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# Journal of Environmental Management and Tourism

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# Smart Specialization as a Comprehensive Territorial and Sectoral Approach to Determining Regional Development Priorities

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**Abstract**

The relevance of the study is due to the active spread of the concept of smart specialization as a comprehensive territorial and sectoral approach to the development of territories not only in the EU but also in other countries, as well as the emergence of new directions and modifications. The article analyzes the ten-year evolution of the concept of smart specialization from a predominantly sectoral approach to a comprehensive balanced territorial-sectoral approach to determining the priorities for the development of regions based on unique competitive advantages based on entrepreneurial search in the context of interregional and macroregional interaction. The possibilities and prospects of using a smart specialization in the implementation of regional development policies of developing countries for the formation of innovative and technological industrial models of development and integration into global value chains have been evaluated. It has been established that at present the concept of smart specialization continues to develop and should consider such modern trends as technological connectivity of industries, digitalization, and convergence of technologies, blurring and increasing transparency of regional and state borders, glocalization, the development of interrelated processes of "competition", "co-evolution", and "co-specialization" of territories.

**Keywords**: smart specialization; interregional interaction; macroregion; the connectedness of territories; digital transformation; spatial development; the convergence of technologies.

**JEL Classification**: O57; R19; R58; O39.

## Introduction

In February 2019, the Government of the Russian Federation approved the Spatial Development Strategy until 2025. In this document, considerable attention is paid to interregional interaction as one of the factors in the growth of economic well-being of territories and increasing their competitiveness. The Spatial Development Strategy provides for strengthening interregional cooperation within the newly created 12 macro-regions (Order of the Government of the Russian Federation 2019). Therewith, promising areas of economic specialization are proposed for each of the subjects of the Russian Federation. However, they often do not meet the current conditions for the development of the global market in the context of technology convergence and digital transformation.

The analysis of the Strategy in terms of the probability of its implementation and compliance with the real problems of the Russian regions in the context of four key aspects (development of agglomerations, geostrategic territories, macroregions, effective economic specialization) allows concluding that in comparison with previously adopted strategic documents, the Spatial Development Strategy has conceptual advantages, but does not solve the key problems and not everything planned can be implemented in the existing economic conditions (Zubarevich 2019, 135).

The main claim made to the list of promising economic specializations fixed in the Strategy is that the above list is a simple list of activities that are statistically observed in certain territories, without any explanation of the reasons for equating them with the economic specializations of the regions, without indicating any criteria for the allocation of specializations. This practically excludes the possibility of determining "promising specializations" without solving the problem of global territorial and industrial optimization with explicit consideration of the forecast of the vector of national and global needs and the forecast of scientific and technological drift (Minakir 2019, 967). The actual assignment of promising economic specializations of the regions shows that at the federal level, the desire to make decisions "from above" dominates, with insufficient attention to the development of "from below" (Kuznetsova 2019, 107).

Another drawback is the discrepancy between the provisions of the Strategy for Spatial Development of the Russian Federation until 2025, adopted following the law on strategic Planning of 2014, and the strategies for socio-economic development of the regions adopted in the period from 2015 to 2017 following the same law. Productive implementation of the strategy is possible only if the economic space is represented as a system of economically interacting regions, and not as an additive set of administrative regions (Minakir 2019, 967).

The lack of interconnections between the Spatial Development Strategy and other strategic documents is also noteworthy, such as the RF State Program "Economic Development and Innovative Economy", the Strategy for Scientific and Technological Development of the Russian Federation until 2035, a long-term program to create new markets and provide conditions for technological leadership of Russia by 2035 "National Technology Initiative", national projects of the Russian Federation "Digital Economy", "Education", "Science", and "International Cooperation and Export".

To a certain extent, as a reaction to criticism of the academic community and practitioners in the field of strategic planning and management and to develop strategies for the development of macroregions provided for by the Law on Strategic Planning and the Spatial Development Strategy of the Russian Federation, the Ministry of Economic Development and Trade of the Russian Federation announced in November 2019 about the development of guidelines for the socio-economic development of territories in the first quarter of 2020, considering their specifics – the implementation for regions and macroregions of the concept of smart specialization, considering the human potential of the region, the level of patent and investment activity, the rate of economic development and other indicators. However, these recommendations have not yet been published.

In this regard, the purpose of the article is to study the concept of smart specialization as an integrated territorial-sectoral approach to the development of territories, generalize its principles and possibilities of application in developed and developing countries, and identify controversial aspects, new directions, and modifications that consider spatial asymmetry, technological advantages, the connectedness of industries, digitalization, and convergence of technologies.

## 1. Materials and Methods

A representative array of publications for the review is formed from the scientific citation databases Scopus, WoS, RSCI, Google Scholar by selecting articles and monographs sorted both by relevance and citation and by publication date, considering the impact factor of journals, which allows identifying generally recognized fundamental works and determining the current trends in the development of the subject area.

The empirical basis of the research is presented by normative legal acts of various levels in the field of socio-economic, spatial development and digitalization, reports and presentations of international organizations, expert and rating agencies, analytical centers, data of the Federal State Statistics Service of the Russian Federation.

The research methodology is represented by the historical-evolutionary and ecosystem approach, dialectical, categorical, subject-object, retrospective, and monographic methods, terminological, comparative, and content analysis of scientific literature and empirical sources, as well as methods of generalization, typology, classification, and systematization.

## 2. Results

Many studies have been devoted to the study of the explanatory factors of specialization of the economy of regions (or countries): the neoclassical economic school (factors of production, natural resources, and technologies); new theories of international trade (market size and factors of "second nature" – the geographical distance between economic agents, economies of scale, intra-industry differentiation of products, differences in consumer preferences); the theory of new economic geography (agglomeration processes, interregional mobility of labor and companies with a demand for intermediate goods). Despite a large number of works and models, economic science does not currently have comprehensive answers to questions about the factors of the spatial distribution of specialization, so the solution to this problem should be sought rather in empirical studies and approaches (Grishina *et al*. 2018).

