Functioning of the Local Production Systems in Central and Eastern European Countries and Siberia

Case Studies and Comparative Studies

Edited by
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WYDAWNICTWO
UNIWERSYTETU
ŁÓDZKIEGO

ŁÓDŹ 2015

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TYPESETTING
AGENT PR

COVER DESIGN
Stämpfli Polska Sp. z o.o.
Cover photo: © Shutterstock.com

Monograph financed under a contract of execution of the international scientific project within 7th Framework Programme of the European Union, co-financed by Polish Ministry of Science and Higher Education (title: "Functioning of the Local Production Systems in the Conditions of Economic Crisis (Comparative Analysis and Benchmarking for the EU and Beyond"))

Monografia sfinansowana w oparciu o umowę o wykonanie projektu międzynarodowego w ramach 7. Programu Ramowego UE, współfinansowanego ze środków Ministerstwa Nauki i Szkolnictwa Wyższego (tytuł projektu: „Funkcjonowanie lokalnych systemów produkcyjnych w warunkach kryzysu gospodarczego (analiza porównawcza i benchmarking w wybranych krajach UE oraz krajach trzecich"))

Published by Łódź University Press
First Edition. W.06764.14.0.K

Ark. wyd.10,7; ark. druk. 14,375

ISBN 978-83-7969-491-4 (p)
ISBN 978-83-7969-492-1 (online)

Łódź University Press
90-131 Łódź, 8 Lindleya St.
www.wydawnictwo.uni.lodz.pl
e-mail: ksiegarnia@uni.lodz.pl
tel. (42) 665 58 63, faks (42) 665 58 62

Print and setting: Quick Druk

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THE COMPETITIVENESS OF CLUSTER "SREDNOGORIE MED": PRECONDITIONS AND LIMITATIONS

1. Introduction

Bulgaria is a country which abounds in rich and varied mineral resources. The huge reserves of copper, iron ore, gold, nickel, lead-zinc ores and others give the country an advantage on which it could build a successful mining industry. But the abundance of natural resources does not suffice to create a competitive and sustainable economy. In his book "The Competitive Advantage of Nations", Michael E. Porter outlines four determinants that help to describe the effect of their impact on the competitive advantages of the nation, the region or the cluster (figure 1).

In Bulgaria, by a combination of the impact of these determinants an interrelated network of companies and municipalities that form a leading cluster for the mining and processing of copper and gold-containing ores has successfully been developing. "Srednogorie Med" cluster is located in Central Sredna Gora and was established as the regional industrial principle as the initiative of the large industrial companies in the region:

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"Assarel Medet AD", "Aurubis Bulgaria AD", "Elatsite Med AD" and "Chelopech Mining EAD". The cluster comprises mainly the companies for the mining and processing of copper and gold-containing ores, located in Central Sredna Gora, as wells the companies serving industrial production and local government representatives.[1]

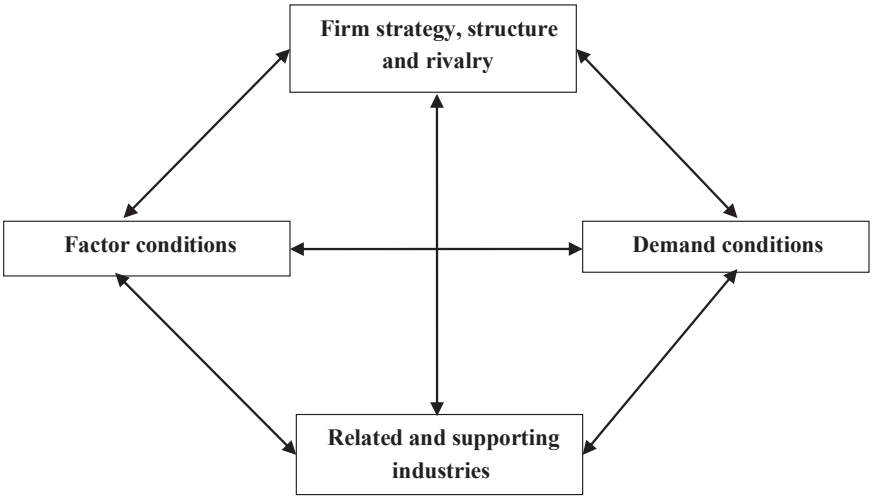

Figure 1. Porter's Diamond Model

Source: M. Porter, *The Competitive Advantage of Nations*, Klasika i Stil, Publishers, Sofia 2004, p. 106

