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Clusters and territorial industrial complexes: common and specific characteristics.

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Definition of objects to be studied.

The appearance in scientific life some new notions and terms adequate to them is a natural process. It is resulted from constant accumulation of knowledge and the birth of new objects while developing and complicating of social relations . In the field of research laws and regularities of spacial economics more and more popular now is becoming the notion of regional or territorial cluster¹. It is natural when revelation and new phenomenon cause corrections in scientific terminology. Though this terminology should be a little conservative, new notion is needed to be tested by time and logic and pass this exam. One of the step in such testing is a comparison of new term with a previous determined one which is belonging to similar object. In our case such an object and therefore term is territorial industrial complex – TIC². Is there an object naming cluster but not defined as TIC? Are there characteristics of cluster which can not be applied to TIC and vice versa? What is the design feature of new term and its ability to develop research approach to a new object? To answer these questions we should appeal to the history of appearance and development of the term TIC. Though first it will be useful to give difinitions for two compared objects.

We can not say that there is one standard definition of TIC³. Moreover, there are separate notions: “TIC – approach” and “TIC – object”, and in the last there is another sub object PO (program-objective)TIC, that is the copmlex to be created for the realization of mission of state importance and which has its program of development. “TIC – approach” is according to its name does not clearly determine the notion but is able to give wide presentation. This approach corresponds to specific methodology of research of any territorial system and assumes mostly possible (from the point of view of calculations) coverage of the elements of economy which territory we investigate and the interrelationships of these elements. When using “TIC – approach” for making forecast to develop territorial systems you must build and analize advanced product, service and resource balances. PO TIC was defined by M.K. Bandman quite rigorously and this very type of objects was chiefly implemented in the process of the development of Siberia.

Put in example two mostly characteristic definitions of compared objects: one for TIC proposed by Bandman (we took it with not imortant abbreviations and transformed for the aims of ulterior

¹ Notion “industrial cluster” does not usually involve the concentration of objects on limited territory and more similar to sectoral systems therefore let us leave it without attention. Notion “economic cluster” is introduced as an attempt to distinguish common features of industrial and regional clusters (Markov, Yagolnitzer, 2006).

² Sometimes we use the terms TPC – Territorial-Production Complex.

³ Problems of forming TICs were developed by many research and project development organizations from Moscow, Leningrad, Kazan, Vladivostok, Irkutsk, Syktyvkar, Kiev, Minsk, Pavlodar and other cities of the USSR. In this paper I decided to concentrate on one example of Novosibirsk school of modeling TICs as within 40 year period was a witness and participant of the development of this scientific direction.

analysis) and other for regional cluster proposed by I.V. Pilipenko who generalized many of existing definitions⁴.

Territorial industrial complex (TIC) implies

- created after planning, proportionally developing assembly of stably interrelated branches of national economy, labor and natural resources, this assembly is
- forming and functioning in order to solve problems of state (national economy) level,
- concentrated on limited and even compact territory,
- ensuring efficient use of resources,
- served by united system of infrastructure ensuring the establishment of planned conditions of life for population and environment protection (Bandman, 1980).

Cluster firstly was defined as consulting remedy to increase competitiveness (according to M. Porter). Then it was considered more wide – as regional, geographical, industrial, economical notion. In this point it stands in one line with other close notions – industrial junction, intersectoral complex, TIC.

Regional cluster is a “group of geographically concentrated in certain region companies (standort) of interfacing industries which produce similar or complementary production, whose important feature is information exchange between companies – participants of cluster and their members – leading to the increase of cluster’s competitiveness in a world economy” (Pilipenko, 2005????)