It is an empirical approach to the definition of territorial economic specialization, implemented on the principle of "bottom-up", is, applied in the EU since 2009 to stimulate innovative development and interregional cooperation, the concept of smart specialization.

The concept of smart specialization was formulated by the European Commission's Knowledge for Growth expert group in 2009 (Foray *et al*. 2009). It has received regulatory consolidation in the EU as a methodology for determining the priorities of innovative development of regions in several regulatory documents (European Parliament 2012, 2013; Smart specialization: Building on Europe's strengths 2013). The methodology and principles of smart specialization have also been implemented by other countries, including China (Anastasopoulos *et al*. 2017, 102) and the US (Radosevic *et al*. 2017), and are highly appreciated by international economic organizations (OECD 2013).

Smart specialization originally advocated the concentration and specialization of research and innovation activities in a way that complements and enhances entrepreneurial and innovation processes. The original thinking was more sectoral in origin and nature (Foray *et al*. 2009; Coffano and Foray 2014, 33), but over time more attention has been paid to the regional and spatial aspects of argumentation (McCann and Ortega-Argilés 2013a, 1291; McCann and Ortega-Argilés 2014, 409; Boschma 2014, 51). The smart specialization approach to research and innovation policy followed the logic of the European Cohesion Policy and was integrated into its updated structure to support the evolution and change of national and regional economic structures by identifying and developing new transformational activities, implementing a strategic and inclusive approach with a focus on efficiency and results, and mobilizing local actors (Foray 2018, 817). The transformative function of smart specialization policies is realized through highly selective policy interventions focused on specific economic activities. Targeted interventions for selective policy intervention are usually referred to as investment priorities or priority areas. The basis for the selection of activities to support should be data collected from the interaction of business entities and policymakers to study and evaluate promising or emerging new activities and their possible development trajectories in terms of feasibility, benefits, risks, and policy needs. The search for and discovery of new activities within a smart specialization is known as the process of entrepreneurial search (or entrepreneurial discovery,) (Foray *et al*. 2009). Thus, the essence of smart specialization is that for each of the participating regions, considering its ability to introduce innovations, an economic development strategy is selected and its place in the global economy is determined (Cecere and Corrocher 2015, 204; McCann and Ortega-Argilés 2013b, 405).

Regional stakeholders in the framework of smart specialization are involved in the process of selecting priority industries, the development of which can transform the economy. A bottom-up approach to management is common within the framework of the smart specialization, entrepreneurial creativity is encouraged at the level of business units, and interregional cooperation is a strategic priority.

The most intensive inter-regional cooperation is carried out on the territory of the EU. N. Rees noted in 1997 that early European projects to promote inter-regional cooperation were a political success, but even despite the new trend of "bottom-up" development of territories at that time, the economic effect was not so

pronounced. The author saw the main obstacle to interregional cooperation in the different levels of development of the interacting regions (Rees 1997, 385). One of the priorities of the European regional policy is to raise the standard of living in the countries that joined the EU after 2004 to a level that is average for more developed countries. In this regard, the so-called diffusion of innovation and knowledge is of particular importance (Cecere and Corrocher 2015, 204). An important principle of management is also its decentralization – the French researcher L. Védrine (2018) concludes that there is a direct relationship between the decentralization of territorial management and a high level of spatial interaction.

The INTERREG program adopted in the EU is entirely dedicated to cross-border cooperation in the member states. Its goal is to create a platform for development projects jointly implemented by border regions (Scott 2017). The program began to be implemented in 1990 and since then has passed five stages, each of which approved the goals, objectives, and budget. The official documentation of the INTERREG program states that with its help, the authorities of various European regions can share ideas and practical experience of regional management, which will later help them to form more effective strategies for the development of territories. INTERREG V was implemented in 2014-2020, its main financial results, aggregated by goals, are shown in Table 1.

Table 1. Financial information at priority axis and program level (Annual implementation report 2019)

| Priority axis | Research, Technological Development, and Innovation | Competitiveness of Small and Medium-Sized Enterprises | Low Carbon Economy | Environment and Resource Efficiency | Technical Assistance | Total |
|---|---|---|---|---|---|---|
| **Total funding** | 99,344,632.00 | 99,344,629.00 | 99,344,629.00 | 99,344,629.00 | 28,931,099.00 | **426,309,618.00** |
| **Co-financing rate** | 85 | 85 | 85 | 85 | 74.52 | **84.29** |
| **Total eligible cost of operations selected for support** | 107,285,469.25 | 101,790,250.25 | 94,104,668.25 | 101,380,441.25 | 28,931,099.00 | **433,491,928.00** |
| **The proportion of the total allocation covered with selected operations** | 107.99% | 102.46% | 94.73% | 102.05% | 100.00% | **101.68%** |
| **Public eligible cost of operations selected for support** | 104,596,974.50 | 99,150,422.90 | 92,821,201.95 | 99,412,630.75 | 28,931,099.00 | **424,912,329.10** |
| **Total eligible expenditure declared by beneficiaries to the managing authority** | 47,213,826.57 | 37,753,153.57 | 34,311,130.24 | 29,590,078.98 | 12,419,873.34 | **161,288,062.70** |
| **The proportion of the total allocation covered by eligible expenditure declared by beneficiaries** | 47.53% | 38.00% | 34.54% | 29.79% | 42.93% | **37.83%** |
| **Number of operations selected** | 66 | 67 | 61 | 68 | 1 | **263** |

A new phase of the INTERREG program is planned for 2021-2027; the main priorities of the European regional development policy for this period are:

- a more smart Europe;
- a "greener" Europe;

- a more "connected" Europe;
- a more "social" Europe;
- Europe is closer to the citizens.

Projects that receive INTERREG funding should be implemented within 3-5 years on the territory of several European countries, while the organizations implementing the projects should have an action plan ready, and a group of project stakeholders should be identified. The respondents from among the representatives of the regional authorities of the EU countries named the acquisition of additional knowledge and access to new technologies as the goals of interregional cooperation while noting that cooperation with regions with an equal level of development or with more developed ones is preferable (Uyarra *et al*. 2018, 2344).

