

M.L. Danylovych-Kropyvnytska
Lviv Polytechnic National University

CLUSTER STRUCTURING OF ECONOMICS: WORLD PRACTICE OF BUILDING AND DEVELOPING CLUSTERS

© Danylovych-Kropyvnytska, M. L., 2014

Establishing and developing different institutions, and encouraging their cooperation to ensure efficiency of the cluster-type structures are studied on the cases of different countries. The cluster structuring of economics that provides economic stability and sustainable growth, has become the basis of economic policies in many developed countries. The comparative studies of regional clusters, their development patterns and cooperation between businesses and the academic environment, as well as the cluster ideas promotion strategies allowed identifying three models of innovative development.

Key words: regional clusters, industrial clusters, innovation-based growth models, cooperation, cluster model of economics.

М.Л. Данилович-Кропивницька
Національний університет “Львівська політехніка”

КЛАСТЕРНА СТРУКТУРИЗАЦІЯ ЕКОНОМІКИ: СВІТОВИЙ ДОСВІД СТВОРЕННЯ ТА РОЗВИТКУ КЛАСТЕРІВ

© Данилович-Кропивницька М.Л., 2014

Досліджено проблеми створення, розвитку та кооперації різних інституцій для забезпечення ефективності кластерних утворень на прикладі різних країн світу. Кластерна структуризація економіки, яка забезпечує стабільність економічного розвитку та ефект стійкості, стала основою економічної політики багатьох розвинених країн. Порівняльні дослідження щодо загального стану регіональних кластерів, їх розвитку, кооперації між бізнесом і академічним середовищем, політики просування кластерних ідей дають змогу виділити три моделі інноваційного розвитку.

Ключові слова: регіональні кластери, промислові кластери, моделі інноваційного розвитку, кооперація, кластерна модель економіки.

Problem statement

In early 1980's, large corporations boosted their activities, and local industrial networks were replaced with global systems. Most of countries understood that they should encourage an inflow of foreign capital, intellectual and human resources into their regions, reinforce intra-regional partnership and exchanges, as well as seek partnership with outer regions. Hence, the idea of creating various clusters has been successfully implemented in many countries, and clusters have become the most favorable structure for ongoing circulation of human resources, technologies and innovations.

Analysis of recent research and publications

The term “cluster” has two distinct features, i.e. industrial and territorial; therefore, academics define:

- an industrial cluster, which is applied to a group of related industries and services
- a regional (local) cluster, a group of geographically concentrated companies that operate in the same or adjacent industries together with the institutions that support them, produce similar or

complementary products and favor information exchanges between cluster members, which results in strengthening its competitiveness [1].

Therefore, a regional cluster is a union of companies, universities and other institutions operating in a define branch of industry within a particular region, and a synergic effect is reached due to rivalry and cooperation that exist between its members.

Numerous academics study the issues of regional advantages for a cluster [2–6]. The authors write mainly on defining advantages a mature cluster brings to a region, and focus on sustainability and continuous economic growth. This literature of the cluster leads to a conclusion that the key advantages of a regional cluster are as follows:

- employment of a larger scale and stable income for its residents
- a larger added value share in the region
- development of industrial and social infrastructure within the region and a synergic effect for other spheres of business activities
- long-term economic growth, competition and cooperation among its member.

Objectives

Cluster structuring has become a heart of economic policies in many countries. However, the practice of building and developing a cluster differs noticeably from a country to a country. This aspect is a subject matter of this study.

Special bodies established at the national or regional level are entitled to manage clusters, gather and analyze relevant information, coordinate educational programs and build relations with governmental structures.

Materials

Many countries conduct comprehensive comparative studies of regional clusters, their general conditions, development patterns, cooperation between business and academic environments, and cluster promotion policies.