Conceptual differences between TIC and cluster are considered to be:

- 1) **Origin.** TIC is a fruit of soviet researchers’ development, and therefore there is some “artificial nature” of these objects. Cluster is a product of market laws. TIC for planned economy, cluster for market.
- 2) **Place of appearance.** TIC for regions of virgin land opening. Clusters for developed regions.
- 3) **Objectives.** TIC is a technical economical structure aimed at making product for future processing. Cluster is a social economic structure aimed at human aspect with orientation on ultimate consumer.
- 4) **Composition and structure.** TIC mostly involves heavy industry controlled from one center. Cluster is a set of small and medium size equivalent companies of high tech profile which created a voluntary pool to achieve common objectives.

Let us observe on the basis of the analysis of the evolution of “TIC – approach” and namely TIC models the character of these differences. Are they principal and allow determine a really new object – cluster – which is significant for the modern stage of economic development and spacial organization of productive forces?

Some history of “TIC – approach”

The basis of studies the problems of regional development using “TIC – approach” was established in the very beginning of the USSR, where this type of vision for solving problems of national economy level was quite natural. Logic and history of “TIC – object” are tightly connected with the logic and history of the development of USSR national economy beginning from GOELRO plan

⁴ It seems reasonable to stop on one definition of cluster including main characteristics represented in many other definitions which have been scrupulously studied by I. Pilipenko in his monograpg and, that is important, have been adapted to the objective of this paper.

(state plan for electrification of Russia), from realization program of construction of Ural-Kuznetzk combine, Big Volga programs, solving Angara-Yenisey problem. Bratsk-Ilmsk, Sayansk, South Yakutsk and other TICs have been frequently mentioned in the directions documents of five-year plans for the development of national economy (Protocols....; Materials.... 1976; Materials.... 1980). So it was natural to link the notion of TIC exclusively with planned economy⁵, which is “free” from competition, conflict of interests, demand analysis and other market instruments as one can think amiss. These market instruments are considered to be a “diamond of competitiveness” of cluster which is a group of interacting companies as compared with separate firms and companies. Application of methods of system analysis and economic mathematical modeling allowed researchers to develop the theory of TIC towards more rigorous definitions, formalization of allocation factors, evaluation of the effectiveness of expected spatial structure variants of economy. The necessity of improvement of adequacy of calculations which are in the basis of good forecasts and reasonable recommendations to further selection of variants of development and then transfer to new conditions in managing in our country, all these reasons have required further development of the theory of TIC and generalization of “TIC – approach”.

Naturally the question on reasonable use of another term – TIC has appeared in addition to many other terms suggested earlier. Sufficient reference can be the work of E.B. Alaev where he had given may be most complete description of various objects relating to the area of economic geographical and regional studies. In this work Alaev stresses that territorial objects of different level, scale and structure (including industrial junction, production complexes, urban agglomerations and similar ones) are not ordinary inventions but reflections of the “natural historical process of self-organization of a society in space” (Alaev).

In our country searching for optimal forms for organizing national economy in the form of structuring the whole economy started from the first years of Soviet state. This can be seen in the protocols of meetings of the Presidium of Gosplan (state planning committee in the USSR) in 20s of the 20th century. The solution of quite special question as the structure of newly created Gosplan met with the problems of connection Gosplan’s structure with the management structure of whole country. The task to restore sectoral structure of management had required adjustment to this system and established “narkomat” – organization similar to former ministries – to each sector. In short period of time (two-three years) it became clear that within this structure Gosplan had too weak connection with province parts of the country and they are not able to show their interests and initiatives. Central bodies (“glavk”) of narkomats were pressing force for province and therefore blocked the work of province bodies and hindered them to produce needed level of production (Protocols... (A)).

In the section of regional planning and zoning appeared an initiative to rebuild national economy according to region factor as an “agglomeration of producing after common plan units” contrary to federative basis (when independent regions form a federation) (Protocols... (B)). It was suggested to do the segregation of regions according to close association of economic links. It was admitted that those territorial linkings can have transient and changeable character. Narcomats were criticized for their orientation on short-term planning and not for managing long-term national economy tasks. “We consider the structure of national economy to be viable that is regions over the territory of the country be selected in definite period of time and these regions be described in their production

⁵ Here one should pay attention on the principal difference between two notions “planned economy” and “administrative machine controlled economy”. These two notions frequently identified for the “humiliation” of plan aspect in modern world economy with absolute belief in the bad character of “administrative machine” methods for ruling economy.

potential aspect and the needed regional administrative machine be formed in order to develop national economy. Narkomats are good as regulating structure but they are not able to build national economy” (Protocols... (B), p.69).

