DOI: 10.29141/2218-5003-2022-13-1-2
JEL Classification: D85, O25

Clusters: Coordination, inter-firm relationships and competitive advantages

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Abstract. The paper aims to analyse the cluster concept from the perspective of its relationships with coordination modes, inter-firm interaction, and competitive advantage. The existing definitions of clusters do not fully cover and logically connect these concepts, which leads to their overly broad interpretation. This, in turn, complicates making a correct choice of cluster policy measures that would allow obtaining the desired result of increasing the competitiveness of industries, regions, and the economy as a whole. Methodologically, the article relies on new institutional economics and system analysis. The research methods used assume a theoretical study of the abovementioned concepts to create a systemic understanding of clusters. This comprehension is necessary to ground the cluster policy productive measures focused on the industry-specific characteristics of the firms included in the clusters being formed. The article shows that the informational nature of agglomeration economies failed to be considered in full often leads to the conclusion that the very fact of firms clustering together can result in an increase in their competitiveness. In practice, such a merger, especially if supported by the government, can improve the economic performance of firms and provide their comparative advantages, but does not guarantee an increase in competitiveness. The theoretical and practical significance of the study lies in the substantiation and development of recommendations for the cluster policy development and improvement in Russia while taking into account the limited scope of its productive application.

Keywords: cluster; coordination; inter-firm relationships; competitive advantage; comparative advantage.

Funding: The study was funded by the Faculty of Economics of Lomonosov Moscow State University (research project "Applying the network analysis methods of institutional factors in the formation and development of industrial clusters").

Paper submitted: September 21, 2021

For citation: Tambovtsev V.L. (2022). Clusters: Coordination, inter-firm relationships and competitive advantages. *Upravlenets / The Manager*, vol. 13, no. 1, pp. 20–36. DOI: 10.29141/2218-5003-2022-13-1-2.

Кластеры: способы координации, межфирменные взаимодействия и конкурентные преимущества

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Аннотация. Статья посвящена анализу понятия кластера с точки зрения его соотношения с такими понятиями, как способ координации, межфирменные взаимодействия и конкурентные преимущества. Существующие определения кластеров не полностью охватывают и логически соединяют эти понятия, что приводит к чрезмерно широкой трактовке кластеров. Это, в свою очередь, затрудняет корректный выбор мер кластерной политики, которые позволили бы получить желаемый результат повышения конкурентоспособности отраслей, регионов и экономики в целом. Методология работы основана на новой институциональной экономической теории и системном анализе. Использованные методы предполагали теоретическое исследование упомянутых выше понятий для формирования системного понимания термина «кластер». Такое понимание необходимо для обоснования продуктивных мер кластерной политики, учитывающих отраслевые особенности фирм, которые входят в формируемые кластеры. В статье показано, что недостаточно полный учет информационного характера возникновения агломерационной экономии часто приводит к выводу о том, что сам факт объединения фирм в кластер может содействовать повышению их конкурентоспособности. В действительности такое объединение, особенно при наличии государственной поддержки, способно улучшить экономическое положение фирм, обеспечить их сравнительные преимущества, но не гарантирует роста конкурентоспособности. Теоретическая и практическая значимость исследования заключается в обосновании и выработке рекомендаций по развитию и совершенствованию кластерной политики в России с учетом ограниченности сфер ее продуктивного применения.

Ключевые слова: кластер; координация; межфирменные взаимодействия; конкурентные преимущества; сравнительные преимущества.

Финансирование: Исследование проведено при финансовой поддержке экономического факультета МГУ им. М.В. Ломоносова (исследовательский проект «Применение методов сетевого анализа институциональных факторов становления и развития производственных кластеров»).

Дата поступления статьи: 21 сентября 2021 г.

Ссылка для цитирования: Tambovtsev V.L. (2022). Clusters: Coordination, inter-firm relationships and competitive advantages // Управленец. Т. 13, № 1. С. 20–36. DOI: 10.29141/2218-5003-2022-13-1-2.

INTRODUCTION

Research into clusters as real-life phenomena that have positive economic implications for their participants began over thirty years ago, first in the world scientific literature [Porter, 1990; Martin, Sunley, 2003; Brenner, 2004] and then followed by the Russian academic society [Tolstikova, 2006; Shastitko, 2009; Markov, 2015]. Initially concentrated on individual clusters and theoretical generalizations, researchers gradually shifted their interest to the field of applied economic analysis and the development of recommendations for politicians and practitioners[1] (Bergek, Norrman, 2008; Artamonova, Khrustalev, 2013; Nikolaev et al., 2014; Barsukov, Kudryashov, 2014). At the same time, a whole range of theoretical issues with tangible practical implications have remained poorly investigated, notwithstanding that some of the statements made in the literature have become widespread in science and in practice.