At the beginning of the new millennium, more than 50 % of the developed economics practiced clustering and more than 100 countries and regions followed one or the other variant of cluster policies that is based on Porter's concept [7]. Famous Japanese regional clusters of Sapporo Valley (Sapporo), Hamamatsu Photon Valley Initiative (Hamamatsu), Kobe Medical Industry Development Project (Kobe), Kita-Kyushu Science and Research Park (Kita-Kyushu), Yorkshire and Humber Bioscience Cluster in Great Britain, Munich Biotechnology Cluster in Germany, Sophia Antipolis in France, Pittsburgh in USA and China's Beijing Zhongguancun are among the cluster leaders. It is also worth to mention famous clusters operating in medium-sized and large businesses like furniture, shoes, food products, in innovative industries like biotechnology, nanotechnology, telecommunications, as well as in manufacturing, e.g. car industry.

A cluster can be initiated by a regional administration or top management of a large company. In particular, the first scenario has been used for building such regional clusters as Shannon in Western Ireland, Lorraine in the northeast of France, Yorkshire & the Humber in Great Britain. The leading countries stimulate the rise of regional innovative clusters that can guarantee the overall success and competitiveness of the country on the world arena.

The US accommodates about 300 clusters, 240 of them are considered regional, and the other 50 have been created solely on the grounds of their proximity to natural resources. The American universities are incorporated into the regional economy since the second half of the XIX century. Since 1970-s they are open for funding by private enterprises. The US legislation provides a clear description of the procedures of how technologies can be transferred from a university to an industrial sector, and collaboration is based on the principle of competition, where financing from the private sector can vary and depends upon the results of researches.

In the course of its history, the country has developed a well-balanced partnership between universities, business and the state. This practice is rooted in Silicon Valley that has been created on the basis on the Stanford University. Versatile cooperation among universities, companies, researchers, entrepreneurs and other organizations has turned Silicon Valley into the world center first for engineering,

then for micro/semiconductor electronics and IT technologies, and nowadays for generating most innovations in the realm of computer, software and Internet. Silicon Valley offers a powerful well-established innovative system that attracts idea generators from the whole world and is a cradle for numerous venture projects (40 % of all venture investments in the US).

The neighborhood of the Massachusetts Institute of Technology (MIT) has become a home place for the second famous innovation region. Boston suburbs house a few dozens of colleges, scientific research laboratories and many enterprises operating in electronics and space industry. These two famous cases have become a strong incentive for less innovative countries to turn their universities into the hubs for cluster initiatives.

In the US, the federal government does not conduct any consistent policy to develop regional clusters, supporting them though. However, for the past four years the influence of the federal government on the development of technological industries and regions has increased. At the regional level, cluster development is supported by partners' structures that include local government, representatives of universities, industrial groups and research institutions. These organizations encourage internal and external companies to operate within a state and gain additional economic benefits. At the same time, the central government finances development programs for defined industries (e.g. electronics, Internet) or supports certain universities or research centers [8].

Nowadays, more than half of US firms follow the model, which implies that cluster companies are located within one region and exploit its natural, human resources and innovative potential to the maximum. Therefore, a concept of regional clusters is a priority for the US [1]. A similar strategy is adopted in Great Britain, Germany, Italy, Canada, the Netherlands, Finland, and France, who concentrate their efforts on supporting existing clusters and networking companies.

Besides the US, Germany is yet another country where local authorities initiate the formation and the expansion of clusters as a means for the development of a regional economy. The development of clusters in this country was a historic and natural process (chemistry, car building) but the term 'cluster' appeared in the context of national economic policies only in 2003.

Many years, Germany's regional clusters grew and matured with hardly any contribution on behalf of the central government. The local authorities give relative freedom to cluster-building institutions, delegating them the power to allocate state subsidies (e.g. BioM in Munich). In fact, all local initiatives to create a cluster, except those that have not found any support with the federal government, can be implemented by regional or local government at their own risk. In other words, cluster development is planned at the local level, therefore takes into utmost consideration the specific features of the region.

