# Local Firms' Strategies and Cluster Cooperation in the Czech Republic: The Case of the Packaging Manufacturers Cluster

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**Abstract:** Cooperation between enterprises is the basis for local clusters' existence and developments. Local clusters are some of the tools which support performance and competitiveness. This article analyses the influence of the existence of a cluster in the packaging industry on the financial performance of its member companies. This paper addresses the impact which the membership of some enterprises in a cluster could have on their financial performance. The research file consists of founding enterprises from the Packaging Manufacturers Cluster. Enterprises that create the core of the cluster do business in industries with the following statistical classifications: CZ-NACE 162400, 172100 and 222200. ROE, ROA and EVA/sales indicators were used as a criterion for evaluating financial performance. For the assessment of financial performance the Malmquist index is applied with two inputs and one output. The aim of the research was to verify the statement that business entities' membership in the local cluster translates into improved financial performance in a time series. The research has shown an improvement in financial performance in companies in the local cluster.

Keywords: strategy; cooperation; local clusters; packaging production; financial performance

#### JEL Classification: P13; L25

#### 1. Introduction

Globalisation is an important phenomenon today. It is one of the most important factors that started the development of business networking, business associations and also the creation of clusters. Businesses are increasingly gathering to create a competitive advantage. If SMEs want to become competitive and survive, they need to learn how to cooperate more, interconnect, connect to chains, networks and, where appropriate, continue to join clusters.

In today's globalised world, local contexts and clusters are becoming an integral source of international competitive advantage. Cluster initiatives provide companies with an environment in which they can interact effectively with each other and with other institutions, collaborate and learn (Osarenkhoe & Fjellström, 2017).

Cooperation and competition, such as organizational relationships or interactions between two or more organizations, have traditionally been seen as opposites. Business behavior is changing and it can be noticed that more and more organizations are involved in these two types of relationships at the same time. This paradoxical phenomenon is called cooperation. This paper focuses on the cooperation of companies in local clusters. The aim of the paper is to evaluate the influence of the Packaging Manufacturers Cluster on the financial performance of member businesses and subsequently, using the Malmquist index, verify the assumption that the membership of businesses in the cluster is reflected in increasing their financial performance over time.

## 2. Cooperation Strategy

Cooperation strategy is a model that includes a network of stakeholders and competitors who work together to obtain the highest possible value. This strategy will make it possible to generate value for companies that cooperate and at the same time compete with other competitors. Thanks to cooperative relationships, competitors are also able to increase their financial and innovative performance.

In the last few years, this phenomenon has become very important among various business entities. It leads to mutual benefits for the participating companies, enables them to build favorable relationships, expand their business into new horizons and increases their knowledge and information levels in the corporate world. In this way, companies stay in touch with their competitors, communicate with them, share their ideas and work together to achieve better performance and make the most of their success.

The cooperation strategy strengthens the competitive advantage of companies (Rademakers & McKnight, 1998) and provides a number of other benefits, including improved productivity, access to raw materials and reduced risk (Meyer, 1998).

Relationships between individual entities can be vertical (forming a value chain) or horizontal, if companies offer products or services using similar inputs, technologies, etc. Creating such a link should bring benefits to the participants involved. These can take the form of cost savings, gaining new markets or customers in existing markets, increasing the influence of government and regional structures, etc.

Networking or cooperation can take the form of a formal or informal exchange of information and knowledge. In the field of human resources, cooperation can take the form of raising the qualifications of employees through the organization of joint seminars, conferences, training courses but also joint training centers. Funding for such activities can be sourced from their own resources or funds from public projects can be used. Innovation maintains the viability and prosperity of companies in the market and research and development is a prerequisite for future development, so joint research and innovation is no less important. Companies can jointly build research infrastructure or cooperate with research institutions that have the necessary material and technical equipment and, last but not least, human capital. The area of marketing and trade offers a number of opportunities for the implementation of joint activities, for example: joint purchasing, joint production, more efficient logistics, etc. Access to finance may be easier for cooperating companies than for stand-alone companies.

Cooperation can take various forms, from tight forms such as mergers, acquisitions and joint ventures to looser forms, where individual cooperating entities do not lose their own economic independence and do not have to be capital-linked. In connection with the latter form of cooperation, network business, strategic alliances or clusters are most often mentioned.

Czech companies are used to cooperating, but only in recent years have these cooperations been formalized and become a potential source of competitive advantage. The development of clusters comes not only with the offer of support for these forms of business by the state, but also with the need to withstand the current competition (Studeníková, 2011).

