

**Clusters and Territorial-Industrial Complexes:  
Similar Approaches or Different Concepts?  
First Evidence from Analysis of  
Development of Russian Regions**

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**Abstract**

In this paper the correlation between the cluster concept and the concept of territorial-industrial complex (TIC) is discussed. The cluster has been attracting a special attention of scholars and policymakers since almost 15 years due to considerable contribution of its theoretical results to raising national and regional competitiveness. The concept of TICs were elaborated by Soviet regional economists and economic geographers in 1920-1980s that realised the idea of optimisation of industrial production within a certain territory in the planning economy according to its endowments of natural and labour resources. An analytical framework is used to compare these two approaches: we distinguish three main schools of the competitiveness theory and identify a system of main competitiveness factors with spatial forms of R&D and production organisation that form regional innovation systems as a basis of national competitiveness. This paper argues that the cluster concept and the concept of TICs differ fundamentally at least in seven criteria though, at first sight, they seem to be similar theoretical construction. A particular attention is paid to the development of clusters in Russia as a one of key elements of regional innovation systems and their interaction with TICs. Finally, a classification of spatial forms of R&D and production organisation with two dimensions is proposed.

Keywords: regional cluster, territorial-industrial complex, regional competitiveness, Novosibirsk IT-cluster, dual spatial economic structure

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## **Introduction**

The cluster concept has been attracting a special attention of scholars and policymakers since almost 15 years due to considerable contribution of its theoretical results to practical rising of national and regional competitiveness. The concept of territorial-industrial complex (TIC) elaborated by Soviet regional economists and economic geographers in 1920-1980s realised the idea of optimisation of industrial production within a certain territory in the planning economy according to its endowments of natural and labour resources. At the first sight, these two concepts have many things in common, but in reality they have many differences. The problem of a correlation between clusters and TICs is vital question for practical application of both concepts in the Russian economy, because a use of these two notions without any differences this may lead to unsatisfactory results of cluster policies and general raising national competitiveness in the world economy.

The paper is structured as follows. In the first section we identify three leading schools of the competitiveness theory and consider briefly the main stages of development of the concept of clusters and TICs. In the second sections the differences between clusters and TICs are distinguished. An analytical framework for studying of competitive forms of production organization as a key tool for national and regional competitiveness upgrading is proposed in the section three. In the fourth section the prospects of regional cluster development in Russian economy and a case study of Novosibirsk IT-cluster are analyzed. Finally, in the fifth section the classification of spatial forms of R&D and production organisation is proposed and the future development of clusters and TICs in Russia is discussed.

### **1. The schools of the competitiveness theory and development of a cluster concept and a concept of TIC**

Generally we distinguish three main theoretical schools (groups of researchers) that have formed and developed the theory of competitiveness in the world economy and enrich each other – American, British, and Scandinavian ones (Pilipenko 2003a, 2003c, 2005b). We made such division due to an influence of social and economic environment, and the economy's territorial organisation of those countries, where investigations were carried out, on the main conclusions of these concepts.

We identify the *American school* of the competitiveness theory formed by M. Porter, M. Enright and other scholars, which is mostly oriented on praxis and policy-

making of competitive development of nations with different standards of living (Porter, 1990a, 1990b, 2001, 2003; Enright, 1993, 2002). *The Britain school* pays more attention to the role of TNCs as one of the main drivers in the development of international division of labour and the changing position of developing economies in the competition processes. J. Dunning, who created the eclectic OLI paradigm (Dunning, 1981, 1993), J. Humphrey, R. Kaplinsky, H. Schmitz, who investigated the interaction of global value-chains and local clusters (Kaplinsky, 2000; Kaplinsky and Readman, 2001; Humphrey and Schmitz, 1995, 2000, 2002), and Ch. Freeman (Freeman and Perez, 1998), formed this school. We identify the *Scandinavian school* according to four groups of theoretical works of Danish, Finish, Norwegian, and Swedish economists and economic geographers – first, the concepts of a learning economy and a national system of innovation worked out at the ends of the 1980s by B.-Å. Lundvall, B. Johnson et al., which built the main theoretical background for further research in this field (Lundvall, 1992, 1996; Lundvall and Johnson, 1994); secondly, B. Asheim and A. Isaksen who proposed the concept of regional innovation systems and learning regions with case studies from Norwegian economy (Asheim, 1994; Asheim and Isaksen, 1996); thirdly, E. Reinert's works on the historical evolution of the competitiveness and "quality index" of economic activities (Reinert, 1994a, 1994b); fourthly, the investigations of Örjan Sölvell, Göran Lindqvist, Christian Ketels, Anders Malmberg, Peter Maskell, Petri Rouvinen and others on local industrial dynamics, inter-firm cooperation (Rouvinen, 1996; Lindqvist, Malmberg, and Sölvell, 2002; Sölvell, Lindqvist, and Ketels, 2003; Maskell and Lorenzen, 2003).