In addition, separate regions or technological areas can also benefit from centralized support programs. First of all, they are designated for those who attempt to diversify, like for example, traditional for Saxony car and machine building industries are gradually replaced with biotechnology, micro- and nanotechnology, the Ruhr region is changing from its innate heavy industry to information technologies, while Leipzig starts to specialize in media services. Germany is one of the countries where local and regional authorities in parallel introduce projects for creating and developing innovative clusters within certain regions, and where local alliances between entrepreneurs and local government are considered as the most important factor for market success [1, 9].

Cluster performance and development are also influenced by the availability and the activity of scientific and research institutions. Germany's Federal Ministry of Education and Research provides a valuable support in exchanging international knowledge and innovations in the areas of health protection, bio-, nano and information technologies, environment, transport, as well as helps foreign educational and scientific programs.

Bavaria has the co-called cluster "coordinators", who are from the academic environment and maintain cooperation between different parties within a cluster. Germany can be proud of well-coordinated efforts between the business and academic environments, as many scholars from universities are involved in research programs financed by private companies or foundations. In other words, research institutions whose mission is to transfer technologies, keep close relations with both universities and production companies.

The regional economic cluster in the city of Wolfsburg created by Volkswagen Group in partnership with McKinsey consulting firm is another specific model of clusterization in Germany. The purpose of this joint project is to encourage fledgling technological companies and suppliers to locate their production facilities in close proximity to VW [10]. Volkswagen believes, dynamic business relations including the cooperation with local suppliers, bring the company additional benefits, while the local authorities are able to solve the unemployment problem within a region. The Group has initiated a joint engineering center where specialists from supplying companies and Volkswagen engineers work together to design new car models and parts. As defined in its general strategy, Volkswagen selected its suppliers among seven thousand firms, but gradually the number of long-term partners reduced leaving only twelve companies to operate in Wolfsburg. The Group applied the same scrupulous approach while searching for partners for the joint engineering center.

McKinsey's study of European most dynamic regions shows that successful projects appear mainly due to the cooperation between the public institutions and businesses, while the attempts of a government to create a regional cluster on their own often lead to failure.

In the economically developed countries, international competitiveness grew in line with the growth of their key industrial clusters. For example, in France in 1950-s and 1960-s certain industries began to cooperate within clusters, like manufacturers of cosmetics, fashion cloths, and products.

In France, clusters are created due to the partnership between local production groups, universities and research institutes. Their development is backed up by a local government and a regional office of the Ministry of Economics, Finance and Industry. The national government, local authorities, universities, firms, associations and other stakeholders build a united organization that secure close partnership. However, a cluster success is endangered by the large number of participants with their responsibilities and financial resources being scattered, and therefore there is a need to form a cluster with a unified and transparent structure.

The worldwide success of Italy in fashion and textile industries is also associated with the cluster development. Italian 'industrial districts' (about 200 agglomerated small and medium-sized companies), which produce the lion's share of Italian exports since 1970-s, are a perfect example of such development. Special clusters were created within the industrial districts that were distinguished for the existence of a combination of certain industries, like metal processing – cutting tools, fashion – design, leather – shoes, wood processing – furniture. In literature, such agglomerations made up of small and medium-sized companies are often referred to as industrial clusters [11].

In Great Britain, the national policy is focused not so much on creating a new cluster, but using existing regional resources. This approach stimulates the cooperation between its business and academic environments and a joint usage of their achievements. The innovations created in the course of such partnership can play a vital role in strengthening unique features of a regional cluster. In order to make a region attractive, the national and business institutions stimulate the participation of foreign companies and exchanges with foreign clusters, as well as usage of foreign resources to build up its competitiveness. Open clusters with foreign companies and universities being their active members are typical of Great Britain.

