

An Assessment of the Level of Economic Integration of Russia's Regions within the System of Economic Security

Una evaluación del nivel de integración económica de las regiones de Rusia dentro del Sistema de Seguridad Económica

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ABSTRACT:

This paper explores issues of economic integration at the subnational level in the context of ensuring the economic security of the Russian Federation. The authors propose assessing the level of economic integration using an indicator of the overall openness of a region's economy. They have developed a methodology for assessing the level of economic integration among regions, which is formalized as an algorithm reflecting a succession of operations on calculating the above indicator and diagnosing potential threats to the economic security of the nation and its regions. The paper identifies three specific groups of constituent entities of the Russian Federation: Cluster 1 – regions taking an active part in interregional commodity exchange, with high values of the indicator of the overall openness of the regional economy; Cluster 2 – regions with a medium level of economic openness; Cluster 3 – regions which are poor participants in processes of regional interaction, characterized by a low level of openness of the regional economy. Using cluster analysis, the

RESUMEN:

Este documento explora cuestiones de integración económica a nivel subnacional en el contexto de garantizar la seguridad económica de la Federación de Rusia. Los autores proponen evaluar el nivel de integración económica utilizando un indicador de la apertura general de la economía de una región. Han desarrollado una metodología para evaluar el nivel de integración económica entre las regiones, que se formaliza como un algoritmo que refleja una sucesión de operaciones para calcular el indicador anterior y diagnosticar posibles amenazas a la seguridad económica de la nación y sus regiones. El documento identifica tres grupos específicos de entidades constituyentes de la Federación de Rusia: Grupo 1: regiones que participan activamente en el intercambio interregional de productos básicos, con altos valores del indicador de la apertura general de la economía regional; Grupo 2: regiones con un nivel medio de apertura económica; Grupo 3: regiones que son participantes pobres en procesos de interacción regional, caracterizados por un bajo nivel de apertura

authors diagnose the issue of poor economic integration among Russia's regions and identify a number of threats to economic security relative to 34 constituent entities of the Russian Federation.

Keywords: region, economic integration, economic security, cluster analysis, threats to the economic security of regions.

de la economía regional. Utilizando el análisis de conglomerados, los autores diagnostican el problema de la escasa integración económica entre las regiones de Rusia e identifican una serie de amenazas a la seguridad económica en relación con las 34 entidades constitutivas de la Federación de Rusia.

Palabras clave: región, integración económica, seguridad económica, análisis de clusters, amenazas a la seguridad económica de las regiones.

1. Introduction

Assessing the level of economic integration of areas (regions and countries) is, traditionally, the object of interest among researchers exploring global and regional economic issues. Note that the actual term 'economic integration of regions' is viewed by scholars from two totally different perspectives. The first approach, which is of a supranational nature, construes economic integration as the process of various countries and regions drawing together (Tinbergen, 1954; Viner, 1950; Meade, 1953; Marks, Nielsen, Ray, & Salk, 1996; Shishkov, 1978; etc.). In this area, researchers are focused on exploring the world economy, more specifically issues of foreign trade, as well as issues related to the formation of a single economic space, the effect of integration in terms of the prospects for the development of nations taking part in integration processes, etc. The second approach implies the exploration of issues related to the integration of regions at the subnational level (Valentei, 2012; Kleiner, 2010; Gagarina, Gubarev, Dzyuba, & Faizullin, 2017). Regionalists investigate issues related to interaction among regions within one particular country, interregional differentiation, well-balanced economic growth in the territorial aspect, etc. From this perspective, the economic integration of regions is interaction among territorial units as subsystems of the national economy which are entrenched statutorily within certain territorial boundaries, governed via a uniform system of authority, and characterized by the commonality of natural, social/economic, cultural, and other conditions (Goloborodko, 2005). Under this approach, regional integration serves as a source of a synergetic effect emerging as the result of integrative interaction among the elements of regional social/economic systems, which can lead to changes in the quality of life within regions and in their course of development and help the regional economies embark on a path of sustainable growth.