[1] In 2005 was registered a non-profit organization, "Srednogorie Med" industrial cluster. The cluster members are "Assarel Medet AD", "Aurubis Bulgaria AD", "Elatsite Med AD", "Chelopech Mining EAD" and "Geotechmin OOD", "Optix AD", "Opticoelectron AD", "Eurotest-Control EAD", "Erlikit Bulgaria", "Energeo EOOD", Panagyurishte Municipality, Pirdop Municipality, Zlatitsa Municipality, Mirkovo Municipality, Chelopech Municipality, Chavdar Municipality, Anton Municipality and Strelcha Municipality. Partners: The Bulgarian Chamber of Mining and Geology, Sofia University "St. Kl. Ohridski", The university of Mining and Geology "St. Ivan Rilski".

2. Analysis of the competitiveness of cluster "Srednogorie Med": preconditions and limitations

2.1. Factor conditions

The competitiveness of the clusters in the mining industry critically depends on the quantity and quality of underground deposits of minerals. Bulgaria undoubtedly possesses huge reserves of mineral resources, the largest relative share of total deposits of metal ores being the mining of copper, gold and silver. The copper-porphyry deposits are of major importance of all available resources in Bulgaria, as 91% of the copper in the country is mined from them, in line with world practice.[2] The companies which exploit these deposits are the mining cluster companies: "Assarel Medet AD", "Elatsite-Med AD", "Dundee Precious Metals EAD", which shows the leading role of cluster "Srednogorie Med" for the development of the mining industry, as well as for the development of the non-ferrous metallurgy ("Aurubus AD" – one of the leading companies in the cluster is the only copper-processing company in Bulgaria).

By copper production, Bulgaria ranks third in copper mining and fourth in gold mining, which shows the leading role of this country in European mining. The companies that carry out mining activities are cluster members, which also allows to qualify the cluster's position in Europe as leading. By copper mining per capita (11–12 thousand tons) Bulgaria falls within the definition of „a mining country" with an indicator above the average on a worldwide scale.

Bulgaria has traditions in mining, rich and developed ore deposits, experienced miners, highly educated professionals and access to high-tech processes for the mining and processing of copper. All of this are important factors of the production process and are available. However what makes a cluster unique and more competitive than others, is the capacity for further development and support of the factors of production. According

[2] *Jubilee Annual Newsletter on Mining and Geology in Bulgaria*, 2010/1, Bulgarian Chamber of Mining and Geology, p. 56.

to Porter the set of factors at any given time is less important than the rate at which they develop, improve and specialize in the specific industries. It is not just the access to factors, but the possibility for them to develop productively that becomes important for competitive advantage.[3] "Srednogorie Med" seems to meet these requirements.

For the development of the factors of production, a decisive role have both public and private sectors. In case of the public educational and research institutions, with which the cluster has partnership, contribute to the development of human resources through the training of specialists and applied research. These are the following universities: The University of Mining and Geology "St. Ivan Rilski", Sofia University "St. Kliment Ohridski", as well as the Geological Institute of the Bulgarian Academy of Sciences "Strashimir Dimitrov."

The public institutions play a crucial role for the formation and improvement upon the factors, no matter if they are qualified human resources, fundamental scientific knowledge, and economic information or infrastructure. As an exclusive owner of mineral resources and conceder of concessionary rights the state has an effect upon the admission to investments in the extractive industry. According to Alex Nestor, Vice-President of Bulgarian Chamber of Mining and Geology and Chairman of the Cluster "Srednogorie Med" even the elementary improvement of the communication between the different institutions in Bulgaria, which execute the policy in the area of mineral resources, as well as the simplification of the administrative procedures, can disburden the investments access in this sector.

The amendment to the Law on Mineral Resources of 2010; the establishing of a single authority for the management and control of the mineral resources in the country (Directorate "Natural resource and concessions", Ministry of Economy and Energy), as well as the draft National Strategy for the Mining (Mining and Raw Materials) Industry in 2012 are the undertaken from the government actions in this direction.