Nowadays, the Scandinavian economy is totally clustered. Economic clustering policy in Finland is one of the examples. The Research Institute of the Finnish Economy defines the country's nine key clusters including forestry, machine building, food, construction and telecommunications. According to the Global Competitiveness Index the country sits confidently among the world first five leaders next to the US and Japan. The country supplies 10 % of the world export of wood products, 25 % of paper while owing only 0.5 % of the global forest resources. On the telecommunication market, it provides 30 % of the world export of mobile communication equipment and 40 % of mobile phones. The wise national policy of cluster structuring supported by innovative institutions is a key to its economic success.

Competitive advantage of Sweden in pulp and paper industry also covers wood processing and paper equipment, production lines and complementary industries. Denmark develops specific production technologies for agri-business and food processing.

The Scandinavian countries classify as innovative only those unions that present a complex system of institutions, regulations and innovation support programs backed up by the government and businesses,

and they can deal with new (telecommunication) and traditional (forestry) industries likewise. The important aspect is that such collaboration within a cluster should stir a rapid development of new products to meet changing consumer demands.

For the past two decades clusters have gained popularity not only among the leading EU countries like Italy, Finland, France, but also among the countries that joined the European Union in 2004, in particular the Visegrád Four (the Czech Republic, Hungary, Poland and Slovakia). These countries have modified their national policies and reached economic indices that make them very attractive to foreign investments and decrease their inflation. Among all Eastern European countries it is the Visegrád Four, who managed to reach the same level of GDP its countries had before the transformation due to the development of new production systems, i.e. clusters.

A large group of developing countries (India, Nigeria, Chile, Ghana), as well as Arabic countries (Morocco, Jordan, Egypt, Saudi Arabia, UAE), with a traditional overpowering state control over economy, is also targeted at assimilating the culture of cluster partnership. So far, they extend their efforts no further than decentralization of the long-established political vertical by means of stimulation of regional cluster initiatives.

In Japan, Southern Korea and other countries of Southeast Asia, the central government grants regions enough management freedom (administrative privileges) so that they are capable of modernizing their economy, encouraging networking between the science and business, and creating promising regional clusters.

In Japan, industrial clusters have been studied in great details since the decline of the economic development of the regions in late 1980-s, though prior to that in 1970-s and 1980-s Japanese financial and industrial groups known as “keiretsu” managed to outdo American vertical corporations on the world markets of cars and electronics.

In the past, it used to be the central government, who made plans for the development of regional industries. However, nowadays regional institutions get increasingly initiative, and they are delegated the implementation of more and more projects. Today both the Japanese ministries and regional authorities are expected to bear responsibilities for stimulating regional clusters. Each region can encourage such development on the account their own resources by means of creating venture businesses and new industries. In this respect, regional clusters have turned out to be a new type of concentrated economy when universities, research institutes and corporate clusters closely cooperate. This trend is widely backed up by the government.

In Japan, the cooperation of business and academic environments sprang up in early 1990-s after the economic crisis. Studies and innovations became more commercial while representatives of universities began to develop effective business projects. The state supports specific zones renowned for exchanges between foreign universities, research institutes and for attracting foreigners to implement local scientific projects.

Natural disasters of the past years, global trade and investments had a negative impact on the complex Japanese economy who on one hand had well-developed production, and on the other underdeveloped agriculture and services. Japanese industrial giants were forced to move their production to other Asian countries threatening to increase the level of unemployment in the regions that heavily depended on production exports. Another problem faced by Japan is a higher pace of population aging and consequently increased social expenses. Despite of the obvious success Japan has reached on the global market, the country confronts a range of problems with the development of its regions. Therefore, the development of regional clusters and other types of cooperation is of vital importance for Japan [12].

In 1988, China founded Zhongguancun Science Park in Beijing that became the first national high-tech industry development zone approved by the State Council and in 1996, Shenzhen High-tech Industrial Park was launched. By 1991 due to the Torch Program for business incubator development, 26 new zones were established. The Ministry of Sciences and Technologies and regional authorities joined efforts to develop clusters in these areas. In 2002, China had 53 special zones that housed 28,388 firms with 3.49 million employees and 1.5 milliard Yuan sales. That very year China signed a contract with Singapore aimed at strengthening partnership in the areas of information technologies, micro-electronics, new

materials and biological sciences (biology, bio-chemistry, immunology, genetics, physiology, ecology etc.). China needed more than 17 years and gigantic foreign investments to build competitive clusters focused on textile, sportswear, cloths, toys, kitchenware etc.

