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# EFFICIENCY OF SMES IN ROMANIA POST CRISIS. A CLUSTERING ANALYSIS

Empirical  
studies

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## Keywords:

Small and medium-sized enterprises (SMEs),  
Efficiency,  
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## JEL Classification

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## Abstract

*Small and medium-sized enterprises (SMEs) have had, even in the economic crisis, a major contribution to the achievement of gross domestic product, to create jobs, to increase economic efficiency by stimulating competition through speed of adaptation to conditions and the adoption of new strategies, the ability to adapt to market requirements. Although, at the beginning of the economic crisis in Romania have been suspended or canceled several hundred thousand companies, starting in 2012 it is observed a revival of SMEs. We could say that post crisis period, thank to measures in support of SMEs, is the beginning of an economic boost of SMEs in Romania.*

*Cluster analysis a multivariate analysis technique, which includes a number of algorithms for classifying objects into homogeneous groups.*

*Analysis of effectiveness of SMEs from Romania using cluster analysis is a new method of economic analysis which enables an analysis, mathematical methods, regional development of SMEs and increasing their competitiveness.*

## 1. Introduction.

The small and medium enterprises in Romania (SMEs) have been hard hit by the economic crisis of 2008-2009. After nearly four years, this important economic sector of the Romanian economy is showing signs of recovery, trying to return to pre-crisis levels, both in terms of number of employees and the share of gross domestic product.

The SME sector in Romania is dominated by very small-sized enterprises (up to 9 employees) and small, so the micro-firms. The number of micro-firms is in 2013, 82.08% of all SMEs in Romania, 14.37% small and medium enterprises 3.55% (Source: NIS Romania, www.insse.ro). Limited liability companies (LLC) represent the wide spread part of SMEs in Romania, that is over 90% [INS, 2013].

Among the SMEs in 2013, trade and services represent over 64%, and in industry and construction, over 28%. [Foundation Post privatization, SME-2013 Report, p. 15-25]. The number of young people under 35 years, entrepreneurs from SMEs in the period 2011-2013, represents approximately 25%, and the number of those under 25 years being between 3.13% 3.73%. (Own calculations on NIS data). A favourable premise is the share of entrepreneurs with higher education (College, graduate, masters, PhD), which has grown each yearly, reaching the highest representative level and that can lead to important performance of SMEs in Romania by moving more quickly to the knowledge-based economy.

The main problems faced by SMEs in the postcrisis were:

- The sharp decline in domestic demand;
- Difficult access to credit due to their high cost;
- Excessive taxation.

Thus, because of these problems, and others with smaller weight, the evolution of Romanian SME activity continued with fluctuating dynamics. Percentage of SMEs that have reduced activity during 2008-2011 was on average about 45%, the proportion of SMEs who worked on the same parameters of economic efficiency averaged 37.5% and SME share of firms that has boosted activity in this period was 17.5% (Source: Own calculations based on data NIS)

## 2. The evolution of economic and financial efficiency of SMEs in Romania in 2010-2013

Romania's economic recovery in the post crisis 2011-2013 is obvious positive GDP growth in 2011, 2012 and 2013, the growth of imports and exports of goods at levels higher than in 2008 and modest growth consumption unequivocally demonstrating this fact. The number of employees increased in 2012 (4430 thousand) and, in 2013, the unemployment rate dropping to 5.2% in 2011 and 2012 and 2013 (NIS and own studies) (the post-privatization foundation, 2012, 2013).

Studying the overall performance of SMEs in 2010, compared to 2009, it appears that approximately 50% of SMEs had the same or better results in 2010 than in 2009 and only 20% had significantly lower results (NIS, insse.ro, 2013) These results were obtained significantly lower in micro. Off fields much weaker results in 2010 compared to 2009, highlight the construction and trade, and falling purchasing power of household consumption and investment in durable goods.

The analysis of statistical data and surveys conducted in SMEs, shows that, in 2011 approximately 70% of SMEs had identical results, better or much better compared to 2010, which shows a positive economic efficiency financial and SMEs

during this period. And in this case, of all SMEs, micro-enterprises have the lowest development. Also, it is noted that the results have started to improve both commercially and in the construction.