There are numerous theoretical interpretations of clusters associating them with one or another concept. For example, Gordon and McCann [2013] juxtapose three typical forms of clustering such as pure agglomeration, the industrial-complex model, and the social network; however, more research is needed in term of their ratio for different types of clusters. Clusters are tackled as complex systems and structures, and this analysis serves as a basis for formulating strategies for their creation and functioning [Kleyner, Kachalov, Nagrudnaya, 2007; Agafonov, 2010]. The cognitive [Morosini, 2004; Giuliani, 2007] and evolutionary [Pouder, St. John, 1996] approaches to studying clusters, as well as their institutional projection [Gareev, 2012; Bochkova, Kuznetsova, Sidorov, 2014; Akinfeeva, Erznkyan, 2014; Maksimova, Milyaev, 2016] are widely debated in the literature. In addition, clusters are analysed from the sociological point of view [Tarasenko, 2013].

The interpretation of clusters as a form of territorial organization of production [Tolstikova, 2006; Shastitko, 2009] associated with quasi-integration processes [Dolgova, 2019] has gained widespread acceptance among researchers. Clusters are also characterized as hybrids [Ménard, 1996] and meta-organizations [Gulati, Puranam, Tushman, 2012].

The arguments put forward in the abovementioned works suggest that the corresponding interpretations have the right to exist. However, there is still an open question about which of them is the most *productive*, that is the one that provides *convincing explanations* for the facts revealed in numerous empirical studies on clusters that have been widely undertaken in the last two decades. These explanations, in turn, create the basis for formulating *policy recommendations* characterized by high effectiveness of the strategies and measures being justified.

[1] OECD. (2007). Competitive Regional Clusters: National Policy Approaches. Paris: OECD; Committee of the Regions. (2010). Clusters and clustering policy: A guide for regional and local policy makers. Brussels: EC.

Thus, in the context of the current theoretical foundations of the cluster concept, primarily production ones, there is a gap between the existing diverse interpretations of these real-life phenomena and their synthesis that would allow identifying clusters' distinctive features and integrating them with the mentioned alternative readings, thereby expanding the foundations for practical advice.

Hence, the present research aims to develop and substantiate a theoretical model of clusters that would regard alternative interpretations and empirically observed peculiarities of real clusters as implications logically deriving from this model.

In the next section, we analyse the concept of coordination of individuals actions, variants of its model and coordination methods, as well as a range of related concepts. Next, we scrutinize the link between clusters and competitive advantages, which will create the basis for developing an operational definition of the concept of a cluster. Finally, we formulate conclusions to be taken into account when conducting economic policy on supporting the industrial clusters' formation.

THE CONCEPT OF COORDINATION, MODEL VARIANTS AND MECHANISMS

We believe that the concept of coordination plays a central part when dealing with the issues discussed above. Similar to many, if not all, terms widely used in the social and economic sciences, this concept has numerous different interpretations, which sometimes differ quite significantly. In-depth analysis of this variety is provided in [Vlasova, Molokova, 2019]. The present research focuses exclusively on a number of particular aspects.

It is worth emphasizing that, based on the objectives of our study, we do not aim to discuss "coordination in general", which exists due to the diversity and universality of feedbacks in both living and non-living surroundings [Heylighen, 2016], but focus on coordination of individuals in the economy instead. One cannot fail to notice that the general basis for the emergence of the possibility or the need to coordinate activities is the existence of alternative courses of action for individuals that can lead to various positive or negative consequences both for themselves and other people, which the actors can be aware of or not. It is noteworthy that coordination of actions is often interpreted in a simplistic manner, as a phenomenon that occurs exclusively when individuals pursue common goals. As put by Malone and Crowston [1990, p. 361], "… we will use the following narrow definition of coordination: the act of managing interdependencies between activities performed to achieve a goal." According to Hoetker and Mellewigt [2009, p. 1026], "coordination addresses the pooling of resources, the division of labour across partners, and the subsequent integration of the dispersed activities, all of which are critical to the generation of value in an alliance."

Meanwhile, in many situations it is rather difficult to talk about the existence of a *common* goal despite the fact that there is an obvious coordination of actions, e.g. a hockey match or the conclusion of a contract. In both cases, the goals of the parties are *opposite*, but one of them takes into account the *expected actions* (and their consequences) of the other when arriving at their decisions, and vice versa. Moreover, in some situations, an individual considers the possible consequences not of the actions of specific people, but of natural and social phenomena or processes, i.e. *coordinates* his/her behaviour according to the changes in the environment, such as an approaching hurricane or a government-imposed ban on a particular product.

Thus, the *presence* of a goal (intention, aspiration, desired result, etc.) is a necessary condition for coordination to exist; however, the coordinated subjects can strive for different, or even opposite, goals. Among the sufficient conditions for coordination are, firstly, the ability to prognosticate other people's actions and their consequences, and secondly, the benefits from the implementation of a coordinated action exceeding the costs of it, including the opportunity costs of activities that the individual refused to perform by making a decision to coordinate their behaviour.

Hence, it appears that, even if the need for coordination seems obvious to an outside observer, individuals do not always harmonize their own actions with the actions of other people and take into account the arising consequences. For example, a person may take an action that negatively affects others without realizing possible outcome. An individual who is aware that the action he/she intends to take is potentially harmful to other people may refuse to coordinate it with them, because they are sure that their potential for violence will allow them to resist the retaliatory actions aimed at punishing them for the damage inflicted, etc.