### 3. Local Clusters

In economic literature, considerable attention is paid to the study of the causes of greater success of some geographical regions (Brenner & Mühlig, 2007). According to Nicolini (2001), local groups of companies such as industrial districts or local clusters are considered a source of regional competitiveness. In the literature focused on local clusters, it is generally argued that the success of such clusters is due to the existence of positive local externalities (Brenner & Mühlig, 2007). This concept follows Alfred Marshall and his theory of industrial districts (Marshall, 1920). Marshall argues that small businesses can benefit from their co-location as they develop a common workforce, benefit from knowledge exchanges and rely on the emergence of a large population of service and supply companies in the region.

According to Delgado et al. (2014), a local cluster can be defined as a regional concentration of related industries and associated institutions in a certain geographical area. According to Porter (1998), the cluster consists of specialized companies, suppliers and service providers, government agencies, financial institutions, companies in related fields and institutions that provide specialized education, information, research and technical support. According to Lindqvist et al. (2008), a local cluster is defined as a cluster in a local labor market region. According to US Cluster Mapping (2018), local clusters are a group of businesses operating in the same or related industries that serve the local market.

Local clusters have recently received a great deal of attention in economic and geographical literature. Emphasis was placed primarily on identifying the conditions essential for the formation of local clusters (Brenner & Mühlig, 2007). Another goal of these studies was to determine which prerequisites are needed for the development of local clusters and to identify the factors behind their economic success (Brenner, 2006). Michael Porter, for example, dealt with the importance of the development of local clusters in his work (Porter 1998; Porter, 2000). The literature below addresses the reasons for the existence of local industrial clusters, how they arise and why they are successful in comparison with other localities (Brenner & Mühlig, 2007).

A prerequisite for the creation of a local cluster is the availability of all local factors and resources in the region. Brenner and Mühlig (2007) summarise the assumptions needed for the formation of a local cluster in their work. The first prerequisite for the creation of a local cluster is the existence of a sufficiently qualified workforce in the region. Some studies state (Latham, 1976) that a skilled workforce is a crucial factor in the development of industry in a particular region. Another assumption, according to Brenner and Mühlig (2007), is the presence of an existing network of intercompany relations.

The literature (e.g. Stoicovici et al., 2017) further states that the presence of universities and public research organizations is a fundamental prerequisite for the development of local clusters. Examples include the local Silicon Valley and Cambridge Boston area clusters (local cluster of leading universities, hospitals and private-sector companies). Some case studies (van den Berg et al., 2001) also state that regional traditions play an important role in the development of local clusters. Storper (1993) also further emphasizes the impact of the region's history on its further development. Another assumption is the current industrial structure of the region, which according to (Brenner & Mühlig, 2007) also has a relatively strong impact on the future technological development of the region. The literature dealing with industrial districts in northern Italy has begun to address the influence of local culture on the emergence of local clusters (see, for example, van der Borg & Russo, 2005). Another prerequisite is the geographical location. This assumption includes the presence of natural resources, access to transport infrastructure, the geographical specificities of the region and location in relation to other regions. Natural resources are considered one of the important initial conditions for the formation of a local cluster. An example is the metalworking industry in the Ruhr area of Germany (Orsagh, 1974; Kibele, 2012). Other articles state that local clusters also formed in regions that had no specific resources, a typical example being Silicon Valley (Saxenian, 1994). It can therefore be stated that the existence of natural resources has played a role mainly in the past, but in recent years it has lost its importance. The literature does not yet present many important studies that would prove that the presence of suppliers is a necessary prerequisite for the emergence of local clusters. Nevertheless, there are some views (Brenner & Mühlig, 2007) that support this argument. The literature usually considers poor transport infrastructure to be a factor preventing the formation of a local cluster (van den Berg et al., 2001; Viederytė, 2018). Transport infrastructure can therefore generally be considered an important factor in the economic development and attractiveness of the region. The quality of life in the regions also contributes to supporting the emergence of local clusters. An example is Munich, which is considered the best place to live in Germany. This fact has supported the emergence of a number of industrial clusters. Van den Berg et al. (2001) argues that a highly skilled workforce prefers living in high-quality regions. Porter (1990) states that war conflicts, historical events, political and economic uncertainty also play an important role in the formation of a local cluster.