Here you can see distinctly the idea that the segregation of region as the part of national economy is implemented to solve specific economical problem within definite time borders. Now we say – for social requirement or in the view of problem, program zoning. It is important to note that in that period of time the contradiction between narkomats (future ministries and then firms) and state interests had been stressed.

The evidence of conclusions to build new structure of national economy under territorial principle had no objections in that years but the difficulties and expensiveness of such restructuring were clearly understood as there was a press of traditional and partly restored structure of the economy. Summing up discussions in Gosplan, N.N. Kolosovskiy noted: “The reasons of these difficulties – from one side is an absence of available state means for necessary reconstruction of industrial basis of the regions, from another side – impossibility to decentralize operational activity when the life of the state required “fluctuation methods” of management “depending on this very moment” (Kolosovskiy, p.5). Another strong argument to the advantage of regional principle for building economy was social aspect of management that is coming the authorities to people and possibility to control these authorities from the beneath, by all people. “When rights of region are constantly developing then the basic needs of population are solved in regional center, in close distant to village level, thanking to this moment the whole question on coming authorities to people is under no doubts” (the same, p.11).

Thus the necessity of segregation of territorial system that time when they had not “TIC” appeared as a result of understanding the actual fact of concentration of production and social activity on determined territories. Therefore the thesis on “artificial nature” of these systems establishing by only government decisions meets serious objections. The study of actual basics of intersectoral cooperations gave Kolosovskiy an idea of energy-production cycles (as a preimage of future intersectoral complexes), which founded physical composition for the economy of region. Even in that years the human factor had sufficient interest and not only as a labor resource. The problems of production allocation have been decided as organizing the whole life of each region.

TIC models as structural elements of national economy complex

In the 60s of the 20th century some hope has appeared as a result of explosion in mathematical methods applied to economical studies. The idea to create “automated control Gosplan” that is a system of models of national economy planning and functioning of socialist economy. Several variants of these systems have been suggested by also IEIE of SB AS USSR – Institute of Economics and Industrial Engineering of the Siberian Branch of Academy of Science of the USSR – (Fedorenko, Aganbegian, Bagrinovskiy, Granberg). This system contained both models of separate industries and models of territorial systems particularly TIC models which provided harmonization of sectoral “requests” for the limited resources of the territory. It is needed to note that the assignment on the scale of development of the industries of specialization have been determined under the requirements of other industries from other regions and even countries (Granberg). In other words market analysis in the meaning of the balance between supply and demand had been implemented but it was inside the model itself in the process of forming balances of corresponding products, services, resources. At a conservative estimate it can be called specific “marketing” because different variants of meeting demands have been studied. Even under the conditions of “autonomous” (i.e. out of system of models) solving TIC tasks, scopes of the

industries of specialization always have been based on the necessity of meeting demand for certain product either in the framework of national economy complex and specific demand for export supplies. Scale of the development of supplementary and tertiary industries (objects) and the scale of expropriating local resources from a territory always have corresponded with the demands of industries of specialization. Better to note that in the process of designing model and further analysis of certain task, it was necessary to estimate competitive variants including their advantages and disadvantages, consequences after externalities changing that is similar to the content of estimation of “possibilities and threats” in terms of SWOT analysis.

Criterion in the tasks of local level (industry and/or territory) was as a rule the minimum of discounted expenditures that together with assumptions about permanent prices accorded with maximization of pure profit of separate element of economy. The assimilation of the methods of solving tasks of stochastic programming, development of the approach to uncertainty zones analysis allowed to detect not only optimal variant of allocation of any object and its scale but as well to estimate the area of optimality (in other words – competitiveness) of involved variant in comparison with others presented in the task.