The above points allow us to characterize the general model of actions' coordination. Most actions implemented on the basis of decisions aimed at accomplishing certain objectives, achieved or not, can also lead to various consequences that the subject of the decision was unable (failed, or did not want) to foresee when arriving at their decision. For other people, these consequences can be both positive and negative. In the first case, the "recipient" of the consequences enjoys the favourable outcome, while in the second case, a conflict with the actor is possible to receive some kind of compensation for the damage caused. In this regard, it is more rational for the subject of the decision to try to foresee the consequences of their options in order to choose the one that will cause the least negative (or acceptable) outcome for others[1].

Such an assessment of the consequences is useful not only in relation to other people, but also to natural processes. That is why it can be considered a universal way for individuals to adapt to the environment, including the social one, and thus viewed as a *general (universal) model* for coordinating individuals' actions. In this regard, it is important to emphasize that, as evidenced by empirical studies [Bargh et al., 2012; Zhao, Al-Aidroos, Turk-Browne, 2013], the ability to anticipate consequences based on the unconscious identification of *regularities* is typical of the brain of both humans and animals[2]. In other words, coordination based on the ability to detect regularities in the environment is virtually omnipresent, since the propensity to it has always created evolutionary advantages allowing one to avoid damage and use limited resources more efficiently.

Thus, we propose the following definition of the concept of *coordination*: this is consideration by individuals of immediate consequences of both their choices and the processes expected or ongoing in the external environment, including the consequences of other peoples' actions.

Such consideration, i.e. choosing a course of actions in a situation where the expected or ongoing action of another individual as well as the processes in nature and society are included in the composition of choice constraints, can be carried out either independently, at will, or be prescribed by a third party. These options explain the (co)existence of *two models of coordination*: voluntary and directive.

In economics, the former is often correlated (or even identified) with markets, while the latter is associated with hierarchies, i.e. organizations, such as firms or states. However, such a comparison does not seem correct. Firstly, in reality, each of these models exists in the form of various mechanisms that effectively operate under different conditions. Secondly, for this reason, in real markets and organizations the mechanisms implementing both models are used.

The opposition between market and organization (hierarchy) has a rather long history. It emerged in the mid-1930s as part of the discussion about the relationship between national planning of the economy and the free market, or about socialism and capitalism [Lange, 1936; Shleifer, Vishny, 1994]. Oliver Williamson [1975] is among the main contributors to the transition from a specific type of organizations – the state – to their wide variety, including firms. The economist has also changed the language of the discussion by embracing the concepts of transaction costs and asset specificity, which made it possible to interpret both phenomena as alternative governance mechanisms of economic exchanges coordination. According to Williamson, if a transaction occurs often enough and requires significant amounts of specific investments, and its results are characterized by uncertainty, then such a transaction will most likely be carried out

[1] As noted above, individuals with a high potential for violence can neglect such foresight.

[2] Although expressed differently in different species.

within hierarchically organized firms. Conversely, if the results of exchanges are quite unambiguous, transactions are not repeated and do not require specific investments, they will most likely occur in the markets.

A number of proponents of this position came to the conclusion that the variety of forms of exchanges coordination could be viewed as points on a scale, one pole of which was the market, and the other was the hierarchy; there were various intermediate or hybrid forms lying between the poles [Thorelli, 1986; Powell, 1987; Koenig, Thietart, 1988].

However, the validity of such a scale was soon questioned. "The idea that economic exchanges can be usefully arrayed along a continuum is thus too quiescent and mechanical. It fails to capture the complex realities of exchange. The continuum view also misconstrues patterns of economic development and blinds us to the role played by reciprocity and collaboration as alternative governance mechanisms. By sticking to the twin pillars of markets and hierarchies, our attention is deflected from a diversity of organizational designs that are neither fish nor fowl, nor some mongrel hybrid, but a distinctly different form" [Powell, 1990, p. 299].

We believe that the mentioned poles are nothing more than "ideal types", or models, and the actually existing coordination mechanisms are positioned between them. Thus, networks are widespread within the empirical, rather than theoretical markets, whereas internal markets [Helleiner, Lavergne, 1979; Ellig, 2001] and networks [Yeung, 2005] are actively used within numerous firms. Thus, the poles of the scale turn out to be hybrids themselves.

Despite being inconsistent with the realities of the economy and, as shown, incorrect, the concept of hybridity as a combination of "perfect" markets and hierarchies has become widespread among economists [Foss, 2003; Ebers, Oerlemans, 2016], including the interpretation of clusters as a type of hybrid exchange organizations [Menard, 1996].

INTER-FIRM RELATIONSHIPS AND CLUSTERS

As indicated in the generally accepted Michael Porter's definition of cluster, this is "a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities" [Porter, 2000b, p. 16]. However, the interdependence and interaction between firms – at least within a particular group, as well as with various organizations such as banks, universities, etc. – are typical of virtually all firms, especially when it comes to those located in close proximity to each other. Does this mean that, if the above definition is followed strictly, clusters are *universal*, and any economy consists exclusively of clusters?

