

COASTAL REGIONS OF RUSSIA: MIGRATION ATTRACTIVENESS AND INNOVATION PERFORMANCE

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ABSTRACT: Coastalisation is a widely known concept that builds on the global urbanisation of the world's marine and ocean coasts. In this paper, the degree of coastalisation of the Russian regions is analysed using a variety of parameters, including population numbers and gross regional products, indicating the accumulation of human activity in the coastal regions against the less densely populated inland territories. This research shows that coastalisation is expected to continue, making coastal regions the most attractive for international and interregional migration, hence their high innovation performance. Based on the principles of human geography, we put forward the hypothesis that Russia's coastal territories are highly heterogeneous in their development dynamics. This study aims to test the interdependence between migration figures and innovation values across 23 regions of Russia with access to the sea. The research design comprises three stages: calculation of innovation performance, evaluation of migration flows and the building up of a typology of coastal regions. The research results reveal an increased migration attractiveness of the country's coastal regions, with the St. Petersburg and Kaliningrad agglomerations and the Black Sea coast of the Krasnodar Krai (region) as the main attractors. Intensive innovation activity is characteristic of St. Petersburg, the northern capital of Russia, whereas peripheral regions where the extractive industries dominate (the Yamalo-Nenets Autonomous Okrug (district), Kamchatka, Krasnoyarsk and Magadan regions) demonstrate a much weaker trend towards combining innovation performance and migration attractiveness.

KEYWORDS: coastalisation, coastal region, coastal migration, innovation activity, Russia

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Introduction

Many international scholars would agree with the famous description of the Russian scenery as 'a sea of land' as termed by Heber (1839). Russia has a vast territory, which occupies a significant part of the globe and stretches from East to West across 11 time zones. Twenty-three regions of the country

border on seas and thus can be broadly defined as coastal. Regions with access to the sea account for 60.1% of the entire territory of the country and 24.5% of its population. These regions include both the territorially vast Republic of Yakutia covering 3,085,000 km² and the Krasnoyarsk Krai (region) with an area of 2,367,000 km², as well as very compact and highly urbanised areas – the

cities of St. Petersburg, Sevastopol and the Kaliningrad region. Fourteen coastal regions are of national importance as far as maritime activity is concerned. The Russian maritime clusters (seaports, fishing enterprises, offshore oil and gas production infrastructure, seaside tourism and recreation, etc.) are located in these regions (Druzhinin 2020; Lachininskii et al. 2019). Eleven coastal regions, located in the Arctic zone and the Far East of Russia, have extremely unfavourable natural and climatic conditions for the development of maritime socio-economic activity. In this regard, they have a focal character focusing on a limited number of industries and activities (mainly raw materials, export-oriented), directly affecting the migration activity of the population and influencing the components of the innovative potential of the territory (Komkov et al. 2017). As noted by Zaikov et al. (2017), the innovation activity of the northern territories is highly related to the development of the Arctic and the extraction of natural resources on the continental shelf (Western Arctic – the Barents, Pechora and Kara Seas; Eastern Arctic – the Laptev Sea, the East Siberian and Chukchi Seas).

In the past decades, the coastal regions of Russia have significantly increased their maritime activity and the population in those areas has considerably grown. According to Ozgen et al. (2012), this creates prerequisites for increasing research, technological and technical potential of regions boosting new ideas, knowledge spillovers, entrepreneurship and economic growth. The question is to what extent this is true today for coastal territories, the migration attractiveness of which often results from other factors, which are not in any way related to innovation. The diversity of the Russian coastal regions, having completely different geographical characteristics relevant for migration attractiveness, makes it possible to put forward and test the hypothesis on the interdependence between migration and innovation values as well as to offer a typology of Russia's coastal regions. This study aims to assess the migration attractiveness of the coastal regions of Russia and compare it with their innovation performance.

The article includes several sections. Section 2 summarises the literature review of the phenomenon of coastalisation with regard to migration and innovation dynamics. Section 3 presents the

methodological framework of the study, featuring the geographical scope and research design. Section 3 provides a structured overview of the research results obtained using the indicated methodology. Finally, the article concludes with a summary, policy recommendations and implications for further research.

Literature review

Coastal areas are an important and dynamic spatial component of a territory; they are characterised by intense economic activity, higher population numbers and a developed infrastructure. Researchers have long been interested in the study of these areas, formed at the 'junction' of the sea and the land; their specific features as well as factors facilitating their development. Systemic research into the role of the World Ocean and coastal territories for humankind has been carried out since the end of the 19th century, starting with the seminal works of Alfred Thayer Mahan. In the mainstream of modern geography, the idea of coastalisation (there is also a synonymous term *thalasso-attractiveness*, i.e. attraction or movement to the sea) has become widespread. The geographic study of coastalisation has been complemented by the analysis of demographic statistics, migration processes, peculiarities and evolution of their settlement systems. Mee (2012) indicates that the population density of the coastal areas is 2.5 times above that of the global average. Various estimates suggest that the coastal zones are home to >30% of the world population, which is still growing exponentially (Hinrichsen 1996; Small, Nicholls 2003). Migration to the coastal regions has been explored by Schubel and Levi (2000), who noted that 13 of the 15 largest cities of the world are located in coastal zones.

The migration attractiveness of coastal territories is related to a number of 'pull factors' that determine the characteristic features of these territories, for instance, socio-economic development (labour market, business environment, market maturity), environmental conditions (climate and ecological situation), political stability and democracy, and public infrastructure and institutions. Recent studies on human movement (migration) to coastal regions have revealed a number of specific features. Analysis

of the attractiveness of southern Europe (Spain, Portugal, Italy) has shown that there is a strong bias towards several types of migration, particularly residential, retirement and lifestyle migration, to name just a few. In their frequently cited works on 'seaside' migration of wealthy retirees of Northern Europe to the resort coastal areas of Spain, O'Reilly (2000) and Benson and O'Reilly (2016) suggest that the so-called 'lifestyle migration' may be an unambiguous determinant of coastalisation in the south of Europe. Casado-Díaz (2006) demonstrated that migrants do not usually integrate into the host society. They tend to establish social contacts predominantly with their compatriots. This can be explained by the lack of close interaction with the indigenous population, since there is no need for these types of migrants to get an education or to find a job (Huber, O'Reilly 2004). The influence of this category of migrants on the region of settlement is limited, predominantly stimulating the development of service industries such as healthcare, construction, local housing and markets and does not explain the innovation performance of coastal areas (Casado-Díaz 2006).

In the study of coastal migration, Merkens et al. (2016) emphasise the important role of coastal and maritime economic activity—shipping, small-scale fishing and tourism along with coastal management. Fulanda et al. (2009) suggest that coastal fishing has been the most significant factor determining the movement of people to the east African and Western Indian Ocean (WIO) region for several centuries. In addition, the development of the marine functions of coastal territories is of great importance (Iden, Richter 1971; Jiang et al. 2014; Morrissey, O'Donoghue 2012). This confirms the previous finding that employment is one of the key motives for migration to the coastal zone (Zelinsky 1971). The highly diverse and developed labour market of coastal cities and agglomerations foster the development of near-the-capital coastal municipalities (Mikhaylov et al. 2019; Montanari, Staniscia 2011; Zhitin et al. 2020). At the same time traditional maritime and coastal activities, e.g. fishing and fish-farming, are low-technology and moderately innovative (Vega et al. 2014). Morrissey (2015) stresses the primary role of major cities and agglomerations often located further inland in maritime economy networks.

