METAL MANUFACURING AS THE SMART SPECIALISATION OF THE REGIONS OF VISEGRAD GROUP (V4) COUNTRIES

KNOP Lilla, OLKO Sławomir

Silesian University of Technology, Gliwice, Poland, EU, lilla.knop@polsl.pl, slawomir.olko@polsl.pl

Abstract

EU policy requires from the regions defining their smart specializations - main activities based on the regional key competencies for obtaining competitive advantages. Smart specializations are based on material, social and intellectual assets available in the region in industrial and scientific institutions. The paper presents the analysis of Visegrad Group regions have opted for specializations connected with metal manufacturing sector. Although the global metal manufacturing sector is not growing as fast as in previous decades, it has a crucial impact on the economy by delivering one of the most important material crucial for other sectors. Metal manufacturing sector is still area of intensive development by implementing knowledge-based innovation.

Keywords: Metal manufacturing sector, smart specialization

1. INTRODSUCTION

The development of metal manufacturing sector is closely related to the dynamics of other sectors of industry. However, this branch has not noted improvement in results, while in other sectors there is no prosperity. This relation is yet of returnable nature, which means that the development of numerous traditional branches and emerging sectors is dependent on the progress taking place in the metal manufacturing sector. In recent years the process of development of Europe has been based on searching for such areas (smart specialization concept) where countries and regions possess and develop resources which ensure competitive advantage to business entities and regions (subregions). The key idea of this concept is the 'entrepreneurial process of discovery', according to which smart specialization is the 'entrepreneurial process of identifying science and technology areas where a specific region might take advantage of its specializations' [1]. Furthermore, it is also a concept of implementing innovation policy through effective and synergistic use of public support for strengthening innovation skills through concentrating on the most promising areas of comparative advantage. The aim of this article is to describe, analyze and evaluate the position of metal manufacturing sector in the process of 'entrepreneurial discovery' of specializations in countries and regions of the Visegrad Group (V4), which celebrates 25 years of its existence this year. It is an informal regional form of cooperation between four Central European countries - the Czech Republic, Poland, Hungary and Slovakia. The purpose of the alliance is to strengthen stability in Central Europe. The members of the group view this cooperation as a challenge and its success is treated as the best evidence of the ability to integrate in structures such as the European Union. The Czech Republic, Hungary, Poland and Slovakia have always been part of a single civilization sharing cultural and intellectual values and common roots in diverse religious traditions, which they wish to preserve and further strengthen.

2. LITERATURE REVIEW

2.1. Metal manufacturing sector in the innovative development of Europe

Historically, Europe has been strong in metallurgy. However, to compete today with America and Asia and to maintain its patent priority on metal-based products, Europe must increase its efforts to make metallurgical discoveries and develop innovation in its products and production capabilities. Many stakeholders have pointed to the necessity of reinforcing Europe's strategic industrial strength in metals [2].

Metal manufacturing sector is of crucial significance in the process of switching to the model of economy which effectively takes advantage of resources and low-carbon [3] and knowledge based economy in line with the objectives of the 'Europe 2020' strategy. Higher efficiency in the use of resources is both a challenge for the sector as well as an opportunity for entrepreneurship - economy with effective use of resources is closely related to the metal manufacturing sector. It is a strong industry providing numerous workplaces and creating high value added [4]. It also supports the European chain of values and is the nexus which leads to an economy with effective use of resources. Moreover, great significance of the meatal industry results from its innovative nature and the role which he plays in the supply process, especially with regard to the leading project 'Europe with effective use of resources', which supports the separation between economic growth and the use of resources, switch to low carbon economy, increase in the use of renewable energy resources, modernization of the transport sector as well as promotion of rational energy economy.

Foremore metals innovation has a major impact on everyday life. For example, new "liquid metal" high tech alloys are set to make the next generation of phones lighter and stronger. Stronger, thinner and lighter metals are at the heart of modern car and engine design. And metals such as platinum and palladium are well known for their pollution-busting capabilities in catalytic converters.

The strategy of the metallurgy industry has had and will continue to have four main thrusts [2]: meeting new demands on new products and applications and promoting product innovations to meet the eternal needs of new social and economical challenges; enhanced materials properties and performance; improved exploration, mining, metal recovery thanks to extractive metallurgy, manufacturing and processing, recycling [5]; enabling technologies and infrastructure.