The amendment in the allocation of the concessionary remuneration between the state and the local budget – 50:50 (former ratio was 70% for the state budget and 30% for the municipalities) affords further oppor-

[3] M. Porter, *The Competitive Advantage of Nations*, Klasika i Stil, Publishers, Sofia 2004, p. 111.

tunities for better development of one other important element of the factor conditions – infrastructure. Considerably grow the financial means of the municipalities, members of the cluster for investments in the local infrastructure. In 2011, for example, the highest concessionary disbursements have obtained the Chelopech Municiplity, where operates the gold extraction enterprise "Chelopech mining" (2,4 mln leva in comparison – the common budget of the municipality for 2012 is 6.2 mln leva); Panagurishte, where is "Assarel Medet" (1.9 mln leva); municipality Etropole has received 1.7 mln leva from the "Elacite-med" activities.[4]

The mayors indicate the ecology, the infrastructure and the health care as a priority field, where the income form the concessionary charges should be invested. Typical for this cluster is the state-private partnership in the building of local technical and social infrastructure. "The ores and minerals will run out sooner or later, therefore we will use this financial means to create a stable economic environment, which should provide a good standard of level to the local people even after the extractive activities conclude."[5] say Alex Kesyakov, the Mayor of Chelopech.

The specialized government agencies help also for improvement of the factor conditions through information dissemination, policy regulation and supervision of safety measures.The creation of fair and equal conditions for all companies can encourage the competition between the participants in the cluster. This in turn can provoke the active operators to improve the factor conditions through investments in human resources, technology and the environment. This way the cluster resources are growing and the factors of production are constantly improving.

As well as the private sector is concerned, particularly the leading companies in the cluster in use different mechanisms for the development of the factors of production. Especially, in-company and external training and internship programmes are aimed at improving the human capital of the companies. Every year the companies increase their investment in personnel training and improvement. For example in 2010 in "Assarel

[4] Capital Newspaper, Municipalities have taken 39 million lev. concession for eight months. After the amendments to the Mineral Resources half of the charges are transferred to the local authorities, 1.03.2012.

[5] *Ibidem*.

Medet AD" organized 401 training courses for a total of 3317 participants. A long-standing practice with the companies ("Geotechmin OOD", "Elatsite Med AD", "Aurubis Bulgaria AD", "Dundee Precious Metals Chelopech") is to provide internship programs, which include a large number of students from various universities and high schools, part of them remaining to work at the company. The mining companies "Dundee Precious Metals Chelopech EAD" and "Aurubis Bulgaria AD" implement joint practical three-year internship programmes with the Vocational School for Mechanical and Electrical Engineering – Pirdop.

Another mechanism for the development of the factors of production are the constant technological innovation and the large-scale long-term investment programs of the leading companies in the cluster. Areas of priority for investment are:

1. The introduction of modern technologies in all areas of production. Copper ores have low metal content (from about 0.5% to 2%) and, as Porter points out, the imperfections in some of the factors of production lead to innovation and investment. A great number of the on going investment projects are focused on improving productivity and cutting cost in the mining and processing of copper ores. Investing in equipment and technological innovation improves the efficiency in the mining and processing of raw materials, leads to their full extraction and contributes to the economic sustainability of the industry.

2. Improving natural environment. Mining companies of the cluster implement environmental projects to reduce harmful greenhouse gas emissions, water pollution, etc. and often the technologies that are used are innovative not only for the country (for example the technology for the treatment of waters in the water treatment plant under construction in the "Elatsite Med AD" mine, etc.). Optimization of the production process, improvement of production efficiency, improvement of internal transport infrastructure reduce the negative impact on the environment.

3. Investment in the development of local communities – supporting the building of local infrastructure – transport, social, communication, etc.

The development and implementation of technological innovations create know-how and professional potential that develops and remains within the country. This favours the formation of an environment

for the development of new mining and metallurgical technologies in experimental and industrial conditions. Thus, the factors of production are improved. Through their investment activities purchase of machinery and equipment and the installation of new production capacities, mining companies promote capital formation in the economy. This leads to higher factor productivity of resources (labour and capital), which increases the real growth of the economy.

2.2. Demand conditions

Domestic demand for products supports clusters in several ways. Often the buying habits of local consumers help to determine the direction and the level, at which companies satisfy customer demand requirements. The country can increase competitive advantage, when this domestic demand puts pressure on the companies to innovate faster, in comparison with international buyers.