Brenner (2006) also deals with the identification of local industrial clusters. In his article, he presents a method that makes it possible to identify local industrial clusters and then applies it to the example of Germany. Based on this method, Brenner (2006) succeeded in compiling a list of all local clusters that existed in Germany in 2001. Brenner (2001; 2004) also further developed a mathematical model that describes the development of local industrial clusters. In their work, Brenner and Gildner (2006) compare selected German regions in which local clusters have long been present with all other German regions and statistically examine the main factors that characterize these regions.

Local clusters are also discussed by Nicolini (2001), who applies an econometric model to identify factors affecting the size and performance of local clusters. Lindqvist (2008) researches clusters in Sweden under the auspices of the Swedish National Program for Innovation Systems and Clusters. In his research, he finds that industry clusters and regional and local clusters play an important role in the Swedish economy. In his research, Lindqvist (2008) identified about 100 local clusters that are or could become leaders in the local industrial environment in the future and are able to compete with their goods and services in international markets.

Examples of successful local clusters include Silicon Valley – a high-tech and information technology center, or southwestern Germany in the field of car manufacturing (Meyer, 1998). Local clusters are also widespread in Italy, especially in the central part and in the north (OECD, 2014). In 2014, ISTAT identified about 156 clusters in the country, which were usually concentrated in economically strong regions: 42 in the northeast, 39 in the northwest, 49 in the center and 26 in the south. Some of the local clusters have a significant share of world markets, such as Sassuolo with a 27% share of world exports of ceramic tiles, Prato with a 4% share of the world textile market and Arezzo with a 3.5% share of worldwide jewelry sales.

#### 4. Methodology and Data

The Cluster of Packaging Manufacturers, which was established in 2005 in the legal form of a cooperative and with its registered office in Jaroměř, was selected for the evaluation of financial performance. This cluster is also known as the Omnipack cluster. The cluster brings together companies engaged in the design and manufacture of industrial packaging and other entities in the field of packaging technology, logistics, service organizations and educational institutions. It operates mainly in the Hradec Králové and Pardubice regions with the aim of strengthening the competitiveness and economic growth of entrepreneurs in the field of packaging and logistics services by supporting their innovative activities (Klastr Omnipack, 2021).

The main sources of data were publicly available information on the official Omnipack cluster website, ARES (Ministry of Finance, 2021), the Public Register and the Collection of Documents in the Commercial Register (Department of Justice, 2021) and the Magnusweb database (Bisnode, 2021). The period 2012-2017 was chosen for the research, which was chosen in terms of the development of the cluster and the beginning of its activities, while also taking into account the fact that the effects of cluster membership can be expected with a certain time lag. The availability of financial results in the Commercial Register has decreased significantly in recent years, so the time series ends in 2017. The research process can be divided into the following phases:

## 1. Creating a list of evaluated companies

In the first step, a database of member entities of the Packaging Manufacturers Cluster was created. In the analyzed period, the cluster had a total of 56 members. As the research focused on the evaluation of financial performance, only business entities were included. In the analyzed period, the Packaging Manufacturers Cluster had a total of 46 member business entities. Of these companies, 10 were in the legal form of a joint stock company and 36 companies were in the form of a limited liability company. Only companies that have been members of the cluster for the same length of time can be compared in the research, only these companies can be considered the so-called consistent core of the cluster. The core of the Packaging Manufacturers Cluster consists of a total of 25 business entities in the CZ-NACE 162400, 172100 and 222200 sectors.

#### 2. Collection of financial statements

For the above-mentioned business entities, it was necessary to obtain the necessary data from the financial statements for the years 2012-2017. The success rate in obtaining financial statements was 84%. Financial statements were obtained from 21 business entities for all years.

## 3. Calculation of financial performance indicators

For the above research sample, selected ratios were subsequently calculated. These indicators should provide a basic picture of the financial situation of companies in the Packaging Manufacturers Cluster. The first ratio chosen was the return on equity (further) ROE (see Equation 1). ROE is one of the basic indicators that provides an overview of the total return on equity. The second ratio was return on assets ROA (see Equation 2). This indicator measures how profitable a company is in relation to its total assets. A high return on investment means that the company's management effectively uses the company's assets to generate its profits. The third indicator was the share of EVA/sales. The EVA indicator (see Equation 3) can take on both positive and negative values. The methodology of the Ministry of Industry and Trade of the Czech Republic was used to calculate the EVA. This is an equity-based procedure in which EVA is defined as the product of equity and spread (i.e. return on equity minus the alternative cost of equity). In the case of a positive EVA, the company creates value for its owners. If the EVA value is negative, the company's value decreases.