V.A. Semidotskii and co-authors noted the absence of "mechanisms of interregional integration" among the problematic aspects of the development of Russian regions, saying that there is a competitive struggle for resources between the regions rather than effective cooperation for all parties. This is also indicated by the insufficient number of public-private partnerships created for the development of "production integration spatial systems" – interregional clusters and special economic zones (Semidotskii *et al*. 2011, 43). M.A. Nikolaev and M.Yu. Makhotaeva speak about the creation of interregional clusters as a tool for the development of interregional cooperation. In their opinion, clusters create additional opportunities for the federal district to improve the dynamics of its socio-economic development (Nikolaev and Makhotaeva 2016, 47). P.V. Stroev and co-authors (2018) consider interregional clusters created for the implementation of large projects, including the participation of foreign capital, to be the main form of interaction between regions. However, at the beginning of 2021 in Russia, according to the Ministry of Industry and Trade of the Russian Federation and the Russian Cluster Observatory of the Higher School of Economics, there were only 7 interregional clusters.

An important part of the smart specialization strategy is the research and innovation strategy. The paper of F. Pagliacci, P. Pavone, M. Russo and A. Giorgi (2019) analyzes it in the context of the EU macro-regional policy. Ignoring the administrative boundaries of regions is also at the heart of the concept of so-called functional regions (Chilla and Streifeneder 2018, 2470).

In the EU, macroregions and Euroregions are part of the macro-regional strategy, under which 10 macroregions were allocated on the territory of the Union. The following functions of macroregions are defined:

- strengthening of integration within Europe;
- creation of new socio-economic spaces that generate economic development and stimulate employment;
- reduction of tension in relations between some neighboring states (Bellini and Hilpert 2013; Medeiros 2018).

Macro-regional strategies occupy an intermediate position between pan-European strategies and national-level strategies (Chilla and Streifeneder 2018, 2470). On the territory of the EU, macro-regions are allocated to solve problems typical for transnational territories (*i.e.* territories covering more than one country); macroregional strategies have been operating since 2009 (Capello and Cerisola 2019, 1043).

Regional cooperation within the European macro-regions has allowed individual countries and, most importantly, their less-developed border regions to become more actively involved in the process of Europeanization. The monograph of Bellini and Hilpert notes that the conclusion of partnerships between cities, the implementation of joint transport, environmental, etc. policies in the border regions marked the transition to a new vision of Europe. Borders between states are losing their significance, interregional and interethnic projects are being implemented (Bellini and Hilpert 2013).

In macroregions, as Bellini and Hilpert point out, the advantages and competencies of the regions that make up its composition are concentrated and combined, while each of them benefits from this cooperation. Within the macroregion, it is convenient to create networks of scientific cooperation and industrial complexes (Bellini and Hilpert 2013). Herewith, the macroregion in Europe remains a so-called "soft" instrument of territorial policy and it is not yet known whether it will evolve in the direction of "tightening", and the concept of the macroregion itself is still quite abstract and allows for a wide range of interpretations (Chilla and Streifeneder 2018, 2470).

Bellini and Hilpert also emphasize that it is not enough to simply announce the creation of a macro-region: Europe needs real productive cooperation between regions, in which each region and actors within it are ready not only to maximize the benefits of cooperation but also to contribute. As one of the problems, researchers note the uncertainty of the political status of macro-regions. The EU experience shows that the transition from the formal definition of the composition and boundaries of a macroregion to its functioning as a special territorial unit is always quite difficult. Therewith, European macro-regional strategies do not imply the adoption of new

legislation and the allocation of additional funding – the meaning of the concept lies in a more efficient redistribution of resources already available to the regions. It is emphasized that the regions, as a rule, differ significantly in the level of development (Chilla and Streifeneder 2018, 2470). Highlighting the experience of the EU in the field of territorial planning, Krinichanskii points to the creation of so-called Euroregions – special territorial units consisting of several regions, each of which does not lose its administrative borders but transfers part of the management functions to the sub-regional level. This spatial structure is compared with the macroregions allocated on the territory of the Russian Federation, but the author notes that the effectiveness of the latter remains low (Krinichanskii 2013, 2). Another problem for Russia is not always a reasonable and appropriate allocation of macroregions, which does not have a positive impact on interregional cooperation (Minakir *et al.* 2020, 66).

The spatial development strategy of the Russian Federation for the period up to 2025 defines 12 macro-regions, for which socio-economic development strategies should be developed on the principles of smart specialization.

The objectives of developing strategies for the development of macroregions are:

- strengthening of interregional interaction;
- coordination of transport and energy infrastructure development planning;
- optimization of the placement of objects in social sectors;
- development of branches of promising economic specializations of the subjects of the Russian Federation, considering the prevention of duplication of investment projects and unjustified competition of the subjects of the Russian Federation;
- planning and implementation of large interregional investment projects;
- creation of territories (investment sites) with a special regime for conducting business activities (Order of the Government of the Russian Federation 2019).

