
Theoretical and methodological approaches to the study of the processes of economic convergence and divergence of regional integration associations

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For citation

Usmanov D.I., Anishchenko A.N. Theoretical and methodological approaches to the study of the processes of economic convergence and divergence of regional integration associations // Market economy problems. – 2023. – No. 1. – Pp. 68-87 (In English).

DOI: <https://doi.org/10.33051/2500-2325-2023-1-68-87>

Abstract

The article presents the results of the study of theoretical and methodological provisions and classification attributes (principles, types, approaches, specificity) of the conceptual framework of «convergence/divergence» conceptual systems as applied to regional integration associations in an uncertain geo-economic environment. The authors conducted an extensive review of scientific literature and cross-research materials which helped to identify forms of interaction between integration associations under the conditions of increasing globalization through deepening of integration processes, which made it possible to formulate a new economic effect of regionalization «aggregation». The study, as a whole, deepens the systematic mapping of the development of the main stages in the evolution of economic models based on the theory of convergence and divergence in the system of economic knowledge, which will serve as a basis for retesting old and initiating new empirical tests for econometric modelling of the impact of endogenous and exogenous variables on the activities of integration associations.

Keywords: *convergence, types of convergence, divergence, regional systems, globalisation, integration alliances, economic growth, inequality, inclusive development.*

The article was prepared within the framework of the state task of the MEI RAS: the research topic «Modeling of the processes of ensuring sustainable and balanced socio-economic and spatial development of Russia and neighboring countries in order to form a Large Eurasian partnership»; the research topic «Institutional transformation of economic security in solving socio-economic problems of sustainable development of the national economy of Russia».

Introduction

Our world has entered a period of rapid change on all fronts – technological, social, economic, etc. The world in general and the world of integration alliances in particular. The scale and speed of these changes themselves indicate the uneven development of global economic phenomena, which amount to one-step processes of convergence of different socio-economic systems and their divergence in the absence of established flexible mechanisms for mutually beneficial cooperation. The transformation of geopolitical and geo-economic interests of trade groupings and alliances is undergoing a serious test of viability and strategic expediency of their existence and development.

Studies of Russian and foreign scholars (see list of references – 2, 3, 4, 5...-61) devoted to global inequality, integration/disintegration processes, economic activity and international trade in general, give grounds to formulate a number of methodological approaches to determine the impact of globalization processes on the formation of effective mechanisms to promote national economies of integration unions to ensure joint economic development. It is more correct even to speak not so much about joint but rather about inclusive economic development, which includes mechanisms of convergence of different-level interaction. Note that globalisation processes not only lead to a change in the importance of the centres of the world economy, but also cause significant shifts within national economies, which raises questions about modelling sustainable and balanced spatial development of integration associations, reducing their differences in the level of economic development and population income.

Basic part

Economic convergence¹ as a concept of balanced development of Eurasian integration is a systematic process (temporal and spatial) of smoothing out inter-country differences in basic (GDP, GNP, HDI, VDI, etc.) and synthetic indicators of inclusion of the economies of EAEU member states, as well as convergence of interstate regulatory and legal systems and measures of political interaction.

The main point is that, however significant this equalising force of convergence may be between countries, it can sometimes be trumped by forces of divergence operating in the opposite direction, that is, forces which contribute to increasing and deepening inequalities. Obviously, as a result of insufficient investment in the development of second nature factors, entire social groups and countries with different potentials may not be able to benefit from growth or even find themselves declassified and displaced by new people, as the current process of catch-up development of some countries by others shows (Chinese workers taking the place of American and French workers; Belarusian and Kyrgyz workers taking the place of Russian workers, etc.) (Piketty, 2015, p. 41). In other words, the main force of convergence in relation to integration processes – the inclusive development of «second nature»² factors for all member states of the union – is only partly natural and

¹ The theory of convergence emerged in the 1950s and 1960s under the influence of scientific and technological progress as a concept designed to balance the interests of the two socio-economic systems – the capitalist and the socialist. The representatives of this theory include: R. Aron (France), J. Galbraith, P. Sorokin, W. Rostow (USA), D. Stretch (Great Britain), J. Tinbergen (Netherlands), O. Fleitheimon (Germany), etc.

Among the foreign authors concerned with economic convergence it is possible to distinguish works of N.G. Mankew, P.M. Romer, D. Weil, R. Barro, X. Sala-i-Martin, D. Kwa, A. de la Fuente, P. Evans, H. Islam, D. Lancieri, T. Piketty and others. Among Russian publications we would like to mention the works of A. Granberg, L. Grinin, R. Grinberg, A. Korotayev, S. Drobyshevski, D. Zverev, A. Iodchin, O. Lugovoi, A. Libman, E. Kolomak, E. Taran and others.

² Second nature factors: 1) agglomeration effect and high population density giving economies of scale; 2) developed infrastructure reducing economic distance; 3) human capital (education, health, labour motivation, mobility and adaptability of the population); 4) institutions facilitating inter-regional and inter-country integration, increasing population mobility, diffusion of innovation, etc.

arbitrary and largely depends on the integration deepening policies of the EAEU member states and the institutional structures that operate in this area.

Before going on to review the scientific approaches and arguments in favour of the concept of convergence, we propose to narrow down and specify the conceptual and categorical apparatus of the study (table 1).

