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THE ROLE OF PORT CLUSTERS IN THEORY AND PRACTICE

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ABSTRACT

This essay focuses on the advantages of creating and operating port clusters, highlighting the success aspects of competitive ports and port clusters in theory and through international examples, as well. The issue of port clusters can be considered part of the theoretical and practical approach to the development of transportation, logistic services, and shipping. The first part of the study defines what clusters in general and port clusters, specifically, mean. It identifies the advantages and success factors of clusters in general. It then gives a detailed picture of the port cluster model identifying the typical activities and actors of port clusters; the success factors of the performance of port clusters. The second part presents the operation of port clusters through international examples. It presents the examples of Valencia Port and the Port of Rotterdam and summarizes the key success factors of competitively preforming clusters. The study touches the question of inland ports in Hungary and the theoretical possibility of Hungarian port clusters.
Keywords: clusters, logistics, port clusters, port authorit

INTRODUCTION

In recent years an important type of business cooperation, the so-called "clusters", came to the focus of interest at both the national and international level. According to *Porter* (2000), regional clusters are "*geographically proximate group of interconnected companies, associated institutions linked by commonalities and complementarities*". Recent research has shown that regional clusters of interlinked industries, organizations, and institutions act as a fertile ground for innovation, entrepreneurship and the upgrade of competitive advantage among firms (*Porter*, 2003a; *Porter*, 2001). The cluster view emphasizes that clusters promote innovation and regional competitiveness in a particular region; the economic results of regions hosting clusters proved to exceed those of regions without clusters.

This study focuses on a special type of cluster that operates in seaports, the so-called "*port clusters*". Competitive ports operate in a cluster environment where an intensive flow of information and know-how fosters increasing innovation and efficiency in the cluster. This issue is relevant to Hungary since it is located in a very advantageous geographical position with great logistics potential. The improvement of Hungarian logistic services and transportation options and the potential of Hungarian ports are questions of national importance.

This study does not to deal with the situation of the Hungarian shipping industry but rather tries to give a detailed picture of the port cluster model, identifying the typical activities, actors, and success factors of performance in port clusters. The second part presents the operation of port clusters through

international examples. It presents the examples of Valencia Port and the Port of Rotterdam. Finally, the study summarizes the key success factors of competitively preforming clusters.

Certain dimensions of the cluster model could serve as development solutions for the Hungarian logistic development strategy and in the question of Hungarian ports on the Danube. This topic is worth close examination and could have extensive effects on Hungary in the future.

DEFINITION AND SUCCESS FACTORS OF PORT CLUSTERS

The concept of clusters mentioned above applies to port clusters as well. It needs to be mentioned that this study focuses on seaport clusters, which are, in some dimensions (structure, number of actors, traffic, etc.) different than river ports.

Definition

Haezendonck (2001) is the first scholar who uses the term "port cluster". She defines a port cluster as '*the set of interdependent firms engaged in port related activities, located within the same port region and possibly with similar strategies leading to competitive advantage and characterized by a joint competitive position vis-á-vis the environment external to the cluster*'(*Haezendonck*, 2001).

Advantages of clusters

We can identify generally what advantages the cluster model carries or how clusters can influence competition apart from the question of which industry the cluster operates in. These advantages are also realized in port clusters.

The cluster view emphasizes that clusters promote innovation and regional competitiveness in a particular region; the economic results of cluster-based regions are proved to exceed the results of non-cluster-oriented ones. Silicon Valley in the US is an archetypical example of a region that breeds strong clusters in many high-tech domains. Due to clusters, many European regions have developed competitive advantages in specialized activities such as financial services (London), petrochemicals (Antwerp), flowers (Holland), biopharma (the Danish-Swedish border region), or the automotive industry (Germany). Successful clusters have also significantly increased their global reach, attracting people, technology and investments, serving global markets, and connecting with other regional clusters that provide complementary activities in global value chains. Clusters and regional specialization are empirically associated with higher levels of innovation and prosperity (*EC*, 2009).