The cluster concept resulted from the wide study on national competitiveness by Porter (1990b, 1998). Porter's "diamond" of national competitive advantages, as well as the concept of four stages of national competitive development offered a clear framework in the determination of the main strengths and weaknesses of a country's competitive position in the world economy. His emphasise on the vital role of not inherited but created factor endowments like skilled labour, strong technology, knowledge base, government support, and business culture could explain to a great extent successful development of nations with scarce natural resources, while richer nations failed to achieve such level of prosperity.

According to Porter's investigations the "diamond" of national competitive advantages is realized in the most efficient way within clusters of adjacent or relative industries linked trough vertical or horizontal relationships. Further, Enright (1993)

theorized the tendency of geographic concentration of competitive industries in his concept of regional clusters and argued that main national competitive advantage are created at the regional level. Later industrial and regional clusters were considered as one of key tools in promoting regional and national competitiveness. This approach brought a new practically targeted view on the process of industrial concentration, which was considered mostly from the academic point of view before (Porter, 1998; Enright and Ffowcs-Williams, 2001; Enright, 2002). The concepts of Porter and Enright identify competitive forms of territorial production organisation by joining economic and economic-geographic knowledge in a practical way.

But a negative tendency of attaching the term “industrial cluster” to all phenomena connected with concentration processes should be pointed out. Different phenomena pooled under the notion of “cluster” have often different genesis and nature that may lead policy-makers to fail in achieving of planned goals, on the one hand, and to a losing of scientific meaning of the term “cluster”, on the other hand. For instance, at least three ways of applying of the notion “regional cluster” can be distinguished (Pilipenko, 2003b): (1) several interconnected locations with concentration of production (Enright, 1993); (2) an industry with supporting services spatially represented by a number of companies (Rouvinen, 1996); (3) value-added chain concentrated in one location (Dalum, Pedersen, and Villumsen, 2002). We propose to identify different types of clusters according to a spatial component in this notion. Hence the non-spatial kinds of clusters like industrial or national ones can be defined as a group of inter-related, adjacent industries and services that specialise most successfully in the international division of labour. The spatial forms of clusters such as regional, transborder (situated in two or more countries) or local clusters are groups of geographically concentrated companies in regions or localities from adjacent industries and services, which produce similar or inter-supplemental goods and services and are characterised by information exchange established between cluster firms and their personnel due to which the overall cluster competitiveness is raised.

The origin of the concept of TICs dates back to the 1920s. TICs were initially connected with economic regions identified in the 1920s in the USSR for realisation of the planned economy’s development. At this time an industrial structure of an economic region was developed according to production factors available on the territory of the region and a unique regional specialization within USSR was formed. Nineteen economic regions were created, among them 11 in Russian SSR, which remained until

nowadays. Later in the 1950s Kolosovsky developed the concept of TICs and elaborated a concept of energy-production cycle (production chain) as a basis of TICs (Kolosovsky, 1958, 1969)<sup>1</sup>. The theoretical works of Baransky on the geographical division of labour between economic regions extended further the concept of TICs (Baransky, 1980).