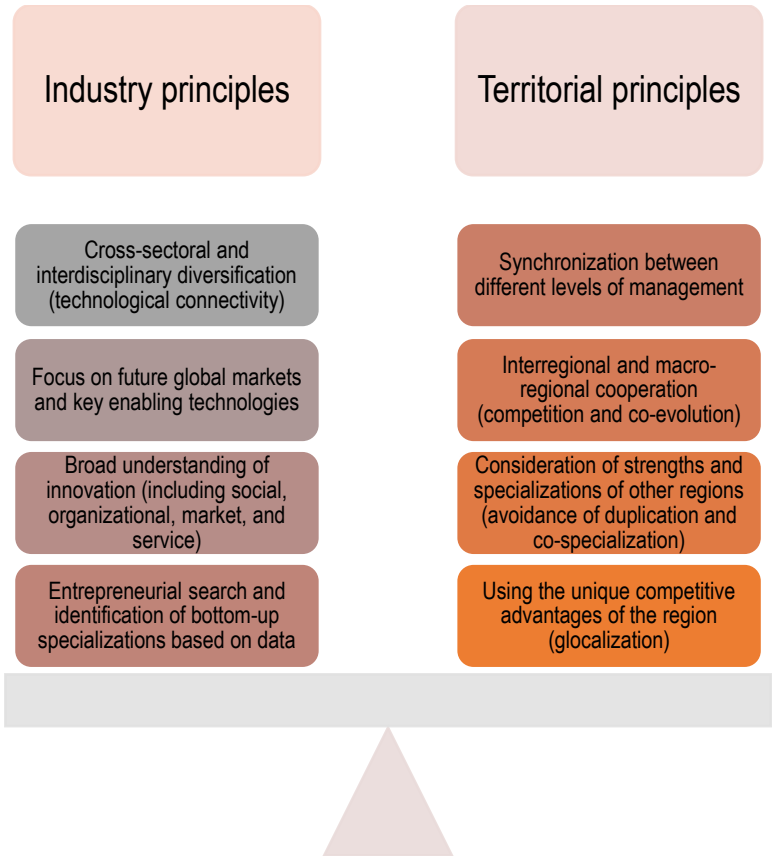
The development and approval of macroregion strategies and plans for their implementation should become the main link between the country's sectoral and territorial development priorities, the basis for the implementation of directions and measures to strengthen interregional cooperation.

Various aspects of the formation and development of the economic space and the definition of the prospective economic specialization of Russian macroregions have attracted the attention of scholars for more than ten years. For example, in the work of N.N. Mikheeva (2008), changes in the proportions of the development of the country's macroregions in terms of growth are considered, shifts in the territorial structure of production and final use of GRP, labor resources, fixed assets, as well as changes in the specialization of macroregions are estimated. O.V. Inshakov and I.V. Mitrofanova (2009) proposed the concept of a priority megaproject for the development of the South of Russia in the context of strategic design in the macroeconomic and global dimension. Factors and features of the formation of cross-border regions in the context of the intensification of communications and globalization on the example of the Baltic macroregion are analyzed in the work of G.M. Fedorov and V.S. Korneevets (2010). The problems of forming the concept of long-term development of the macroregion from the point of view of determining the parameters of the concepts of regional development over a long period and choosing the sources of resource support for development on the example of the Russian Far East are considered by P.A. Minakir (2012). The distinctive features of economic development, the main trends, and problems of the introduction and development of innovations in the North Caucasus macroregion are defined in the work of Yu.E. Klishina, N.P. Oboturova, O.N. Uglitskikh (2013). Several works (Silin *et al*. 2017a, 2017b; Kurushina and Petrov 2018, 176; Bodrunov 2018, 2) are devoted to the development of the economic space of the Ural macroregion. They describe the problem of de-industrialization of the Urals and propose modernization of traditional sectors of the economy in conjunction with new industrialization – the development of production of the fifth and sixth technological modes (Silin *et al*. 2017a, 2017b). The paper of E.V. Kurushina, M.B. Petrov (2018) substantiates the scientific principles and indirect criteria for the success of interregional integration projects, which, in addition to territorial community and complementarity, should include the principles of security, network organization, obtaining synergetic effects, considering cultural and historical proximity, common mentality and established economic ties. The study of the subject-terminological field and the practical application of the territories of advanced development on the example of the Ural macroregion as one of the poles of scientific and technical development of the Russian Federation, capable of implementing the triad "industry – science – education", is devoted to the study (Bodrunov 2018, 2). Analyzing the prospects for the development of the newly created Central Chernozem macroregion in Russia, the authors of the study (Stryabkova *et al*. 2019, 3228) conclude that there is a high potential for interregional cooperation within this territorial unit. V.V. Okrepilov and

co-authors (2020) assess the areas of specialization and prospects for the integration of the regions included in the North-Western macroregion.

Thus, the evolution of the concept of smart specialization over the past ten years has resulted in a balanced, integrated approach to determining investment priorities for regional development, based on the integration of territorial and sectoral principles (Figure 1).

Figure 1. Integration of the industry and territorial approach in the concept of smart specialization




Summarizing the above, the focus of the current edition of the smart specialization policy among the main "innovations", in comparison with its initial version, is on:

- entrepreneurial initiative "locally" as opposed to vertical management structures (priority is given to actors-entrepreneurs who possess both technical and business competencies);
- specific geographical spaces (places) of innovation implementation, but not the sectors of the economy in which they are implemented;
- regional relations with the "outside world": regions make strategic decisions, ignoring their administrative borders, based only on their position in the national and global division of labor (Uyarra *et al*. 2018, 2344).

## 3. Discussion

The concept of smart specialization is still far from perfect and that its practical implementation is hampered by several obstacles (administrative, institutional, etc.). For example, its implementation has achieved great success in developed regions and countries – developing and peripheral regions cope with this task much worse (Varga *et al*. 2018, 48). The reason for this may be the lack of institutional capacity and political constraints to find directions for development (Trippl *et al*. 2019, 1328).

Therewith, the greatest difficulty in implementing smart specialization (especially in the least developed regions) is the lack of "thinking outside" the region, rather than inside its administrative borders, i.e. the lack of a strategic approach to interregional interaction (Uyarra *et al*. 2018, 2344). An example of how regional integration can contribute to economic growth is the LAPSSET International Transport Corridor project, launched in Central Africa. The project is based on considering the competitive advantages of the participating regions and is considered as a growth pole of the African economy (Speakman and Koivisto 2013, 93). Studies of the project

components of the LAPSSET corridor in 2011 demonstrated high economic efficiency. For most of the high economic internal rates of return (EIRR) were calculated from 17% to 23.4%, with an industry minimum standard of 10% for infrastructure projects (Table 2).