According to *Porter* (1998), clusters influence competition in three ways: (i) *clusters increase productivity/efficiency; (ii) clusters stimulate and enable innovations; (iii) clusters facilitate commercialization and new business formation.* It creates an area in which information and know-how flows more freely among members, where the capacity for innovation is high, and where it attracts and "produces" a pool of skilled labour. According to *Porter*, competitiveness of companies is determined only partly by internal capabilities. In his famous Diamond Model, external factors also play an important role: related and supporting industries can produce inputs that are

important for innovation and internationalization. The close connection of suppliers, manufacturers, and retailers that makes specialized information available for the participants enables them to respond to any change in customer need quickly with the needed innovation (*Porter*, 1998).

Other advantages of clusters can be summarized along the following dimensions: there is a better access to (i) *specialized labor, competent people and innovative ideas*; (ii) *specialized suppliers and demanding customers*; (iii) *venture capital and competent investors*.

It has to be outlined that one of the main success factors of clusters is the adequate level of *trust* between cluster member companies and other actors in the cluster. If there is a cooperative behavior *between members* and there is *an intensive flow of information and know how* between cluster member companies and actors, doing business between cluster members – contracting, monitoring etc. – has lower transaction costs (*Dyer and Singh*, 1998). More trust leads to more knowledge spillover, since firms are more inclined to share knowledge. The level of trust in a cluster is influenced by the importance of *reputation effects* in a cluster. If reputation effects are strong, abusing trust has negative effects and therefore a culture of trust is sustained.

Typical activities and actors of port clusters

De Langen[1] (2004) examines three seaport clusters (Rotterdam Port in the Netherlands, Durban Port in South Africa and Lower Mississippi in the USA), revealing that seaports are usually organized in port cluster forms. In these port clusters he finds that there are a significant number of actors and institutions that are interconnected in a way to the core specialization: the arrival of ships and cargo in the ports. The arrival of ships and goods attracts related economic activities. For this reason ports can be drivers of agglomeration in cities (*De Langen*, 2004 cites *Fujita et al.*, 1999).

Based on his case studies, a bunch of typical port cluster activities can be identified such as *cargo handling operations, logistics activities, manufacturing, and trading activities*. The most complete measure for the performance of clusters is the *value added* generated in the cluster. The value added generated in the cluster is the sum of the value added generated by the members of the population. The value added consists mainly of labor expenses, depreciation, and profit before tax (*De Langen*, 2004). It is argued that the value added and work force are generated mainly through interconnected activities such as logistics, manufacturing, processing, or trade that are concentrated in seaports and in primary port activities (such as cargo handling).

The permanent actors of port clusters are port authorities, service providers, producers, and any companies related to port activities. Municipalities, public and regional organizations, other authorities, banks, educational and research institutions, or financial organizations can be members of port clusters. According to *De Langen* (2004) a *port region* can be identified. In the three ports studied, port activities are shared among many municipalities and concentrated not only in port cities. Many times in port cities fewer port activities are found than in cities close to the actual ports.

[1] Peter De Langen is a Dutch professor with present reaearch position at Erasmus University Rotterdam. His PhD thesis was on the 'Performance of Seaport Clusters' and published a number of articles on this issue.

Factors determining success and performance in port clusters

The attractiveness and competitiveness of ports are determined by many factors. In this chapter I will identify these factors through the example of the Rotterdam Port, one of Europe's largest ports.

The Port of Rotterdam in the Netherlands is one of the world's largest ports, and by far the largest in Europe. Because of many competitiveness factors such as the huge size of the port, the very advantageous geographic location, the massive amount of goods going in and out of the port, and the surrounding competitive business infrastructure, many transport and logistics companies from all over the world choose to locate in Rotterdam. It is in the heart of Western Europe, from where most of the European continent can be easily reached.

From this example it is clear that the main competitiveness factors are the *geographic location, size, and infrastructure* of ports. The advantageous geographic position makes it possible to reach the port easily from any location with cargo in many different modes of transport and then to transport it to any other location. The size of the port determines the economy of scale. The more companies, suppliers, specialized workforce, universities or other institutional actors are present in the port, the more competitive the port will be in attracting new companies, ships, and actors. The effective infrastructure is also a decisive factor for the area to be competitive. Effective infrastructure means that it is easy for shipping and logistics companies to shift between different modes of transport according to needs and cost-effectiveness. The Port of Rotterdam offers inter-modality between sea-going vessels, inland vessels, pipelines, rail, and road. This infrastructure facilitates the process of getting the freight from the port into the European hinterland (*EMCC*, 2008).

