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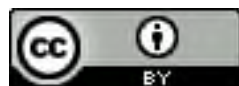
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# ASSESSMENT OF CLUSTERING POTENTIAL OF MANUFACTURING SECTOR OF VITEBSK REGION *VITEBSKAS APGABALA RŪPNIECĪBAS NOZARES KLAŠTERIZĀCIJAS POTENCIĀLA NOVĒRTĒJUMS*

**Elena Kostuchenko**

Senior Lecturer of the Department of Economics, Polotsk State University,  
e.a.kostuchenko@pdu.by, Novopolotsk, Belarus

**Abstract.** *The theoretical foundations of clusters are studied. The impact of clusters to the competitiveness of organizations is revealed. The structural elements of clusters have been identified. The definition of innovation-industrial cluster is proposed. Widely used method for identifying clusters are listed. The assessment of clustering potential of manufacturing sector of Vitebsk region is made on the basis of the analysis of the coefficients of localization by types of economic activity, per capita production by types of economic activity and specialization of the region on the given type of economic activity.*

**Keywords:** *cluster, cluster structure, clustering potential, competitiveness.*

## Introduction

Clustering is the primary driver for economic development in many locations. OECD estimated in the beginning of the 21<sup>st</sup> century more than 35 countries had cluster development initiatives underway. These included Argentina, Australia, Belgium, Canada, Chile, Columbia, Costa Rica, Denmark, El Salvador, England, France, Finland, Germany, Georgia, Guatemala, India, Ireland, Italy, Jordan, Mexico, Morocco, Mauritius, Netherlands, Nicaragua, Norway, Scotland, Slovenia, Singapore, Spain, Sweden, South Africa, Trinidad, Sri Lanka, Wales, USA. All of these countries, at different levels of government, are using cluster development as a primary economic driver. Other areas have also used cluster development to focus their regional economic development activities. Clusters in many of these locations are now seeking to establish international linkages (*Cluster Navigators Ltd., 2001, p.35*). There is a number of successful efficiently functioning clusters in Eastern Europe and on the territory of the Commonwealth of Independent States, too.

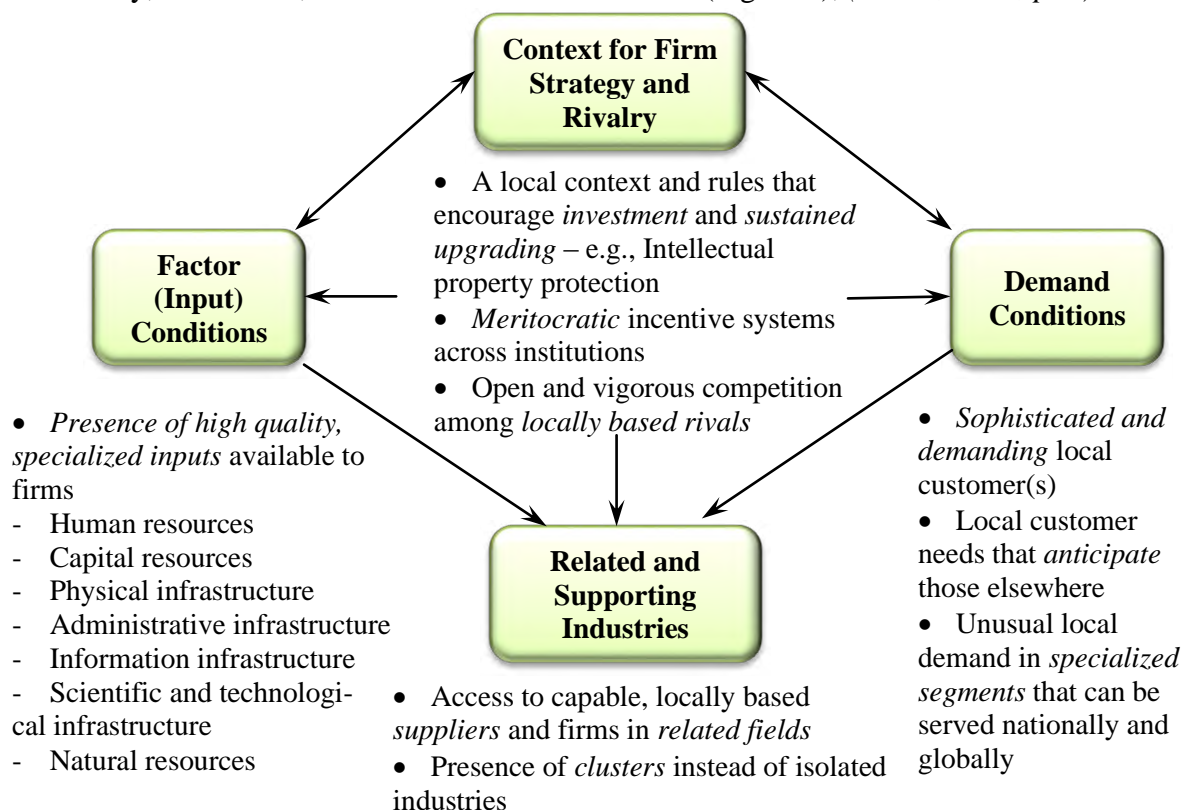
One of the main priorities of state policy of the Republic of Belarus is the transition of the economy to an innovative way of development, since the intensification of innovative activity makes it possible to raise the level of competitiveness of national economy, to ensure stable and gradual development of the country.