TICs received a vital applied importance and clear spatial structure in the 1970s with an implementation of a new Soviet development paradigm “Shift to the East”. The mathematical models of TICs were elaborated by a group of scholars led by Mark Bandman and TICs were built in Western and Eastern Siberian, the Far East and Kazakhstan SSR to exploit effectively natural resources and develop city network and infrastructure (Aganbegyan and Bandman, 1984; Bandman and Orlov, 1988). The following TICs are worth mentioning as they contain a number of industries, which are the base of the contemporary competitiveness of Russian economy – Kansk-Achinsk fuel-energetic TIC, Middle-Ob’ TIC, Bratsk-Uts’-Ilimsk TIC, Sayany TIC, Irkutsk-Cheremhovsk TIC, and Kuzbass TIC. Industrial models of TICs were also applied in Eastern European countries and the developing nations of Southern Asia where interaction between big, medium and small enterprises was planned according to allocation of resources available in a region (Kuzmin and Lipets, 1974; Goryacheva and Lipets, 1975).

## **2. Clusters and TICs: a comparison of two concepts**

Clusters and TICs differ in a number of dimensions (Pilipenko, 2004a, 2005b). First, these two concepts were elaborated in different economic systems, which have various aims of economic activity. While an entrepreneur decide himself where and how to invest in the market economy according to the principle of the maximization of profits, the planning economy implied a diminishing of costs and rational exploit of natural resources at state-owned plants. The differences between these two social-economic systems determine all the following differences between clusters and TICs.

Secondly, clusters and TICs have different genesis. In case of TICs theoretical and applied research resulted in a practical construction of TICs in a geographical space. It should be stressed that TICs were clear techno-economic models suitable for a parameterisation. Unlike TICs, Clusters generally form themselves as a result of the

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<sup>1</sup> Energy-production cycles resemble the concept of value-added chains. The difference between two concepts lies in various final consumers of commodities produced within these two production chains. While value-added chains are mostly buyer-oriented, energy-production cycles were mainly producer-oriented as final goods were used in other plants for a subsequent production of producer-oriented goods.

market “invisible hand”. Firms cluster to profit from closely located specialized suppliers, a high-qualified labour pool, a rapid innovation diffusion, an efficient use of external economies of scale that raise firms’ competitiveness in the world economy (Marshall, 1961), and other advantages of a spatial concentration. Moreover, some scholars prevent cluster facilitators from a creation of new clusters and point out that cluster development can be stimulated only (Enright and Ffowcs-Williams, 2001, p.7).

Thirdly, clusters and TICs are located normally in different types of regions. Clusters normally develop in within agglomerations with well-developed basic, institutional and scientific infrastructure and a high population density. The TIC models were applied in clear spatial forms mainly in newly developed regions with a scarce population. The governmental decision to shift production facilities to the Eastern regions of USSR and centralization of financial resources enabled such a large scale develop of Siberian and Far Eastern regions. In a market economy a question of an economic expediency would have been firstly posed and such projects could not have been realized in such a short period of time. As a result Russia has more equal population distribution nowadays than that in developed economies with large area like USA and Canada. The population density in Russia in the most inhabited region is only 49 times higher than in the least populous region while in USA this discrepancy is 137 times and in Canada it exceeds 950 times (Treivish, 2002, p.133).

Fourthly, these spatial production forms differ in terms of their firm structure and distribution. Clusters are groups of companies from one or related industries that are often linked to R&D institutions and have close connection with local/regional state authorities. TICs are primarily inter-industrial complexes that involve production chains between different industries. The cluster decision-making centre is located in a cluster itself. Quite often a leading or largest company that have numerous suppliers and buyers from SMEs in a cluster plays a role of a driver of the cluster development. On the contrary, the production processes in TICs, which mainly consisted of large vertically integrated plants, were controlled from the central authorities.

Fifthly, cluster firms specialise in high-technology industries and services or traditional buyer-oriented industries, while TICs’ plants and factories represented producer-oriented heavy industries and manufacturing.

Sixthly, the role of information flows between cluster SMEs and their staffs makes one of key distinctions between these two concepts. A simple geographical concentration of enterprises within a certain region without any inter-firm information

flows does not mean that such companies form a cluster. Information channels are indispensable cluster feature that enable firms to use all advantages from being clustered (Rosenfeld, 1997). Information flows between large plants in TICs did not play any significant role, because central authorities controlled all the production processes.