Above attractiveness, *favorable conditions, and legalization framework* of a given country are also important factors. The Netherlands offers flexible labor market legislation, beneficial tax regulations for highly skilled workers and companies, and straightforward visa requirements that make it possible to import labor from abroad. There is broad access to services and business partners. Being located in the Port of Rotterdam makes it easier to engage in networks with other companies, consumers, suppliers, and supporting sectors such as the oil and energy industries (*EMCC*, 2008).

Van Klink's (1995)[2] work on agglomeration in seaports identifies factors that influence the attractiveness of ports: *logistics know-how, costs of land, labor climate (training and work attitude), and efficiency of road network.*

Haezendonck (2001)[3] analyzes the performance of a port cluster with an adapted version of Porter's diamond framework. 14 factors have been identified that influence the competitiveness of seaports, including *internal competition*, *internal cooperation, client relationships in the cluster, the presence of related and supporting industries, and the behavior of (different levels of) the government.*

In his study *De Lange* (2004a) identified four variables of port cluster performance. According to Rotterdam Port experts, the most important factor is *cluster structure* (number of firms, internal competition, heterogeneity of firms quality

[2] Referred by *De Langen* (2004b)

[3] Referred by *De Langen* (2004b)

of location) and general economic climate. The other two factors – cluster governance and national and international policies are deemed to be less important.

According to European research studies on clusters, a *professional cluster manager* and a *supporting management organization* are indispensable for successful clusters. Cluster management organizations have many competencies and tasks (*Cluster Initiative Greenbook*, 2003). Their main role is to collect and transfer information between members, promote business cooperation, facilitate and support innovation projects, improve business environment, improve human resources, and broaden the cluster.

INTERNATIONAL PORT CLUSTERS

In this chapter two big European leading ports will be presented, the Port of Rotterdam and Valenciaport. Both ports are considered to be among the best ports in Europe. Through these examples those factors will be identified that guarantee a port's competitive performance.

Valenciaport[4]

In 2004 the Global Institute of Logistics[5] (GIL) launched a research project to investigate the global value chain. The institute wanted a reliable benchmark to measure container terminal efficiency and port performance. This was essential to improve port/terminal-led best practice and relationship management. In 2006 the research identified the Valenciaport port cluster, represented by the Port Authority of Valencia, as a port cluster at an exceptional level of maturity with stakeholders truly engaged in the collaborative process. The Institute's criteria for best-in-class designates, among other points, that the cluster demonstrates the spirit of collaboration, strikes the right note between public and private partnership, and has developed a model that is transferable.

The Port Authority of Valencia, commercially known as Valenciaport, runs and administrates three state-owned ports along 80 km of Spain's eastern Mediterranean coastline.

Success factors of Valenciaport

Research has identified those factors that led to the success and competitiveness of Valenciaport. These are the *exceptional level of maturity of partnership with stakeholders, the engagement of port related actors in the value chain, education and training within the cluster, the role of Fundación Valenciaport in the dissemination of best practices, the guarantee of high quality level of port services, and the infrastructure and complex ICT solutions that the port offers.*

The Port of Rotterdam

The Port of Rotterdam in the Netherlands is the largest port in Europe, with transport and logistics companies from all over the world choosing to locate in

[4] This chapter is based on the Seaport Cluster Research Programme 2007-2011 edited by *Gil* (2009).

[5] The New York based GIL is a multi-stakeholder, cross-industry, not for profit organization, concerned with the development and proiferation of best practice in the global supply chain. (GIL website)

Rotterdam because of the huge size of the port, the massive amount of goods going in and out of the port, the surrounding infrastructure and its location in the heart of western Europe. The port is also linked to more than 1.000 other ports worldwide. Some 58.000 people are employed in the harbor in all areas of the transport and logistics sector. From Rotterdam, companies have easy access to no less than 450 million consumers in Belgium, France, Germany, Hungary, Italy, the Netherlands, Poland, Scandinavia, and the UK.