The country's central government, municipalities and the developed zones all work together on creating and developing clusters. In agreement with the central government, a municipality can create a hi-tech zone on its territory. The central government also defines and selects firms granted with certain privileges.

The cooperation between business and universities of China is regulated by the Committee on the National Development and Reforms that has contributed to reforming of 242 research institutes that have been connected with public organizations but wanted to move from public research programs to private. Cooperation between business and academic environments is practiced only in a few industries like information technologies and bio-technology, but their experience gradually reaches out to other sectors.

Until recently China has been heavily dependent upon the import of technologies, therefore the capacity of Chinese companies to generate innovations is allegedly limited. In order to overcome this drawback, in 2001 the decision was made to establish offices for licensing technologies at universities that fostered the cooperation between business and academic environments and raised the technological level of products. New Chinese policy aims at commercialization of research projects. However, despite of a large number of hi-tech zones their profitability varies. Thus, the main task is to overcome interregional disproportions of the Chinese economy [13].

Conclusions

Having analyzed the development of clusters in various countries, their ability to generate and disseminate innovations it is possible to define three models of innovative development of a country. The first can be called the model of "accumulating" scientific and innovative potential. It is based on the integration of fundamental scientific studies and applied projects of leading corporations, the development of an educational system and a considerable financial support on behalf of the government. This model is typical of the US, Germany, the Scandinavian countries, France and Great Britain.

The second model is the model of 'transferring' innovative results. It is typical of Japan's national innovation policy. Under this model, new knowledge and technologies are introduced into a country's economy by way of improving foreign scientific and technological potential while taking into consideration of national specific features and needs.

The third model of "catching up" implies that an innovative development is achieved by using new technologies and products made by the developed countries. This model is followed in China, Northern Korea, Hong Kong, Singapore, and the Philippines. Under this model, the state innovation policy plays a key role and focuses on stimulating innovations by means of building innovative clusters and faster application of international scientific and technological achievements.

Prospects for further research

Ukraine faces an acute task to raise its role and importance on the world economic and political arena, since it is one of those states that have far-reaching scientific and technical potential. The events of the past few months inspire Ukraine to seek and form alliances with other countries to strengthen the position of Ukraine as a democratic state with sustainable and competitive economy. On this road, it is necessary to use not only traditional but also modern forms of cooperation which are typical of the global economy, i.e. clusters and networking structures.

Ukraine was a leader in implementing the world expertise of developing new cluster-type regional industrial systems on the post-Soviet territories. As early as in 1998 Podillia that included Khmelnytsky, Vinnytsia and Ternopil regions, formed three clusters, i.e. construction, sewing and agricultural, and the first non-governmental organization called Podillia First for promoting a cluster model of economy in the region.

However, for the past fifteen years Ukraine hardly made any attempt to implement a centralized policy in order to support any innovation initiatives. The redirection of the investment policy towards

regional clusters requires absolutely new technologies that become increasingly expensive with the view to the costs of scientific researches and highly qualified human resources. It is of vital importance for Ukraine to develop unique cluster structures of its own and create favorable conditions for business activities.

Further studies of how to improve the overall quality of the business environment could lay a foundation for new cluster initiatives in Ukraine. At the current stage, the most natural way is to integrate with the EU countries using cluster principles, recent agreements about foreign investments, as well as further exchange of innovations in the areas of IT-technologies, electronics and telecommunications.