In the case of the mining cluster in Bulgaria, however, the trend is almost reversed. The domestic demand in Bulgaria for copper and copper products is limited and at present it is very tight due to a decline in the industrial development of the country (construction, metallurgical and chemical industries). The biggest copper processing plant in Bulgaria is "Aurubis Bulgaria AD" in Pirdop – a member of the cluster. The company is also the only producer of anode and cathode copper in Bulgaria (its production is intended mainly for the export market). In 2012 – 85.3% of the electrolytic copper was directed to exports which grew by 2.3% while domestic sales declined.[6]

The size of the domestic market plays a complex role in the national advantage and stands out as an important aspect in the discussion on national competitiveness, although there is not much agreement on the direction of this cause and effect relationship or reasoning, Porter points out.[7] According to some authors a huge domestic market is an advantage due

[6] According to the data of the Bulgarian Association of Metallurgical Industry, 2013.

[7] Porter M., *The Competitive*…, p. 130.

to the existence of economies of scale. Others consider a huge domestic market a weakness and point out as the main argument that the limited local demand forces companies to export, which is important for global industries.

In the trade in goods where the product specifications and the quality are similar to global ones, the advantage of the country/nation, the cluster respectively, is the result of playing against other large international mining countries and organizations.[8] We share this notion with respect to cluster "Srednogorie Med". Bulgaria exports copper raw materials (copper and copper products) for the following leading export markets: Turkey – 21.9% of total exports of copper and copper products; Italy – 16.3%; Germany –12.6%; Serbia – 10.1%; Belgium – 8.9%.[9] Also export of Bulgaria to China is constantly growing. According to the National Statistical Institute in 2011 refined copper and copper alloys stood for 68.4% of Bulgaria's export to China. For the period January–September 2012 the share of refined copper and copper alloys was even greater, or 73.9% of total export to China. Besides these, 10.1% of the country's export is copper ores and concentrates, another 3.8% is waste and copper scrap and 1.3% is copper matte and cement copper. The total share of copper raw materials in Bulgarian export to China is 89.1%.[10] This situation is different from previous years when the greater part of these copper products were exported to Western Europe. Their main producer is Aurubis Bulgaria, Pirdop.

The analyses, carried out and based on National Statistical Institute data and reports of the branch organizations – the Bulgarian Chamber of Mining and Geology and the Bulgarian Association of Metallurgical Industry, show that the cluster is predominantly export-oriented and its development is definitely influenced by the market conditions in international markets (mainly the London Metal Exchange).

The main conclusion that we can make with reference to demand conditions as a determinant of competitive advantage is that with such a huge demand for copper from other countries, Bulgaria with its domestic

[8] *Socio-Economic Impact Analysis of Dundee Precious Metals' Mining Projects in Bulgaria*, Institute for Market Economics, 2007, p. 22.

[9] *Export profile of Bulgaria*, Ministry of Economy, Energy and Tourism, 2011.

[10] *National Statistical Institute*, 2013.

market for metals has a reduced impact on the competitiveness of companies of the cluster. The domestic environment is not dynamic and does not abound in challenges. It does not stimulate and encourage companies to improve and extend their advantages over time. What is crucial to the development of the companies, it is global demand for copper and its products. Thus, the key segments of customers develops globally and come such industry as construction, power engineering, automotive, etc. Prices of these products on global commodity markets are very dynamic and depend on supply and demand. The prices of copper and gold on international markets over the last decade are characterized by fast growth as a result of the increased global consumption. It should be noted however, that prices of copper, as well as of other commodities, follow sinusoidal increases and decreases that carry a major risk for investors.

According to Eng. L. Tsotsorkov, the CEO of "Assarel Medet" and Chairman of the Bulgarian Chamber of Mining and Geology, the risks for the future development of the leading companies in the cluster are mostly related to market conditions and the EU, as well as the eco standards of the EU. They will largely determine the competitiveness of the companies in the mining sector in the new economic conditions.