In accordance with the State program of innovation development of Republic of Belarus for 2011 – 2015 years, in the formation of an institutional environment conducive to innovation and technological development, among other things, promoting the formation of innovative-industrial clusters based on the enterprises, organizations and public sector institutions is considered. In this area, a number of cluster structures in the regions is supposed to be created, in particular, the chemical cluster in Grodno, agro-machine-building cluster in Gomel, chemical-textile cluster in Mogilev, autotractor-building and IT clusters in Minsk, and petrochemical cluster in Novopolotsk (*State Program of Innovative Development of the Republic of Belarus, 2011, p. 10*).

A unified theory of clusters is not yet formed in the international practice. There is a set of definitions of a cluster; there is no universally accepted classification of clusters and a unified approach to the study and identification of cluster structures. Conducting systemic research on the formation of conceptual structure and basic conceptual positions of cluster concept gains a particular relevance in this context. Thus, the purpose of research in this article is to investigate theoretical foundations of clusters and to assess clustering potential of manufacturing sector of Vitebsk region.

## The impact of clusters to the competitiveness of organizations

Successful economic development is a process of successive economic upgrading, in which the business environment in a nation evolves to support and encourage increasingly sophisticated ways of competing. The diamond model can represent interdependence between productivity, innovation, and the business environment (Figure 1), (Ketels, 2003, p. 5).



**Figure 1 Interdependence between productivity, innovation and the business environment (Ketels, 2003, p. 5)**

A country's or region's future competitiveness depends on progress in two dimensions: cross-cluster issues affecting the whole economy and clusters (Ketels, 2003, p. 23).

Clusters provide the opportunity to move to a new level of private-public partnership. They can also be a test-ground for developing solutions to economy wide problems. However, cluster initiatives alone are less effective, if they are not part of an overarching approach to improve competitiveness on the national and/or regional level (Ketels, 2003, p. 23).

The impact of clusters to the competitiveness:

1. Clusters increase productivity and efficiency:
  - efficient access to specialized inputs, services, employees, information, institutions, and "public goods";
  - ease of coordination and transactions across firms;
  - rapid diffusion of best practices;
  - ongoing, visible performance comparisons and strong incentives to improve vs. local rivals.
2. Clusters stimulate and enable innovations:
  - enhanced ability to perceive innovation opportunities;
  - presence of multiple suppliers and institutions to assist in knowledge creation;
  - ease of experimentation given locally available resources.
3. Clusters facilitate commercialization:

- opportunities for new companies and new lines of established business are more apparent;
- commercializing new products and starting new companies is easier because of available skills, suppliers, etc. (Ketels, 2003, p. 7).

So, clusters reflect the fundamental influence of externalities / linkages across firms and associated institutions in competition clusters and competitiveness.

### Cluster definitions. Structure of clusters

On the one hand, cluster definitions need to be broad enough to include all relevant industries and institutions that have material linkages with the core activities of the cluster; on the other hand, cluster definitions need to be narrow enough to cover companies that face a common set of barriers to upgrade productivity and performance (Ketels, 2003, p. 25). Clustering could be called coopeiton – cooperating in order to be more competitive and successful (Cluster Navigators Ltd., 2001, p. 6).

Clusters have been well described by Professor Michael Porter, the OECD, and many others.

Cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities (external economies), (Porter, 2008, p. 6). Clusters encompass an array of linked industries and other entities important to competition including governmental and other institutions – such as universities, standard setting agencies, think tanks, vocational training providers and trade associations (Andersson, Schwaagserger, Sörvik, Hansson, 2004, p. 17).

Clusters consist of co-located and linked industries, government, academia, finance and institutions for collaboration (Figure 2).