1. Кластеры – центры деловой активности [Электронный ресурс] // Дело. Общество. Деньги: интернет-журнал. – 2008. – № 1. – Режим доступа: <http://delo.yuga.ru/pages/dod/news/show/?newsid=31425> // 20.10.08, 08:10.
2. Ялов Д.А. Кластерный подход как технология управления региональным экономическим развитием [Электронный ресурс] / Д.А. Ялов // Компас промышленной реструктуризации: интернет-журнал. – 2003. – № 3(4). – Библиогр.: 2 назв. – Режим доступа: <http://www.compass-r.ru/st-3-03-1.htm>. – Назва з екрана.
3. Производственные кластеры и конкурентоспособность региона [Текст]: монография [Электронный ресурс] / кол. авт. под рук. Т.В. Усковой. – Вологда: Ин-т социал.-экон. развития территорий РАН. – 2010. – 246 с. – Режим доступа: <http://library.vscs.ac.ru/Files/books/1269838662PROIZVODSTVENNIE%20KLASTERI.PDF>.
4. Евстигнеева Л. Макроэкономические аспекты региональной политики [Электронный ресурс] / Л. Евстигнеева, Р. Евстигнеев // Экономическая политика: интернет-журнал. – 2006. – № 4. – [25 с.]. – Библиогр.: 53 назв. – Режим доступа: http://www.ep.ane.ru/pdf/abst/year_sod_2006.pdf.
5. Татаркин А.И. Развитие промышленного комплекса региона с использованием кластерных инициатив [Электронный ресурс] / А.И. Татаркин // Бизнес-информ: интернет-журнал. – 2012. – № 9. – [9 с.]. – Библиогр.: 8 назв. – Режим доступа: http://www.business-inform.net/pdf/2012/9_0/32_41.pdf.
6. Румянцев А.А. Методологические основы формирования концепции стратегического управления инновационным развитием региона [Электронный ресурс] / А.А. Румянцев, С.А. Тихомиров // Вестник Санкт-Петербургского университета: интернет-журнал. – 2005. – Серия 5. Экономика. Выпуск 4. – [10 с.]. – Библиогр.: 12 назв. – Режим доступа: <http://vestnik.unipress.ru/pdf05/5-4-05.pdf>.
7. Andersson T. The Cluster Policies Whitebook [Электронный ресурс] / T. Anderson, S. Schwaag-Serger, J. Sorvik, E.W. Hansson // International Organisation for Knowledge Economy and Enterprise Development, Malmö 2004. – Режим доступа: <http://www.competitiveness.org/filemanager/download/344>.
8. Волкова Н.Н. Индустриальные кластеры США [Текст] / Н.Н. Волкова, Т.В. Сахно // США – Канада. Экономика, политика, культур. – 2007. – № 1. – С. 51–68.
9. Семёнова Н. Кластеризация – новое явление в мировой экономике и политике [Электронный ресурс] / Н. Семёнова // Режим доступа: <http://www.nanonewsnet.ru/blog/nikst/klasterizatsiya-novoe-yavlenie-rol-v-mirovoi-ekonomike-politike>.
10. Кралич П. Кластер по-немецки [Электронный ресурс] / П. Кралич, М. Стаччи, Т. Хойзер // Вестник McKinsey: интернет-журнал. – 2010. – № 21. – Режим доступа: http://www.mckinsey.com/russianquarterly/articles/issue21/28_0210.aspx.
11. Porter Michael E. Clusters and the New Economics of Competition // Harvard Business Review. – 1998. – Jg. 76, № 6. – P. 77–90.
12. Japan: Special zones for structural reforms. 2002–2006 [Электронный ресурс]. – Режим доступа: <http://www.cao.go.jp/en/minister/specialzones>.
13. Асаул А.Н. Закономерности и тенденции развития современного предпринимательства / А.Н. Асаул, Е.А. Владимирский, Д.А. Гордеев, Е.Г. Гужва, А.А. Петров, Р.А. Фалтинский; под ред. засл. строителя РФ, д-ра экон. наук, проф. А.Н. Асаула. – СПб: АНО ИПЭВ, 2008. – 280 с.