It is commonly known that in the "standard" microeconomic theory any "normal" firm not seeking to enter into anticompetitive collusion with others is assumed to have only two types of relationships – with buyers of its products, and with sellers of the resources it needs. Notably, the composition of both buyers and sellers can constantly change depending on price fluctuations and the budgetary constraints of market participants, since both types of inter-firm transactions result from *competition*. All firms compete with each other for buyers, and the markets, in which exchanges are carried out, are impersonal, where sellers and buyers do not know each other. Therefore, long-term relationships emerging between firms and other organizations were usually seen as something potentially non-market and violating the freedom of competition.

However, almost half a century ago, George Richardson called this approach a "distorted view" of how markets work. He emphasized that any industry is organized in one way or another, and price mechanism coordination is complemented by varying degrees of coordination through cooperation: "… we must not imagine that reality exhibits a sharp line of distinction; what confronts us is a continuum passing from transactions, such as those on organized commodity markets, where the co-operative element is minimal, through intermediate areas in which there are linkages of traditional connection and goodwill, and finally to those complex and inter-locking clusters, groups and alliances which represent co-operation fully and formally developed" [Richardson, 1972, p. 887].

Richardson believes that inter-firm cooperation provides a way of coordinating economic activity, which is alternative to both hierarchical and market structures. According to the economist, it is necessary to distinguish between inter-firm cooperation and purely market transaction. The relationships within the former are "close, complex and ramified" [Op. cit., p. 891], while the latter, on the contrary, does not imply long-term relationships, can be characterized by opportunism, and represents isolated purchase and sale actions [Ibid.]. It is easy to notice that such a position is close to the concept of Ian Macneil, who distinguished between classical and relational contracts [Macneil, 1978], in which the latter exactly corresponds to the phenomenon of inter-firm cooperation.

Richardson considered any industry as a composition of a large number of interconnected activities, such as production, sales, marketing, research, development, design, etc., which for each firm in the industry can be both similar and complementary in relation to the activities of others firms [Richardson, 1972, pp. 888–889]. Similar activities require the same resources and competencies, while complementary activities represent different stages of the production process and need to be coordinated. Such heterogeneous processes implemented within an industry give rise to inter-firm cooperation.

These provisions attracted the attention of a large group of young marketing researchers, mostly from Eu-

rope, who in the mid-1970s united to set up *the Industrial and Marketing Purchasing Group*, or *IMP Group*[1]. According to Malcolm Cunningham, one of the founding fathers of the Group, the reason behind this collective action was their dissatisfaction with the explanatory power of marketing theory, which was deeply rooted in neoclassical microeconomics treating markets as atomistic and faceless. This understanding also extended to the corporate segment of the market (business-to-business (B2B) markets), although the practical experience of the marketers united in a group clearly showed that this segment was neither atomistic nor faceless for its participants [Cunningham, 1980].

Supporters of the Group highlight that establishing any inter-firm relationships is an expensive and time-consuming process; these relationships constantly need investment that would be applied for either their development or termination [Hakansson, Snehota, 2000]. Easton [1992] identified two factors that are critical to the development of inter-firm interactions, these are expectations of both parties of the relationships to be beneficial, and the complementarity or compatibility of the goals pursued by them. It is clear that the profitability here is the resulting utility exceeding the costs incurred in forming and maintaining business relationships, whose utility is primarily associated with gaining access to particular resources [Gulati, Gargiulo, 1999].

Due to the variety of resources, the need for which may arise most unexpectedly, the overall attractiveness of the company is also important for the impulse to forge business relationships. However, the company's *to-be-attractive* property implies a certain limitation of its freedom of choice. According to Hakansson [1989, p. 124], "The company that possesses no relationships is theoretically free to enter into collaboration with anyone at all, but in fact it is difficult to find anyone who is interested. The company that has already entered into a number of relationships will find it much easier to interest a partner, but its choices will be far more limited. (…) In general, established relationships are a vital condition for the initiation of [further] successful collaboration."

Inter-firm relationships evolve over time; they develop as the parties make investments and derive benefits from them. The relationships fade if investments become unilateral and benefits are asymmetric [Uribe, Sytch, Kim, 2020]. Trust, commitment and expectations of future interactions are important development factors: "Trust is a necessary condition for commitment and commitment only makes sense if tomorrow matters" [Hakansson, Snehota, 1995, p. 198].

The variety of relationships between different firms indicates that within economic industries and between them, there are not just paired ties, but *business networks* existing and evolving [Sheresheva, 2006]. These forms of inter-firm interactions display the following characteristic features. Firstly, they are the result of multiple interactions between different firms, rather than created by any firm and then superimposed on others. Secondly, business networks are not transparent for firms, each of which has its own, not necessarily similar to others, ideas about commitments, resources and activities of other network participants, i.e. about the overall structure of the network. Thirdly, business networks are decentralized, i.e. they do not have companies that would act as leaders in inter-firm interactions. Fourthly, boundaries of business networks are not clearly defined, their participants are absolutely free to enter into new collaboration with anyone, connect new partners with the old ones, etc.; in other words, business networks are basically limitless [Hakansson, Johanson, 1993].