Figure 2. Cluster structure (Solvell, Lindqvist, Ketels, 2003, p. 18)

Summarizing the approaches to the interpretation of the concept of “cluster”, in the purpose of our research we offer the following definition of concept “innovation-industrial cluster”: a set of geographically localized in a certain area, complementary, competing businesses (including suppliers, producers and consumers) linked by relations of cooperation to each other and with state and local authorities, united on an informal basis around the research or scientific-educational center, with a purpose of creating a favorable environment for the dissemination of innovation, and enhancing innovative activity and competitiveness of organizations-actors of the cluster, regional and national economy.

### Identification of clusters in Vitebsk region

At present, there is no generally accepted method for identifying clusters. The uniformity of composition is noted only in countries implementing one cluster project, for example, the project “INCLUDE” (INCLUDE, 2016). The experience of clustering shows that most countries in their analysis use the analysis of M. Porter’s value chain (qualitative analysis of the production chain) and “cost-output” analysis as methods of cluster research (Roelandt, Den Hertog, 2015).

In general, all methods of identifying clusters can be divided into quantitative and qualitative ones. The first group includes, for example, method of calculating the localization

coefficient, complex methodology using the localization coefficient (M. Porter), analysis of “cost-output” tables, methodologies for identifying clusters based on indicators of overflows of knowledge, labor, (Ripley’s K-function, Markon’s M-function, G. Lindkvist’s Q-function), method of structural shifts (Shift-Share method), etc. The group of qualitative methods includes the method of interviewing experts, the snowball method, compiling the genealogical tree of the cluster, case study, etc.

Some authors suggest using the localization coefficient, the coefficient of per capita production and the coefficient of specialization of industries to identify cluster subjects (Винокурова, 2006). If the calculated coefficients are greater than one and tend to grow, therefore, it is possible to create clusters for these types of economic activity. We approve the proposed methodological approach on the example of the economy of the Vitebsk region calculating coefficients by types of economic activity of section C “Manufacturing” in 2000-2017. The corresponding coefficients are shown in Table 1.

Analyzing the values of the coefficients of localization by types of economic activity, per capita production by types of economic activity and specialization of the region on the given type of economic activity in aggregate, it can be concluded that there are prerequisites for clustering in Vitebsk region by such type of economic activity as “Manufacture of textiles, wearing apparel, leather and related products” (sub-section CB), “Manufacture of wood and paper products; printing and reproduction of recorded media” (sub-section CC), “Manufacture of basic pharmaceutical products and pharmaceutical preparations” (sub-section CF) and for aggregation of types of economic activity of sub-sections CF-CI (Table 1).

Table 1

**The localization coefficient, the coefficient of per capita production and the coefficient of specialization of industries for Vitebsk region by types of economic activity in 2000-2017**

(calculated by the author, Костюченко, 2015; National Statistical Committee of the Republic of Belarus, 2016, 2018; Главное статистическое управление Витебской области, 2016, 2018)