$$ROE = EBIT/Equity \tag{1}$$

$$ROA = EBIT/Assets$$
 (2)

$$EVA = (ROE - r_e) \cdot Equity \tag{3}$$

The CAPM method was used to estimate the cost of equity (see Equation 4). Where  $r_f$  is the risk-free rate of return, often taken as the rate of return on treasury bills,  $\beta$  is a quantity used to measure the systematic risk of a given asset and its values were obtained from the website of prof. Damodaran (2019) and  $r_m$  represents the expected rate of return on the market.

$$r_e = r_f + \beta(r_m - r_f) \tag{4}$$

Although EVA is considered an excellent measure of performance, it also has its limitations. According to the chosen methodology, the EVA indicator can be determined only for companies with a positive equity value. Therefore, companies that had zero or negative equity value in at least one year had to be excluded from the research. In the case of the Packaging Manufacturers Cluster, it was one company.

#### 4. Determination of inputs and outputs of DEA model

The number of employees and long-term capital were selected as inputs for the DEA model. Long-term capital is given by the sum of the following balance sheet items: equity, issued long-term bonds and long-term bank loans. The output is economic value added.

#### 5. Calculation of Malmquist index

For each company in the file, the technical efficiency score was calculated in the MaxDEA 7 Ultra software environment and the values of the Malmquist index and its individual components were determined according to equations (5) and (6). Finally, the value of the Malmquist index was calculated by (7).

$$E_q \frac{D_q^{t+1}(x^{t+1}, y^{t+1})}{D_q^t(x^t, y^t)}$$
(5)

$$T_q = \sqrt{\frac{D_q^t(x^{t+1}, y^{t+1}) D_q^t(x^t, y^t)}{D_q^{t+1}(x^{t+1}, y^{t+1}) D_q^{t+1}(x^t, y^t)}}$$
(6)

$$MI_q(x^{t+1}, y^{t+1}, x^t, y^t) = E_q T_q$$
(7)

 $MI_q > 1$  means increased productivity;  $MI_q = 1$  means that there was no change in productivity; and  $MI_q < 1$  means a decrease in productivity (Caves et al., 1982).

## 5. Results

The first part presents the results of the development of selected financial performance indicators, which provide a basic picture of the financial situation of companies in the Packaging Manufacturers Cluster. The second part contains knowledge from the application of the Malmquist index.

Figure 1 compares the development of the median values of the ROE indicator of member business entities in the Packaging Manufacturers Cluster for the period 2012-2017. Figure 1 shows that the companies in the Packaging Manufacturers Cluster achieved positive accounting profitability in the monitored years, as measured by the ROE indicator. It is clear from the results of the return on equity that in 2017 the companies in the Packaging Manufacturers Cluster recorded the best return on equity result in the period under review. Figure 1 also shows that the return on equity showed a predominantly increasing trend in the Packaging Manufacturers Cluster in the period under review, with the exception of 2015. The average ROE growth rate calculated by the geometric mean was 7.29%.



Figure 1. Development of the median values of the ROE indicator in 2012-2017

Figure 2 compares the development of the median values of the ROA indicator of member business entities in the Packaging Manufacturers Cluster for the period 2012-2017. The return on total invested capital showed an increasing trend in the Packaging Manufacturers Cluster during the period under review. The companies in the Packaging Manufacturers Cluster achieved the best appreciation of the invested capital in 2017. The average ROA growth rate calculated by the geometric mean was 4.73%.

Figure 3 compares the development of the median values of the EVA/sales indicator of member business entities in the Packaging Manufacturers Cluster for the period 2012-2017. The EVA indicator used, which, in contrast to the accounting profit, also includes implicit cost of equity, was negative in the Packaging Manufacturers Cluster throughout the period under review. This means that, as a whole, the member companies did not create any value for their owners, on the contrary, they consumed the invested equity. From Figure 3 it can be stated that the profitability of sales expressed by the EVA/sales share was also negative in the Packaging Manufacturers Cluster. However, Figure 3 shows a trend of gradual slight improvement. Profitability of sales expressed by the share of EVA/sales reached more favorable values in 2017 (it is less negative).



Figure 2. Development of the median values of the ROA indicator in 2012-2017



Figure 3. Development of the median values of the EVA/sales indicator in 2012-2017

The aim of this research was to evaluate the potential impact of the cluster on the financial performance of member businesses and use the Malmquist index to verify the assumption that the membership of businesses in the cluster affects their financial performance and manifests itself with increasing financial performance over time.