Interestingly, in 2010 and 2011 entrepreneurs' opinion on the future state of the business environment remains about 80% "embarrassing business development" (White Paper of SMEs, 2010, 2011).

Indicators, such as average number of employees in SMEs and the number of economically active enterprises have grown further in 2010 and 2011. The number of economically active companies was about 437 000, and the number of employees stood at approximately 2.5 million (NIS and own studies). These increases did not lead to recovery of losses compared to 2008, the percentage remaining approx. 14% less, so the number of employees and the number of active firms.

Statistical data from the Trade Registry shows a negative growth of SME companies' registrations in 2012 compared to 2011 by approximately 5%. Also, the number of suspension activities increased from about 21,000 to about 24,000, and the number increased by dissolving in 2011 to approximately 12,000 to 22,000 in 2012. Number of canceled SMEs stood both in 2011 and in 2012 at the level of approx. 72,000, the difference between the two years was 2%. In 2013, the number of active SMEs reached approx. 717,000 (NIS and own studies).

Causes of suspensions, removals, or the level of registrations of new SMEs were the economic and financial crisis, but heavily and GEO. 34/2009 on the introduction of mandatory minimum tax and other fiscal measures burdensome. The reduction of budget revenues and pensioners were factors likely to reduce household consumption

drastically and create skepticism among entrepreneurs.

The contribution of SMEs to the total turnover of the economy is about 60% in 2011, and the distribution of turnover by class of SMEs (micro, small, medium) is about the same, 33%, with a small gap (about 2%) in favor of small and medium SMEs (NIS statistics and own processing).

Structure of turnover of SMEs shows that the largest share of turnover is given by wholesale and retail trade and repair, leading to the conclusion of poor performance of SMEs in the industrial sector (A. Stancu, 2011).

The evolution of net profit shows a greater increase in net profit for micro. This is due to their ability to adapt quickly to market requirements, obtain a higher speed of rotation of capital, reduced costs due to the reduced number of employees.

It also notes that approximately 55% of all active SMEs have profit in 2011 and its turnover in 2011 compared with 2010 approx. 8%, the share is small, the expense of micro-firms whose turnover has decreased (own processing).

As to the average number of employees in SME and the average labor productivity, it is determined that an average of approx. 6 employees (compared to the European average, 4.3) average labor productivity, calculated by the average turnover per employee is approx. 240,000 RON in 2011, much lower than large enterprises. This shows the low level of technology and capitalization.

SME profitability, measured as the ratio between the profit and the average number of employees in 2011 was approximately 12,000 RON/person on average. The highest profitability was achieved in micro.

In 2012, about 75% of SMEs reported performance as good or better

than in 2011, the percentage of SMEs with better performance and very good, being approx. 25%. Average labor productivity and profitability have had an upward trend in 2012 (own processing).

Analysis of efficiency indicators proves economic and financial efficiency and reduced competitiveness of SMEs in Romania, indicating that SMEs in agriculture and food industry achieved profitability almost double the average.

One of the factors indicating the potential use of company's rapid growth and ability is the coverage of production capacity by orders (Wang Yue-hua, 2009). In 2013, over 41% of SMEs had a coverage by orders below 50% (own processing).

The statistical data shows that, in 2012-2013, the sales volume, the volume of orders, exports, employment, economic efficiency indicators of SMEs, such as size of the profit, increased from 15% -24%.

We conclude that, in 2010-2013, the SME sector has been severely affected by the economic crisis of recent years. At the end of 2011, statistics showed a rebound in economic indicators in positive territory, which indicates signs of stability and economic recovery. In 2012 and 2013, trends in recovery efficiency of SMEs went on the same upward trend.

This means that the efficiency-enhancing measures, economic-financial and positive restructuring taken by entrepreneurs were correct, counteracting the effects of economic crisis leading to economic recovery of companies (A. Puiu et. al, 2001).

The strong revival occurred in 2012 and 2013, in micro and small businesses, mainly due to rapid adaptability and low costs.