An influx of specialists having different competences, primarily highly skilled ones, has become an important determinant for the formation of the innovative potential of coastal territories. Lyu et al. (2019), who studied the innovation performance across 270 Chinese cities, argue that the influx of highly skilled migrants to cities and especially to cities on the eastern coast, significantly affected the development of innovation—the driving force behind the development of agglomerations.

The analyses of the impact of migration on the innovative development of host territories have shown its positive effect clearly. However, this holds true only for a distinct composition of immigrants from different backgrounds. The sheer size of the immigrant population in a certain locality has no valuable effect (Ozgen et al. 2012).

Recent studies show that international 'talent' migration makes the most significant contribution to the generation of new knowledge (Wang et al. 2020) and increases the R&D investment in production (Wei et al. 2020). Hunt and Gauthier-Loiselle (2010) have shown that an increase in the share of migrant college graduate population boosted innovation, which reflected in the number of patents per capita in the United States. This has been confirmed by the most recent publications (Drivas et al. 2020). Moreover, Stuenkel et al. (2012) have drawn attention to the contribution of foreign students to the production of research publications and an increase in citations.

Zhao and Li (2021) have maintained that internal migration has a significant positive impact on regional innovation. In their recent publications, Ozgen et al. (2014, 2017) have demonstrated a positive partial correlation between innovation and cultural diversity at the workplace. The contribution of migration to productivity growth in companies and industries is less clear and may often be negative. This can be explained by Peri's efficient specialisation hypothesis (Peri 2012; Paserman 2013), according to which migrants and natives sort themselves efficiently across industries to increase aggregate productivity.

The data on R&D expenditures, technological innovations and the level of education of incoming migrants (2010–2016) show that there is a positive causal link between innovation and migration inflows in the Russian regions (Aldieri et al. 2020). However, the question is whether we can

use the data on migration to explain the ‘coastal innovation paradox’ (Glavovic 2013). The innovative potential of coastal territories is generally perceived as related to the attraction and concentration of the population. The concentration of people, their ideas and financial capital in coastal regions, along with the aforementioned factors, result in the strong economic and innovation presence of these territories. Some studies estimate that over 30% of the world’s gross domestic product (GDP) is produced in coastal regions (Gallup et al. 1999). In Europe, the share of gross regional product (GRP) generated by coastal regions is 43% (Mikhaylov et al. 2018). The inflow of people, that is, a higher population density can not only serve as an indicator of the formation of ‘growth poles’, but also form the basis for a further advanced growth of intellectual capital and leadership.

Most of the studies evidencing a positive link between the migration attractiveness of coastal regions and innovation (and economic) performance have been carried out using the example of southern regions (e.g., the Mediterranean Basin), whereas there have been only a few studies of northern territories (e.g., North America) and they do not confirm this positive pattern. The coastal regions of Russia, stretching in the broadest strip from the northernmost mainland point of Russia at Cape Chelyuskin in Krasnoyarsk Krai (77° 43'N) to the Bazarduzu mountains in the Republic of Dagestan (41° 11'N), are extremely diverse in natural, climatic, resource, economic, demographic and residential conditions. By studying Russia’s vast coastal areas, we attempt to assess the interdependence of the migration attractiveness of the Russian coastal regions and their innovation performance as well as to build a typology of these regions based on their socio-economic and climatic conditions.

Methodology

The geographical scope of the study covers 23 coastal regions of Russia across five sea basins: the Baltic Sea basin (three regions), the Black Sea basin (four regions), the Caspian Sea basin (three regions), the Arctic basin (four regions in the European part and four regions in the Asian part) and the Pacific Sea basin (five regions). The

nomenclature of territorial units for statistics of the second level (NUTS 2) is applied for being the scale of regional policies on migration and innovation, featuring the required statistics. The research period is eight years (2011–2018) – the period corresponding to the ‘Innovation development strategy of the Russian Federation until 2020’. The data used in the study were provided by the Federal State Statistics Service of the Russian Federation (Rosstat, <https://eng.rosstat.gov.ru>).

The research design is structured into three methodology blocks. First, we evaluate the attractiveness of the coastal regions for migration by considering the following most justified and frequently used indicators (Rangel, Lopez 2018):

- crude rate of net migration, which is evaluated separately for international and interregional migration flows;
- crude rate of migration volume for international and interregional migration flows;
- efficiency of migration, which is measured as the ratio of crude rate of net migration to crude rate of total migration, in per cents.

The assessment of migration attractiveness was done in three stages. During the first stage, migration data for measuring the aforementioned indicators were collected and aggregated for 2011–2018. In the second stage, the average values of indicators for 2011–2018 were calculated for the coastal regions and for Russia as a whole. The arithmetic mean values of indicators were computed. In the third stage, the intervals of replacement (compensation) of migration loss to other regions of Russia by migration gain from abroad were determined, featuring the following intervals: 100%, 50–75%, 30–40% and <20%. This made it possible to describe and analyse the specifics of migration flows with other territories.

Second, we analyse the innovation performance index. The index was calculated in three stages. In the first stage, the average values of indicators were calculated for the coastal regions of the Russian Federation (for 2011–2018) and the country as a whole (for some regions the data were for 2013–2019). In the second stage, the values of indicators were normalised by correlating them with the average for Russia. The resulting value higher than 1 indicates that the coastal region has a stronger performance in this indicator, compared with the national average. The criteria for

Table 1. Methodology for calculating the innovation attractiveness index.

Indicator	Calculation method and impact on attractiveness for migration of highly qualified personnel	Data source, period
Level of innovation activity, %	Calculated as share of innovative companies in total number of companies in region; Enables assessing market of employers who are potentially interested in highly qualified specialists and representatives of creative class;	The efficiency of the Russian economy. Rosstat. https://rosstat.gov.ru/folder/11186 , 2011–2018
Number of high-performance workplaces per employed, units	Calculated as ratio of number of high-performance workplaces to average number of employees; It provides estimate of jobs created at enterprises whose employees receive average monthly wage above threshold value necessary to ensure development of economy; For individual entrepreneurs, average revenue is taken into account;	The efficiency of the Russian economy. Rosstat. https://rosstat.gov.ru/folder/11186 , 2013–2019
Coefficient of inventive activity, units per 10,000 people	Calculated as number of domestic patent applications for inventions filed in Russia per 10,000 people; Evaluates creativity of labour resources in region;	The efficiency of the Russian economy. Rosstat. https://rosstat.gov.ru/folder/11186 , 2011–2018
Researchers under age of 39 per total number of researchers, %	Calculated as share of researchers under age of 39 in total number of researchers; Evaluates human resources potential of science, which is of decisive importance for generation of scientific and technical knowledge as basis for innovation;	Target indicators for the implementation of the Strategy for innovative development of the Russian Federation for the period up to 2020. Rosstat. https://rosstat.gov.ru/folder/14477# , 2011–2018
Average nominal wages, units	Calculated as ratio of average nominal wage in region to average nominal wage in Russia; Evaluates attractiveness of region's labour market.	Average monthly nominal and real wages of employees of organisations. Rosstat. https://rosstat.gov.ru/labor_market_employment_salaries , 2013–2019

Source: calculation by the authors.

multicollinearity were checked. In the third stage, the final value of the innovation performance index was calculated as the arithmetic mean of the normalised values of all indicators. Table 1 shows the indicators used to calculate the index.