2.2. Smart specialization - preliminary assumptions

Theories of regional development undergo constant evolution which results from the need to take into account the new phenomena which have a significant influence on economy, the processes of businesses localization as well as concentration and deconcentration of production. The concept of smart specialization was suggested in 2007 by D. Foray and B. Van Dark [6]. The notion smart was previously used in relation to a city - smart city [7,8], to smart grid [9,10], to smart organization [11] or SMART objectives. Similarly, the notion of specialization has been the subject of interest among economists for hundreds of years. With reference to regional development the following theories must be distinguished: theory of basic product by H. Innes, according to which the path to regional development is gradual production specialization; the concept of flexible manufacturing system (where the role of specialization is also stressed); the theory of industrial district by A. Marshall; the cluster concept by M.E. Porter; the strategy of endogenous development.

Initially, the work by D. Foray and B. Van Dark focused on the search for solutions to increase engagement of science and R&D in the processes of creating and implementing innovation. Smart specialization was regarded as an attempt to create a '…holistic (comprehensive) perception of the notion of specializations in the area of science and technology in knowledge based economy' [12]. By combining cohesion policy, analyzed in a report by F. Barcy [13], which stressed the necessity to formulate priorities and work out better coordination, with the sectorial approach to regional development by P. McCan and R. Ortega [14], the Expert Group 'Knowledge for Growth' developed the assumptions of smart specialization. It is underlined, that the process of smart specialization should be a bottom-up (entrepreneurial) process - regional organizations (enterprises, science and R&D entities etc.) should individually point out the directions of investment, research and development, while defining the strategy of smart specialization cannot be imposed. The entrepreneurial process of discovery consists in choosing priorities and allocating resources by participation of stakeholders (e.g. companies, universities, public research institutions, independent innovators), who ought to indicate the most promising areas for regional development in the future. This process is to demonstrate, what a certain region or country deals with most skillfully in the area of research, development and innovation (R+D+I), in line with the assumption that entrepreneurs themselves have the best knowledge or can accurately determine what their

strengths are. This process usually takes place through trial and error as well as experimenting with new forms of activity. In consequence, regions must take the initiative and engage entrepreneurs in designing strategy, while offering stimuli for risk-taking. It is currently assumed that in order to effectively use the funds invested in science, research and development, regions should rather strive to reach its position on the 'regional' market rather than fragment investment in areas, where they will still remain catching up regions. Smart specialization assumes close relations between R&D activity, human capital development (employees' qualifications and skills) and economic specificity of regions and countries. The key issue is to identify and select areas of highest potential, which might ensure competitive advantage to business entities and regions (subregions). For the analysis of the strength of the collaboration in the regional networks and clusters a variety of techniques are implemented, especially in case of the knowledge exchange between entitles [15]. As a result, the strategy of smart specialization should consist in entrepreneurial (bottom-up) establishment of economic priorities in the area of R&D&I as well as focusing investment on areas ensuring increase in value added of economy and its competitiveness on foreign markets. However, it is important to remember that smart specializations [16] not necessarily are to be focused on one branch - horizontal solutions are advanced; the effects of regional specializations are to be not only innovative products but also organizational, marketing, service, social innovations; based not only on general technologies, but also the implication of these technologies in one or more important for the region areas (e.g. not 'nanotechnology' but 'nanotechnology in cosmetics') [17]. As a result of diagnostics and designing activities in the region we obtain an identified smart specialization which plays pivotal role in implementation of Regional Innovation Strategy directing public and private R+D+I funds [18].