### 3. Research on economic efficiency growth prospects of SMEs in 2014, a cluster analysis.

Cluster analysis is a new method of analysis of the economic phenomenon. Objective of the analysis is to increase economic efficiency by strengthening the competitiveness of SMEs and local and regional business links (A.G. Babucea, 2003).

We started with the management objectives of SME perspective, the frequency of operations by developing regions are localized SMEs. SME White Paper 2013, using data organization in the following table 1.

To achieve cluster analysis, we determined correlations between different approaches using **Euclidean distance**, **Minkowski distance** and **Cityblock distance (Manhattan distance)**.

**Euclidean distance** is the square root of the sum of squared differences between each variable of the same type,

$$D(i,j) = \sqrt{\sum_{f=1}^p (x_{if} - x_{jf})^2}$$

To remove the effect of the way in which measured variables, some researchers use the data standardization of the formula:

$$z_{if} = (x_{if} - m_f) / s_f,$$

When  $m_f$  and  $s_f$  are average and standard deviation for the variable  $f$  matrix entries. Euclidean distance transformed

$$D(i, j) = \sqrt{\sum_{f=1}^p (z_{if} - z_{jf})^2}$$

becomes a measure of the differences. This transformation has the effect of making the data for use, for all variables standard deviation will be 1.

**Cityblock distance** or **Manhattan distance** between two objects is the sum of absolute differences between variables of the same type distance

$$(x, y) = \sum_i |x_i - y_i|$$

**Minkowski distance** is defined by the relation:

$$D(i, j) = \sqrt[q]{\sum_{f=1}^p |x_{if} - x_{jf}|^q}$$

Where  $q$  is an integer greater than or equal to 1. It is noted that as the Euclidean distance, city block and are embodiments of this distance ( $q = 1$  for City Block, and  $q = 2$  for the Euclidean distance).

Data processing and determination of the correlations was performed using IBM software application SPSS Statistics. After processing the data in the table, the following results were obtained. Squared Euclidean Distance. Based on the calculation of Euclidean distance, complete proximity matrix (Proximity Matrix) for all pairs of cases.

Processing was performed using SPSS Statistics Application IBM computer. After work-up gave the following results:

From Table 2, Agglomeration Schedule can see how they grouped the cases in each group phase. In the second column, Combined Cluster are presented grouped cases. In the third column, Coefficients are coefficients distances between the elements grouped. In the fourth column, Stage Cluster First Appears, phase number shown us that have appeared each of the two elements. The last column, Next Stage, tells us how the item will probably appear in the first group and which phase will change him.

Table 3, Cluster Membership, depending on the number of groups formed, displaying cases that goes into them. From the observed clustering dendrogram (Figure 1) managerial characteristics of importance, regardless of region development of SMEs concerned.

The 6, 7, 8, 10, 11, 12 features have the same importance, equal to 1. The

characteristic 9, 10, 2 are important terms of economic efficiency perspectives, characteristics of importance between 9, 10 and 11, 2 and 13 and form a cluster and features 3 with 2, 4, 5 imported 11. Features 3, 2, 5, 4 and 1, 9, 10 were together the greatest importance in the development of future economic efficiency firm, about 24.

If we used the **City Blocks distance** processing, dendrogram obtained is (Figure 2) and the results are almost identical to those of the Euclidean distance. Differ only lead to some of the groups of clusters, which shows that, depending on the calculation method and the clustering obtained, some features change the significance.

In the Minkowski distance calculation method, dendrogram obtained is (Figure 3)

#### 4. Conclusions and future research

The primordial importance of SMEs in the post-crisis resulting from:

- The ability to rapidly adapt to market requirements;
- The possibility of creating new local jobs;
- Capacity for innovation;
- Ability to cooperate with all types of businesses, both horizontally and vertically;

From the cluster analysis performed deducting the importance of specific management approach in relation to others in increasing economic and financial efficiency of the company

Thus, it is found that, in 2014, for entrepreneurs of SMEs, of great importance (with score over 15) for enhancing the effectiveness of economic and financial are: cost reduction, distribution and relationships with customers, the production of new products, development of effective economic strategies.