Seventhly, higher wages in cluster labour pools and higher productivity in cluster firms lead to raising of regional competitiveness while in the concept of TICs people were considered to be one of factors of TIC's development as well as natural resources, infrastructure, etc. It can be concluded the concept of clusters and TICs exist in parallel and correspond to different social-economic systems where different goals are and were targeted.

### **3. Analytical framework for studying of competitive production forms**

Although scholars in schools of the competitiveness theory, presented in the section 1, analyse the problem of national competitiveness from different points of view, all the works have three major features in common. First, they argue that the competitive advantages are created and mainly utilised on the regional level with support of central and regional governments. Secondly, they emphasise the main role of economic actors in the national and regional competitiveness, i.e. competitive enterprises of different size and structure (American and Britain schools), research institutions (American and Scandinavian schools), governments, which should catalyse the whole innovation process in the country (American and Scandinavian schools). Third, it is claimed that local concentration of activities and building of enterprise networks within industrial districts, regional and local clusters as new forms of industrial organisation are essential conditions for stimulating regional and national competitiveness in the world economy<sup>2</sup>.

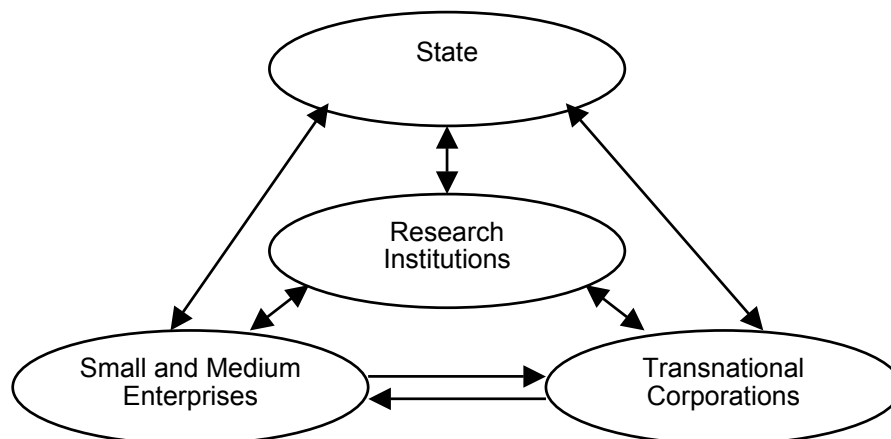
Hence, I identified a group of main competitiveness factors, which can be defined as economic actors that are forming a spatial structure of national economy under the pressure of international competition in industrial and service sectors to use their competitive advantages in the international division of labour in the most efficient way (Pilipenko, 2003a, 2004b, 2005a). These are – “government”, “research

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<sup>2</sup> It should be also stressed that particular spatial forms of production organisation determine to a great extent the effectiveness of production and services not only in the market economies but it was one of main factors of a planning economy's effectiveness. TICs are the clear evidence of it.

institutions”, “transnational corporations” (TNCs), and “small and medium enterprises” (SMEs), which build a system where “government” plays a key role (figure 1).

“Government” represented by central, regional and local authorities is responsible for the creation of a generally favourable environment for enterprise development, organisation of special forms of technological cooperation (centres of expertise, etc.), and realisation of cluster policy “top-down” on the federal and regional level. “Research institutions”, which are mainly scientific institutes and higher schools, provide creation of new knowledge, convert knowledge into innovations, and application of innovations to production in technology and science parks. “Transnational corporations” own, use, and constantly develop key innovations in the countries of their origin (Pilipenko, 2001). They are able to take in innovations from other nations and use competitive advantages from different localities abroad through global value-added chains and interaction with local cluster of SMEs. “Small and medium enterprises” tend to organise competitive forms of industrial organisation, i.e. clusters and some types of industrial districts with external economies of scale, where they obtain high competitiveness due to permanent upgrading by way of creation of incremental innovations. SMEs also cooperate with TNCs by participation in value-added chain activities.

