, $E_4 \succ E_{10}$

E_5	$E_5 \succ E_3$, $E_5 \succ E_4$, $E_5 \succ E_6$, $E_5 \succ E_7$, $E_5 \succ E_8$, $E_5 \succ E_9$, $E_5 \succ E_{10}$
E_6	$E_6 \succ E_3$, $E_6 \succ E_9$, $E_6 \succ E_{10}$
E_7	$E_7 \succ E_3$, $E_7 \succ E_6$, $E_7 \succ E_9$, $E_7 \succ E_{10}$
E_8	$E_8 \succ E_4$, $E_8 \succ E_6$, $E_8 \succ E_7$, $E_8 \succ E_9$, $E_8 \succ E_{10}$
E_9	$E_9 \succ E_{10}$
E_{10}	

Based on these domination relations, we can draw the following hierarchy:

Table 7: Hierarchy of companies by ELECTRE method:

No. crt.	Company	Number of companies which are dominated	Number of companies by which is dominated
1	S.C. Danone P.D.P.A. (E_1)	9	0
2	Whiteland Import – Export (E_2)	8	1
3	S.C. Albalact S.A. (E_5)	7	2
4-5	S.C. Napolact S.A. (E_4)	5	4
4-5	S.C. Dorna Lactate S.A. (E_8)	5	4
6	S.C. Delaco Distribution S.A. Braşov (E_7)	4	5
7-8	S.C. Friesland Romania (E_3)	3	6
7-8	S.C. Hochland Romania (E_6)	3	6

9	S.C. MilkIndustrializationMures(E_9)	1	8
10	S.C. Trd. Tnuva Romania Dairies S.R.L. (E_{10})	0	9

With the utilities and the coefficients of importance from above tablesare calculatedindicesof competitivenessofcompanies by formula $C_i = \sum_{j=1}^{n} u_j K_j$, $i = 1,2,...,m$. Descending ordering the indices of competitivenessoffirms, we obtain the following tableclassification:

Table 8: Hierarchy of companies bycompetitiveness index

No. crt.	Company	Competitiveness index
1	Whiteland Import – Export (E_2)	0,828425
2	S.C. Danone P.D.P.A. (E_1)	0,778815
3	S.C. Albalact S.A. (E_5)	0,724629
4	S.C. Napolact S.A. (E_4)	0,621377
5	S.C. Delaco Distribution S.A. Braşov (E_1)	0,580139
6	S.C. Hochland Romania (E_6)	0,559437
7	S.C. Friesland Romania (E_3)	0,524883
8	S.C. Dorna Lactate S.A. (E_8)	0,522348
9	S.C. MilkIndustrializationMures(E_9)	0,351955
10	S.C. Trd. Tnuva Romania Dairies S.R.L. (E_{10})	0,142178

Conclusions

Returning tothe main suppliers of dairy products in 2009, we note major differences between companies in terms of all economic indicators considered (seeTable).

The first two places in both rankings are divided among them selves by SCDanoneP.D.P.A.andWhite land Import -Export, showing good results in all indicators.

Danone recorded maximum values in terms of turnover(Lei 434.6 millions) and net profit (Lei 27.24 millions), high values for the indicators:

number of employees and net profit ratio and average values for the turnover ratio 2009/2008 and for labor productivity. The company occupies only the second place in ranking by index of competitiveness, with its value 0.7788150 since its recorded values for turnover relative variation and labor productivity are average, and these indicatorshavehigh coefficientsofimportance.

Whitelandachievedthe highestproductivity(0,8815lei /employee), highvalue forthenet profit rate, relativelyhigh value ofturnover,net profit andthe exchange rate inturn over and has a small number of employees compared to other competitors in the Top 10 suppliers of dairy products by turnover in 2009. As for indicators with high coefficients of importance is recording high values, the company holds the first place in ranking by competitiveness index, index of competitivenes s0.828425.

The company Danone occupies first place in the hierarchy of companies by ELECTRE method and the small difference between the indices of competitiveness of this company and the company Whiteland, only 0.04961 for the second, is placing the company Danone first and Whiteland firm second place in a ranking of competitiveness.