The research should be extended by a cluster analysis to determine the distribution by grouping the most effective management approaches. This way you can make an analysis of forecasting the future development of SMEs by groups of counties and regions.

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## Appendices

**Table 1. Addressing future management strategies of SMEs by region**

managerial approach	NE	SE	S	SV	W	NW	C	B-I
strategy development	0,7950	0,1026	0,0391	0,0738	0,1140	0,1042	0,0817	0,0998
relationships with suppliers	0,5430	0,4103	0,3398	0,4016	0,4649	0,3472	0,5131	0,3659
relationships with suppliers and customers	0,6225	0,6496	0,6289	0,5738	0,4298	0,6042	0,6961	0,5696
development of new products	0,3510	0,2735	0,3594	0,2541	0,1404	0,5069	0,3268	0,3451
reduce costs	0,3974	0,3162	0,4023	0,2705	0,3509	0,2500	0,2680	0,3971
new processes	0,0265	0,0598	0,0586	0,1230	0,0351	0,0417	0,0621	0,0748
information	0,0199	0,0684	0,0586	0,0738	0,0263	0,0486	0,0490	0,0936
reorganization	0,0066	0,0256	0,0039	0,0246	0,0088	0,0347	0,0065	0,0125
delivery	0,0132	0,0513	0,0234	0,0533	0,2982	0,0694	0,0098	0,0146
capitalization	0,0132	0,0085	0,0078	0,0123	0,0789	0,0000	0,0196	0,0146
training	0,0331	0,0171	0,0195	0,0123	0,0263	0,0556	0,0196	0,0229
decrease the number of employees	0,0000	0,0000	0,0156	0,0000	0,0088	0,0000	0,0065	0,0146
employees performing	0,0027	0,0598	0,0469	0,1270	0,0175	0,0,625	0,0752	0,0395

Source: White Paper on SMEs in 2013

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		NextStage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	8	11	,002	0	0	3
2	6	7	,003	0	0	5
3	8	12	,004	1	0	4
4	8	10	,006	3	0	5
5	6	8	,022	2	4	6
6	6	9	,080	5	0	10
7	4	5	,123	0	0	8
8	2	4	,189	0	7	9
9	2	3	,546	8	0	11
10	1	6	,641	0	6	11
11	1	2	1,294	10	9	0

Case	4 Clusters	3 Clusters	2 Clusters
1: strategy development	1	1	1
2: relationships with suppliers	2	2	2
3: relationships with suppliers and customers	3	2	2
4: development of new products	2	2	2
5: reduce costs	2	2	2
6: new processes	4	3	1
7: information	4	3	1
8: reorganization	4	3	1
9: delivery	4	3	1
10: capitalization	4	3	1
11: training	4	3	1
12: decrease the number of employees	4	3	1