3. METAL MANUFACURING AS THE SMART SPECIALISATION

The research was divided into two stages. The first one presented the development of metal manufacturing sector in the counties of Visegrad Group in comparison to all EU countries. The production of iron, steel and ferroalloys (NACE 24) and the production of metalwork (NACE 25) in the years 2008-2013 was analyzed based on three indicators: the number of companies, income from sales and employment. Since 2004 all V4 countries have been members of EU and the Visegrad Group constitutes a forum of experience exchange as well as developing common approaches in matters essential for the future of the region and the EU. Against this background national and regional specializations were presented with special attention to metal manufacturing sector. In the last two years EU countries and regions and other European countries and regions have been describing smart specializations and registering them on the S3 platform. The identification process is based on four main approaches: analysis of data and technology - in general, it is a process of 'cataloguing' studies and patents as well as R&D scope and the level of employment in these areas; economic specializations - based on critical mass indicators of specializations in the region; competitive selection based on analysis of business activity, including clusters; market selection regarding regions with unrecognized competitive advantage and conducted research [19]. The data on the platform allowed for the analysis of countries and regions, which indicated metal manufacturing sector as smart specializations. The analyzed processes were the production of iron, steel and ferroalloys (NACE 24) and the production of metalwork (NACE 25). Taking into account these assumptions and the indicators of S3 platform national and regional specializations of the V4 countries were presented in comparison to other EU countries.

In the evaluation of metal manufacturing sector against the 'discovery' of specializations, four criteria (used in the S3 assessment) were applied. They include: the number of enterprises, employment rate, the value of income and number of clusters. **Figure 1** presents the number of companies registered in NACE 24 and 25 groups. The biggest number of enterprises was registered in the Czech Republic, the least in Hungary (**Figure 1**). Altogether the number of companies in 2014 amounted to 110 000, which constitutes ¼ of the general number of enterprises in Europe. A vast majority of companies (98 %) are enterprises from the metalwork production group (NACE 25) and representing SMEs (small and medium-sized enterprises).

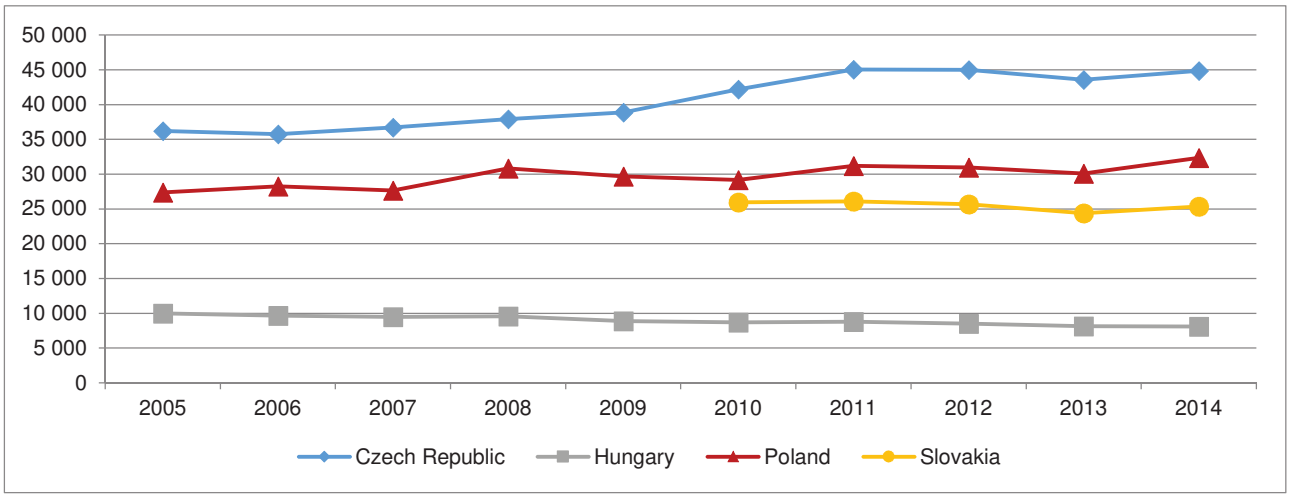

Figure 1 Number of metal enterprises in V4 countries

The dynamics of the production level of iron, steel, ferroalloy and metalwork is similar among the V4 countries (**Figure 2**). The highest values are achieved by polish enterprises, followed by the Czech Republic, Slovakia and Hungary. The production level of the V4 group constitutes 8 % of the total production in Europe and is constantly decreasing. The key questions that come forth against these results are those concerning the significance of this industry in V4 countries.