2.3. Related and supporting Industries

The third determinant of national advantage in a given industry is the presence in the region of supporting or related industries. A number of studies[11] show that every job, created in the mining and petroleum industry, creates jobs in other sectors. (For example, according to an analysis of the major mining companies in Western Australia, each job created in the mining and petroleum industry, creates three time more jobs in other sectors across Western Australia). And only more jobs are created

[11] Research in different countries defines multipliers differently. According to various studies and research, carried out in countries being – leaders in the mining of mineral ores, such as Canada, Chile, Ghana, Tansania, Peru and others, the stimulated employment was between 165% and 250% of the number of the directly and indirectly employed. In the industrialized countries the multipliers of stimulated employment are about 100%.

but also more investments are made in order to create a better and sustainable infrastructure that supports the industry. Mining companies contribute to the development of the technical and social infrastructure in cooperation with local governments. This has a significant impact on the future economic growth of the country, regional development and the development of the small municipalities, in which the mining and processing of copper and gold-containing ores is carried out.

The mining industry, as a whole, depends on many suppliers of infrastructure, access to equipment, scientific planning, labour and export. The specific nature of the production process requires also special machinery, know-how, reagents and chemicals, software and systems for process management. A number of companies, operating on the Bulgarian market (Bulgarian and foreign producers and importers) offer modern, high-tech equipment and machinery, used in the mining and processing of ores. In the global competitive environment the components, machinery and other investments are available in global markets. Therefore, as Porter points out, "more important than access to machinery and other inputs is the advantage that home-based suppliers provide in terms of constant coordination. Their establishment is supported by the fact that the essential activities and senior management of the suppliers are located in the country. Competitive advantage is the result of close working relationships between world-class suppliers and the industry."[12] According to experts, characteristics of mining companies are the good partner relationships with the suppliers of equipment (Atlas Copco, Kirov, etc.) The relationships between the value chains of the companies and their suppliers are important for competitive advantage.

Determining role in the cluster's development unless suppliers have related industries. According to Porter "related industries are those in which firms can coordinate or separate activities of the value chain when competing, or those, involving complementary products (say computers and software). The separation of operations can be carried out in the development of technologies, production, distribution, marketing or services."[13]

[12] M. Porter, *The Competitive*…, p. 140.

[13] M. Porter, *Ibidem*, p. 144.

In terms of the mining sector the related industries are in the area of designing, surveys (geological, geotechnical and hydrogeological surveys and drillings); mining consulting and engineering, construction activities, research, after-sales services of the main machinery and equipment etc.

Much of the activities, related to the mining industry, are provided by companies that are members of the cluster. "Geotechmin" (the group comprises 21 companies with a total number of employees of over 4200 people), one of the founders of the cluster, provides design and consultancy services in the area of mining, hydrotechnical, civil engineering and protection of the environment. Among the partners of "Geoptechmin" group are "Assarel Medet AD", "Aurubis Bulgaria". "Geotechmin OOD" designs buildings, related mainly to the development of "Elatsite" mine[14] the ore-dressing factory in the village of Mirkovo, hydrotechnical tunnels among them. Several companies of the "Geotechmin group", belonging to the business unit Mining, offer a variety of services in the area of mining engineering consulting. Among them are the projects of "Helix OOD" for the implementation of geological and hydrogeological drilling of "Elatsite" mine, "Explosivprogress – GTM EOOD" as a distributor of the products, manufactured by explosives factory "Elatsite" – waterproof emulsion explosives which since 2007 have had a CE marking, allowing their supply on the international market. Explosivprogress – GTM provides for the mining companies ("Elatsite mine") a complete service that includes surveys, design and consulting related to: the drilling and blasting in the mining of ore, etc.

The conducted research gives us grounds to believe that the related and supporting industries contribute to the competitiveness of the cluster.

2.4. Firm strategy, structure and rivalry

Bulgaria is a parliamentary democracy with a free market economy and firms can freely enter and go out of the mining industry for the period of the permit/concession agreement, compliance with environmental norms and standards, safe and healthy working conditions, and other industry standards being monitored meanwhile.

[14] Elatsite are part of the Geoproject Group.

However, the barriers to entry in the industry are very high, as mining industry is capital intensive. The process of mining ore and metals from the earth requires a huge investment in equipment and machinery, transport and often infrastructure improvements to support the local community. In fact, it is difficult for new companies to enter the mining industry and to compete with the large companies.