Third, the interrelation between the migration attractiveness and innovation performance of the coastal regions of Russia is evaluated. This is done by building a scatter plot with the final index of innovative performance and indicators of interregional and international migration in 2011–2018.

Research results

The migration attractiveness of coastal regions

Throughout post-Soviet history, migration processes in the coastal regions of Russia predominantly followed the nation-wide trends since

they were determined by the geopolitical and socio-economic external and internal conditions of the formation of the state (Table 2). After the peak migration in the period following the demise of the USSR (1991–1996), a period of stagnation began. It was accompanied by a significant reduction in the total and net migration in the period 1997–2010, with separate peaks at the beginning of the 2000s. Only in the 2010s, the migration mobility of the population intensified; these data can partially be explained by changes in the system of statistical accounts of temporary and permanent migrants in the country. At the same time, the importance of the coastal regions both in the total and net migration grew significantly. In the peak years of 1993–1996, these indicators accounted for 25% of international gross migration. In the subsequent two periods, 1997–2010 and 2011–2018, the total and net migration went up to 20–22% and 32% respectively. The intensity of gross international migration increased to 137% (from 24 to 33 persons per 1,000 population).

Table 2. Gross migration and balance of migration in coastal and inland regions of Russia in 1993–2018.

	Migration intensity coefficient, per 1,000 people								Share of total value in Russia, %							
	International				Interregional				International				Interregional			
	1993–1996	1997–2002	2003–2010	2011–2018	1993–1996	1997–2002	2003–2010	2011–2018	1993–1996	1997–2002	2003–2010	2011–2018	1993–1996	1997–2002	2003–2010	2011–2018
Gross migration																
Coastal regions	9.9	3.8	1.7	7.4	23.9	17.7	13.8	32.7	25.4	22.8	20.4	31.5	28.9	27.9	26.6	29.0
Inland regions	8.6	3.8	1.9	5.0	17.2	13.3	11.2	25.0	74.6	77.2	79.6	68.5	71.1	72.1	73.4	71.0
Inland regions excluding Moscow	8.9	3.9	2.0	5.2	17.7	13.5	11.4	24.4	71.4	72.1	74.2	63.4	67.0	66.6	67.1	61.7
Moscow	4.6	2.9	1.3	3.3	13.5	11.7	9.8	29.7	3.2	5.1	5.4	5.0	4.4	5.5	6.4	9.3
Russia	8.9	3.8	1.9	5.6	18.8	14.3	11.8	26.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Migration balance																
Coastal regions	13.0	5.5	7.0	15.7	-7.2	-7.3	-1.8	8.9	18.9	14.5	17.9	24.1	-	-	-	-
Inland regions	16.3	9.5	9.3	15.3	3.6	3.1	0.6	-2.8	81.1	85.5	82.1	75.9	-	-	-	-
Inland regions excluding Moscow	17.6	9.8	9.7	16.2	3.1	0.8	-3.3	-9.2	80.7	80.2	76.9	71.5	-	-	-	-
Moscow	1.1	6.8	5.8	8.2	4.9	27.3	35.7	48.8	0.4	5.3	5.2	4.4	-	-	-	-
Russia	15.6	8.6	8.8	15.4	-	-	-	-	100.0	100.0	100.0	100.0	-	-	-	-

Source: calculated by the authors.

Today the migration turnover of the coastal regions of Russia is higher than the average for Russia, for the inland regions, and even Moscow.

The coastal regions of Russia have been actively involved in diverse migration processes, which is evidenced by a rather tangible migration increase in the population, mainly due to the exchange with foreign countries, which is also typical of other regions of Russia. A distinctive feature of Russian coastal regions (in contrast to the country as a whole) is the nature of interregional migration. Before 2010, the coastal regions were donors for migrants who headed for other territories of Russia and mainly its capital. Since 2011 the situation has changed: the coastal regions have consistently demonstrated high migration attractiveness, which is evidenced by positive net interregional migration.

However, the growth of population resulting from migration to coastal territories is not widespread. The climatic and natural conditions of a particular region are a major limiting factor for migration. In addition, the economic characteristics of a territory (types of economic activity, the level of wages, the job market) and its residential characteristics (the presence of large agglomerations) also affect migration. The study data show that only seven coastal regions have high migration attractiveness, which is confirmed by

significant net interregional and international migration. The 'northern capital' St. Petersburg and the Leningrad region, the Russian exclave in the Baltic (Kaliningrad region), the recreational and tourist Krasnodar Krai, the Republic of Crimea and the city of Sevastopol are 'core' territories attracting migrants (Table 3). These regions demonstrate a high efficiency of migration—about 14.4% of the total migration results in migration gain (excluding the city of Sevastopol, where it is >36.4%), while the average for the coastal regions is 8.5%, and in Russia—only 2.9% (Fig. 1).

Another region attractive for migrants is the export-oriented Krasnoyarsk Krai, which is rich in natural resources and raw materials. This is a recipient region, which also receives migrants from abroad. The region has a high potential for building up a positive net migration due to relatively large volumes of migration, the efficiency of which remains one of the lowest among the coastal regions of Russia—no more than 1.5%, indicating the prevalence of the rotational type of migration.

The Rostov region is migration neutral, with a small positive net migration of 3–4 people per 1,000 population. It results from a compensation (migration growth from other countries) and the lowest migration efficiency (0.9%) for an

Table 3. Russian coastal regions by the crude rate of net migration for 2011–2018.

Crude rate of net migration, per 1,000 people	Centre of migrants' attraction from other countries (>10.0)			Centre of migrants' attraction from other countries (>10.0) with compensation for interregional outflow, %				Territories with average (5.0–9.9) and low (0.0–4.9) level of attraction of migrants from other countries with compensation for interregional outflow, %			
				100	50–75	30–40	0–20	100	30–40	0–20	
Centre of migrants' attraction from other regions of Russia (>10.0)	LEN	SEV	KDA								
	KGD	SPE									
Average (5.0–9.9) and low (0.0–4.9) level of attraction of migrants from other regions of Russia	CR										
Low (-4.9 to 0.0) and medium (-14.9 to -5.0) outflow of migrants to other regions of Russia				KYA				ROS			
Strong outflow of migrants to other regions of Russia (<-15.0)					SAK	AST	KHA	MUR	PRI	SA	KL
					YAN	KAM	CHU	MAG	KR	DA	ARK
					NEN						

Note: The benchmark for determining the severity of migration processes are the national average values of the crude rate of net migration. The abbreviated names of the regions of the Russian Federation are given in accordance with the classification of the ISO. The blue frame stands for regions of a 'core' of migrants' attraction; the regions with an extremely weak manifestation of the specifics of migration processes are highlighted in the green frame; yellow frame - regions that combine the pronounced roles of the centre of migrants' attraction from other countries and the outflow area to other Russian regions with a high share of replacement of the outflow by the inflow (more than 50%); red frame - regions of the outflow area of migrants.