Table 1

Terms, concepts and phrases characterizing the conceptual system «Convergence and Divergence» in relation to integration socio-economic processes

The term	Feature	Source
Convergence	an equalising force that ensures convergence between countries	Piketty, T. (2015), <i>Capital in the XXI Century</i> , translated from French by A.L. Dunayev, ed. Volodin, Ad Marginem Press, Moscow, 592 p.
Divergence	forces of divergence acting in the opposite direction, i.e. forces that increase and deepen inequalities	
Convergence	a set of geographical units (countries, regions, counties, etc.) as a reduction over time of the dispersion of an indicator (e.g. GDP per capita), usually measured using standard deviation or similar measures	Lancieri, D. (2014), "Is there convergence in fertility in the European Union Member States?", <i>Demografic Review</i> , vol. 1, no. 2, pp. 110-1391.
Divergence and convergence	– is the divergence or convergence of evolutionary paths, respectively, but the overall level of development may remain comparable. – are processes that have accompanied historical movement throughout the historical process, both among related and unrelated societies (p. 63)	Grinin, L.E. and Korotayev, A.V. (2019), "Divergence and Convergence in the World Economy", <i>Kondratiev Waves</i> , no. 7, pp. 62-133.
Convergence (Latin: convergence) and Divergence (Latin: divergence)	characterise the process of development of an object, its properties of isolating and combining qualitative features, and updating its structure. Under similar conditions, the elements of the structure of a complex system, developing, isolate their properties, and gradually the whole system begins to function differently, i.e. it becomes divergent with respect to its similar ones. Further, the development of the system leads to a qualitative leap, which brings it closer to similar dynamically developing systems	Taran, E.A. (2019), "Convergent structural shifts in the economy", Ph ... Cand. Of Economics: 08.00.01, E.A. Taran, Tomsk, 189 p.
Economic divergence	is antagonistic to convergence and means deepening the negative gap with the technologically advanced market economies, both in terms of macro indicators and structural proportions	
Convergence	– is the process by which the levels of development of countries and regions converge over time	Iodchin, A.A. (2007), "Econometric Modelling of Interregional Convergence in Russia", Ph. ... Cand. in Economics: 08.00.13, A.A. Iodchin, M.V. Lomonosov Moscow State University, Moscow, 27 p.
Convergence	– is a fusion of synergistic effects, a structural-technological alliance and a key link in structural modernisation, ensures self-organisation, self-generation of the economy by focusing the objective of the state structural policy on motivating economic entities to form the necessary structural shifts and becomes the basis for the innovative structure model of the Russian economy (p. 7)	Hasanov, M.A.O. and Hasanov E.A.O. (2014), "Structural convergence in the Russian economy and its limitations", <i>Vestnik of Tomsk State University. Economics</i> , no. 1 (25), pp. 5-16.

The term	Feature	Source
Convergence of technological structure	– is a process of interpenetration and combination of various technological innovations, it stimulates the formation of new types of structural shifts, in particular structural convergence, which forms the basis for the formation of new forms of network and cluster structures of the economy (p. 15)	
Convergence	is a necessary condition and result of regional economic integration	Libman, A.M. (2006), “The role of economic integration and disintegration in the post-Soviet space: A quantitative analysis”, <i>Problems of Forecasting</i> , no. 5, pp. 58-72.
Ex ante Convergence	is linked to state regulation and targeted policies of «lifting up» structurally weak regions and harmonisation of economic institutions (this form of convergence is given much attention in the European Union) (p. 58)	
Ex post Convergence	convergence is the result of the spontaneous interaction of economic agents and the flow of capital, goods and labour between countries, as well as competition between states for mobile factors of production (p. 58)	
Convergence	1. The similarity, the coincidence of some features, properties of phenomena independent of each other. 2. The coincidence of some properties in different organisms, not as a result of kinship, but for some other reasons (biolog.), etc. (p. 714)	Ozhegov, S.I. and Shvedova, N.Yu. (2010), <i>The Explanatory Dictionary of the Russian Language: 80000 words and phraseological expressions</i> , Russian Academy of Sciences, Inst. Langu. Im. V.V. Vinogradov, 4th ed, A TEMP, Moscow, 944 p.
Convergence	is a purposeful process of balancing the development of the region's centropiphery system through the formation of synchronization mechanisms and interconnected zones of specialization and cooperation	Urmanov, D.V. (2014), “On the essence and content of spatial convergence in the centro-peripheral model of the region”, <i>The science. Technic. Technologies (Polytechnic Bulletin)</i> , no. 2, pp. 64-71.
Convergence	represents a phase of internationalisation of the interaction of macro-level systems, underpinned by both general economic liberalisation and the rigid structuring of national credit and monetary systems (p. 26)	Godes, N.V. (2013), <i>Eurasian Payment Union: theoretical model and prospects of its application</i> , ed. by I.N. Zhuk, Law and Economics, Minsk, 205 p.
Convergence	is the process of developing new forms of inter-country intra-industry division of labour, as well as the expansion of the world market, contributes to the interdependence of the economies of different countries. A common financial, information, telecommunication, cultural and economic space is being created. These processes contribute to the trend of convergence of the economies of different countries, taking into account the preservation of their national characteristics	Polozhentseva, Y.S., Vertakova, Y.V. and Samokhvalova, M.S. (2018), “Assessment of uneven economic space of regions based on convergence and divergence”, <i>Proceedings of Southwestern State University. Series: Economics. Sociology. Management</i> , vol. 8, no. 3 (28), pp. 53-63.
Divergence	is a process of divergence, a gap between the levels of development of individual countries, an increase in the differences between national economic models and their individual structures and methods	
NBIC-convergence ³	is the mutual penetration of nanotechnology, biotechnology, information and cognitive technology, leading to the creation of technological	Bodrunov, S.D. (2019), <i>General Theory of Noonomics. Textbook, Cultural Revolution</i> , M, 504 p.,

³ «synergistic combination of four major «NBIC» (nano-bio-info-cogno) provinces of science and technology».