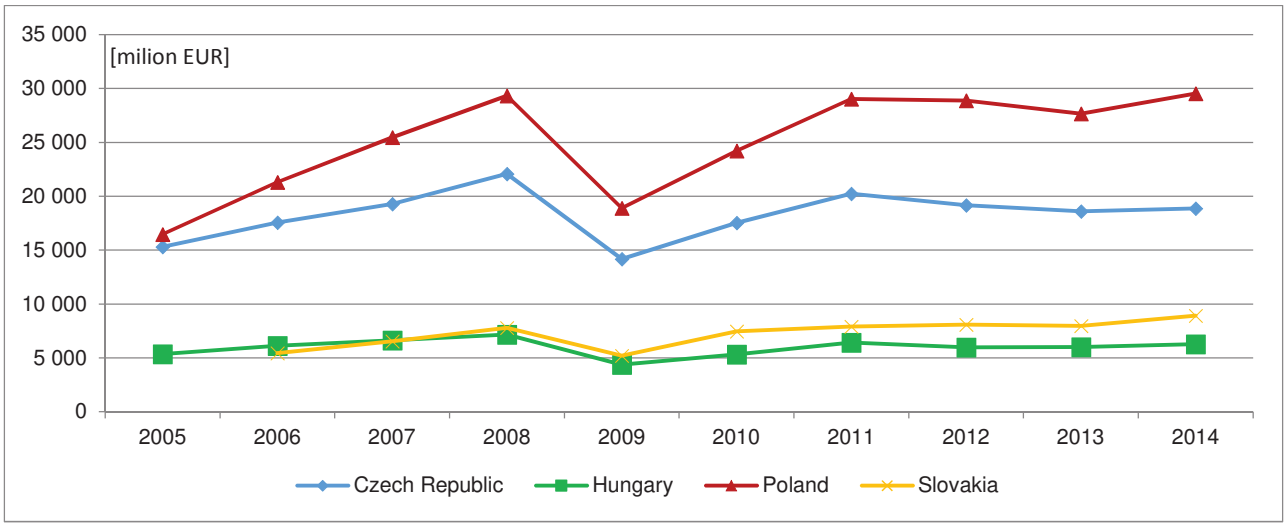

Figure 2 Metal (NACE 24, NACE 25) production value in V4 countries

A considerably higher indicator is revealed in the number of employees (**Figure 3**). The number of employees in V4 against all people employed in NACE 24 and 25 constitutes 15 % with the highest percentage in Poland (7 %), then the Czech Republic (4 %), Slovakia and Hungary (2 % each). The last criteria under investigation is the number of clusters specializing in metal manufacturing sector. Similarly, to the previous results, the indicators here are also very poor. In Poland only 4 out of 27 clusters in Europe were identified. In the remaining V4 countries clusters in metal manufacturing sector did not create related networks.