Source: developed by the authors.

ISO - International Organization for Standardization.

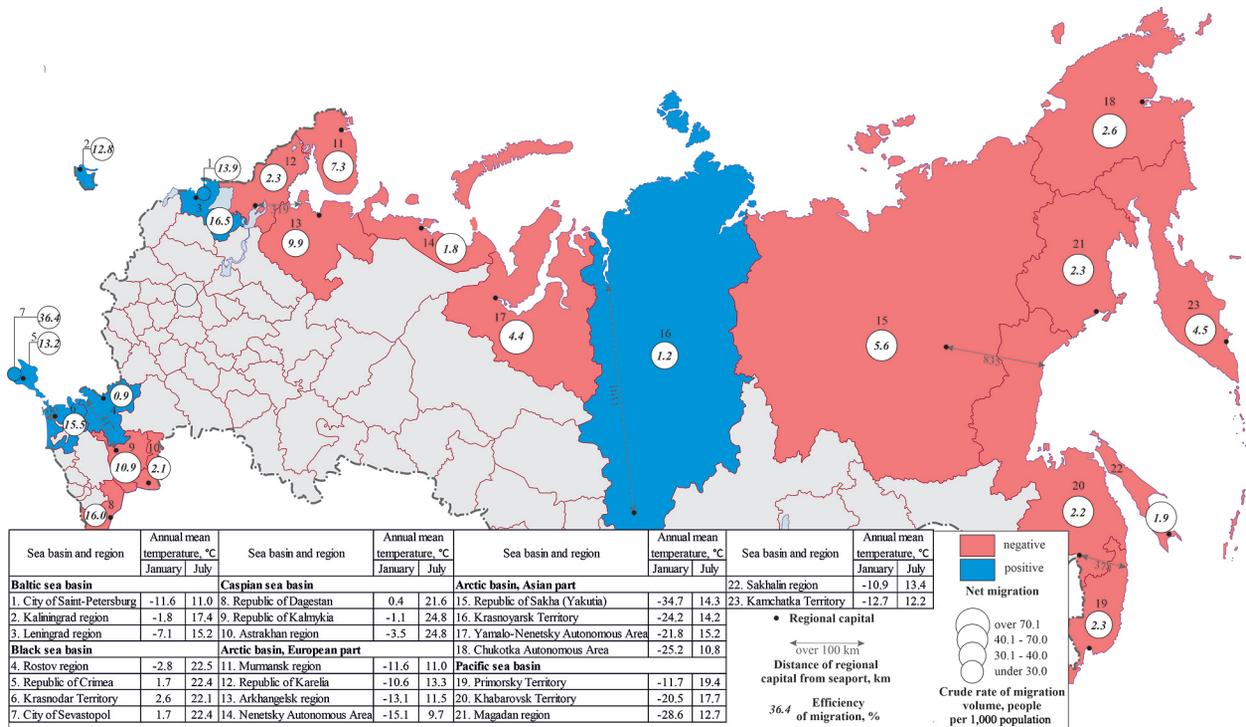


Fig. 1. The effectiveness of permanent migration in Russian coastal regions on average, 2011–2018.

insignificant decrease in the population number caused by the outflow of people who decided to relocate to the capital.

Despite their attractiveness for immigrants from other countries (mainly post-Soviet), the rest of the coastal regions experienced an outflow of the population during the study period. The 'western drift' of the population of the Far Eastern part of Russia still persists, albeit often decreasing in volume. This may be explained by the exhaustion of the potential of migrants (those who wanted, have already left). This tendency has largely spread to the Caspian regions (Kalmykia, Dagestan) and northern Russia.

The study identified an area of a stable outflow of the population, which included Yakutia, Kalmykia, Dagestan, Magadan, Murmansk and Arkhangelsk regions. In some of them (the regions of the Far East and the Murmansk region), there was an improvement in the migration situation due to an increase in the positive net international migration and a decrease of interregional outflow. For three regions (the Dagestan, Kalmykia and Arkhangelsk regions), the entire post-Soviet history was marked by an interregional population decline, which was only partially compensated by the positive net international migration. The efficiency of migration here remains at a slightly higher level than the average for all coastal regions (10.3%).

The situation is somewhat better in the Khabarovsk and Primorsky Krajs, the Chukotka Autonomous Okrug and Karelia, where the upward trends in the positive net international migration are sometimes supplemented by a decrease in interregional outflow. The efficiency of migration here is extremely low – 2–3%, which corresponds to the national average and is almost four times lower than the average for Russia's coastal regions. Provided that the prevalence of outgoing over incoming mobility continues, an increase in efficiency will lead to a further depopulation of these territories.

A special type of mechanical reproduction of the population has developed in the Astrakhan region and some resource-based coastal regions of Russia (Sakhalin, Kamchatka, Nenets and the Yamalo-Nenets Autonomous Okrug). These territories manage to combine the established roles of the 'core' of attraction for migrants from other countries and the area of outflow of migrants to

other regions of Russia with a high proportion of outflow replacement by inflow (>50%). However, the efficiency of migration processes here testifies to a high level of the so-called *shuffle* – the share of net migration in the gross does not exceed 5%. As a result, the performed analysis demonstrates significant differences between the coastal regions of Russia in terms of factors and features characterising their migration activity.

The innovation performance of coastal regions

In 2011–2018, the level of innovation activity of organisations was higher than the national average in six coastal regions – in St. Petersburg and the Leningrad region, as well as in the resource and raw material export-oriented regions of the north and north-east of Russia (the Magadan region, Chukotka Autonomous Okrug, Kamchatka and Khabarovsk Krajs). During the period under review, St. Petersburg was the leader in innovation; the share of innovative companies ranged from 14.8% to 18.9% with a minimum in 2016. The Magadan region ranked second, with an average level of innovation activity of organisations of 17.16%, which showed a significant drop from 33.6% to 6.2%. In 2011, this indicator was 3.2 times higher than the average of Russia, and by 2014–2016 – only 1.5 times higher. In 2017–2018, the region already lagged behind by more than 15%. This is the most significant drop in innovation activity among all coastal regions.

The study shows that during 2011–2018, there was a general tendency towards a decrease in the share of organisations engaged in innovative activities, which was reflected in the regional statistics. It is noteworthy that several regions – the Kaliningrad, Leningrad, Rostov, Sakhalin regions and the Republic of Sakha (Yakutia) – demonstrated better and more stable innovative performance.

In 2011–2018, the annual share of coastal regions in the national structure of production of innovative products averaged 20% (with a minimum in 2015–2016 – 15%). Four regions, St. Petersburg, Krasnoyarsk and Krasnodar Krajs and the Rostov region, contributed the most. Their share in the total volume of innovative goods, works and services of the coastal regions was constantly growing: from 35.7% in 2011 to 75.8% in 2018 (Fig. 2) (Table 4).

Table 4. Assessment of the coastal regions of Russia by some indicators of innovative attractiveness, 2011-2019.