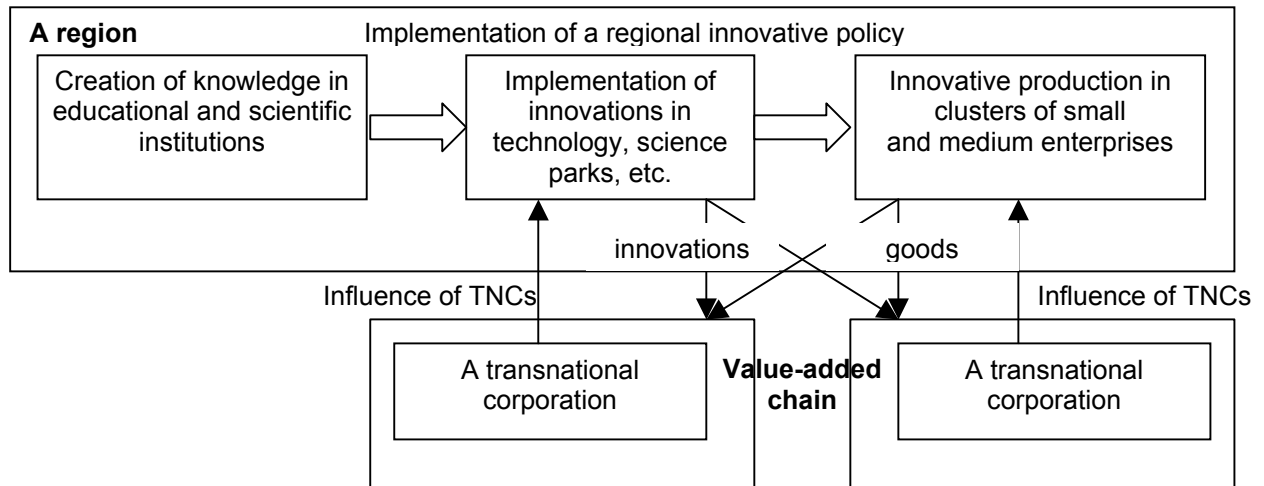


**Figure 1.** The system of main competitiveness factors of developed nations.

All these actors interact in the geographical space through different forms of knowledge creation and production organisation that build a backbone of regional innovation systems sustaining and raising national competitiveness. The interaction between this spatial forms and the creation of new commodities and services within regional innovation systems can be outlined on the regional level as the following chain



(Pilipenko, 2004b): (1) regional innovation policy – (2) knowledge creation in research institutes – (3) innovation application in technology parks – (4) production of new goods in clusters of SMEs – (5) production of new goods by TNCs in global value chains (figure 2). Further we will concentrate on the factor “small and medium enterprises” and regional (local) clusters as their spatial manifestation which are one of key elements of future regional innovation systems in Russia.



**Figure 2.** The model of spatial interaction of competitiveness factors within a regional innovation system.

#### 4. Development of regional clusters in Russia

The modern spatial structure of Russian economy was completely built during the Soviet period and full integration with other Soviet republics achieved precise goals within the planned economy. Unlike the developed nations, big enterprises still prevail in Russian economy accounting for 84 per cent of jobs and 85 per cent of GDP in 2004. They were built within the centralized planning system and strictly bound up with such location factors as allocation of raw materials, fuel, and consumers that were frequently other industrial plants. In the Asian regions of Russia (Western and Eastern Siberia and Far East) the spatial interaction between main and supporting industries built according TIC models depending on the location of natural resources is seen even more distinctly.

Though the majority of plants have been privatised since 1992 and new vertically integrated financial-industrial groups were formed, the value-added chains have not changed considerably due to production expediency. And it is too early to bring up the question of development of networked groups of SMEs as suppliers for big

enterprises. Therefore, efforts to identify non-spatial industrial clusters in Russia by input-output analysis or location quotients would repeat the process of the planning of TICs (region – basic development parameters – industrial structure), but in a reverse consecution.