Table 2. Economic viability of LAPSSET program and implementation cost (LAPSSET Corridor Development Authority 2015)

| Project components | Quantity | Cost, millions USD | EIRR, % |
|---|---|---|---|
| Lamu Port | 32 Berths | 3.095 | 23.4 |
| Railway | 1.710 Km. | 7.099 | 17.8 |
| Highway | 880 Km. | 1.398 | 12.9 |
| Crude Oil Pipeline | 2.240 Km. | 3.949 | 21.6 |
| Product Oil Refinery | 120.000 bpd. | 2.800 | 13.9 |
| Resort Cities | 3 Lots | 1.214 | 20.8 |
| Airports | 3 Lots | 506 | 20.7 |
| Services infrastructure | | | |
| High Grand Falls (Hydro + Water) | 1 Lots1 Lots | 2.110 | |
| Associated Infrastructure | | 2.500 | |
| Total Cost USD | | 24.524 | |

Even though developing countries are not yet sufficiently integrated into the processes of globalization, largely due to the low rates of innovation activity in the regions, investments in the framework of smart specialization strategies can give a certain impetus to the development of the regional economy. For example, the experience of Brazil shows that for the successful implementation of the smart specialization model, several common problems that have caused the country's lag in innovation activities must first be solved. This approach can be applied in other countries with a similar level of economic development, considering the prospect of switching to smart specialization (Bosch and Vonortas 2019, 32). The concept of smart specialization in the context of the Republic of Moldova is one of the important strategic approaches to the country's economic development through specific support for research and innovation in the context of the country's aspirations for European integration, but also a complex task since it requires the participation and joint efforts of various stakeholders (Shavga and Baran 2020, 49). The Kyrgyz Republic is also aimed at creating an effective innovation ecosystem based on smart specialization with mandatory involvement of regions, in particular, in agriculture (Suleeva 2018, 56).

The possibility and expediency of using the principles and methodology of smart specialization in the Russian regional development policy have been actively discussed in the academic community recently. A.O. Gasford (2019) notes that it is important for the successful implementation of the principles of smart specialization to assess the interaction between the main priorities and levels of management: state, regional, and municipal. G.Ya. Belyakova and S.D. Proskurnin (2016) propose to focus on certain local territories (high-tech zones, special economic zones, clusters) in which the drivers of the economy are located, and to develop a strategy for their development, considering the principles of smart specialization. In the work of Yu.V. Dubrovskaya and M.R. Kudryavtseva (2017a), the advantages of applying the smart specialization strategy for technological re-equipment of existing manufacturing industries, determining the vector of interregional and international cooperation to increase the investment attractiveness of Russian regions are formulated.

The article of S.P. Zemtsov and V.A. Barinova (2016), substantiates the need for a differentiated regional innovation policy in Russia based on the principles of smart specialization, aimed at preserving human capital, forming innovative entrepreneurship, and intensifying horizontal ties. The paper of E. Kutsenko, E. Islankina and A. Kindras (2018) shows that in the absence of uniform rules for selecting, verifying, and synchronizing innovation development priorities, a common analytical database, support and expertise tools, even regions with high innovation potential find it difficult to form and implement unique strategies that would fully comply with the principles of smart specialization. In the subsequent work of E.S. Kutsenko, V.L. Abashkin and E.A. Islankina (2019), the authors analyzed the correspondence between the sectoral specialization of the subjects of the Russian Federation and the priorities of regional development expressed in the form of cluster initiatives and showed that the statistically identified sectoral specialization of Russian regions is often not taken into account when applying state support measures.

The authors of the study (Repichev *et al*. 2018, 37) state that in Russia there are systemic obstacles that hinder the formation of smart specialization, related to the fragmentation and isolation of regions from each other, the lack of mechanisms for the formation of interregional production chains, the centralized and universal nature of strategic planning for economic development, which does not consider the specific features and needs of

specific regions: geographical, resource, environmental, production, and infrastructure. However, the paper of L.A. Kostygova (2019), argues that the experience of modernizing the EU industry based on considering the territorial characteristics of production at the regional and interregional level can be useful for both industrialized and developing countries in the formation of global value chains (GVC) based on a comparative analysis of countries and regions, which allows avoiding unjustified duplication of investment use cases, identifying potential opportunities for niche areas in terms of developing new ideas and turning them into innovations within the framework of interregional industrial investment projects and forming a network of territorial innovation clusters in Russia. According to the report of the HSE Center for Structural Policy Research (Simachev *et al*. 2020), after the COVID-19 pandemic, a transformation in global chains is expected, which will be associated with fragmentation and geographical migration of individual elements of the chains, while the transformation models will be determined by the specifics of industries, technological features of the chains and the attractiveness of territories.

Due to the ongoing changes, the previously adopted approaches to regional innovation systems and clusters, as noted in the article of E. Uyarra, C. Marzocchi and J. Sorvik (2018), have recently been rethought, since, in conditions of extra-regional connectivity, including at the level of GVC, regions can no longer be considered as closed spaces – their development also directly depends on decisions taken in other regions (Table 3).

Table 3. Foreign value-added share of gross exports, 2005-2016 (OECD 2018)

| | EU28 average | G20 average | China | Japan | United States |
|---|---|---|---|---|---|
| 2005 | 28.7 | 16.9 | 26.0 | 10.2 | 10.8 |
| 2006 | 30.4 | 17.7 | 25.5 | 12.2 | 11.4 |
| 2007 | 30.6 | 17.7 | 24.2 | 13.2 | 11.7 |
| 2008 | 31.2 | 19.0 | 22.6 | 15.2 | 12.9 |
| 2009 | 27.9 | 16.7 | 19.2 | 10.9 | 9.4 |
| 2010 | 30.6 | 17.6 | 21.0 | 12.2 | 11.1 |
| 2011 | 32.2 | 18.7 | 21.4 | 14.3 | 12.7 |
| 2012 | 32.7 | 18.7 | 20.4 | 14.0 | 12.4 |
| 2013 | 32.3 | 18.6 | 19.8 | 15.2 | 11.5 |
| 2014 | 32.0 | 18.1 | 18.7 | 15.8 | 11.2 |
| 2015 | 31.1 | 17.2 | 16.3 | 13.2 | 9.5 |
| 2016 | 29.1 | 15.6 | 15.1 | 11.4 | 9.0 |