In consequence, domestic competition is weak, even lacking – in the country there are no other companies for the mining and processing of copper besides the member companies of the cluster. This is the area where government support might be useful. An active policy to encourage the prospecting and exploration of minerals in the country will lead to proving the existence of new deposits and establishing new mining companies. Prognoses has shown that country possesses minerals of all groups and a large number of potential sites for prospecting, but there is no national strategy and policy in the mining industry and no policies in the planning of the utilisation of mineral resources.[15] To the arguments we have listed so far we should also add the great opposition of some non-governmental environmental organizations to the development of new mineral deposits, including copper ores. In consequence, there is no communication and willingness to discuss controversial issues. Another reason for the lack of competition and new entrants is a number of administrative procedures, limiting the mining of new deposits. The draft of the National Strategy for the Development of the Mining Industry, which is to be adopted by the government, envisages amendments to several laws which will facilitate the granting of mining concessions. According to the Bulgarian Chamber of Mining and Geology it is also necessary to adopt a roadmap that sets clear deadlines for starting the exploitation of the relevant deposits, and also to set specific deadlines for administrative procedures. "For investors it is important to know when they can begin actual mining as they have their plans and expectations for revenues",[16] experts from the mining companies say.

[15] *Draft of a National Strategy for the Mining (Minerals and Raw Materials) Industry*.

[16] *Mining Industry in Bulgaria, Yearly newsletters 2013, Bulgarian Chamber of Mining and Geology*, www.bmgk-bg.org

Due to these reasons, we can hardly expect domestic competition to increase in the future. The current main players on the domestic market still remain the mining companies, operating till their concession agreement expires.

As far as the rivalry among existing firms is concerned at the moment it seems to be relatively weak, besides creating competition for the best employees and in combating environmental challenges. Metals are commodities with low added value and only higher production generates more revenues. In 2011, the production of the mining companies generated 1.5 billion levs, 25% more than in 2010. At the same time the mined ore increased by 4%, but much of the increase was due to the higher prices of copper and gold on world markets. Despite the economic crisis leading companies in the cluster are innovative, well- managed and financially healthy. In 2011 "Assarel Medet" generated revenues of 509.8 million levs, "Elatsite Med" – 492.7 million levs. In 2011 "Chelopech Mining" marked significant growth. The revenues of the gold-mining company rose by more than 65% in 2011, reaching 299.1 million levs. So from making losses in the previous year, it turned out that the company had not only made profits (158.6 million levs), but had also achieved a high profitability ratio – 53%.[17] Characteristic of the sustainable functioning of the leading companies in the cluster are not only the revenues, generated by sales, but also the higher yield and the increasing volumes of investment in technologies and the environment.

Success in the mining industry depends on: (1) the size of the company in terms of capital, infrastructure and immovable property; (2) the production program of the company is related to the access to raw materials and the size of the deposit – the quality and quantity of the deposit of mineral resources, the conditions for mining; (3) the cooperation with the Bulgarian government for access to the resources, necessary for mining, production and export.

3. Conclusions

The analysis we have carried out allows us to draw the following conclusions :

1. A favourable effect on increasing the competitiveness of the cluster lies in the access to the factors of production, as well as their development

[17] According to company's annual reports.

and improvement through investment in technologies and training. However, the research and development activities between the research institutes and universities in Bulgaria, partners of the cluster, and the mining companies, are still insufficient.

2. The role of state institutions does not contribute to the development of the competitive advantage of the cluster. There is a conflict between The Mineral Resources Act and other regulations of crucial importance for the industry. A well-developed policy for the development of the mining sector, as well as policies in the planning of the use of mineral resources, are lacking. Access to the available statistical information at the Ministry of Economy, Energy and Tourism and the National Statistical Institute is difficult.

3. The development of the companies in the cluster will continue to depend on the market situation on the international commodity exchanges. Insignificant domestic consumption does not create challenges for the companies in the cluster. Bulgaria with its domestic metal market has a reduced impact on the competitiveness of the companies in the cluster. The domestic environment is not dynamic and rich in challenges, it does not encourage and drive companies to improve and extend their advantages over time.

4. Related and supporting industries contribute to the creation of competitive advantage. Leading companies in the cluster have access to suppliers of machinery, equipment, raw materials on a world level and good business partnerships with their suppliers. Many of the activities of the related and supporting industries are carried out by companies, members of the cluster.

5. There is no domestic rivalry, the only companies for the mining and processing of copper and gold-containing ores are the companies of the cluster. The current situation cannot be expected to change in the near future, because of the lack of development of new deposits, as well as the lack of policy in this area.