*Figure no.1. Dendrogram using Euclidian distance*

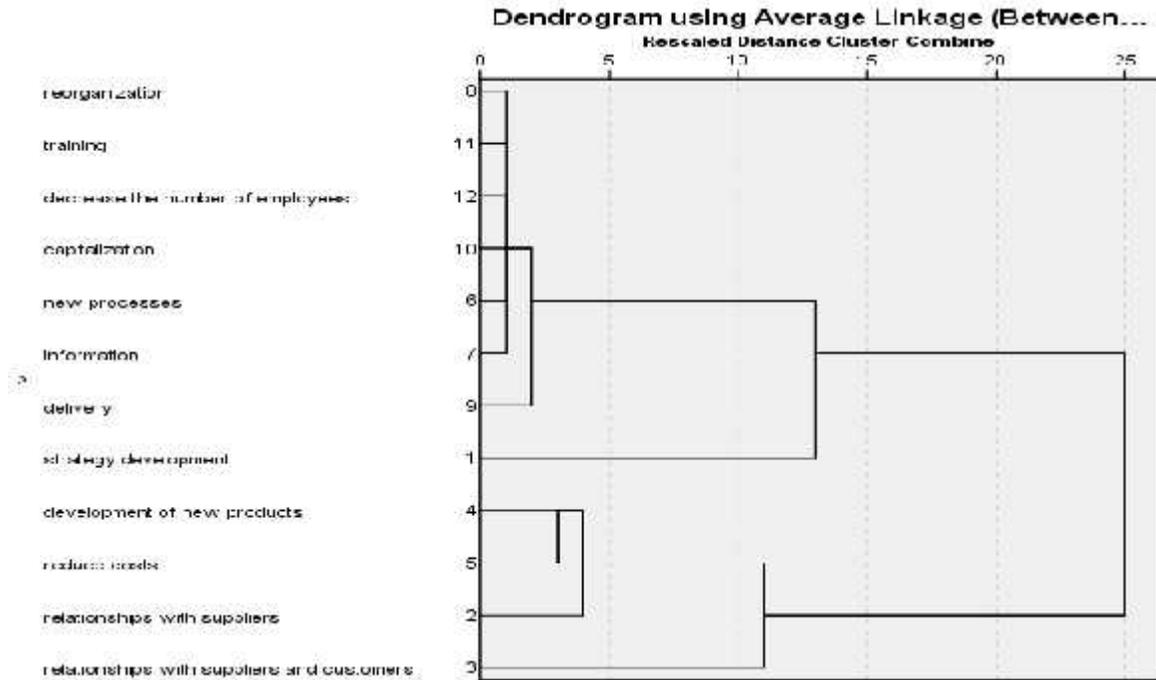


Figure no.1. Dendrogram using City block distance

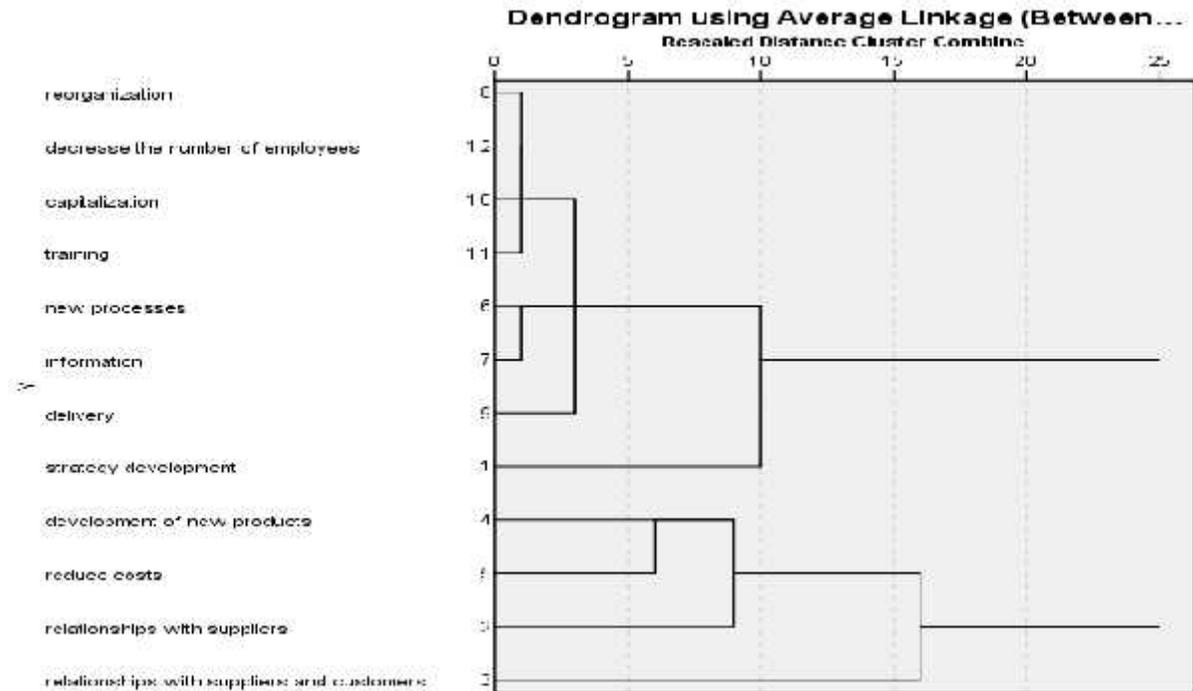


Figure no.3. Dendrogram using Minkowski distance