Region	Level of innovation activity, %	Coefficient of inventive activity, units per 10,000 people	Researchers under age of 39 per total number of researchers, %	Number of high-performance workplaces per employed	Average nominal wages
Russian Federation	9.29	1.82	41.46	0.25	-
Arkhangelsk region	5.81	0.72	49.58	0.33	1.03
Astrakhan region	8.55	0.82	41.66	0.17	0.75
Sevastopol	3.68	1.24	32.06	0.22	0.51
St. Petersburg	17.20	3.37	41.28	0.31	1.32
Kaliningrad region	4.14	0.65	39.55	0.22	0.80
Kamchatka Krai	14.45	0.34	42.30	0.33	1.65
Krasnodar region	7.71	0.95	39.73	0.16	0.78
Krasnoyarsk region	8.62	1.33	48.36	0.29	1.02
Leningrad region	9.35	0.67	29.80	0.24	0.98
Magadan region	17.16	0.49	30.90	0.35	1.92
Murmansk region	8.99	0.45	36.68	0.30	1.32
Nenets Autonomous Okrug	6.15	0.23	63.00	0.63	1.97
Primorsky Krai	7.68	0.97	34.48	0.26	0.98
Republic of Dagestan	5.65	1.67	31.10	0.08	0.57
Republic of Kalmykia	2.35	0.72	44.94	0.15	0.59
Republic of Karelia	7.64	0.47	40.28	0.26	0.90
Republic of Crimea	5.27	0.31	32.54	0.20	0.48
Republic of Sakha (Yakutia)	7.45	0.78	38.33	0.36	1.48
Rostov region	8.32	1.57	46.71	0.21	0.72
Sakhalin region	3.70	0.17	47.64	0.25	1.74
Khabarovsk region	10.49	1.10	35.11	0.28	1.10
Chukotka Autonomous District	16.04	0.20	67.27	0.51	2.31
Yamalo-Nenets Autonomous District	7.46	0.50	50.53	0.53	2.26

Source: developed by the authors based on Table 1.

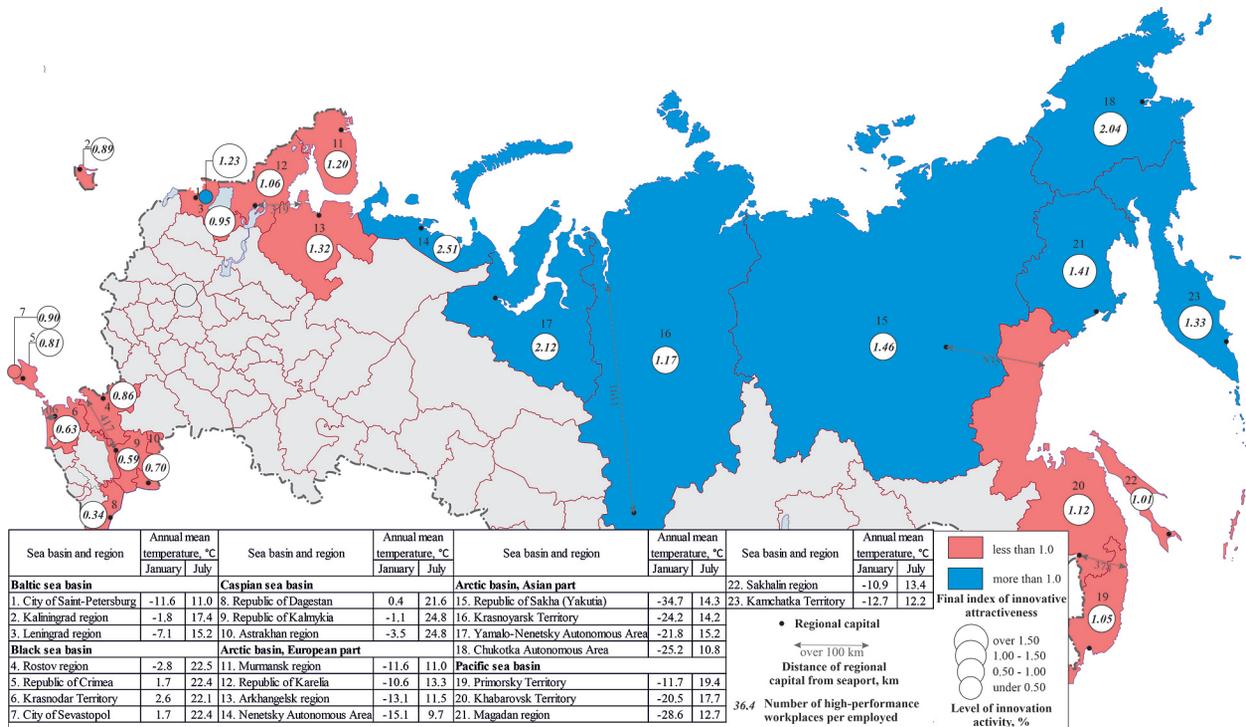


Fig. 2. The innovation performance of the coastal regions of Russia, 2011-2018.

The innovative development of the regional economy is generally associated with a creation of high-performance workplaces and an increase in average wages, both factors stimulating migration. It is characteristic that in 2019, 20.7 million high-performance jobs were registered in Russia, of which 24.5% were in the coastal zone. The largest absolute number of highly productive jobs was created in the regions with the largest volume of innovative production—the city of St. Petersburg, Krasnoyarsk and Krasnodar Krai and the Rostov region. On average, their share in the sample regions with access to the sea is 51.4%. The leading economic sectors are manufacturing, trade, transport and storage. In the number of high-productivity jobs per one employed, the highest values are observed in the raw-resource economies of autonomous okrugs—the Nenets, Yamalo-Nenets and Chukotka, where the mining industry dominates in the structure of highly productive jobs. These coastal regions have the highest wages compared with the national average (Table 2). In 2013–2019, 11 coastal regions were below the national average in the average nominal wages (the lowest was in the Republic of Crimea and Sevastopol), and nine regions—in the share of highly productive jobs relative to the average annual number of employed (the Republic of Dagestan had the lowest share).

The research sector makes an important contribution to the development of innovative activity of the regions, the human potential of which can be characterised by the share of researchers under the age of 39. The creative potential of regions can be assessed using the invention coefficient. In 2011–2018, there was a country-wide campaign of ‘rejuvenation’ of research staff with an increase in the share of researchers under 39: from 37.5% in 2011 to 43.9% in 2018. This trend was observed in most coastal regions. However, in some coastal regions, the opposite tendency was seen: in the Khabarovsk and Magadan regions the share of young researchers decreased by 19.5%, in the Republic of Kalmykia—by 17.8%, the Krasnodar Krai—by 16.9%, the Nenets Autonomous Okrug—by 15.6% and the Republic of Sakha (Yakutia) by 10.1%. Most of these regions experience the outflow of migrants (with the exception of the Krasnodar Krai and the Nenets Autonomous Okrug).

Based on the invention coefficient, St. Petersburg is the leader among the coastal regions

and in the country as a whole. Other coastal regions lag significantly behind (Table 2). It is necessary to note that in 2011–2018, the city of Sevastopol, Krasnodar, Krasnoyarsk and Khabarovsk Krai and the Rostov region had a relatively high annual number of Russian patent applications per 10,000 people. The Republic of Dagestan, which ranks second in the average value of the coefficient of inventive activity for the period, demonstrated a significant decrease from 4 to 0.34 patent applications per 10,000 people.