The term	Feature	Source
	processes in which these technologies function as mutually conditioning, forming an inseparable whole (p. 113)	ISBN 978-5-00020-061-2
Convergence	convergence of economies of different actors; different economic systems, their individual institutions and mechanisms; basic macroeconomic indicators of different countries (pp. 46-47)	Drobotova, O.O., Kuzmina, E.V., Merzlikina, G.S., Peredunova, S.V., Minaeva, O.A., Pshenichnikov, I.V. and Reshetnikova, T.Y. (2017), <i>Integration processes as the basis industrialization of regional economic systems: Monograph</i> , for edited by G.S. Merzlikina, Volgograd State Technical University, Volgograd, 156 p.
Convergence	is a process of transformation that blurs boundaries between businesses and sectoral boundaries by combining value propositions, technologies or markets (scholars have identified several types of convergence, including knowledge, technology and industry)	Dyatlov, S.A. and Lobanov, O.S. (2020), "Sectoral convergence in the digital economy", <i>Innovations</i> , no. 2 (256), pp. 75-82.
β -convergence	implies that poor regions (or countries) have higher economic growth rates than rich ones, which in the long run should lead to equalization of regional levels of economic development	Barro, R.J. and Sala-i-Martin, X. (1990), <i>Economic Growth and Convergence across the United States</i> , Working Paper 3419, National Bureau of Economic Research, Cambridge, Mass, 69 p.
σ – convergence	is defined as a decrease in the variation (inequality, differentiation) of regional economic development levels over time	
β -convergence	assumes a negative correlation between the initial level of the region and the growth rate of the studied indicator; this concept is based on the assumption that poorer territorial entities grow at a faster rate, approaching the developed regions (p. 6)	Danilova, I.V. and Kilina, I.P. (2019), "Innovation space: theoretical and methodological aspects", <i>Management of economic systems: electronic scientific journal</i> , no. 7 (125), pp. 1-18.
σ – convergence	is a general case of convergence, involving a reduction in the dispersion of values in the sample under study, characterised by a smoothing of regional levels (p. 6)	
β -convergence or β -convergence	is the presence of a statistically significant negative relationship between per capita income and economic growth of a territory (over several decades)	Limonov, L.E. (2018), <i>Regional Economy and Pro-spatial Development</i> , Yurite Publishing House, Moscow, vol. 1, p. 213.
σ – convergence or σ -convergence	is a decrease in per capita income dispersion between regions, i.e. it occurs when the per capita income dispersion between all regions (although not necessarily between incomes of population groups within regions), falls over time	
β -convergence	is a negative dependence of growth rates on the initial level of development, i.e. poor regions (or countries) have higher economic growth rates than rich ones, which in the long run should lead to the alignment of regional levels of economic development (p. 194)	Tolmachev, M.N. (2012), "Theoretical and empirical approaches to agricultural production convergence", <i>Vestnik of Volgograd State University. Series 3: Economics. Ecology</i> , no. 1 (20), pp. 193-199.
σ – convergence	is defined as a reduction in the variation (inequality, differentiation) in levels of economic development of regions (or countries) over time (p. 195)	
Convergence	is a special type of structural shifts, during which new forms of network and cluster economic structures and, in the long term, new industries can be formed	Hasanov, M.A. (2014), "Institutional traps of welfare economy in Russia and prospects for new industrialization", <i>Modern Problems of Science and Education</i> ,

The term	Feature	Source
		no. 5, pp. 328-235.
Convergence	is a «superstructural» mechanism based on the economic basis of integration, which in turn manifests itself in the form of development of production cooperation and specialization, both of individual economic entities within a particular country and entire countries in the global space	Chelnokova, O.Yu. (2016), “Interconnection and interdependence of convergence and integration in economy”, <i>Proceedings of Saratov University. New Series. Series: Economics. Management. Law</i> , vol. 16, no. 2, pp. 154-158.
Convergence	is the process of convergence, convergence, the emergence of increasing proximity in some sense in the phenomenon under study (used in various sciences: economics, political science, biology, mathematics and other sciences)	Didenko, N.I. (2017), “Analysis of convergence-divergence in the development of demographic processes in the global economy”, <i>Bulletin of the V.N. Tatishchev Volga State University</i> , vol. 1, no. 4, pp. 26-31
Divergence	is a process to indicate movement along diverging lines, an increase in the gap between levels of something, an intensification of differences	
Great convergence	is an objective result of global economic development in general, the outcome of economic and political development of both developed and developing countries (and voluntarily or involuntarily the contribution of developed countries to this outcome looks even higher than that of developing countries themselves), it is a way to maintain the welfare of Western countries in the conditions of the demographic crisis that grips them, an opportunity to create a broader basis for further innovative development of the world	Grinin, L.E., Korotayev, A.V. and Greenberg, R.S. (2016), “Introduction. Cyclical Dynamics and Some Problems of the World Economy”, In: <i>Crises and Forecasting in the Light of Long Wave Theory</i> , edited by L.E. Grinin, A.V. Korotayev, R.S. Grinberg, Moscow, pp. 5-16.

Source: compiled by the authors / составлено авторами.

Based on the results of the content analysis on the content and essence of the conceptual and categorical system «convergence and divergence» in relation to the object and subject matter of the study, we can draw some conclusions.