There are several favorable conditions offered by the country such as flexible labor market legislation, beneficial tax regulations for highly skilled workers and companies, and straightforward visa requirements, which make it possible to import labor from abroad. Being located in the Port of Rotterdam makes it easier to engage in networks with other companies, consumers, suppliers and supporting sectors such as the oil and energy industries (*EMCC*, 2008*)*.

The Port of Rotterdam itself is part of an even larger cluster of huge seaports located nearby in Antwerp in Belgium, Le Havre in France, and Amsterdam in the Netherlands, and it is not far from Bremerhaven and Hamburg in Germany. All of these ports are located at the end of the industrial export transport pipeline from central Europe to the rest of the world, and also facilitate the import of goods to European industries and consumers. A substantial part of world trade passes through these ports and the Port of Rotterdam is the largest of them (*EMCC*, 2008).

Economic structure of the cluster

In 2002, some 3.550 companies were located in the cluster of the Port of Rotterdam, and 87% of these enterprises were categorized as being involved in cargo handling, transport, and logistics. The huge size of the Port of Rotterdam cluster also means that it attracts numerous companies whose primary activity is not transport and logistics but some other business that connects well with the transport and logistics sector. Hence, the Port of Rotterdam also hosts a cluster of energy companies and chemical companies that now account for more than 50% of the revenue of the port (*EMCC,* 2008). The Port of Rotterdam hosts a diverse set of companies and numerous multinational corporations that have chosen to locate their headquarters in Rotterdam (*de Langen*, 2004). Moreover, the area has a number of leading companies spurring economic activities for other enterprises in the cluster.

Apart from various educational facilities such as the Netherlands Maritime University Rotterdam, Maasvlakte Maritime Training Centre, and the Shipping and Transport College, the port also has numerous other institutions working in its interests.

Success factors of Rotterdam Port Cluster

The case of the Rotterdam port cluster shows what the key success factors of ports are, as has already been argued above. The factors determining success and competitiveness are the *size* and *geographic location*, the effective *business environment* and *infrastructure* of the port*,* the number of companies operating in the port, the presence of interconnected companies, related and supporting industries, the effective cluster governance, and the favorable conditions and legalization framework of a given country. One of the many advantages of operating in the port is being part of a port business network composed of universities, training institutions, skilled laborers, suppliers, and other companies.

Enterprises are mostly engaged in relations with their customers or suppliers, or to some extent also with research institutions and suppliers of labor. Hence, the role of the cluster's institutions, such as Erasmus University, mostly has an indirect impact of monitoring the cluster and gathering knowledge. The port provides a beneficial business climate with a good supply of skilled labor, utilities, infrastructure, moderate taxes, and transparent environmental legislation[6] (*EMCC*, 2008).

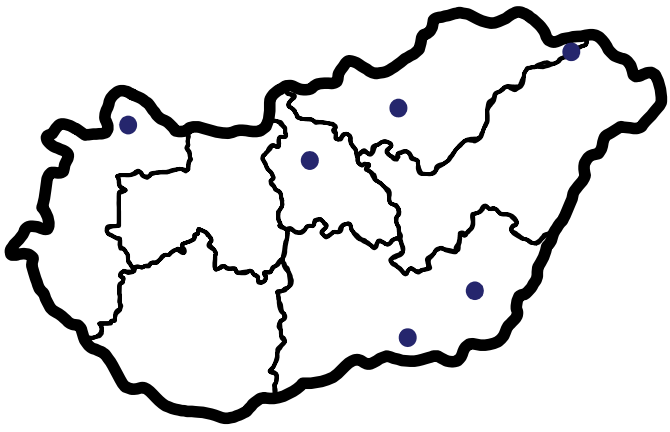
In many companies, primarily in multinationals, employees are the main source of know-how, and hence it is vital for the companies to capture the experience of their personnel. In order to utilize this staff knowledge, the management emphasizes that it should be systematically organized, for instance by using ICT. Info-communication technology increases company performance by making the relationship between sellers and buyers even stronger. For example, clients can follow all ships in real time on a map and access detailed information on a certain ship and its operations. Messages can be given directly to captains by email. With ICT technologies activities and operations on ships can be controlled while much of the physical work becomes automatic (*EMCC*, 2008).