What types of resources, access to which attracts participants in business networks, could be thought of as the most in demand? Zaefarian, Henneberg and Naudé [2011] conducted an empirical analysis of nearly 700 companies in the USA and identified five main resource acquisition strategies, such as money, new market, utilization, intellectual, and credibility bonds. The distribution of these strategies is not dependent on the kind of industry; various mixed strategies are applied as well.

It is easy to notice that the state can support or even provide access to the mentioned types of resources, which is why it is of great importance for firms to interact with regional authorities for economic management and regulation [Correia, Brito, 2016]. As rightly stressed by the authors, the emergence and development of this kind of relationships depends on whether or not there is *relational compatibility* between firms and the regional bodies. This concept has been used in business network analysis since the late 1990s [Masciarelli, 1998]; however, it was intuitively interpreted as a firm's ability to develop close inter-firm ties and did not require operationalization. An attempt to refine the concept was carried out about twenty years ago, when the relational compatibility of organizations was proposed to be considered dependent on three factors: competence, distance, and continuity [Trimarchi, 2002]. *Competence* (or reputation) consists of two components – technical and commercial. The former indicates whether there are technical skills that allow the successful use of resources, and the latter shows the presence or absence of the skills to ensure cost-effective functioning. *Distance* characterizes the degree of compatibility between the interacting organizations and consists of six elements: social, geographic, time, technological, commercial and psychic. *Continuity* (or frequency) evaluates the duration of the relationship, the frequency of contacts and transactions, etc. The combination of these factors in comparison with similar ones of partners will indicate the level of their relational compatibility and, as a result, the likelihood of the organization's *voluntary* inclusion in the network.

[1] Obviously, the name is a play on words evoking associations with an *imp*, a mischievous child.

Firms operating in the same territory (or, to be more precise, the heads of these firms) may not interact with each other for one of three reasons:

- They are unaware of each other's existence;
- They know each other but struggle to think of any benefits from the interaction;
- They know each other, recognize the possible benefits, but they also see negative consequences that can outweigh the gains.

The third case corresponds to the low relational compatibility of the mentioned firms. For geographically proximate firms, the lack of relationships most likely indicates the psychological incompatibility of managers, and the emotional unacceptability of direct communication for them. For instance, empirical analysis showed that inter-organizational collaboration within innovation clusters is not only associated with interpersonal relationships, but most strongly correlates with the mutual emotional attractiveness of the organizations' leading employees [Basov, Minina, 2018].

As for the interactions between the firms located in a particular region and its authorities and local self-government bodies, it is easy to see that the range of incompatibility sources for these potential partners increases significantly. It can be argued that it is possible for firms to overcome this incompatibility only if these bodies are able to provide access to the most significant, i.e. financial, resources. However, such a possibility is rather vague due to budgetary legislation and constraints, which is why the access will most likely be of temporary nature. This means that territorial networks emerging as a response to certain programmes of participating firms financial support will exist for as long as this support is provided – of course, if the network or some parts of it did not arise earlier and spontaneously according to the partners' voluntary decisions.

However, as highlighted at the beginning of the section, such voluntary networks can lead to distortions of competition. Baumol [2001] outlined the clear boundaries of inter-firm relationships, which were *acceptable* from the standpoint of the social well-being growth. The researcher stressed that negative consequences for the economic growth and development arose when firms *coordinated* product prices, i.e. undermined the price mechanism of market coordination. Other intercompany relationships that did not involve such a coordination directly – primarily, the information exchange affecting innovation processes in the economy – could have a quite positive effect on the level of public well-being.

At the end of the brief overview of inter-firm relationships, it is worth noting the following. The generally accepted definition of clusters formulated by Porter is a characteristic of its *observed* features. This interpretation is quite in line with the object of identifying clusters among many different firms operating in the same territory. However, it has little to do with the *nature* of this set of interacting companies, which was decided to be called a "cluster". The definition does not cover clusters' special features that distinguish them from other groups of firms, such as alliances or strategic alliances that interact with each other in the course of their functioning. The very fact of the emergence of spontaneous relationships between firms suggests that their leaders found (created or guessed) some ways to positively influence each other, while their competitors failed to take actions that would "cancel out" the work of these channels.

COMPETITIVE ADVANTAGES OF CLUSTERS

The differences between clusters and other forms of inter-firm interaction are sometimes associated with the fact that clusters create advantages for their participants. According to Cortright [2006, p. iv], "An industry cluster is a group of firms, and related economic actors and institutions, that are located near one another and that draw productive advantage from their mutual proximity and connections." Cortright discusses specifically productive, but not competitive advantage; however, it is clear from the context that we are talking about the latter. A more recent publication of the Brookings Institution provides another concise and clear definition: "Industry clusters are groups of firms that gain a competitive advantage through local proximity and interdependence" [Donahue, Parilla, McDearman, 2018, p. 2].