The interrelation of the migration attractiveness and innovation performance of coastal regions

The analysis of the interrelation between the migration attractiveness and innovation performance of the coastal territories of Russia, reflected in Figure 3, demonstrates (in most cases) the absence of a direct relationship between the indicators.

Based on the analysis of the migration attractiveness and innovation performance of Russian coastal regions, the following typology of regions is proposed:

- Type 1 includes the ‘northern capital’ St. Petersburg, where migration attractiveness and innovation activity are complementary to each other;
- Type 2 includes the resource and raw materials export-oriented Krasnoyarsk Krai characterised by high innovation activity and migration growth due to its high attractiveness for migrants from abroad;
- Type 3 includes other resource and raw materials export-oriented coastal regions of Russia’s north and north-east having high innovation activity, including:
 - Subtype 3.1 are regions that attract the majority of migrants from other countries and experience the outflow to the other Russian regions; they are characterised by a high level of compensation for a decline in interregional population by incoming migration from abroad (the Kamchatka Krai, Yamalo-Nenets Autonomous Okrug, Sakhalin region, Nenets Autonomous Okrug, Khabarovsk and Primorsky Krai);
 - Subtype 3.2 are regions having a positive net international migration but a signifi-

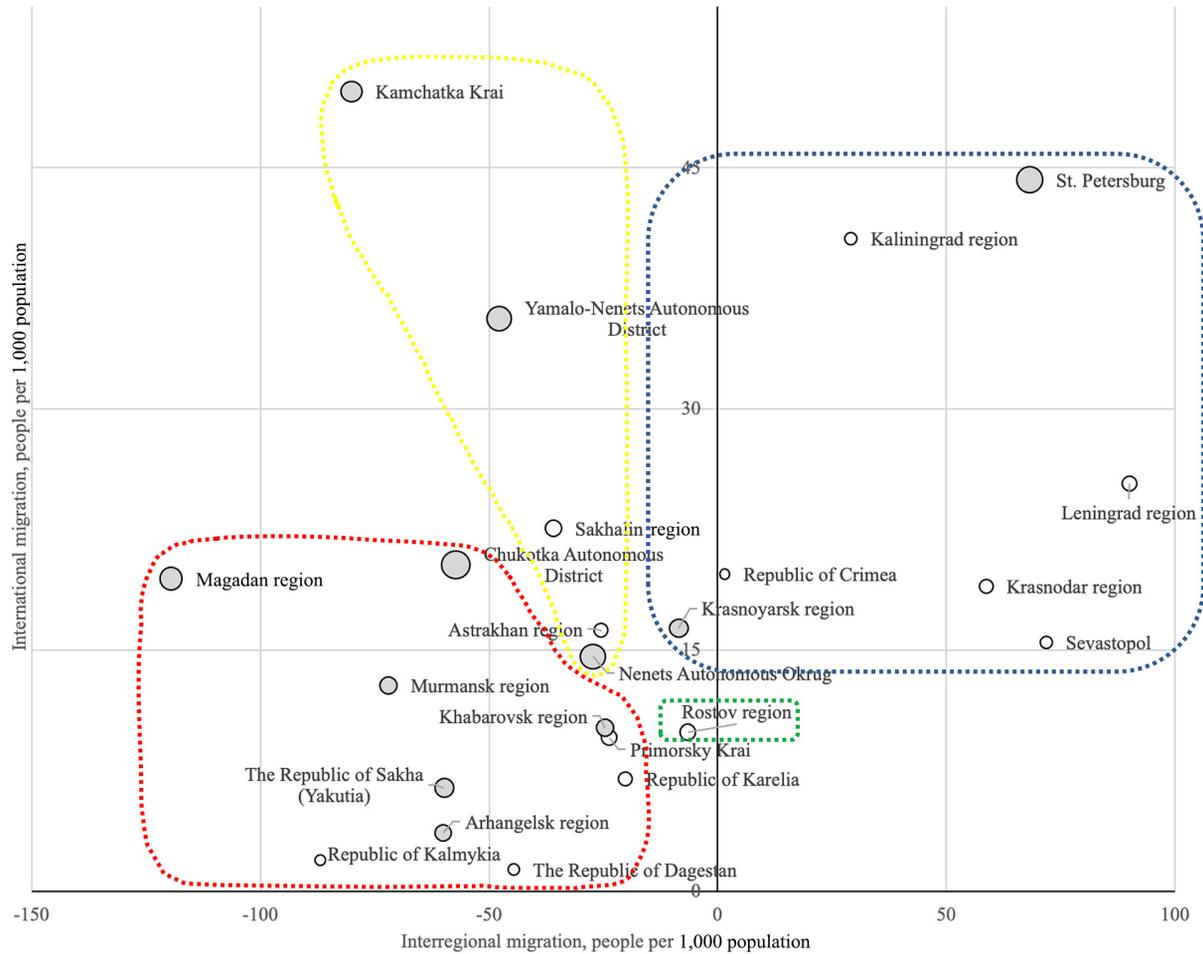


Fig. 3. The ratio of the final index of innovative performance and indicators of interregional and international migration in 2011–2018.

Note: The circle diameter indicates the value of the innovation performance index. Regions with an index greater than 1 are shown in grey. The blue frame is used for migration core regions attracting the majority of people; the regions with an extremely weak manifestation of the specifics of migration processes are in the green frame; yellow frame shows regions that combine the pronounced roles of the centre of migration from other countries and the outflow to other Russian regions with a high share of replacement of the outflow by the inflow (more than 50%); red frame shows regions of the outflow area of migrants.

cant overall migration outflow (Magadan, the Murmansk regions, Chukotka Autonomous Okrug, the Republic of Sakha (Yakutia), Arkhangelsk region).

- Type 4 includes migratory attractive territories on the coast of the Black and Baltic Seas with a low level of innovation activity (the Krasnodar Krai, Kaliningrad region, the Republic of Crimea, Sevastopol, Leningrad and Rostov regions).
- Type 5 combines coastal regions with an outflow of the population and a low level of innovative activity (the Republic of Dagestan, Republic of Kalmykia, Republic of Karelia, the Astrakhan region).

Discussion

The study found that the high migration attractiveness of Russia's coastal regions is mainly determined by a variety of factors (e.g., favourable natural and climatic conditions), rather than the level of innovative development. The results obtained allowed us to formulate three most important conclusions about the territorial interdependence of migration attractiveness and innovation performance of coastal Russian regions with access to the sea.

First, the significant and clearly pronounced heterogeneity of sea coasts in Russia in terms of their natural, climatic, social and economic

parameters predetermines the multiplicity of forms of interdependence of migration attractiveness and innovation performance. Migration attractiveness combined with significant innovation potential, are characteristic of only a small part of the coastal segments and, accordingly, of a few coastal regions. An even rarer case (in fact, only St. Petersburg) is a combination of the population inflow and high innovation activity having mutually beneficial supportive effect. This is another clear example of the high migration attractiveness of regions boasting a high concentration of knowledge and research institutions such as corporate and government R&D centres, research universities and technological incubators. This finding confirms previous studies, for example, held by Fielding (1992) and Felsenstein (2011).