The research of A.S. Dubnikov (2018), is devoted to the complexity of the organization of the production process in the era of digital communications and interactive innovations and the study of the phenomenon of GVC. Now this phenomenon finally goes beyond national borders, is divided into specialized operations, and is distributed along the links of GVC. Global firms seek to recombine the territorial distribution of links, selecting specialized contractors from the local cluster where it can be performed most effectively for each business task. As a result of this process, global production and innovation networks, macro-regional network "factories" are formed. It is necessary for the formation of network nonlinear models of production and export diversification to form innovative clusters with smart specialization as local nodes of the GCC and to prioritize the improvement of the economic environment for the continuous updating of technologies over the course of improving the technologies themselves (Smorodinskaya and Katukov 2017, 72). The study of Adler and Florida demonstrates that large corporations in the era of the post-industrial economy tend to place their headquarters in the cities with the most developed human capital and with the greatest global connectivity (the presence of international airports, etc.). Such cities (usually national capitals and/or major financial centers) strengthen their status as "world capitals", while simultaneously demonstrating both the importance of interaction and the growing importance of geographical proximity (Adler and Florida 2019, 610).

According to the conclusions given in the paper of G. Cecere and N. Corrocher (2015), the presence of innovation hubs in the region increases the connectivity of the region with others, since hubs act as centers of information diffusion. A study conducted by X. Zhang and co-authors on the example of the People's Republic of China demonstrated that the "flow of knowledge" is the main source of spatial economic interaction. According to the authors, the diffusion of technologies does not play such a significant role. Therewith, the observed result is typical both for interaction within the country and at the global level (Zhang *et al*. 2019, 5). Innovation processes, as proved in the paper of K. Martinus, J. Suzuki and S. Bossaghzadeh (2019), are possible not only in large agglomerations but also in the so-called peripheral regions, provided that these regions are sufficiently connected with the centers of innovation activity.

The increasing role of the diffusion of information, knowledge, and technologies in the development of territories leads to an increase in the role of universities as centers of spatial development and participants in solving global problems (overcoming global challenges) of the community (Bakhtina *et al*. 2019, 52). The strategic policy documents of many countries are currently focused on global challenges, such as demographic changes and well-being; food security, sustainable agriculture and marine economy and bioeconomics; ecology and the environment, rational use of natural resources (Bichisao *et al.* 2019; Decree of the President of the Russian Federation 2016; Order of the Government of the Russian Federation 2019). Under the influence of these factors, the concept of the "triple helix of innovation" is being transformed into the concept of the "quadruple helix of innovation", which combines the modern understanding of the involved (civic) university and the principles of smart specialization (Goddard *et al*. 2017).

The concept of the four-link spiral expands the triple helix paradigm by including in the innovation process, along with science, industry, and the state, a society that is the end-user of innovation and therefore significantly affects the creation of knowledge and technology, which significantly complicates the already difficult process of quantifying the effects of smart specialization (Karayannis and Grigoroudis 2016, 31; Unger and Polt 2017, 10). The concept of the four-link spiral allows achieving high efficiency of innovations, reducing the percentage of their rejection by the market, and saving resources by including civil society in the innovation process. Using it in the formation of smart specialization will allow achieving the uniqueness of the innovation trend for each region within a single system and a single strategy for the development of the country (Nezhnikova *et al*. 2018, 33).

As we noted earlier, smart specialization involves identifying development priorities in the process of entrepreneurial search, which implies the presence of a structured business community and civil society institutions in the region. Therein, universities in the regions should take upon the role of supporting institutions, networks, and clusters that can generate "strategic" knowledge. To do this, universities need to understand their business environment and its needs to choose the right areas of scientific specialization. Universities, acting as centers of excellence in several fields and being in collaboration with other research centers outside the region, can serve as external expertise and information channel for the regional industry. Being outside of the political or competitive struggle in the region, universities can take upon the role of a "collector" of complex projects, at the intersection of industries, sciences, interests that require the involvement of many organizations and a long implementation time (Goddard *et al.* 2017).

A similar role of universities as integrators of high-tech projects in the regions was defined when 15 world-class scientific and educational centers (SEC) were created in Russia within the framework of the "Science" national project. The main task of the SEC is to consolidate the educational, scientific, and technological capacities of the regions to develop the territories and create the potential for integrated innovative development of the state as a whole. The paper is devoted to the search for a conditional connection between the SEC model and the European experience of innovative development from the point of view of the possibility of borrowing institutional forms and from the point of view of analyzing the prospects for the development of similar characteristics of the Russian and European educational, scientific and technological systems (Medushevskii 2019, 29).

The problem in the development of Russian foreign trade in technology remains the significant predominance in the export of non-protectable results of intellectual activity and services of a technological nature, the cost of which is significantly lower than the cost of objects of exclusive rights. Engineering services dominated in terms of the volumes of technological exports and imports of Russia in 2019 (73.5 and 58.4%, respectively). The share of receipts from exports under agreements, the subjects of which were protected industrial property, amounted to only 1.3%, while their share reached 27% in the structure of payments for the import of similar objects (Rosstat 2020). In the context of regions, more than half of technology exports are accounted for in the Central and North-Western Federal Districts, and more than half in them – in Moscow and the Moscow Region and St. Petersburg, respectively (Table 4).

According to the organizers and speakers of the educational intensive "SEC: from idea to implementation", SEC, created considering the socio-cultural and historical context, should perform the function of developing regions and creating regional digital ecosystems of technology transfer and commercialization of RIA; become points of growth in the regions of the Russian Federation to align socio-economic development and increase the competitiveness of Russian innovative products on the world market; should not compete for resources among themselves, but be complementary to each other in solving tasks for the development of macro-regions. SEC are a large-scale experiment to find new regional mechanisms for joint activities in the field of education, science, and innovation through the communication of participants and attracting extra-budgetary funding (Koroleva *et al*. 2019, 477).