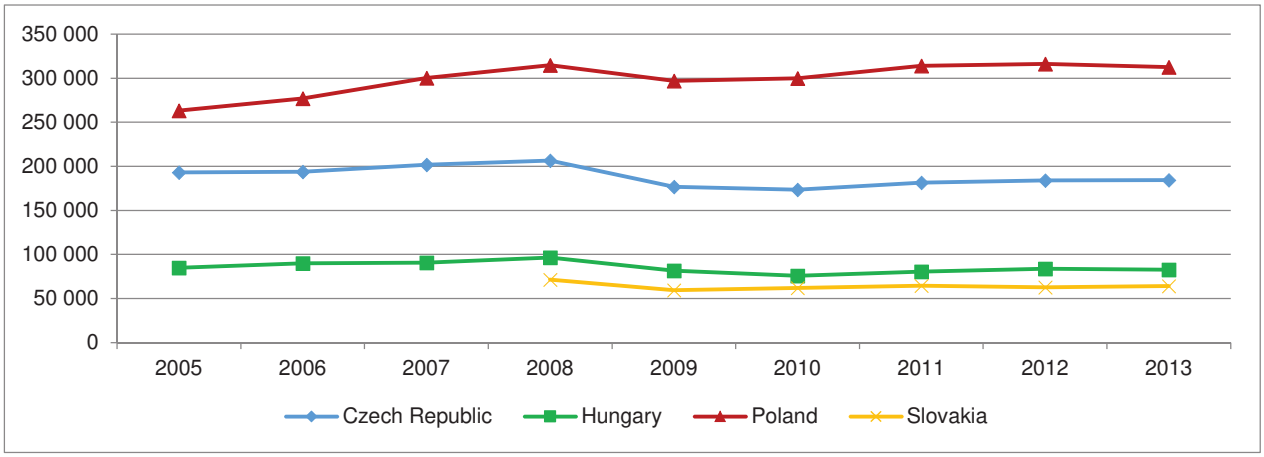

Figure 3 Number of employees in metal manufacturing sector in V4 countries

Smart specialization analysis in V4 countries and regions confirm the low level of participation of the metal manufacturing sector in the 'entrepreneurial discovery' process. Poland and Slovakia distinguished metal manufacturing sector among their national specializations. In Poland, 19 groups of specializations were distinguished, including (KIS 10) specializations in modern technologies of obtaining, manufacturing and use of natural resources and production of their substitutes as well as the number 1 priority - manufacturing of metal mineral resources (e.g. innovative technologies in deep metal manufacturing, new metallurgy technologies in production of non-ferrous metals from primary and raw materials, refractory metal manufacturing with special use of national resources). In Slovakia 4 national specialization were distinguished: automotive and mechanical engineering industries, consumer electronics and electrical equipment, ICT and services, production and processing of iron and steel. Development trends in the specialization areas of economy concern: to develop of production processes in industry focusing on better use of available resources, greater use of recycling materials and environment-friendly materials through the R&D&I development; the use, placement and replacement of previously used materials for advanced materials with a new and more complex performance, including technological processing; to develop of technological investment units, particularly in the field of metallurgy, engineering, energy and integrated industrial equipment, with respect to the application and use of light metals and advanced materials in the manufacture of transport and construction facility to reduce overall weight and contribute to the green economy (development and application usage of composite materials). In the case of the Czech Republic and Hungary the process of 'entrepreneurial discovery' did not point to metal manufacturing sector as smart specialization, but metallurgical and metal-working sectors are sources of important modules and components e.g. for products in heavy-current electrical engineering (e.g. generators, electric motors etc.), automotive frames, machines, advanced materials etc.

Only 4 regions in V4 countries distinguished metal manufacturing sector among their specializations, they include: świętokrzyskie and zachodniopomorskie voivodeships in Poland and the Moravskoslezsko and Stredni Cechy regions in the Czech Republic. In general, 20 regions in Europe indicate metal manufacturing sector as a regional specialization (2 in the Czech Republic, 1 in Denmark, 4 in Greece, 3 in Spain, 2 in Finland, 2 in Poland, 6 in Sweden). However, the analysis of national and regional specializations denotes concentration of specializations around related industries, including especially: automotive, machine, aviation, construction or advanced material technology and nanotechnology.

4. CONCLUSIONS

The conducted studies led to the formulation of several final conclusions and recommendations for further research.

Metal manufacturing sector in V4 countries is not regarded as crucial in the process of 'entrepreneurial discovery', yet Poland and Slovakia indicate it as their national specialization. The figures (number of companies, value of production and employment) are not high, however, in general, all V4 countries, if not directly, stress the role of metal manufacturing sector in the development of traditional and emerging industries.

There is lot of competition in the metal manufacturing sector. Especially European steel manufacturers are challenged by Indian and Chinese metal manufacturers. They usually have larger scale of economies and thus focus on larger volumes and price competition. European enterprises have the opportunity to create advantage based on innovations in the metal manufacturing sector supporting other leading industries in Europe. European programs and regional research entities are essential in this process, example of which might be the technology observatories created in Poland [20].

Cooperation among the V4 countries is not visible when it comes to the process of 'entrepreneurial discovery'. However, the development of related industries (automotive, machine, construction or nanotechnology) could constitute grounds for the creation of international specializations.

The tendencies called reshoring (reintroducing domestic manufacturing to a country by recreation of full production chain) or nearshoring (establishing value chain creation in nearby countries) observed in highly developed countries can, in the future, be also observed in V4 countries on the condition that they are economically viable and supported in terms of administration. The sectors of substantial development potential presented in the article are supported by metal manufacturing sector located in Visegrad Group countries.

ACKNOWLEDGEMENTS

The paper presents the results of wider research conducted at the Faculty of Organization and Management Silesian university of Technology on innovations in clusters and interorganizational networks.