Second, innovation activity in Russia is hypertrophied in the metropolitan (Moscow) and sub-capital (St. Petersburg) areas as well as in a few leading regional centres. Outside them (which means in the absolute majority of coastal regions), innovative activity is not only sporadic, but also very selective and confined mainly to large export-oriented industries—primarily to fuel and energy. The prevailing factor for attracting migrants under these conditions is the ‘quality’ of the territory (infrastructure, employment and business opportunities, natural and ecological conditions, geographic proximity to major Russian and foreign centres, etc.), as well as the image of the territory and the prestige of residence.

The study showed that the resource and raw material economic orientation of certain regions is a decisive factor for attracting international migrants even though these regions often have unfavourable climatic conditions. To a significant extent, this trend makes it possible to level the migration loss of the population. This finding correlates with the previous studies on the migration attractiveness of the resource-oriented economies of the world (e.g., the countries of the Persian Gulf done by Ewers, Malecki 2010). The effect of this factor is the most pronounced in the Krasnoyarsk Krai.

It is important to note that the presence of distinct centres of attraction for migrants at the micro level is often due to the implementation of special programmes aimed at attracting highly qualified migrants who, after relocation, are ready to settle permanently in the host region. This is confirmed

by recent studies on the importance of strategies for innovative development and increasing the attractiveness of territories for well-educated and highly skilled human resources (Miranda-Martel et al. 2017; Aragonés, Salgado 2019). In the coastal regions of Russia, organisations engaged in maritime activities are increasingly becoming participants in regional programmes to increase labour mobility and receive subsidies on employment mobility (e.g., compensation of costs related to the transport of personal belongings of those who relocate, vocational training costs, housing and amenities, rental and utility costs, the purchasing of an apartment, etc.). For example, in the Sakhalin region, one of the recipients of federal and regional subsidies is the SMNM-VIKO company, which serves the offshore and onshore facilities of the Sakhalin-2 and Sakhalin-1 international projects. In Kamchatka, there are many organisations receiving state support, including those specialising in port logistics: in the Primorsky Krai—the shipbuilding complex Zvezda and Zavod VRK Sapphire producing marine equipment; in the Khabarovsk Krai—Amursk shipbuilding plant, oil refineries and research organisations; in the Krasnoyarsk Krai—the Taimyrneftegaz JSC, which carries out geological exploration and oil production (the port of Dudinka) and the Information Satellite Systems JSC under the umbrella of Roscosmos. The North of Russia only the Sevmash JSC PO (focusing mainly on shipbuilding) in the Arkhangelsk region receives subsidies for the attraction of highly qualified staff. The Magadan region and the Republic of Sakha (Yakutia) are among other coastal regions, implementing similar programmes.

Conclusion

The results of this study indicate that in modern Russia, the main migration flows gravitate towards the largest cities (first of all, those having clearly defined ‘capital’ functions) and the agglomerations they form. Other migration flows tend to shift (although not as dynamically as in the 1990s) from the northern and eastern territories of the country to its western and south-western regions, primarily to their coastal zones. These coastal areas have a developed social infrastructure and relatively favourable conditions

for living and doing business (St. Petersburg and its agglomeration, the Kaliningrad agglomeration, as well as group settlement systems in the Russian Black Sea region, including Sochi, Anapa, Gelendzhik, Sevastopol, etc.).

The evidence from this study suggests that not all coastal regions of Russia are equally attractive for migrants. Generally speaking, migration is highly selective due to a variety of factors, first and foremost, geographical, economic and social characteristics of the coastal region.

A similar conclusion is valid for the innovation performance of the country's regions with access to the sea. The predominantly 'raw material' profile of the Russian economy that has developed over the past three decades predetermines the accelerated development of innovation, which is primarily observed in the coastal resource-based and export-oriented regions (the Yamalo-Nenets Autonomous Okrug, Kamchatka and Krasnoyarsk Krai, Sakhalin, Magadan, Murmansk regions, etc.). The innovation potential of St. Petersburg has always been high. The city is a rare exception since its sea coast is both highly attractive for people and innovation. The Far East and the Arctic zone demonstrate a positive net international migration as a result of the 'rotational' method of attracting labour resources. However, in interregional migration, these territories continue to lose the population.

The 'innovation factor' proves its significance for the migration behaviour of the population, which can clearly be seen in territories implementing large-scale industrial and infrastructural projects (e.g., development of offshore hydrocarbon resources). These projects attract the flows of labour resources, having the necessary expertise.

The findings of this study fully confirmed the hypothesis on the interdependence of migration attractiveness and innovation performance.

Author's contribution

All authors equally contributed to the paper.

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References

- Aldieri L., Kotsemir M., Vinci C.P., 2020. The role of labour migration inflows on R&D and innovation activity: Evidence from Russian regions. *Foresight* 22(4): 437–468. DOI 10.1108/FS-03-2020-0035.
- Aragonés A.M., Salgado U., 2019. Suecia y Dinamarca: líderes en innovación y la atracción de talentos mundiales. *Equidad y Desarrollo* 33: 11–41. DOI 10.19052/eq.vol1.iss33.2.
- Benson M., O'Reilly K., 2016. *Lifestyle migration: Expectations, aspirations, and experiences*. Routledge, London-NY.
- Casado-Díaz M., 2006. Retiring to Spain: An analysis of difference among North European Nationals. *Journal of Ethnic and Migration Studies* 32(8): 1321–1339.
- Drivas K., Economidou C., Karamanis D., Sanders M., 2020. Mobility of highly skilled individuals and local innovation activity. *Technological Forecasting and Social Change* 158: 120144. DOI 10.1016/j.techfore.2020.120144.
- Druzhinin A.G., 2020. The strongholds of Russian coastal borderlands: Economic dynamics amid geopolitical turbulence. *Baltic Region* 12(3): 89–104. DOI 10.5922/2079-8555-2020-3-6.
- Ewers M.C., Malecki E.J., 2010. Leapfrogging into the knowledge economy: Assessing the economic development strategies of the Arab Gulf States. *Tijdschrift voor Economische en Sociale Geografie (Journal of Economic and Human Geography)* 101(5): 494–508. DOI 10.1111/j.1467-9663.2010.00628.x.
- Felsenstein D., 2011. Human capital and labour mobility determinants of regional innovation. In: Cooke P., Asheim B., Boschma R., Martin R., Schwartz D., Todtling F. (eds), *Handbook of regional innovation and growth*. E. Elgar, Cheltenham, UK: 119–131.
- Fielding A.J., 1992. Migration and social mobility: South East England as an escalator region. *Regional Studies* 26(1): 1–15. DOI 10.1080/00343409212331346741.
- Fulanda B., Munga C., Ohtomi J., Osore M., Mugo R., Hosain M.Y., 2009. The structure and evolution of the coastal migrant fishery of Kenya. *Ocean & Coastal Management* 52(9): 459–466. DOI 10.1016/j.ocecoaman.2009.07.001.
- Gallup J.L., Sachs J.D., Mellinger A., 1999. *Geography and economic development*. Center for International Development at Harvard University. Working Paper.
- Glavovic B.C., 2013. Coastal innovation paradox. *Sustainability (Switzerland)* 5(3): 912–933.
- Heber R., 1839. A sketch of Moscow, in a letter from Bishop Heber to his mother. *The Saturday Magazine* 14(444): 215–216.
- Hinrichsen D., 1996. Coasts in crisis. *Issues in Science and Technology* 12: 39–47.
- Huber A., O'Reilly K., 2004. The construction of Heimat under conditions of individualised modernity: Swiss and British elderly migration in Spain. *Ageing and Society* 24(3): 327–351. DOI 10.1017/S0144686x03001478.
- Hunt J., Gauthier-Loiselle M., 2010. How much does immigration boost innovation? *American Economic Journal: Macroeconomics* 3(2): 31–56. DOI 10.1257/mac.2.2.31.