Table 1 gives an overview of the development of the average value of the Malmquist index (hereinafter MI) and its components – changes in technical efficiency (E) and technological changes (T) for the Packaging Manufacturers Cluster in individual years. Due to the construction of the MI (multiplicative indicator), a geometric mean was used to calculate these average values. The value located at the bottom of the MI column represents the average annual change in financial performance for the reference period 2012-2017 (calculated as a geometric average of the geometric averages of individual years) and is referred to in the text as the total change in financial performance. The E and T values represent the average annual change in technical efficiency and technological change for the observed period 2012-2017. The last two columns of the tables then show selected macroeconomic characteristics. The first selected characteristic is the GDP growth rate of the Czech Republic. The last column then contains the Industrial Production Index (further IPP).

Period	MI	Ε	Т	GDP	IPP
2013/12	0.8987	0.6548	1.3725	0.9952	0.9992
2014/13	0.9582	0.9680	0.9898	1.0272	1.0428
2015/14	1.2352	1.2695	0.9730	1.0531	1.0428
2016/15	1.0801	0.9273	1.1648	1.0245	1.0343
2017/16	0.9516	1.0677	0.8912	1.0435	1.0648
Geometric mean	1.0180	0.9556	1.0653	1.0285	1.0366

Table 1. Malmquist index for the Packaging Manufacturers Cluster

At the beginning of the period, between 2013/12, the MI value was 0.8987, which means a 10% decrease in the average performance of cluster members. An analysis of the MI components showed that a negative change in internal technical efficiency (35%) had a larger share in the decrease, while technological progress of 37% had taken place. There was also a decline in performance in the following period. The largest year-on-year increase in the value of MI occurred between 2015/14, 24%. The breakdown of the index shows that in this period the index grew by an average of 27%, mainly due to improved internal technical efficiency of cluster members. The last significant changes in efficiency occurred between 2016/15, when the MI value also increased by 8%, but this growth was, on the contrary, caused only by a positive change in technology. The total MI value shows the overall change in the financial performance of the member companies. Overall performance grew only slightly by an average of about 2% per year. Table 1 also shows that the companies' performance was driven mainly by technological progress (an improvement of 6.5%), while the value of technical efficiency fell by an average of 4% year-on-year.

## 6. Discussion

The results of the research confirmed the impact of cluster membership on improving financial performance, as also reported by Lei and Huang (2014). According to the results,

the research agrees with Skokan and Zotyková (2014), who believe that the impact of the cluster on the performance of a member company and its business results is highly individual and depends on a number of factors. It is also important to recall that during the period under review, a financial crisis occurred in 2012-2013, which may have negatively affected the economic performance of some companies and thus of the cluster as a whole. It is also important to mention that the economic crisis of 2012-2013 affected each industrial area with a different force.

The reasons for the fluctuations of MI and its components are not entirely clear. The economic situation in the Czech Republic may have contributed to changes in financial performance. Until 2014, the Czech Republic was in recession, which may have affected the individual member companies of the cluster with some delay. The Czech Republic has been showing economic growth since 2014, and the development of MI has also shown an improvement in the financial performance of member companies since this year. A relatively surprising finding was the decline in financial performance in the last monitoring period 2016–2017. Another possible reason for fluctuations in MI values are individual changes in the performance of individual member companies, which could affect the performance of the entire cluster.

### 7. Conclusions

The paper deals with the evaluation of the development of financial performance of 20 members of the Packaging Manufacturers Cluster in the reference period 2012-2017. In addition to ratios, the Malmquist index was also used. The number of employees and the amount of long-term capital were chosen for the inputs, and the EVA indicator for the output. First, an analysis of the development of selected ratios of cluster members was performed, then a performance evaluation was performed using the Malmquist index and possible causes of significant changes in development were discussed.

It can be concluded that the financial performance of the companies in the Packaging Manufacturers Cluster increased in the period 2012-2017. The cluster underwent technological change and innovations, with an increase in innovation performance of 6%. A relatively surprising finding was the decline in financial performance in the last monitoring period 2016-2017, despite the continuing economic growth in the Czech Republic.

Compared to previous research (Pelloneová & Štichhauerová, 2019), it can be stated that there is a different impact of the cluster organization across sectors and a different impact on individual components of MI. In the aviation industry, research has not shown a positive impact of cluster membership on their financial performance. The reference period of this study ends in 2017, however, the author of this paper will continue the research in order to include other years and other industries in the research.

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