| Indicator                                                                                                     | Year | Coefficient value (by sub-sections of section C “Manufacturing”) |     |     |     |     |     |     |     |     |     |     |     |     |     |       |
|---------------------------------------------------------------------------------------------------------------|------|------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
|                                                                                                               |      | CA                                                               | CB  | CC  | CD  | CE  | CF  | CG  | CH  | CI  | CJ  | CK  | CL  | CM  | CN  | CF-CI |
| Localization coefficient by types of economic activity (in terms of “volume of production”)                   | 2000 | 0,7                                                              | 0,9 | 2,0 | 0,4 | 0,3 | 3,0 | 0,7 | 0,2 | 0,4 | 0,2 | 0,2 | 0,6 | 0,0 | 0,2 | 1,8   |
|                                                                                                               | 2005 | 0,6                                                              | 1,3 | 1,8 | 0,6 | 0,2 | 2,8 | 0,8 | 0,2 | 0,5 | 0,2 | 0,2 | 0,7 | 0,0 | 0,2 | 1,8   |
|                                                                                                               | 2010 | 0,7                                                              | 1,1 | 2,5 | 0,7 | 0,2 | 2,5 | 1,1 | 0,4 | 0,5 | 0,2 | 0,2 | 0,6 | 0,1 | 0,3 | 1,6   |
|                                                                                                               | 2015 | 0,7                                                              | 1,1 | 3,0 | 0,7 | 0,2 | 2,7 | 0,7 | 0,5 | 0,5 | 0,2 | 0,2 | 0,6 | 0,1 | 0,3 | 1,6   |
|                                                                                                               | 2017 | 0,7                                                              | 1,2 | 2,9 | 0,6 | 0,3 | 2,6 | 0,9 | 0,6 | 0,6 | 0,3 | 0,2 | 0,5 | 0,1 | 0,2 | 1,7   |
| Localization coefficient by types of economic activity (in terms of “volume of produced innovative products”) | 2000 | -                                                                | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -     |
|                                                                                                               | 2005 | -                                                                | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -     |
|                                                                                                               | 2010 | 0,2                                                              | 1,0 | -   | -   | -   | 3,6 | 0,1 | 0,2 | 0,1 | 0,0 | 0,1 | 0,4 | 0,0 | 0,0 | 2,4   |
|                                                                                                               | 2015 | 1,0                                                              | 1,8 | 2,0 | 0,1 | 0,5 | 1,9 | 0,4 | 0,2 | 0,1 | 0,0 | 0,1 | 0,4 | 0,1 | 0,5 | 1,5   |
|                                                                                                               | 2017 | 1,1                                                              | 1,7 | 2,1 | 0,2 | 0,4 | 2,1 | 0,3 | 0,3 | 0,1 | 0,1 | 0,2 | 0,4 | 0,1 | 0,6 | 1,6   |
| Localization coefficient by types of economic activity (in terms of “employment”)                             | 2000 | -                                                                | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -     |
|                                                                                                               | 2005 | -                                                                | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -     |
|                                                                                                               | 2010 | 1,2                                                              | 1,6 | 2,7 | 1,1 | 0,4 | 4,6 | 0,9 | 0,6 | 1,1 | 0,6 | 0,5 | 1,1 | 0,1 | 0,5 | 1,1   |
|                                                                                                               | 2015 | 1,1                                                              | 1,6 | 3,2 | 1,1 | 0,5 | 4,5 | 0,9 | 0,6 | 1,2 | 0,5 | 0,5 | 0,9 | 0,2 | 0,5 | 1,2   |
|                                                                                                               | 2017 | 1,2                                                              | 1,5 | 3,3 | 1,0 | 0,6 | 4,7 | 0,8 | 0,5 | 1,2 | 0,6 | 0,5 | 0,9 | 0,3 | 0,6 | 1,3   |
| Coefficient of per capita production by types of economic activity                                            | 2000 | 1,0                                                              | 1,3 | 2,8 | 0,6 | 0,4 | 4,3 | 1,0 | 0,3 | 0,6 | 0,3 | 0,3 | 0,9 | 0,0 | 0,3 | 2,5   |
|                                                                                                               | 2005 | 0,8                                                              | 1,8 | 2,5 | 0,8 | 0,2 | 3,8 | 1,0 | 0,3 | 0,7 | 0,3 | 0,3 | 1,0 | 0,0 | 0,3 | 2,5   |
|                                                                                                               | 2010 | 0,9                                                              | 1,5 | 3,4 | 0,9 | 0,2 | 3,4 | 1,4 | 0,5 | 0,6 | 0,3 | 0,3 | 0,7 | 0,1 | 0,4 | 2,2   |
|                                                                                                               | 2015 | 0,8                                                              | 1,4 | 3,7 | 0,9 | 0,2 | 3,4 | 0,9 | 0,6 | 0,6 | 0,3 | 0,3 | 0,7 | 0,2 | 0,4 | 2,0   |
|                                                                                                               | 2017 | 0,9                                                              | 1,7 | 3,6 | 0,8 | 0,3 | 3,5 | 0,8 | 0,6 | 0,7 | 0,4 | 0,3 | 0,8 | 0,2 | 0,5 | 2,1   |
| Coefficient of specialization of the region on the given type of economic activity                            | 2000 | -                                                                | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -     |
|                                                                                                               | 2005 | -                                                                | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -   | -     |
|                                                                                                               | 2010 | 1,4                                                              | 2,2 | 5,0 | 1,4 | 0,3 | 4,9 | 2,1 | 0,7 | 0,9 | 0,4 | 0,4 | 1,1 | 0,1 | 0,5 | 3,2   |
|                                                                                                               | 2015 | 1,2                                                              | 2,2 | 5,6 | 1,3 | 0,4 | 5,2 | 1,4 | 0,9 | 0,9 | 0,4 | 0,4 | 1,1 | 0,3 | 0,5 | 3,0   |
|                                                                                                               | 2017 | 1,1                                                              | 2,3 | 5,4 | 1,2 | 0,4 | 5,3 | 1,5 | 0,8 | 0,9 | 0,5 | 0,3 | 1,2 | 0,2 | 0,6 | 3,1   |

Analyzing the values of the coefficients of per capita production by types of economic activity and specialization of the region on the given type of economic activity in aggregate, it can be concluded that there are some prerequisites for clustering in Vitebsk region by such type of economic activity as “Manufacture of food products, beverages and tobacco products” (sub-section CA) and “Manufacture of rubber and plastics products, and other non-metallic mineral products” (sub-section CG).