Port Clusters in Hungary

There are six officially registered logistic clusters in Hungary (*Figure 1*): The North Hungarian Logistic Service Cluster (centered in Miskolc); the South Plain Transportation Development Cluster (centered in Szeged), the Záhony Area Logistic Cluster (centered in Záhony), the Logistic and Trasportation Cluster (centered in Budapest) and the Sopron Region Logistic Cluster (*Pole Program Office website*). There is only one logistic cluster, the Záhony Cluster, a cross-border cooperation with 12 founding companies, with the scope to become a competitive inland port (*The Záhony Logistic Cluster website*).

Figure 1

Logistic clusters in Hungary



[6] *Nijdam*, 2007 reffered by *EMCC* (2008)

This study does not focus on the situation and development options of the Hungarian shipping and port industry. In Hungary we cannot talk about many big and important companies operating in Hungarian ports nor about port business networks composed of suppliers, buyers, special labor force, or port specialized institutions. Thus, we cannot talk about Hungarian port clusters at all.

Considering the focus of national economic development policy, Hungary should not focus on building international and inland ports, but rather on building ports engaged in the logistic value chain. At those locations where the flow of cargo is uneven or seasonal, creating smaller port infrastructure is more effective than big investments in ports. Economic development policy and investments have to focus rather on those locations where there is a constant need of port services. There is no need to have more ports along the Hungarian part of the Danube. Hungary has to focus on to develop better managed and equipped ports, offering effective business environment and infrastructure (*Logisztikai körkép*, 2010).

Certain elements of the port cluster model can be potentially helpful in developing Hungarian ports and port activities. This can only be achieved on the long run with conscious and committed national economic development strategies and with the involvement of the private sector, trade unions, and other specialized organizations.

CONCLUSIONS

International examples show that port actors such as port authorities, service providers, producer or any company from supporting or related industries, municipalities, public and regional organizations, other authorities, banks, educational and research institutions, and financing organizations, are organized in port clusters. This study focused on the importance of clusters, especially port clusters, identified the factors determining successful port performance, and tried to give insight of why this topic is worth thinking about from the Hungarian point of view. Both the theoretical approach and the cases of two internationally competitive clusters were shown: Valenciaport in Spain and the Port of Rotterdam. In the case of Valenciaport we could see the success factors: the exceptional level of maturity of partnership with stakeholders, the engagement of port-related actors in the value chain, education and training within the cluster, the role of Fundación Valenciaport in the dissemination of best practices, the guarantee of high quality level of port services, and the infrastructure and complex ICT solutions the port offers.

In the case of Rotterdam Port, many success factors were identified as well, such as the *size* and *geographic location*, the effective *business environment* and *infrastructure* of the port, the number of companies operating in the port, the presence of interconnected companies, related and supporting industries, the effective cluster governance, and the favorable conditions and legalization framework of a the host country.

Other success factors of ports were identified in the work of many researchers: logistics know-how, costs of land, labor climate (training and work attitude), and efficiency of road network. In the case of Rotterdam Port *cluster structure* (number of firms, internal competition, heterogeneity of firms, quality of location) and general economic climate were important.

There is a great potential in Hungarian logistic capacity, but a competitive strategy and vision is needed as to how to improve logistic services or inland ports. Inland ports on the Danube at the moment do not play a significant role in logistic strategy and logistic thinking. In Hungary we cannot talk about many big and important companies operating in Hungarian ports, nor about port business networks composed of suppliers, buyers, special labor force or port specialized institutions. We cannot talk about Hungarian port clusters at all. In Hungary successful and effective cooperation between companies and other institutions, or clustering in general are hindered by many factors independently from industrial focus. It is worth investigating the possibilities for improving the competitiveness of the Hungarian logistic industry. An integral part of this issue could be the development of ports, not by focusing on building new ones on the Danube, but by improving better managed and equipped ports and offering an effective business environment and infrastructure. Certain elements of the port cluster model can be considered useful for developing Hungarian ports and port activities. This can only be achieved by a long term commitment to national economic development strategies and the involvement of the private sector, trade unions, and other specialized organizations.

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