Table 4. Export and import of technical technologies and services by federal districts of the Russian Federation in 2018 (Rosstat 2019)

| | Export | | |
|---|---|---|---|
| | Number of agreements | Cost of the subject of the agreement, million US dollars | Receipt of funds for the year, million US dollars |
| Russian Federation | 3033 | 32,368,919 | 1,405,475 |
| Central Federal District | 647 | 1,620,347 | 173,620 |
| including: | | | |
| Moscow | 324 | 359,403 | 50,015 |
| Moscow Region | 73 | 1,172,363 | 51,050 |
| North-Western Federal District | 1,072 | 1,646,446 | 676,375 |
| including: | | | |
| Saint Petersburg | 1,003 | 1,603,061 | 662,755 |
| Southern Federal District | 88 | 36,550 | 27,680 |
| North Caucasus Federal District | 8 | 193 | 287 |
| Volga Federal District | 400 | 28,797,922 | 437,289 |
| Ural Federal District | 263 | 110,522 | 30,034 |
| Siberian Federal District | 545 | 151,564 | 55,374 |
| Far Eastern Federal District | 10 | 5,374 | 4,817 |

At the same time, several problems of the effectiveness of the functioning and evaluation of the SEC have already been identified. In the article of V.V. Zakharova (2020), the author examines the target indicators of SEC, highlights the existing contradictions, and emphasizes the relevance of research on the best practices of the organization and the functioning of already established SEC. It is necessary to give the subjects of the Russian Federation real powers to develop science and higher education organizations located on their territories for the effective functioning of SEC, the development of smart specialization, and interregional scientific and technological cooperation due to horizontal ties (Untura 2020, 62). In the work of N.G.Kurakova, O.V. Cherchenko (2020), it is proposed to develop a more coherent system of indicators of technological development of the country as a whole and individual regions and to more clearly formulate the goals and objectives of SEC as a model of technological development. The mechanisms and criteria for assessing the achievement of world-class SEC raise questions. According to the authors of the study (Zhuravleva *et al*. 2020, 112), this requires the involvement of SEC participants in global innovation structures based on international scientific cooperation and the concept of open innovation – network structures, technology platforms, innovation clusters, and comparison of SEC performance indicators with information reflected in various international ratings and reports of world opinion leaders, leading experts, as well as ratings in the fields of innovation and education.

The concept of smart specialization, the principles of its implementation, and its effectiveness in different contexts and for different countries and regions have been sufficiently studied and covered in scientific publications. However, in the course of expanding its application both in Europe and in other countries, in the process of the digital transformation of the economy and the transition to a new technological order, new controversial issues arise, and previously unexplored aspects are revealed that form the prospects for its research and development.

The first such question concerns the limits of government intervention in determining investment priorities and funding levels. The article of R. Crescenzi et al. (2018), assesses the impact of the joint industrial research subsidy program funded by the Cohesion Policy Funds in the less developed Italian regions. The authors found that the program did not lead to a significant increase in investment, value-added, or employment of the beneficiary firms, and the positive effects were manifested only in low-tech sectors, while cooperation with universities or other enterprises had limited or no impact at all. Based on this, the authors argue that if cooperation is not the result of a process of entrepreneurial discovery and autonomous search for the best possible partners, but the product of public incentives, it may not have a positive effect. However, government investments do not always show a negative effect. In the work of S. Sarkar, J.J. Bilau and M. Basílio (2020), an example of an infrastructure project in the Portuguese Alentejo region shows the effectiveness of large public investments in "anchor" infrastructure and their contribution to attracting other investment funds for use in smart specialization projects.

Examining the mechanisms for coordinating investment priorities in 39 regional and national smart specialization strategies in Italy and Poland, the authors of the article (Gianelle *et al*. 2020a, 2020b) identified a tendency to form a large number of narrow priorities, which they associated with lobbying mechanisms, an ill-defined system of incentives for innovation, underestimation of risks and broad state support, which contradicts the principles of smart specialization. This raises the question of the ability of strategic management bodies to effectively select and support the implementation of priorities, in the face of a shortage of institutional, administrative, and technical resources at the national and regional levels.

The next debatable issue is the development of methodological approaches to determining investment priorities of smart specialization in the context of the digital transformation of the economy and the convergent development of technologies. Until recently, the practical implementation of smart specialization policies was quite limited, as a coherent set of analytical tools is still not defined. In the study of P.-A. Balland, R. Boschma, J. Crespo and D.L. Rigby (2019), the authors propose, when defining the priorities for the smart specialization of territories, based on the concept of technological connectivity and complexity of knowledge, the conjunction of industry, innovation, scientific, and technological competencies, and local "implicit" knowledge. The article of M. Dosso and D. Lebert (2020), continues the current research on the analytical tools of smart specialization, in which the authors propose a cartographic method for identifying new structural features, positioning, and benchmarking regions in a complex interregional network of the local, national and global knowledge following their technological potential for developing smart specialization strategies. Benchmarking procedures in the smart specialization are not new (Dubrovskaya and Kudryavtseva 2017b, 351). However, this process can now be significantly improved due to end-to-end digital technologies such as big data analysis and artificial intelligence. Specialized digital platforms to support entrepreneurial search and dissemination of knowledge networks contribute to the integration of regional innovation ecosystems into the interregional and international context following the global challenges of accelerating technological development (Pogodina and Abdikeev 2018, 210; Khmeleva *et al*. 2019, 35; Rizvanova 2019, 70). Such tools could also solve the problem of insufficient static data for regional, and especially municipal, analysis. However, the question remains: how much can the process of entrepreneurial search be technologized and where is the boundary of this technologization?

Finally, the concept of smart specialization has recently become a powerful tool for achieving the environmental sustainability of regions. The paper of S. Montresor and F. Quatraro (2020), identifies the drivers of new specialization in green technologies and the role of key enabling technologies and confirms that smart specialization can contribute to the transition to environmental sustainability if policy development includes the principle of green diversification combined with investment in key enabling technologies. In Russian conditions, this approach can also be applied in the modernization of the economy (Korovin and Averina 2019, 18), especially in old industrial regions (Nikulina and Averina 2019, 16).

## Conclusion

Smart specialization as a concept for determining the strategic priorities of the region allows for the integration of the spatial potential of territories within the framework of interregional and macro-regional interaction, smoothing out the imbalances of socio-economic development and spatial fragmentation of settlement through the formation of innovative and technological industrial development models, integration into global value chains and internationalized reproduction cycles.