REFERENCES

[1] FORAY, D. ERA: Enterpreneurial Regional Action, Public Service Review. *European Science and Technology*, 2009, vol. 2, pp. 44-47.

[2] STALIOS, A. (ed.) *Metallurgy made in and for Europe. The Perspective of Producers and End-Users. Roadmap*. Brussels: European Commission, 2014.

[3] RYSZKO, A. Interorganizational cooperation, knowledge sharing, and technological eco-innovation. The role of proactive environmental strategy - empirical evidence from Poland. *Polish Journal of Environmental Studies*, 2016, vol. 25, no. 2, pp. 753-764.

[4] SZMAL, A. The competitive challenges for the polish steel industry. In *METAL 2014: 23rd International Conference on Metallurgy and Materials*. Ostrava: TANGER, 2014, pp. 1914-1919.

[5] RYSZKO, A., Environmental management practices, interorganizational cooperation and knowledge sharing in the steel and metal industry in Poland. In *METAL 2014: 23rd International Conference on Metallurgy and Materials*. Ostrava: TANGER, 2015, pp. 2050-2055.

[6] FORAY, D., VAN DARK, B. *Smart specialisation.* Policy Brief No. 1, Expert Group Knowledge for Growth, European Commission 2007, 2007.

[7] FLORIDA, R. Cities and the Creative Class. *City & Community*, 2003, vol. 2, no. 1, pp. 3-19.

[8] GIFFINGER, R. *Smart Cities: Ranking of European Medium-Sized Cities*. Vienna: Centre of Regional Science, 2007, 28 p.

[9] COLL-MAYOR, D., PAGET, M., LIGHTNER, E. Future intelligent power grids: Analysis of the vision in the European Union and the United States. *Energy Policy*, 2007, vol. 35, pp. 2453-2465.

[10] BRZÓSKA, J. Modern power infrastructure versus development of services of general interes. In *CLC 2013 Carpathian Logistics Congress*, Ostrava: Tanger, 2014, pp. 363-370.

[11] DEISER, R. *Designing the Smart Organization*, *How Breakthrough Corporate Learning Initiatives Drive Strategic Change and Innovation.* John Wiley and Sons, 2009, 352 p.

[12] FORAY, D., DAVID, P.A., HALL, B.H. Smart specialization. The concept. *Knowledge Economists Policy Brief No. 9*, European Commission, Brussels, 2009, 26 p.

[13] BARCA, F., An Agenda for a Reformed Cohesion Policy: A place-based approach to meeting European Union challenges and expectations. *Independent Report prepared at the request of Danuta Hübner, Commissioner for Regional Policy*, European Commission, 2009.

[14] MCCANN, P., ORTEGA-ARGILÉS, R. Smart Specialization, Regional Growth and Applications to European Union Cohesion Policy. *Regional Studies,* 2015, vol. 49, no. 8, pp. 1291-1302.

[15] FORAY, D., GOENAGA X. The Goals of Smart Specialisation. *S3 Policy Brief Series, No. 01*, 2013.

[16] OLKO, S., Analiza relacji w klastrach - przegląd wybranych podejść., *Kwartalnik Naukowy Organizacja i Zarządzanie*, vol. 4, 2011, pp. 81-93.

[17] BRZÓSKA, J., Innovations as a factor of business models dynamics in metallurgical companies. In *METAL 2014. 23rd International Conference on Metallurgy and Materials*. Ostrava: TANGER 2014, pp.1842-1849.

[18] BRZÓSKA, J., OLKO, S., Conception and Implementation of Regional Innovation Strategy based on smart specialisations. The Case of Śląskie Voivodeship., *IFKAD 2016 International Forum on Knowledge Asset* Dynamics -11th edition, 2016.

[19] FORAY, D. at all. *Guide to Research and Innovation Strategies for Smart Specialisations (RIS 3),* UE, 2012.

[20] KNOP, L. Competence centre for clusters in the regional innovation ecosystem: the case of the Silesian Voivodeship in Poland. *In Gorges I. (ed.): Global perspectives on sustainable reginal development*. Verlag Dr. Kovač, Hamburg 2015, pp. 79-96.