Cluster "Srednogorie Med" has the necessary preconditions for strengthening its competitiveness. In contemporary economic environment, existing market conditions and the EU eco-standards will determine the competitiveness of the leading companies in the cluster.

However, in our opinion the potential of cluster "Srednogorie Med" to create a sustainable national competitive advantage is limited. Firstly, because the resources are non-renewable and limited to the depletion of the de-

posits, and secondly, because products created in the cluster are of low added value – ores/raw materials are exported, products of higher added value are not created. The government should play a decisive role in this respect.

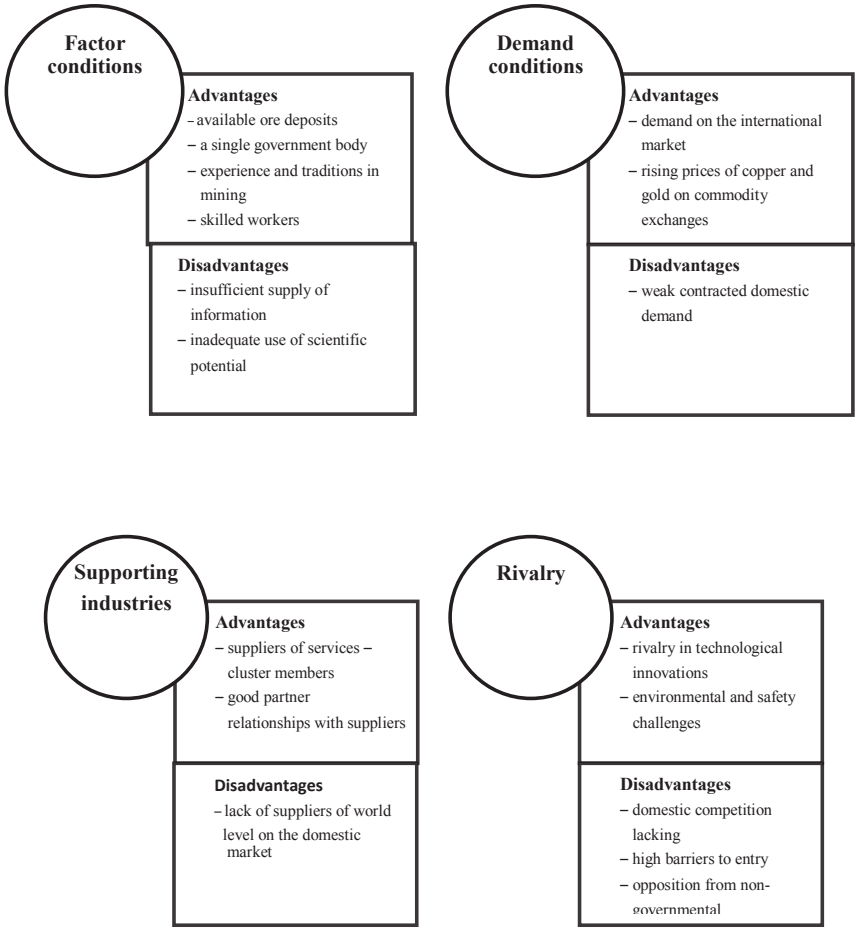

Figure 2. Advantages and disadvantages of cluster "Srednogorie Med" by the determinants of Porter's diamond

Source: own composition

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Abstract

In the environment of global competition, the role of clusters in creating national competitive advantage is rapidly increasing. One of the first and successfully developing clusters in Bulgaria, with a contribution to the economic development of the country, is mining cluster "Srednogorie Med." Established on the regional industrial principle, the cluster, as a type of local production systems, brings together the efforts of the companies for the mining and processing of copper and gold-containing ores, located on the territory of Central Sredna Gora, the companies, serving industrial production and the municipalities on whose territory the companies operate.

This paper aims mainly presenting the level of competitiveness of the local "Srednogorie Med" cluster with the usage of M. E. Porter's diamond model as well as at outlining the preconditions and limitations for the creation of a competitive advantage for the cluster in its future development.

The study is based on secondary information (periodicals and the Internet), as well as personal interviews with representatives of the cluster.

Key words: Porter's diamond, mining industry, "Srednogorie Med" cluster.