Variants of balance proportion between supply and demand have been estimated from the position of maximization of final consuming that is in general case corresponds with the tasks of minimization of expenses (in case of multi periodical statement of problems – minimization of discounted expenses). To start calculations of national economy expenses from the level of whole economy will be natural but having in mind the requirement of further “descent” to the lower local levels (industries, sub industries, regions and separate enterprises), the structure elements should be represented in the tasks of national economy level in one or another aspect. Territorial block of models (as industrial) was a component of united system of the models of national economy planning – as an attempt to realize natural intention to strengthen centralized aspect of managing of the national economy. Thus TIC have not been “constructed from the top” but showed up from the point of view of best variants to achieve national objectives namely the maximum of population well-being. “TIC – object” has been formed as a result of optimal choice of spatial development of country: namely **this set of interrelated productions concentrated on given territory** was found as a result of solving serial of tasks of national, sectoral and regional levels. Author is the supporter of the view that potential of national economy approach to forecasting and planning is yet not called up in our country (Lvov, Moiseev, Grebennikov).

Thus the statement that “TIC – approach” had not corresponded to a “diamond of competitiveness” of cluster (Porter) is wrong, at least in these important characteristics as demand and competitiveness analysis. We can agree that in TIC on the stage of its functioning no “inside TIC competition” was supposed to investigate, though for cluster that moment may be of principal interest. Namely this reason allow to consider a cluster to be similar to TIC on the set of objects but is specific for “post TIC” period when no big new structural changes are expected on given territory that may require studies of physical composition. More actual are the processes of evolution development with characteristics of various small (in scale but not in significance) changes in technologies, the appearance and realization of innovations which increase competitiveness of the objects on the given territory and thanks to the established in the previous period of implementation “TIC – approach and/or object” set of interrelated productions (firms, companies, enterprises etc.).

The development of computation technologies, appearance of powerful computers have ensured a chance to transfer to multi period (dynamic) models of TIC that allowed sufficiently diversify the objects of studies. It was clear that large and important changes for the economy of whole country can happen not only in newly developing regions where the utility of “TIC – approach together with – object” is undoubted but also in well-developed regions. Moreover it is expected that “TIC –

object” has limited period of life namely the period of target (i.e. with the participation of state) solution of given problem. Application of dynamic factor allowed to reflect a sequence of transformations of spatial structure of economy of territory under investigation. Similar tasks have been solved for Kemerovo region (Artyushkova, Malov), for the territory where Kursk magnetic anomaly has its impact, and even without connecting to present administrative division (Burmatoва), for Vladimir and Voronezh regions. Namely for the last region the agribusiness sector was especially selected as the industry of specialization (Vorobyeva, Khudyakova). It is important to segregate the use of “TIC – approach” for the analysis of social economic development of a territory which is initially expected to be specialized both on “producing” knowledge, high technologies and their adaptation – for Novosibirsk Akademgorodok (Sevastyanov, Klistorin). “TIC – approach” has showed its functionality and wide coverage for the problems of both newly developing regions where dominate heavy industry and mining and of well-developed regions with specialization in various activities including high-end.

“TIC – approach” under transition to market conditions

The answer to a question about how strong state should interfere market, how to find optimal proportion between market and state regulation can hardly be unambiguous. Author is the supporter of state regulation expedience in present Russian situation.