However, competitive advantages (CAs) as such cannot be considered specific to clusters as varieties of inter-firm relationships: their presence has been established for alliances [Gomes-Casseres, 2003], strategic alliances [Prashant, Harbir, 2009], ecosystems [Williamson, De Meyer, 2012], and other types of related firms [Lavie, 2006].

To comprehend the correlation between competitive advantages and the level of functioning (profitability) of a firm, it is important to establish the kind of companies in relation to which the firm under study can have CAs. If its competitors are local players demonstrating poor performance compared to market leaders, then the firm may have significant *comparative* CAs, but at the same time show an overall low level of functioning (or efficiency) in the market for this product. The influence of clusters on comparative advantages of firms has been emphasized for a long time [Rodriguez-Clare, 2007], but has not received widespread support: researchers stick to a different interpretation of competitiveness [Ketels, 2013], although there are works devoted to assessing the comparative advantages of clusters [Bhawsar, Chattopadhyay, 2018].

A comparison of properties displayed by different sets of firms with the cluster characteristics indicates that the distinctive feature of the latter is their participants' *territorial proximity*, or their co-localization[1]. This attribute

[1] Hence, it appears that the identification of regional firms from industries with significant connections in the input-output models does not necessarily indicate the presence of clusters.

draws attention to the phenomenon of *agglomeration economies*. As known, it was first pointed out by Alfred Marshall at the end of the 19th century. He distinguished between the following economies from co-locating firms engaged in related industries [Marshall, 1890]: (1) skilled local labour pool, (2) unfettered access to non-traded local inputs (e.g. supply chains or infrastructure), and (3) information spillovers. Later, the mechanism of the positive externality of co-localization was rediscovered by Arrow [1962] and Romer [1986], which gave grounds to Glaeser et al. [1992] to speak of the Marshall-Arrow-Romer (or MAR) externalities.

The specificity of MAR externalities is that they are not of an "automatic" nature, i.e. do not appear in every case of firms' territorial coexistence [Faggio, Silva and Strange, 2017; Proost, Thisse, 2019; Wang, 2021]. With regard to clusters, Porter [2000a, p. 264] noted: "The mere presence of firms, suppliers, and institutions in a location creates the *potential* for economic value, but it does not necessarily ensure the realization of this potential. Many of the competitive advantages of clusters depend on the free flow of information, the discovery of value-adding exchanges or transactions, the willingness to align agendas and to work across organizations, and strong motivations for improvement." This is also clearly indicated by empirical evidence obtained by researchers from different countries and regions: for instance, the first two sources of positive externalities may stop operating with an increase in the number of firms located in the territory. Such a rise can enhance competition between them for workers and other resources to such an extent that it will cause an increase in wages and prices for the resources used, which will naturally reduce competitiveness [Grashof, Fornahl, 2021].

In recent decades, the third source of agglomeration economies has been exposed to a variety of information technologies that significantly simplify the information exchange between firms distant from each other; however, some economic interactions are still more productive if communication is direct [Bathelt, Turi, 2011]. As noted by De Vries and Hospers [2006], territorial proximity reduces transaction costs incurred in searching for information (in our opinion, primarily implicit or tacit) that may cover a wide range of issues, but above all – for ideas, which are so important for firms cooperating in the field of innovation.

In general, as the analysis shows, the expansion of IT-based communication capabilities, as well as globalization processes, including the growing opportunities for global outsourcing, are far from nullifying MAR externalities [Ruiz-Ortega, Parra-Requena, García-Villaverde, 2016], although changes in the importance of co-localization factors occur over time [Diodato, Neffke, O'Clery, 2018].

In the theoretical model of industrial clusters by Thomas Brenner, the heterogeneity of MAR externalities and their changes are reflected in the presence of a *bifurcation point* in the dynamics of inter-firm relationships. Under certain conditions, the set of firms can move into a "low" equilibrium, where the presence of relationships does not lead to competitive advantages and growth. At the same time, under other conditions a "high" equilibrium may arise, which means the emergence of a cluster that has economic advantages compared to sets of firms that are not located in territorial proximity and do not interact with each other [Brenner, 2004].

The conditions leading to a "high" equilibrium – the emergence of industrial clusters – are quite diverse [Brenner, Mühlig, 2013], although researchers pay special attention to the third source of MAR externalities [Malmberg, Maskell, 2002; Håkanson, 2005), i.e. information spillovers and knowledge dissemination.

It is obvious that knowledge underlying agglomeration economies and competitive advantages of clusters can be of different content. For example, this can be information about resource suppliers and customers, details about valuable local resources possessed by some of the cluster members, knowledge about how to influence municipal or regional leaders, etc. All of these can be useful for creating advantages for cluster members, regardless of the industry they operate.