Although ranked the fifth in the hierarchy by turn over, SC Albalact S.A.occupies the third place in competitiveness index classification and in the classification by ELECTRE method, for which reason in the competitiveness rankings will be the third position. The company chose market leading products and earned a profit rate of 11.52%, the highest rate of all ten companies. However, Albalact obtained the biggest turnover growth in relative terms(18.59%) andprofit one of the largest. Only labor productivity is at a lower level compared to the other nine competitors in the dairy market.

Analyzing the tables we see that the three companies we discussedearlier clearly stand out from other leading in competitiveness.

SC Napolact SA, obtained the 4-5 places in the classification by ELECTRE methodand 4th place by index of competitiveness, so will rankin the top 4 by competitiveness.The company achieved a high net profit and also a high net profit rate(9.03%), but its turnover declines by 3.44% over the previous year.

SC Dorna Lactate S.A. takes places 4-5 in the hierarchy obtained with ELECTRE method, surpassing 5 companies and being surpassed by 4 companies, but is placed only the 8th place in the hierarchy based on index of competitiveness, with competitiveness index 0.522348. Instead, SC Delaco Distribution S.A. Brasov is a position below, which means the 6th place in the

first classification, dominating four firms and being dominated by 5 companies and has the competitiveness index 0.580139, with 0.057791 more than Dorna Lactate, occupying Ranking 5th in the other hierarchy. For these reasons, we believe that the 5th place for competitiveness is occupied by Delaco.

For SC Delaco Distribution S.A. Brasov year 2009 was a balanced one, most notably being that earned a substantial profit 7.36 million RON and registered a net profit rate of 3.90%.

On 6th place in the hierarchy of competitiveness are candidates SC Hochland Romania and SC Dorna Lactate SA, about which we discussed earlier. Hochland achieves the 7-8 places by ELECTRE method, surpassing the 3 companies and being surpassed by six companies and occupies 6th place in the other hierarchy, obtaining with 0.037089 more than its rival for the competitiveness index, 0,559437. Since the difference between Dorna Lactate and Hochlandin the first hierarchy is high enough for the first company, while the difference in the second classification is relatively small against the same company, we can award it with the 6th place in the competitiveness hierarchy. Dorna Lactatehasthe biggest numberof employees (746), and the lowestlabor productivity(0,2083lei /employee)of the companiesstudied.The company alsoachieveda significant increase inturnover,butendedthe financial yearwitha loss.

7-10 places in competitiveness ranking, as is easily noticed, the other companies are placed in the following order: SC Hochland Romania, SC Friesland Romania, SC Milk Industrialization Mures and SCTRDTnuva Romania Dairies LLCHochland has obtained a substantial profit in 2009 and has a remarkable profit rate(3.23%), but the previous years hows a slight decrease inturnover by5%.

Friesland, despite the fact that has achieved a turnover exceeding 284,41million RON (the third position) that has a big number of employees (674), recorded a drop in turnover compared to the previous year and a low labor productivity.

Milk Industrialization Mures ends the financial year with the losses 1.79% in turnover and a net turnover in rebound from the previous year by about 15%.

Finally, SC Trd. Tnuva Romania Dairies SRL, even though it managed to increase its turnover by nearly one percent over the previous year, has high losses, which exceedwith about 6 percent the turnover and among the lowest labor productivity compared to the companies discussed (0,3059 million RON

/ employee).

Based on these elements we draw the following hierarchyof competitiveness, which summarizes the two rankings obtained based on ELECTRE method and the index of competitiveness method:

Table 9: Competitivenessclassification

No. crt.	Company	The rank achieved by ELECTRE method	The rank achieved by Competitiveness index
1	S.C. Danone P.D.P.A. (E_1)	1	2
2	Whiteland Import – Export (E_2)	2	1
3	S.C. Albalact S.A. (E_5)	3	3
4	S.C. Napolact S.A. (E_4)	4-5	4
5	S.C. Delaco Distribution S.A. Braşov (E_7)	6	5
6	S.C. Dorna Lactate S.A. (E_8)	4-5	8
7	S.C. Hochland Romania (E_6)	7-8	6
8	S.C. Friesland Romania (E_3)	7-8	7
9	S.C. MilkIndustrializationMures (E_9)	9	9
10	S.C. Trd. Tnuva Romania Dairies S.R.L. (E_{10})	10	10

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