Regulation means the skill to analyze past, forecast future and influence certain participants of the development process towards achieving expected situation. For the conditions of former USSR the necessity to investigate the area of making forecasts was undoubted as the state had controlled all life of national economy. Though within private property framework the forecast of expenses and prices (as an element of regulation) is both prospect and necessary attribute of state functions. The notion “civilized market” as a necessary component has the requirement to regulate personal consumption of capital lenders i.e. their incomes and ways of using these incomes (Bogachov, Zaslavskaya). After getting such opportunity (establishing safely working system of taxation, payment for natural resources and other types of fiscal mechanism) market economy has succeeded in channelling most part of surplus product to productive cumulation, education and science that ensure efficiency of market economy. In other words, the success of market economy is explained by the learned ability of society to commensure interests of separate subjects of economical relationships and find a compromiss between them at the aim of creation society of commonwealth. One should probably agree that deep and important reasons of periodical (and accelerating) occurrence of problems of this type (regional is a particular case) are in structural changes of production forces, acceleration of these changes and scale increase (Valtukh). Market mechanism is an instrument of “fine adjustment” (Bogachov, Karagedov) has its natural limits as regulator. Regional problems has reasons both because of general economic structural shifts and availability of natural and historical territorial specific features. It is true for the countries with different political systems, property forms and scale, for Russia, Brazil, USA, Netherlands (Territorially... 1992; Heide; Larina). For our country with its huge territorial differences the detection and analysis of ways to solve regional problems are becoming more and more actual under any proportions of state and private forms of property. In case we want to have civilized not wild market. One of the most bright example of successful impact of state is a realization of program of the development of river Tennessee’s valley in the USA (Territorial; The TVA).

Very unusual but enormously important for Russia is the statement on the necessity of planning in general and on regional level made by Henk ter Heide. After investigating history and laws of the

evolution of planning in Netherlands he came to the conclusion that this process was and is in present a part of “**natural order of life**” (marked down by me – V.M.). Need for joint collective activity in order to keep lands captured of sea, for maintenance and raise their fertility, for construction infrastructure and development of intellectual potential – all these factors have resulted in the consciousness of the three most important functions of planning – running the future, troubleshooting and coordinating activity in order to achieve common aims. Nonrandomly in Netherlands more than 80% of taxes collected from regions then go to central government and after it come back in towns and provinces in different forms. Determinative role of state in future development of Netherlands fairly good combines with market mechanism when there is a freedom of “many actors on a small stage” (Heide). Though mostly clear and definitely on the regulation role of state said P. Samuelson: “Man now as it seems is not obeyed by such consideration that is best regulator is a state that regulates as less as possible” (Samuelson, p.188).

So market economy on the modern stage of development in its socially advanced forms results in the necessity of state’s participation in regulating economy. Refusal of state regulation (especially in transition economies as in Russia now) is interfaced with loosing social concord, conflicts and catastrophes. Even such a short period of 1992-1996 of Russia’s history clearly confirms this fact. Before the beginning of revolutionary changes (in 1990!) several researchers analyzed the consequences of partially started “perestroika” and warned on the necessity to keep centralized principle in the management of national economy. It should be kept not only for that period of time but stayed “*conditio sine qua non*” (mandatory condition) for the successful development of modern industrial economy (Bogachov).

Experience in managing regional development in the USSR especially when carrying out large scale structural transformations always has been in a focus of foreign economic geographers. The necessity of state’s participation in this process not always and not for all observers has caused an “allergy” to soviet experience in case realization of similar transformation under market conditions.

Significant mark for distributing “TIC – approach” among economic geographers from various countries has become the International geographical Congress in 1976. Moreover from that time and under influence of some foreign researchers, TIC models application for market economy have being developed. One of the first task in this line has become the want for detecting entities of economic relationships and recording their conflict interests. On the example of one of depressive region in India – state Kerala – was tested TIC model with incorporated block of calculations of profitability of private businesses for different variants of production and spatial structure of the region. As well as for different measures of state support (Forecasting, 1980). Criterion for choosing a variant was maximization of the growth of new working places under limited water resources and federal investment (as a support to private business) and under the condition to achieve reasonable level of local profitability by each private business.