One of the types of knowledge that spreads within clusters is information about technologies and new resources and products. In today's conditions, as evidenced by numerous empirical studies, they are becoming especially significant for high-tech industries, or knowledge-based industries. The fact that the manifestations of agglomeration economies differ in high-tech and low-tech industries was established several decades ago [Goss, Vozikis, 1994] and confirmed in subsequent studies. For instance, Henderson [2003] demonstrated that externalities of local information spillovers increased productivity effects in high tech but not other industries. McCann and Folta [2011] found that firms with higher knowledge stocks benefited more from agglomeration. According to Gornig and Schiersch [2019], agglomeration economies have the largest effect on total factor productivity for firms in high-tech industries, whereas they have no significant effect on TFP in low-tech industries. The recent meta-analytic study by Grashof and Fornahl [2021] produced similar results. At the same time, it is important to emphasize that low- and medium-tech industries do not lose their significance in the context of modern economy, since they make the most meaningful contribution to the population well-being and economic growth [Hansen, Winther, 2015]. They just find sources of their competitive advantage in the niches other than information flows in MAR externalities that encourage high-tech innovations forming competitive advantages for their manufacturers [Hirsch-Kreinsen, Jacobson, Robertson, 2006]. Thus, empirical analysis has shown that all the mechanisms of agglomeration economies were supported while keeping input-output link-

ages particularly important [Ellison, Glaeser, Kerr, 2010], which was important for low-tech industries.

Information spillovers, which were found to be of special importance for the significant MAR-effect to emerge, could not but give rise to a knowledge-based theory of geographical clusters [Maskell, 2001]. According to the theory, co-located firms within related industries enhance the ability to create knowledge by variation and a deepened division of labour, which results in extensive labour exchanges. At that, research studies highlight the importance of informal contacts between employees in different firms [Tallman et al., 2004; Dahl, Pedersen, 2004].

It should be noted that when analysing clusters, researchers also emphasize the presence of specific – *relational* – sources of competitive advantage [Dyer, Singh, 1998; Rothaermel, 2001; Lavie, 2006]. The relational view can be regarded as a development of the resource-based view of the interpretation of firms' functioning and development. The difference lies in the fact that significant resources, rooted in inter-firm relationships, can be located *outside* the boundaries of firms. Such resources that affect competitive advantage usually include relation-specific assets, knowledge-sharing routines, complementary resources and capabilities, and effective governance. These types of resources act as sources of relational rent, that is profit generated as a result of exchange relationships between firms, and it cannot be created by any of them independently. Thus, relational rents are the result of *cooperation* between firms located in a particular cluster [Gohr, Viana de Oliveira, 2019]. Undoubtedly, cooperation can be risky [Singh, Mitchell, 1996], but the expected benefits from it make it usually quite attractive for firms that decide to become members of clusters.

CLUSTERS AND CLUSTER INITIATIVES PERFORMANCE

The above analysis of the conditions and economic implications of the functioning of geographically proximate groups of interrelated firms and other organizations shows that not all of them are, or can become, sources of growth and development of regional and national economies. At the same time, "… policy-makers the world over have seized upon Porter's cluster model as a tool for promoting national, regional and local competitiveness, innovation and growth" [Martin, Sunley, 2003, p. 5].

Total clustering of different economies has begun in the 2000s. As evidenced by the global practice, cluster policies have diverse forms and directions. The most widespread of them are the so-called "cluster initiatives", i.e. "organized efforts to increase growth and competitiveness of clusters within a region, involving cluster firms, government and / or the research community" [Sölvell, Lindqvist & Ketels, 2003, p. 9]. In the early 2000s, in Sweden there were four different models of regional cluster initiatives: (a) industry-led initiatives aimed at building competitiveness and competence within an existing base; (b) top-down public policy exercises in brand-building; (c) visionary projects to produce an industry cluster from "thin air"; (d) small scale, geographically dispersed, natural resource based, temporal clusters that link or dip into global rather than national systems, sources of innovation and competitive advantage [Lundequist, Power, 2002].

Cluster initiatives were primarily focused on the creation of "artificial" clusters, or *cluster organizations*. Their key objective was to coordinate the participants' actions in order to encourage their cooperation, support innovation and enhance the attractiveness to draw external resources, such as foreign investment, skilled workers, know-how, and financial capital [Davies, 2001]. At that, 60% of approximately 1,400 cluster organizations established since the 1990s in the global economy had public financing [Ketels, Lindqvist, Sölvell, 2012]. As demonstrated empirically, member entities in clusters established with public support do not achieve a better level of financial performance in comparison with those created bottom-up, without any direct public support [Žižka, Pelloneová, 2019].

According to Fromhold-Eisebith and Eisebith [2005], there are two general cluster initiatives models: *explicit* cluster policies implemented top-down by regional authorities to set up cluster organizations, and *implicit* initiatives that are organized and financed bottom-up by groups of firms. The comparative analysis of them allowed identifying the strengths and weaknesses of both approaches. The authors could not conclude that the one was unequivocally superior to the other. Probably the most preferable option is when top-down support is provided to a group of firms that build relationships on their own initiative and face obstacles that are difficult for them to overcome without the assistance of regional authorities.

In different countries, cluster policy took different forms. For instance, in Spain it was aimed at creating cluster associations based on the development of public-private partnerships [Konstantynova, 2017]. The Super Cluster strategy initiated in Thailand in 2015 shared more common characteristics with special economic zones [Kowalski, 2020].