The appointment of promising branches of specialization of regions that do not correspond to global trends, "from above", from the federal level, which occurred in the Spatial Development Strategy of the Russian Federation, is associated with a high risk of not receiving the expected effects in the development of regions due to the consolidation of the existing low-tech specialization. It is much more productive to move "from the bottom", from the competitive advantages of the regions in combination with innovations within the framework of smart specialization, since it is most effectively manifested at the intersection of existing potential, experience, competencies, and technologies relevant to the region.

An example of such a definition of global promising specializations of regions based on cooperation between the state, business, science, and society, often in cooperation with other regions, can be the project of Russian world-class SEC, which, contains a combination of "top-down" and "bottom-up" approaches. Therein, the state can and should act as an investor in the implementation of large investment projects for the development of the "anchor" (including research) infrastructure of the regions to increase their attractiveness for private investment in smart specialization projects. Industrial and innovative territorial clusters, technological valleys and technoparks, special economic zones, etc. can also become institutional forms of support for smart specialization. The implementation of smart specialization as a criterion for decision-making at the federal and regional levels

should be based on the convergence of innovation, industry, and regional policies, integrated into a coordinated management chain and stimulated by tax incentives.

The speed and scale of the development of new technologies is now the main challenge and opportunity to enter new markets for both developed and developing countries and regions. The associated technological diversification, aimed at integrating into existing and creating new value chains, will allow changing the specialization of regions with a focus on the current situation of global markets and demand. Since the quality and sufficiency of data (statistics) plays an important role in determining the priorities of smart specialization, it is necessary to improve the system of statistical observation and tools for monitoring the development of promising industries and sectors of industries and sectors of the economy. The expansion of the analytical base should be based, among other things, on new methods of displaying data within the framework of complex network theory, the use of artificial intelligence algorithms, and big data analysis.

Summing up, it should be emphasized once again that at present, when using the concept of smart specialization, it is necessary to consider modern trends in the development of territories, such as digital transformation and convergence of technologies, blurring and increasing transparency of state borders; openness (transcendency of economic activity) of countries and regions of different scales; "glocalization", i.e. the preservation and strengthening of regional differences, the convergence of innovation systems, networks and sectors, the displacement of the principle of mono-sectoral priority selection by the principles of inter-sectoral diversification, related diversity and strong interdisciplinary ties, dynamic development of interconnected processes of "competition", "co-evolution", and "co-specialization".

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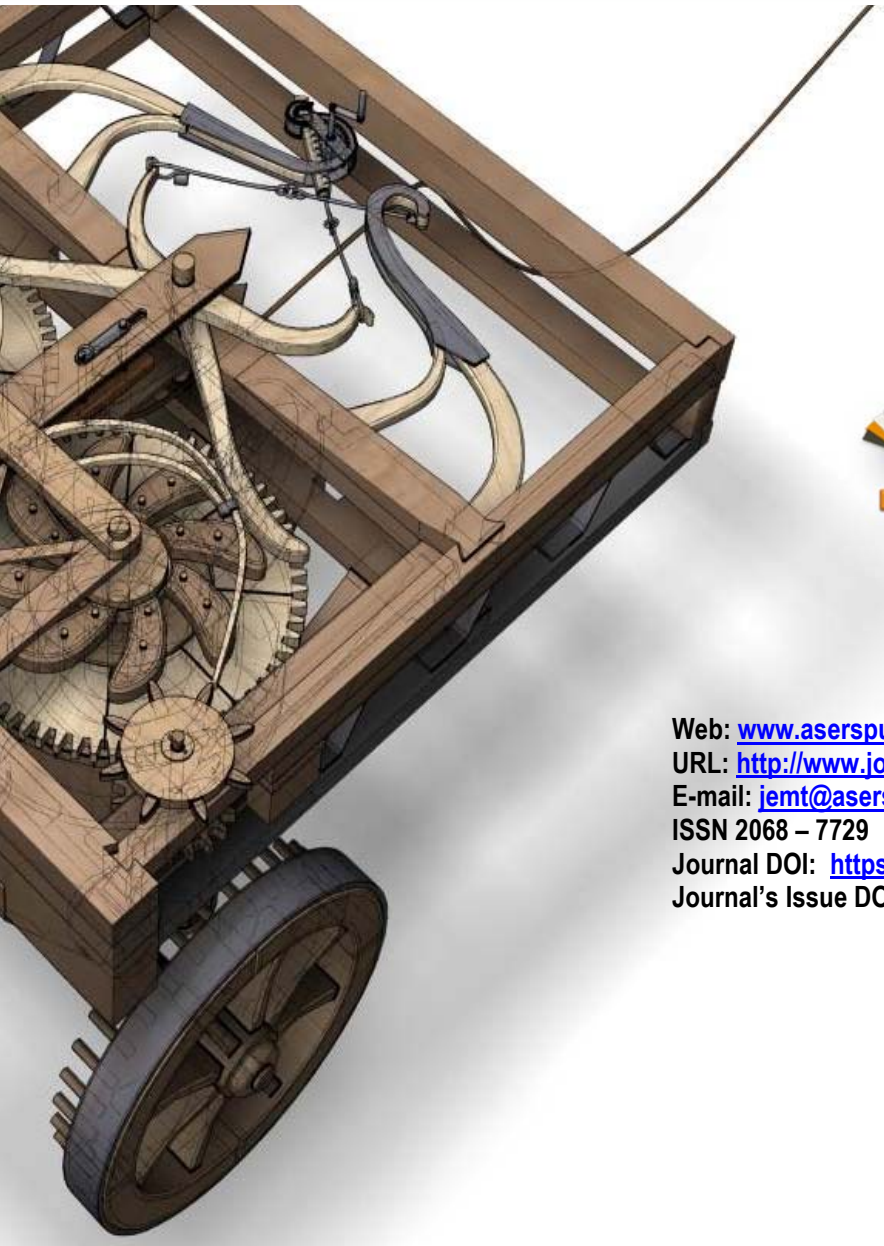

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