Changes in our country from 1985 predetermined the appearance of the cycle of works where the necessity for recording interests of entities of economic relationships has been postulated and proved (though using maximum simple outline) as a necessary condition for the development of Russian economy. Nevertheless specificity of “TIC – approach” and characteristics of design and realization of the program of development investigated region kept its originality: *not “dissolving” in the whole mass of objects of regional economy try to distinguish program objects and show their impact on the development of economy over all levels of administrative and territorial entities whose interests counteract in this given problem region.*

For market economy conditions (more exact for transition economy) “TIC – approach” together with “TIC – object” was realized in mostly complete form on the example of Nizhnee Priangarye

(Lower part of Angara river valley) (Nizhnee; Bandman, Grenbek; Problemnye...). For this problem region not only pilot research works have been implemented on the basis of a group of optimizational, imitational and behavioral models but also regional surface planning for separate regions have been implemented as well. The mechanism for realization of this problem has been proposed. That should be a special body to control this Federal target program with corresponding line in Federal budget and the outline of information and financial interacting between different participants developing given territory. Namely such hardly formalized aspect of TIC as its institutional structure has been considered.

Instead of conclusion

Modern requirements for accelerating innovations and the facts of effectiveness of territorial concentration of firms which are generating these innovations give foundation to segregate special type of object – regional cluster. It should be agreed with those researchers who suppose that it is not true to identify notions (and corresponding to them objects) of regional cluster and TIC (territorial industrial complex). Though present set of features selected as key features I can not accept. Elements of market relationships, attention to labor resources, attention to the regions with well-developed structure of economy with the evaluation of effect from innovations, and evaluation of TIC competitiveness are represented in “TIC – object” and its corresponding models (not to mention “TIC – approach”) quite completely.

Serious difficulty of comparing these two objects is that for cluster has not yet been developed methods for formal description. Thus the problem of comparing similar characteristics would be more pictorial and rigorous. It is necessary as well to define applied aspect of the studies on detecting clusters. Works on TIC are unambiguously oriented on solving regional policy problems therefore it would be helpful to define the final aim of clusters’ further use. Research on reasons and consequences of appearing clusters would also have positive impact on the development of ways of regional policy within its “segment”.

Future researchers of regional clusters may pay their attention on the following (in my opinion) actually distinctive and unique characteristics of this new object:

- 1) **Scale of reorganization.** For TIC – large-scaled (therefore single) changes in spatial structure of regional and country economy. For cluster – small- and medium-scaled but permanent (therefore important as well) changes in the already established economical relationships.
- 2) **Elements of innovation.** For TIC the innovations are put in projects: forecast for 15-20 years can not based on old technologies. For TIC in well-developed regions the effect after innovations is estimated according to the results of implemented tasks. For clusters innovations themselves are the product and objective of their activity within all period of innovations’ life (from appearance to entering market). We can say that innovation is a “criterion” for future model of cluster.
- 3) **Information environment.** For “TIC – object” as it is an entity created for solving tasks of national economy level, information is not “limited resource”. Questions on where, when and what to be produced are defined “inside” complete project and it is characteristic not only for planned economy. For cluster the aspect of information between interfacing elements (firms, companies, organizations) should be important to ensure their competitiveness with the help of constant developing and introducing innovations to market.
- 4) **Target missions.** TIC is an efficient instrument in the area of realization of regional economic policy by the state. Quantitive transforms of spatial structure of an economy of

whole regions require serious preliminary work using engineer documents of regional surface planning (or physical planning). The detection of existing and/or prospective clusters should probably give a signal to companies for closer interacting and to regional authorities to promote such interaction. For this aim the research and development of economical effect evaluation of this association will be needed and implementing economical calculations of verbal validities. It should be demonstrated how this type of association (having this composition and structure of interrelationships) ensures minimum time and transaction expenses in realization of innovations in real production of services, goods and knowledge.

The notion of territorial industrial complex have not denied notion energy production complex and very close notion of production territorial complex. TIC notion supplemented them with new characteristics whose importance was growing in time. Changes of social relationships and appearance of new tasks for spatial development absolutely require an adequate answer in conceptual and dictionary apparatus

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