The conceptual systems convergence⁴ (Ozhegov and Shvedova, 2010) (lat. *convergere* – convergence) and divergence (lat. *divergere* – divergence) characterize the process of object development, its properties to isolate and combine qualitative features, to update its structure. Under similar conditions, the elements of the structure of a complex system, developing, isolate their properties, and gradually the whole system begins to function differently, i.e., it becomes divergent with respect to its similar ones (Taran, 2019). Subsequently, the development of the system leads to a qualitative leap, which brings it closer to similar dynamically evolving systems. This makes it possible to classify different systems, highlighting in them both similarities and differences.

At the same time, as far as economics is concerned, there is a polysemy effect, i.e. ambiguity of definitions of convergence and divergence, their place and role in describing the processes of economic development of integration associations. Thus, the view about the non-economic nature of convergence of economic systems, originating from the logic of development of social formations (Belenky, 2013), is present along with the concept of purely economic indication of convergence – as an objective trend of industrialized societies (interpenetration of different models and types of economic systems, transformation of institutions and leveling of intersystem differences) (Abalkin, 2005), or as a subjective deviation from the historical process of economic development (result of efforts of elites to implement convergence and divergence of the economic systems) (Tsagolov, 2012).

⁴ The term «convergence» is borrowed from biology, where it refers to the convergence, in the process of evolution, of features of groups of organisms that are distant in origin, the acquisition of similar structures by living under the same conditions.

In the framework of our research we propose *to understand convergence as a trend of increasing globalization through deepening (regionalization «aggregation»⁵) of integration processes of convergence of post-Soviet member states having common goals or attributes for equal and mutually beneficial cooperation*. In other words, convergence is nothing but the convergence of the economies of different entities (regions, countries); different economic systems, their individual institutions and mechanisms; basic macroeconomic indicators (Drobotova, Kuzmina, Merzlikina, etc., 2017; Urunov, Usmanov and Zoidov, 2022), etc. Accordingly, *divergence will be seen as the opposite process of convergence, i.e. factors (endogenous and exogenous), trends and patterns that hinder integration processes between the countries concerned*⁶. In other words, it is a deepening of the negative gap from technologically advanced market economies, both in terms of macro indicators and structural proportions (Uhlin, 2004). It is also important to emphasise that the incentives for convergence and the factors for its development operate differently in each country, and the task of the EAEU governing bodies is to form a balanced policy in this area.

In the economy, convergence is the effect of balancing economic systems of different levels of development, potential, level of capital, human resources and technological mode due to the regionalization effect of «aggregation», where the main core of integration processes – absolute convergence – stands out, based on the combination of cultural, historical, geo-economic, military and political, territorial preconditions for countries bordering the Russian Federation. We should also add that technological and institutional factors are not the least important. In general this hypothesis is based on the assumption that developing countries can have a higher rate of economic growth than developed countries. In neoclassical models of economic growth like R. Solow and E. Denison's model (Robert, 2013), strict (absolute) convergence is the hypothesis that states that two or more countries have the same production function, population growth rate, attrition rate and saving rate, then obviously they tend to have the same sustainable level of capital intensity. Naturally, developing countries (e.g. Armenia, Kyrgyzstan) have a lower initial level of capital intensity than developed countries (e.g. Russia, Kazakhstan), resulting in countries with a level of capital intensity below the equilibrium level. Obviously, as we approach a sustainable level of capital intensity, the growth rate of capital intensity will decrease, and hence the growth rate of the economy as a whole will decrease as well. In other words, absolute convergence on the features outlined above is unlikely. Even if we assume that the above prerequisites are met and that countries with initially smaller capital stock develop faster than countries with larger initial capital stock, we will face the effect of different-level convergence, where some countries are satisfied and others do not receive the expected economic effects of integration, leading to a defocusing of the goals and motivations of all member states of the union. Therefore, in reality, convergence is in most cases conditional (weak), as countries have different starting points for interaction, i.e. we are talking about a convergence of economies developing at different speeds. The result will be equalization of per capita income in all countries, which corresponds to the variation features of R. Solow and E. Denison's neoclassical growth theory (Solow, 1956, pp. 65-94; Nureyev, 2013, pp. 201-213; Lucas, 2013, pp. 42-60; Robert, 2013).

The convergence thesis is important in R. Solow's model. In his research he identifies three reasons for the convergence effect (Romer, 2011, p. 32-36):

⁵ Regionalization of «aggregation» (lat. aggregatio accession) is a form of integration combining different levels of interaction both between individual trade, economic, social institutions of inter-firm and intercultural development (regionalization «from below») and at the level of intergovernmental and inter-state coordinated strategic measures to balance interests in priority areas determined by supranational institutions of governance of all member states of the union (regionalization «from above»).

⁶ The theory of economic divergence is considered in the works of E. Atkinson, T. Piketty, R.I. Kapelyushnikov, E.V. Balatsky and K.M. Sahakyants, G.N. Barsegov, A. Gerschenkron, K. Dervish, E.L. Eati and T. Williams, M. Kos and C. Otrok, A.V. Korotayev, D.T. Kuad, J.D. Lisovolik, L. Lee, R. Smith and M.H. Pezaran, D.Y. Rudenko and K.Y. Zinkovskaya, X. Sala-i-Martin et al.

1. Economies move along balanced growth trajectories, i.e. the difference in output per worker is only due to differences in the positions of countries relative to the balanced growth trajectory, so that the more «productive» poorer countries catch up with the less «productive» rich countries;

2. The marginal return on capital is lower in the more capital-intensive countries, so capital starts flowing from the rich countries to the poor ones, producing reductions in income between countries;

3. Because of the distribution of technology over time, the resulting income differences between countries begin to narrow after poor countries gain access to it.