In our opinion, spatial clusters can be identified in new propulsive industries that have been developing under market conditions since 1991 and are represented primarily by SMEs at the moment. These are information-communication technologies (ICT sector); biotechnologies; production of new construction materials; innovative services; etc. These industries play nowadays an insignificant role in job and GDP creation of Russia, but they are an indispensable part of future regional innovation systems. They also have a strong potential for future development that will positively affect traditional industries and may ensure a timely transition to the new techno-economic paradigm in the world economy by way of regional innovative development, which can be illustrated by a case study of Novosibirsk region (Novosibirskaya oblast') in Western Siberia.

The Academic City of Novosibirsk (Akademgorodok) is nowadays the third ICT-centre of Russia after Moscow and Saint Petersburg with more than 20 SMEs working in this field from about 150 innovative firms located there. The Academic City was originally built in 1957 to host the headquarters of the newly set up Siberian division of Russian Academy of Sciences followed by the foundation of Novosibirsk State University (NSU) in 1958 and the foundation of research institutes. The essential features of this centre were diversity and interactivity in research disciplines, close connection of academic and education sectors, and active application of innovations into practice.

These attributes played a crucial role when some academics began to start up ICT-enterprises in the early 1990s in geographical proximity to each other, developed close interaction with research institutes as source of innovations, established cooperation with NSU as a source of new gifted personnel, while NSU profited from financial support provided by ICT-firms, and cooperated with the Novosibirsk technology park. The intensive information flows and exchange of know-how can also be observed between cluster firms and their personnel. Up to 2004 the classical local ICT-cluster had been formed with the main specialisation on offshore programming that stopped “brain-drain”, on the one hand, and raised productivity and welfare in this region, on the other hand. Though Novosibirsk ICT-companies lack for the government’s encouragement and favourable business environment, they gradually diversified their

activities and began to re-orient them to the domestic market. This case study shows that there is a pressing demand to elaborate the national strategy of competitive development of Russia in the world economy by stimulating development of regional innovation systems.

## **5. The classification of spatial forms of R&D and production organisation**

The abundance of notions, which were put into the scientific circulation during last decades to reflect various forms of R&D and production organisation, often caused confusion in their use. We endeavour to regulate notions by creation of a classification with two dimensions (Pilipenko, 2004b). The first dimension is the genesis of forms of R&D and production organisation. Regional and local clusters, all types of industrial districts according to Markusen (1996), and locations of vertically integrated plants in old industrial regions fall into the group where spatial production forms are developed under the spatial manifestation of market forces. In the second group spatial TICs, technology and science parks, innovation technological and business innovation centres are distinguished, i.e., all spatial production and knowledge creation forms that were artificially created by authorities. The difference between self-organised and artificially developed forms of production organisation was also distinctly shown in case of clusters and TICs. The second dimension is the prevailed size of enterprises and their combination where differences between regional (local) clusters and various types of industrial districts become more precise (table 1). This classification can contribute to a better understanding of the genesis of production forms and provide a base for their correct implementation to raise the competitiveness level of Russia and other countries in transition.

The development of a dual spatial structure of Russian economy in the future may be predicted. On the one hand, the locations with large enterprises in traditional industries built during Soviet period within the concept of TICs will be upgraded. On the other hand, regional and local clusters with predominantly SMEs working in new propulsive industries and services will develop. But meanwhile the balanced headway of the economy is unfeasible without realisation of a special competitiveness strategy by way of stimulation of new inland forms of R&D and production organisation and coordination of activities of the main actors of regional innovation systems in the Russian economy.

**Table 1.**

The classification of spatial forms of R&amp;D and production organisation

Prevalent size of enterprises Type of creation	Small and medium enterprises <b>Ib</b>	Small, medium and large enterprises <b>Iib</b>	Medium and large enterprises <b>IIIb</b>	Large enterprises <b>IVb</b>
<b>Formed themselves as a spatial result of the market “invisible hand” Ia</b>	- Marshallian industrial district - Italian industrial district - Regional cluster - Local cluster	- Hub-and-spoke industrial district - State-anchored district - Regional cluster	- Satellite platform district	- Vertically-integrated industrial plants (often in old industrial regions)
<b>Created artificially by state authorities IIa</b>	- Technology park - Science park - Business innovation centre - Innovation-technological centre	- Technopolis - Territorial-industrial complex	- Territorial-industrial complex	- Territorial-industrial complex

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