Undoubtedly, state support is always perceived positively by business, especially in countries with developing market economies [Galaso, Rodríguez Miranda, 2021]. However, it is not always provided in the amount and forms sufficient for the recipient firms to acquire sustainable competitive advantages. Answering the question whether the government can create a vibrant cluster, Vernay, D'Ippolito and Pinkse [2018] came to the following conclusions: "government-supported clusters can self-organize if members are given the opportunity, but with the consequence that it becomes difficult for the government to fully control such clusters." If the government

decides to keep full control, such a cluster will require constant support, which will have an adverse effect on its competitiveness.

The cluster policy pursued in countries does not always take into account which industries are the most "responsive" to the agglomeration economies. Therefore, clusters are quite often introduced in low-tech industries, which is unlikely to lead to significant economic results. For example, when analysing plastics and textile industries in the Czech Republic in the period of 2009–2016, Pavelkova et al. [2021] failed to confirm any significant influence of firm localisation in natural cluster or membership in the cluster organisation on financial performance for firms in studied sectors.

The duration of various cluster policy measures and the ambiguity of the practical results lead to the emergence of numerous studies that formulate diverse recommendations for improving and developing the policy tools. For example, Schmiedeberg [2010] analyses the approaches to evaluating cluster policy. Wolman and Hincapie [2015] question and criticize the assumption widely shared in the cluster theory that the mere fact of being in a cluster benefits the participants, as well as the entire region.

It should be noted that not all recommendations for the development of cluster policy have sufficient scientific grounds. For instance, in order to support regional production clusters, Smirnova and Shastun [2020] argue for limiting exports of some rare natural resources. They suppose that foreign producers are more competitive, and members of Russian clusters are not always able to purchase the raw materials for processing. However, the authors are silent about what will motivate Russian processors of these resources to enhance their competitiveness if they get raw materials without any efforts on their part. Economists are unanimous in their view that restricting competition cannot increase competitiveness.

CONCLUSION

Analysis of clusters regarded as groups of interconnected organizations implementing MAR externalities as sources of competitive advantages gives reason to separate them from other similar groups, primarily regional systems of interacting firms. If firms and other organizations operating in a particular territory form a network, but comparative competitive advantages do not appear, then such a network can hardly be called a cluster, interpreted as a tool for enhancing the competitiveness of firms and the region as a whole. In the same vein, one cannot speak of a cluster on the basis of an exchange network available between firms or their groups, which can be detected by analysing the links in the input-output model. After all, the distinguishing feature of clusters is the competitive advantages of their participants; therefore, the presence of such links gives grounds to talk about the *potential* for the emergence of a cluster, which is considered to be realized if certain firms gain a "group-wide" competitive advantage[1].

Another conclusion concerns the definition of the term "cluster". Many researchers highlight the fact that there is a lack of a common or generally accepted definition of this concept; however, the question of offering a clear interpretation is hardly discussed. The definition of any concept is such a description of its essence that allows one to *exclude* some objects from it that are parts of *other concepts* but somewhat similar to its own elements. For instance, the description of clusters as a form of territorial organization of production [Tolstikova, 2006; Shastitko, 2009] cannot be seen as a definition, since there are *many different forms* of such organization. For the same reason, the interpretation of clusters as meta-organizations cannot also be considered as a definition [Gulati, Puranam, Tushman, 2012].

We believe that clusters can be explained as a set of co-located and interconnected firms and other organizations that seek to provide agglomeration economies and relational sources of competitive advantages. If such purposes are fulfilled, there emerges a successful cluster; if not, a typical regional system of interrelated firms is in operation.

The coordination of clusters is based on a relational, often verbal, contract that ensures the conclusion of an indefinite number of classical contracts, and an important means of protecting them from violations is the refusal to conclude subsequent contracts. Clusters emerge and disintegrate in *market economies*, since in other economic systems, such as centrally planned ones, we can speak of competitive advantages only metaphorically as competition in them is of a different content than in market systems[2].

As for cluster initiatives and state cluster policy, our analysis has showed that any form of the latter, which involves financial and other support for the participants in organized clusters, is of use for them. However, it does not necessarily lead to an increase in their global competitiveness, since it can be utilized by firms to survive exclusively in the local institutional environment. Thus, pursuing comprehensive cluster policy and supporting widespread cluster initiatives cannot be considered a productive way to enhance the competitiveness of the national economy. For this purpose, *selective* policy that provides for the mechanism for implementing agglomeration economies can be used. ■

[1] At the same time, as if forgetting their own position regarding clusters as "generators" of competitive advantages, Michael Porter and colleagues write about the algorithm for identifying clusters by *analysing intercompany relationships* [Delgado, Porter, Stern, 2016].

[2] Therefore, the interpretation of territorial production complexes (TPCs) as objects similar to clusters (see, for example: [Drozdova, 2011; Nosov, 2018]) cannot be considered correct: "TPCs formed in the Russian Federation are in many respects identical to clusters, but in today's market conditions they do not serve the key purpose, i.e. improving competitiveness" [Dondokov, 2015, p. 384].

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