- Iden G., Richter C., 1971. Factors associated with population mobility in the Atlantic coastal plains region. *Land Economics* 47(2): 189–193.
- Jiang X.Z., Liu T.Y., Su C.W., 2014. China's marine economy and regional development. *Marine Policy* 50(A): 227–237. DOI 10.1016/j.marpol.2014.06.008.
- Komkov N.I., Selin V.S., Tsukerman V.A., Goryachevskaya E.S., 2017. Problems and perspectives of innovative development of the industrial system in Russian Arctic regions. *Studies on Russian Economic Development* 28(1): 31–38.
- Lachininskii S.S., Mikhaylov A.S., Samusenko D.N., Mikhaylova A.A., Sorokin I.S., 2019. Coastal cities and agglomerations in the innovative space of western Russia. *Regional Research of Russia* 9(4): 396–405. DOI 10.1134/S2079970519040051.
- Lyu L., Sun F., Huang R., 2019. Innovation-based urbanization: Evidence from 270 cities at the prefecture level or above in China. *Journal of Geographical Sciences* 29: 1283–1299. DOI 10.1007/s11442-019-1659-1.
- Mee L., 2012. Between the devil and the deep blue sea: The coastal zone in an era of globalisation. *Estuarine, Coastal and Shelf Science* 96: 1–8. DOI 10.1016/j.ecss.2010.02.013.
- Merkens J.-L., Reimann L., Hinkel J., Vafeidis A.T., 2016. Gridded population projections for the coastal zone under the Shared Socioeconomic Pathways. *Global and Planetary Change* 145: 57–66. DOI 10.1016/j.gloplacha.2016.08.009.
- Mikhaylov A.S., Mikhaylova A.A., Kuznetsova T.Y., 2018. Coastalization effect and spatial divergence: Segregation of European regions. *Ocean and Coastal Management* 161: 57–65. DOI 10.1016/j.ocecoaman.2018.04.024.
- Mikhaylov A.S., Mikhaylova A.A., Lachininskii S.S., Hvalev D.V., 2019. Coastal countryside innovation dynamics in North-Western Russia. *European Countryside* 11(4): 541–562.
- Miranda-Martel M.J., Mihi-Ramirez A., Arteaga-Ortiz J., 2017. How the level of economic growth and the constituent elements of innovation attract international talent? *Inzinerine Ekonomika-Engineering Economics* 28(2): 187–197. DOI 10.5755/j01.ee.28.2.17518.
- Montanari A., Staniscia B., 2011. From global to local: Human mobility in the Rome coastal area in the context of the global economic crisis. *Volltextausgaben* 3–4: 127–200. DOI 10.4000/belgeo.6300.
- Morrissey K., 2015. An inter and intra-regional exploration of the marine sector employment and deprivation in England. *The Geographical Journal* 181: 295–303. DOI 10.1111/geoj.12099.
- Morrissey K., O'Donoghue C., 2012. The Irish marine economy and regional development. *Marine Policy* 36(2): 358–364. DOI 10.1016/j.marpol.2011.06.011.
- O'Reilly K., 2000. *The British on the Costa del Sol*. Routledge, London.
- Ozgen C., Nijkamp P., Poot J., 2012. Immigration and innovation in European regions. In: Nijkamp P., Poot J., Sahin M. (eds), *Migration impact assessment: New horizons in regional science*. Edward Edgar Publishing Ltd., UK: 261–301.
- Ozgen C., Nijkamp P., Poot J., 2017. The elusive effects of workplace diversity on innovation. *Papers in Regional Science* 96: 29–50. DOI 10.1111/pirs.12176.
- Ozgen C., Peters C., Niebuhr A., Nijkamp P., Poot J., 2014. Does cultural diversity of migrant employees affect innovation? *International Migration Review* 48: 377–416. DOI 10.1111/imre.12138.
- Paserman D., 2013. Do high-skill immigrants raise productivity? Evidence from Israeli manufacturing firms, 1990–1999. *IZA Journal of Migration* 2(6): DOI 10.1186/2193-9039-2-6.
- Peri G., 2012. The effect of immigration on productivity: Evidence from US states. *Review of Economics and Statistics* 94(1): 348–358. DOI 10.1162/REST_a_00137.
- Rangel C.G., Lopez E.J., 2018. Redistribution of migratory attractiveness among Mexican municipalities, 2000–2020. *Estudios Demográficos y Urbanos* 33(2): 289–325. DOI 10.24201/edu.v33i2.1739.
- Schubel J.R., Levi C., 2000. The emergence of megacities. *Medicine & Global Survival* 6(2): 107–110.
- Small C., Nicholls R.J., 2003. A global analysis of human settlement in coastal zones. *Journal of Coastal Research* 19: 584–599. Online: www.jstor.org/stable/4299200 (accessed: 23 November 2020).
- Stuen E., Mobarak A., Maskus E., 2012. Skilled immigration and innovation: Evidence from enrolment fluctuations in US doctoral programmes. *Economic Journal* 122(565): 1143–1176.
- Vega A., Miller A., O'Donoghue C., 2014. Economic impacts of seafood production growth targets in Ireland. *Marine Policy* 47: 39–45. DOI 10.1016/j.marpol.2014.01.025.
- Wang Y., Luo H., Shi Y., 2020. Complex network of scientific talent migration in discrete dynamics from 2001 to 2013. *Discrete Dynamics in Nature and Society* 248983. DOI 10.1155/2020/9248983.
- Wei H., Yuan R., Zhao L., 2020. International talent inflow and R&D investment: Firm-level evidence from China. *Economic Modelling* 89: 32–42. DOI 10.1016/j.econmod.2019.09.007.
- Zaikov K.S., Kalinina M.R., Kondratov N.A., Tamitskii A.M., 2017. Innovation course of economic development in the Northern and Arctic territories in Russia and in the Nordic countries. *Economic and Social Changes: Facts, Trends, Forecast* 10(3): 59–77. DOI 10.15838/esc/2017.3.51.3.
- Zelinsky W., 1971. The hypothesis of the mobility transition. *Geographical Review* 61: 219–249.
- Zhao X., Li X., 2021. The influence of internal migration on regional innovation in China. *Economic Research-Ekonomika Istraživanja* 34(1): 498–520. <https://doi.org/10.1080/1331677X.2020.1792325>.
- Zhitin D.V., Lachininskii S.S., Mikhaylova A.A., Shendrik A.V., 2020. Urban transformation of a post-soviet coastal city: The case of Saint Petersburg. *Geography, Environment, Sustainability* 13(1): 145–158.