One of the properties of the neoclassical theory of economic growth is the convergence of regions and countries according to a number of classification features (table 2). Regional convergence is the convergence of development levels of regions, while country convergence is the convergence of countries. A distinction is made between convergence in growth rates, income levels and factor productivity, meaning the smoothing of differences between countries (regions) by the relevant indicator.

Table 2

Types of economic convergence in relation to integration processes

Types convergence	Feature	Source
<i>Type I Convergences</i>		
Absolute convergence (unconditional convergence)	According to this type of convergence, poor countries show more rapid growth, which gradually slows down as they approach the level of developed countries. Gradually, growth rates level off. Two concepts of convergence are distinguished – beta (β -convergence) and sigma (σ -convergence). Beta convergence implies faster growth for poor countries than for rich and economically developed countries. Sigma convergence implies a reduction in the level of dispersion of per capita income between states.	Barro, R.J., Sala-i-Martin, X. (1990), <i>Economic Growth and Convergence across the United States</i> , Working Paper 3419, National Bureau of Economic Research, Cambridge, Mass, 69 p.
Conditional convergence (weak convergence)	Poor countries grow faster than rich countries under otherwise equal circumstances (assuming similar structural parameters and production function), i.e. under the same steady state. If the steady states are different, conditional convergence means that a country grows faster the further away it is from its own steady state.	
<i>Type II Convergence</i>		
Ex ante convergence	This type of convergence is associated with «a system of state regulation and a targeted policy of «pulling up» structurally weak regions to the level of developed regions». The most prominent example is the EU countries.	Libman, A.M. (2006), «The role of economic integration and disintegration in the post-Soviet space: a quantitative analysis», <i>Problems of Forecasting</i> , no. 5, pp. 58-72.
Eh post convergence	This type of convergence is the result of the spontaneous interaction of economic agents and the flow of capital, goods and labour between states.	
Clubhouse convergence	Groups of countries with similar growth trajectories, where convergence occurs between these subsets of countries (usually defined using dummy variables included in a conditional convergence model).	Lancieri, D. (2014), «Is there convergence in fertility in the European Union Member States?», <i>Demografic Review</i> , vol. 1, no. 2, pp. 110-139.

Types convergence	Feature	Source
<i>Type III Convergence</i>		
Institutional convergence	Convergence in terms of creating conditions for the development of integration: the legal and regulatory framework in place, the system of regulatory bodies of the integration association and joint institutions, the integration policies being implemented.	ECE report «Integration Indicator Framework as an Analytical Tool», (2019), available at: http://www.isbnk.org/upload/File/The%20System%20of%20Integration%20Indicators%202019.pdf .
Market-infrastructure convergence	The convergence of levels of formation of common markets for goods, services, capital and labour, taking into account the institutional conditions for integration that have been created.	
Macroeconomic convergence	In a broad sense, it is the convergence of the economic systems and policies of the member states, and in a narrow sense, it is the convergence of the values and dynamics of the main macroeconomic indicators of the member states.	

Source: compiled by the authors according to: (Barro and Sala-i Martin, 1991; Barro and Sala-i-Martin, 2010; Libman, 2006).

In general, the convergence of countries belonging to economic associations is both one of the objectives of the economic integration process and a prerequisite for its success. Three types of economic convergence can be distinguished: real, nominal and institutional. Real convergence means the convergence of per capita income levels between countries of economic unions. Nominal convergence is the synchronisation of the dynamics of the most important macroeconomic indicators. Institutional convergence implies the convergence of economic activity conditions and the level of development of market institutions (Pelipas, 2017).

It is important to stress that real convergence can become sustainable only when it is based on a deep integration of economies, becomes a consequence thereof, and not the result of a mechanical redistribution of income.

Based on content and comparative analysis, academic publications on various aspects of globalisation, convergent and divergent trends in economic development have been systematised and can be classified as follows:

1. *«Problems of economic convergence and divergence of developed and developing states»*. A great contribution to the study of these issues was made by such domestic and foreign scientists: Aron R., Albastova L.N., Akindinova N.V., Apergis N., Barro R.J., Borsi M.T., Belski Y.L., Balatsky E.V., Bessonov V.A., Glazyev S.Y., Idrisov G.I., Klavdienko V.P., Knyagin V.N., Lobanov O.S., Libman A.M., Metiu N., Menshikov S.M., Mantsev V.V., Minakov V.F., Panopolu E., Perroux F., Ryabov B.A., Rozhkova E.S., Sala-i-Martin X., Sukharev O.S., Saakyants K.M., Sorokin P., Tsumas S., Faltsman V.K, Fomin D.A., Khanin G.I., Shuvaev A.V., etc. The works of the above-mentioned researchers consider a wide range of issues related to the convergence of socialism and capitalism; the theoretical foundations of economy digitalization and global technology transfer are studied in detail; the general regularities inherent in the structural dynamics of the reforming Russian economy are analyzed.

2. *«Theoretical foundations of state regulation of multiform market economy»*. These issues were studied by foreign and Russian scientists: Barr R., Domar E., Keynes J.M., Kolomak E.A., Kozlov V.M., Kurbatova M.V., Coase R.H, Kapelyushnikov R.I., Levin S.N., Malyavina A.V., Marshall A., North D., Oiken V., Perroux F., Polterovich V.M., Rykova I.A., Smolnitsky V.A., Titov K.A., Hicks J.R., Harrod R, Erhard L., Yasin E.G., etc. These authors studied a set of measures of state structural policy, the peculiarities of its formation, as well as the institutional framework for regulating the national economy.