Analyzing only the values of the coefficients of specialization of the region on the given type of economic activity, it can also be noted that there are some prerequisites for clustering in Vitebsk region by such type of economic activity as “Manufacture of coke and refined petroleum products” (sub-section CD) and “Manufacture of transport equipment” (sub-section CL).

In general, we can conclude that in Vitebsk region the most significant prerequisites for clustering exist precisely for the types of economic activity “Manufacture of textiles, wearing apparel, leather and related products” (sub-section CB), “Manufacture of wood and paper products; printing and reproduction of recorded media” (sub-section CC), “Manufacture of basic pharmaceutical products and pharmaceutical preparations” (sub-section CF) and for aggregation of types of economic activity of sub-sections CF-CI. In other words, we can say that there is a sufficient degree of localization of the organizations of relevant economic activities for identifying potential petrochemical, leather, footwear and textile clusters in the territory of Vitebsk region.

### Conclusions and suggestions

In the conditions of formation of the “network economy”, traditional approaches to innovative development and increase of competitiveness should be supplemented by a new cluster approach in the formation of factors of competitive advantages. Clusters are self-organizing systems in which strategic competitive advantages are created through the synergistic effect of network cooperation and public-private partnership. The growth of innovation activity in clusters is the result of positive externalities: the exchange of knowledge, technologies; high innovative activity of firms due to high competition.

In general, the theoretical study allows asserting that for the Republic of Belarus cluster approach may become a very promising way to increase the competitiveness of products and a mechanism for enhancing innovation processes in regions. On the territory of Vitebsk region, there are prerequisites for the establishment of petrochemical cluster, leather, footwear and textile clusters. These clusters may become the basis of enhancing the competitiveness of firms participating the clusters, which may increase the competitiveness of Vitebsk region and country economy as a whole.

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### **Kopsavilkums**

Klasteri ir galvenais virzītājspēks ekonomikas attīstībai daudzās valstīs. “Tīkla ekonomikas” veidošanās apstākļos tradicionālās pieejas inovatīvai attīstībai un konkurētspējas palielināšanai arī Baltkrievijas Republikā jāpapildina ar jaunu klasteru pieeju, veidojot konkurences priekšrocību faktoros. Klasteris ir pašorganizējoša sistēma, kurā stratēģiskas konkurences priekšrocības tiek radītas, izmantojot tīkla sadarbības un publiskā, privātā sektora partnerības sinerģisko efektu. Inovāciju un rūpniecības klasteris ir ģeogrāfiski lokalizēts noteiktā apgabalā, papildinošs, konkurējošs uzņēmums (ieskaitot piegādātājus, ražotājus un patērētājus), ko savstarpēji saista sadarbības attiecības ar valsts un pašvaldību iestādēm, kas neformālā veidā ir apvienojušies pētniecības vai pētniecības izglītības centros ar mērķi radīt labvēlīgu vidi inovāciju ieviešanai, lai veicinātu klasteru dalībnieku, reģionālās un valsts ekonomikas inovatīvu darbību un konkurētspēju. Inovāciju aktivitātes pieaugums ir pozitīvu ārējo faktoru rezultāts, kā zināšanas, tehnoloģiju iegāde, augsta inovatīva aktivitāte uzņēmumos sakarā ar konkurences pieaugumu. Nav vispārpieņemtās metodes klasteru identificēšanai. Visas metodes, ar kurām identificē klasterus, var iedalīt kvantitatīvās un kvalitatīvās.

Analizējot lokalizācijas koeficientu vērtības pa ekonomiskās darbības veidiem, produkcijas uz vienu iedzīvotāju sadalījumu pa ekonomiskās darbības veidiem un reģiona specializāciju uz doto ekonomiskās darbības veidu kopumā, var secināt, ka Vitebskas apgabalā ir klasterizācijas priekšnoteikumi pēc tāda veida saimnieciskās darbības veida kā “Tekstilizstrādājumu, apģērhu, ādas un saistīto izstrādājumu ražošana” (CB apakšnodaļa), “Kokapstrāde un papīra izstrādājumu ražošana; poligrāfija un ierakstu reproducēšana” (CC apakšnodaļa), “Farmaceutisko pamatvielu un farmaceitisko preparātu ražošana” (CF apakšnodaļa) un CF-CI apakšnodaļa ekonomiskās darbības veidu kopumam. Var secināt, ka Vitebskas apgabala teritorijā ir priekšnoteikumi ķīmijas, ādas, apavu un tekstila klasteru izveidošanai.