3. *«The impact of technological convergence on structural formation processes»*. Beloglazova S.A., Bainbridge U., Vetluga K., Hasanov E.A., Hasanov M.A., Yelkhina I.A., Pelipas I., Roko M., etc. devoted their studies to the study of such influence. They also examined the specific features of the phenomenon of structural convergence.

When considering the phenomenon of economic convergence, it is useful to highlight and analyse some approaches to its study in the context of integration processes and alliances (table 3).

Table 3

Scientific approaches to the study of economic convergence in the context of integration processes and associations

№	Name of approach	The essence of the approach	Authors
1	The convergence of capitalist and socialist modes of production	Micro-level analysis – combining the elements of the market and internal production planning in individual firms	R. Aron, W. Buckingham, J. Galbraith, C. Dankert, W. Rostow, P. Sorokin
2	Convergence as a convergence of developing and developed countries in terms of economic growth	Emphasis on comparing selected indicators of macroeconomic dynamics across countries	M. Abramowitz, R.J. Barro, N.G. Mankew, P.M. Romer, D. Weil, F.B. Larren, R. Lucas, X. Sala-i-Martin, J. Sachs et al.
3	Convergence of the institutional structure of different countries	Emphasis on the analysis of institutional structure and perspectives on institutional borrowing	M.T. Borsi, V.P. Klavdienko, N. Metiu, A.M. Libman et al.
4	Convergence as part of the globalisation economics	Emphasis on the structure of global GDP production	F. Aguilon, E. Atkinson, E.A. Bezglaznaya, Y.L. Belski, A.V. Grigoryeva, M.V. Kazakova, B. Milanovich, T. Piketty, A.A. Razem, S.B. Safronov et al.
5	Convergence of the innovation and technology structure of advanced economies	Emphasis on analysing the impact of converging technologies on the structure of the economy	S.Y. Glazyev, M.A. Hasanov, E.A. Hasanov, V.F. Minakov, A.V. Shuvaev, G.I. Idrisov, V.N. Knyaginina, et al.

Source: compiled by the authors.

The first approach is the convergence of capitalist and socialist modes of production. This approach emerged and began to develop actively from the mid-twentieth century in connection with the study of the convergence of the two ways of production – socialist and capitalist. Researchers who adhered to this approach wrote in their works «about the growing affinity of forms of production organization as the industrial mode spreads and expands, leading to the concentration of capital, consolidation of industry structures, industry and intraproduction planning» (Perroux, 2007, pp. 32-43; Gugniak, 2015, pp. 62-66; Belenky, 2013).

Buckingham W. and Dankert C. write: «the conceptual embodiment of the approach under consideration is the synthesised economy (Buckingham and Dankert, 1962; Mosini, 2007), the mixed convergent economy (Truba, 2013, p. 91; Pitirim Sorokin: New Materials for Scientific Biography, 2012), a subsidiary state intervening in the economy» when necessary (Galbraith, 1976; Galbraith and Menshikov, 1988), an integral type of social production (Pitirim Sorokin: New Materials for Scientific Biography, 2012; Lawrence, 2001), a universal type economy with a high share of communal production.

The followers of this approach have limited themselves to an institutional vision of the prospects and problems associated with the interpenetration of these patterns. Within the framework of the study of this theory, researchers drew attention to some similar elements, such as: demands for a more equitable distribution of income; the introduction of a planning element into the activities of foreign international legal entities; and the desire of some economic associations in the Soviet Union to make profits (Mantsev, 1975; Albastova, 1976).

The structural component of the convergence of economic modes has not been disclosed in the framework of the considered approach. According to the results of the structural analysis, there is every reason to say that such convergence implies convergence of the form, but in no way ensuring affinity of the substantive components of the economic structure. Proceeding from this point of view, it should be said that structural shifts resulting from the market reform of Russia's national economy in the 1990s had some convergent features: emergence of a large number of competing enterprises, destruction of the directive-planned economy, mass privatisation. At the same time, the country

showed other, much deeper signs of another structural shift, which was divergent in nature. The structure of Russia's national economy lacked many of the elements and features of a modern market system with a developed industry. There were no innovation-introducing companies, no high-tech holdings, no private research firms and no innovation-entrepreneurial networks.

Over time, the structural differences between the Russian economy and the economies of China, the United States and Western Europe deepened to such an extent that market reforms, defined as a manifestation of the convergence of the economies of the former Soviet Union and the advanced Western countries, created a reverse shift – a divergence.

The second approach is convergence as a convergence of developed and developing economies in terms of economic growth rate. This approach is supposed to evaluate the convergence of developed and developing economies in terms of economic growth rate that took place in the mid-twentieth century. Researchers have tried to explain convergence of economies of different countries within the framework of neoclassical theories of economic growth (Tumanova and Chagas, 2004, p. 201) (endogenous and exogenous growth – P. Romer (1986) and R. Solow (1956)). The following types of convergence have been identified:

- conditional convergence – more rapid growth of emerging economies with a similar ratio of capital to labour, slowing down as this ratio approaches that of advanced economies;

- «sigma convergence – equalization of the dispersion of per capita national income among advanced economies and some developing countries»;

- «beta convergence is a higher growth rate in countries whose per capita GDP is lower than that of more developed economies».

Scholarly research has identified increasing productivity in emerging economies as a key cause of convergence in economic growth, as developing economies gain greater access to the latest technology and foreign direct investment, stimulated by higher returns on capital, as a key cause of convergence. Examples include the recovery of Japan, Germany and France in the post-war years.

The particular type of clubbed convergence of states whose growth performance is quite similar both in terms of initial conditions and in terms of pace. One example is the so-called Asian Tigers, where Singapore, Taiwan, South Korea and Hong Kong were able to achieve rapid growth due to the massive influx of technologically related foreign investment in the 1990s. The development of the BRICS countries in the 2000s, which developed in the context of exceptionally favourable global commodity market conditions (Kolomak, 2009, pp. 113-120), is another good example. At the same time, many economists have drawn attention to the rather serious limitations of the theory of international economic growth convergence. J. Sachs, F.B. Larren and M. Abramowitz (Sachs and Larren, 1996) highlighted pressing institutional problems of market economy reforms. A. Gerschenkron drew attention to the imperfections of industrial policy in emerging economies (Belykh, 2013, p. 59-66). R. Lucas emphasized the low quality of human resources, insufficient private investment and savings (Lucas, 2013), calling them the main barriers to investment in industrial growth and the inflow of new technologies.

X. Sala-i-Martin and R.J. Barro described the convergence of growth that was characteristic of the technologically close economies of Western Europe and the United States in the mid-20th century, while in Eastern European countries this trend was much less pronounced (Barro and Sala-i-Martin, 2010). The key proposition of the hypothesis formulated by these authors is «a long-term trend of development of the economies of modern states in the convergent convergence of their per capita GDP with a certain steady-state, which is the level of per capita gross domestic product» in the most developed country.

A convergence of the pace of development of the Russian national economy with that of technologically advanced countries took place in the 2000s (for a rather limited period of time). Then, in a not entirely favourable economic environment, the growth of state federal budget revenues and revenue streams from exports of Russian raw materials provided a significant acceleration of growth rates above the world growth rate. But this effect waned over time, leading to a divergence in macroeconomic trends with advanced economies.

Thus, the above suggests that economic growth convergence is the result of a full-blown positive structural shift, which was induced from the outside and caused by qualitative growth in capital accumulation, imports and adaptation to the prevailing conditions of innovative technologies,

industrial and political institutions, as well as restraining income growth in order to achieve the goal of increasing the return on capital.

A third approach is the convergence of the institutional structures of different states. The essence of convergence in this approach is that the economic systems of different states develop in a prototypical way, modelling «institutional structures, solving similar problems of an economic nature, discarding inefficient institutions, filling gaps with rules and norms that have proved positive in world practice» (Apergis, Panopoulou and Tsoumas, 2010; Perroux, 2007; Budak and Sumpor, 2009).

N. Metiu and M.T. Borsi pointed out that the development of institutional structures of different states ensures their identity (Borsi and Metiu, 2015).

A.M. Libman, in his research, has identified several market reform tasks addressed by institutional convergence (Libman, 2005, pp. 58-72):

- trying to overcome the internal blockades of reform;
- improving the position in global institutional competition;
- reducing the costs of cross-border transactions.

These tasks are facilitated by adapting global experience, importing and adapting effective institutions as temporary ones D. Rodrik (2008), V.M. Polterovich (2012, pp. 25-44). We should agree with the opinion of researchers (Klavdienko, 2014; Uspenskaya, 2017), who believe that convergence of institutions, which caused the increased efficiency of application of internationally accepted norms, is possible in the countries whose economic systems are influenced by strong convergence factors:

– external – cultural cooperation between countries, military intervention (in the case of Russia, the former Soviet Union; in the case of the United Kingdom, India; in the case of the United States, South Korea);

– internal – development and expansion of traditional cooperation, production, financial and trade relations: the United States, Canada, Mexico; Eastern and Western European countries.

The national economy of Russia, which before the reform had been developing outside full-scale industrial, scientific and economic cooperation with technologically developed countries for quite a long time, and today continues to take part in global production as a raw materials appendage, has not yet created a set of rules and standards, as exist in developed economies. This means that borrowing successful foreign experience alone is not sufficient for a serious and comprehensive structural shift.

The fourth approach is convergence as an integral element of the process of economic globalisation. This approach is based on the analysis of globalization factors that produce changes and structural shifts, which bring together national economies of different states and cause similar processes in their development. The scientific literature draws attention to the fact that «economic convergence in the framework of the globalization concept is based on the reduction of the contribution of the most developed states in the production of world GDP and its «smearing» between developed and developing economies (by the way, «smearing», according to some projections, will last until the mid-21st century). Thus, while in the year 2000 the distribution of the population of the OSCE member states (Shiltsin, 2010) and their share of world GDP produced was 20% and 77%, by 2030 this ratio is projected to be 20% and 50%» (Dolores, Rivas and Villarroja, 2016). According to a number of scholars (Kazakova, 2018; Grigoryeva and Bezglaznaya, pp. 23-25), this implies quite profound structural changes in Latin America, Africa and Asia. Such changes will contribute to similar levels of productivity as well as a reallocation of the participation of advanced and emerging economies in the global value chain. Convergent structural shifts encompass the efficiency and balance of private and public institutions, a gradual narrowing of the technological gap through the diffusion of cutting-edge science and technology via telecommunications, and a reallocation of investment in high-tech and manufacturing across countries.

The convergence effect is also inherent in the process of introducing components of the structure of developed economies (through the expansion of TNCs – transnational corporations) into the national economies of developing countries.

It should be noted that the above conclusions are made taking into account the successful example of the EU regional integration, where the member states have established and are supporting a supranational structure. In general, the main factor behind the possibility of such integration association is the interdependence of national economies in Europe and the formation of supranational

economic regulation institutions (Safronov, 2010). The existence of a common technological platform and the practice of free movement of capital between sectors (thanks to the development of common European business networks (Grigoryeva and Bezglaznaya) also played a role. The integration process in the form of transition to a single currency was largely made possible by the convergence of European economies on such macroeconomic indicators as interest rates, debt-to-GDP ratio, and inflation rate (Ryabov, 2004). Note that along with «globalization» convergence, meso-economic (Zaretskaya, Dremova and Osinevich, 2013; Didenko, 2017; Barro and Sala-i Martin, 1991; Dosi and Fabiani, 1994) and regionalization (Iodchin, 2007; Shiltsin, 2010; Chuveleva, 2016; Usmanov, 2015) convergence has been the object of research.

Undoubtedly, the process of globalisation, which is accompanied by, according to specialists: 'the creation of international technology transfer and cross-national economic blocs', has provided the factors and prerequisites for structural changes in the former socialist bloc and Southeast Asian countries. In our view, the development and functioning of employment in a network format is also important. These shifts are characterised by a technological convergence. It is pointed out that 'there is a qualitative change in the nomination mechanisms' of key sectors and industries, in response to which a fundamentally new structural formation emerges.

At the same time, the specialisation of the economies of some countries is clearly visible, which makes their structure more distant from that of developed economies in terms of form. The Russian economy is a source of raw materials (wood, coal, natural gas, oil, petroleum products, etc.) and the structure of the Russian economy is becoming more and more distant from the technologically developed countries. Consequently, there is a process of divergence. In other words, participation in globalisation processes is not yet a guarantee of structural convergence and positive structural change. In 2005, for example, Russia had a rather high export quota and exported more than half of its hydrocarbon production (coal, gas and oil) – 31% – and in 2014 it was 51%. This is about twice as high as another BRICS member, Brazil⁷.

The fifth approach is the convergence of the innovation and technology structure of the national economies of the leading states. This approach is based on the studies devoted to the «convergent nature of structural changes, as well as features of convergence of innovation and technological structure of economies of leading industrial states. The peculiarities of convergence of innovation and technological structure of different states were pointed out in their studies by E.A. Hasanov and M.A. Hasanov. They considered it as a result of mutual penetration and combination of different innovations of technological plan» (Hasanov and Hasanov, 2014, pp. 5-16). The category of «structural convergence» or «structural convergence» is studied by foreign scientists in the context of forming a technological system or paradigm, in which innovative technologies, combining and intertwining with each other, become a special structural-forming resource of structural economic shifts. This is fully consistent with the idea of technical unity of many countries, the foundation of which is provided by available global communication technologies and digitalization of technological processes (Minakov, Shuvaev and Lobanov, 2018). This idea is also linked to the notion of a «convergent hyper-network», which is capable of integrating important elements such as cognition, adjustment of institutions («nooeconomics») and management of economic processes in the economy (Loginov, 2011, pp. 16-18).

Convergence of the technological structure is therefore to be understood as the merging of certain innovations into a self-generating system. In this system, emerging technologies intertwine and merge with each other, generating technologies which diffuse to generate new industries. Under the conditions of continuous digitalisation, a profound, qualitative and complete restructuring of economic relations is recognised as a driving force for structural change, as a result of the global diffusion of convergent innovations. These include the emergence and development of a network format for investment and production management, the emergence of new forms of self-organisation in entrepreneurship (blockchain) and the gradual loss of the emission-key role of the state.

At the same time, the transformations in the technological structure of the Russian national economy are more of a degenerative nature. This is completely opposite to the global trend set by the sectoral expansion of technological convergence. The reform of Russia's national economy,

⁷ Defined by UNCTAD, available at: <http://unctad.org/> (Accessed 10.11.2021).

along with positive aspects, has also brought a number of negative transformations, which have caused a serious slowdown in commercialisation of innovations and innovative products. The result was:

First, creation of financial and institutional conditions for the consolidation of unprofitable and high-cost productions in the radioelectronics and machine-building industries, whose enterprises are the main consumers of innovative breakthrough technologies.

Secondly, the mothballing of resource-intensive industries and technologies with a low share of generated value added (final assembling or extraction of raw materials).

At present, innovation projects financed by RUSNANO occupy about 25% (a quarter) of the domestic technology market. The state corporation itself, however, is unprofitable. About half of the domestic machine building industry's production (55%) is concentrated in the state corporation Rostec. Of the companies and organisations that are part of Rostec, about 45% are lossmaking. The latest figures show that the loss compensations from the state budget for all these state-owned organisations amount to 120 billion roubles. In the Russian national economy no more than 16 per cent of technologies developed are commercialised. Of these, only about 50 per cent correspond to the global level. And this is despite overall technological leadership in twelve of the 34 global technological areas. Accordingly, the emergence of new components in the innovation and technological structure by itself does not yet act as a factor determining the conditions of convergent changes in the national economy of Russia.

Conclusion

Summing up the review of existing approaches to the definition of the content side of convergence in structural changes of the economy, we conclude that it quite objectively describes the processes of similar transformations of structural proportions related to the increase of returns on factors of production in the national economy of different countries, as well as the expansion of their share in the factor structure and further influence on transformations in social, innovation and technological, market and competitive and sectoral structure.

For the purposes of our study, the main scientific approach to understanding the components of the mechanism of economic convergence is the postulates of the globalisation economy. As we have already defined, convergence in general terms consists in the convergence of key economic indicators (usually expressed per capita) of different states grouped together in a certain group. A group of states may be defined through a common characteristic (e.g. developing countries of South-East Asia or a certain region of Africa), as well as through formally established associations like the European Union or the Eurasian Economic Union that share political, socio-cultural and economic history and common development goals, and are enabled through such integration to reduce common threats – whether geopolitical, economic, man-made or other threats – for them.

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