Despite the differences in the scale of the subject of inquiry, the above research approaches are, in essence, not antagonistic with respect to one another. Scholars from both camps concur on the following principal issues:

- the way one construes the essence of integration processes, which in present-day economics must be of a convergent nature to facilitate the equalization of the levels of social/economic development of regions and countries;
- methods employed to assess the outcomes of the integration process, the most popular one currently being modeling, which implies the use of simulation, factor, and econometric models;
- indicators for diagnosing the nature of integration processes among regions, which must be determined based on data from official statistical observations or other reliable, authorized sources of information;
- the belief in the state playing a leading role in ensuring the conditions for the successful integration of various-level regions.

The 'Strategy for the Economic Security of the Russian Federation through to 2030' (2017) lists 40 key indicators of the state of economic security, one of which is 'the level of economic integration among the constituent entities of the Russian Federation' (Decree of the President of the Russian Federation No. 208, 2017). This circumstance has objectively served to boost researcher interest in the issue of assessing integration processes at the regional level. Having said that, both researchers and specialist practitioners have yet to produce a uniform methodology for calculating the above indicator. In this regard, the authors are proposing a methodology of their own for assessing the level of economic

integration among regions, which summarizes most of the domestic and foreign experience in diagnosing integration processes at the regional level and may be of practical significance to public authorities focused on ensuring the economic security of regions.

2. Background and methods

To assess the level of economic integration of various-level territories, a researcher can make use of certain indicators that have been employed by regionalists for many decades. These include indicators of the openness of an economy. The best known and most used of them is the indicator of the overall openness of a regional economy (Formula 1), which is the ratio of the volume of mutual trade in goods to the gross regional product (GRP):

$$TO = \frac{E+I}{GRP}, \quad (1)$$

where TO is the indicator of the overall openness of regional economy, E is the exports to other regions of Russia (million rubles), I is the imports from other regions of Russia (million rubles), and GRP is the region's GRP (million rubles).

Most generally, the indicator of overall economic openness characterizes the significance for the region of trade relationships with other regions of the country. An increase in this indicator signals a boost in interregional interaction, which will facilitate stimulating in regions the internal processes of positive social/economic dynamics and reproducing the conditions for further growth in the form of new amalgamations and combinations of regional resources, i.e. regions will be entering a self-sustaining growth mode. It should be noted that to gain deeper insight into processes of regional integration it is worth assessing the level of interregional interaction not just in the goods market but the markets for services, capital, and labor as well.

At the supranational level, assessing the level of economic integration may necessitate the use of the following indicators:

- the indicator of the significance of mutual trade, which determines the share of the mutual trade turnover in the overall trade turnover;
- the intra-industry trade index – in particular, the Grubel-Lloyd coefficient, which characterizes the existence of exported and imported goods flows among certain industries within the regions;
- the coefficient of the structure of trade across economic categories, etc.

The most used globally is the Grubel-Lloyd index, which is computed based on the following formula (Grubel & Lloyd, 1975):

$$GL = 1 - \frac{|X-M|}{X+M}, \quad (2)$$

where GL is the Grubel-Lloyd index, X is the export of a product, and M is the import of a product.

The Grubel-Lloyd index can take on values from 0 to 1. The closer the index's value to 1, the greater the "intersection" of trade flows. This circumstance serves as an implicit testimony to boosts in integration processes among regions. It should be noted that the special nature of statistical reporting practices followed currently in the Russian Federation is preventing the use of the Grubel-Lloyd index for assessing the level of economic integration among Russia's regions. In this regard, it would be advisable to recommend organizing systematic statistical monitoring of certain components of exports and imports which could help compute the above indicator at the regional level. It has been suggested by a number of researchers (Belyaevskaya-Plotnik & Sorokina, 2017) that tracking the Grubel-Lloyd index could help put together a database which will be crucial to assessing threats to the nation's economic security, especially in the area of interregional interaction, and making efficient managerial decisions aimed at ensuring high levels of integration among Russia's regions.

To assess the level of economic integration among regions, the authors have employed the

indicator of the overall economic openness of regions for which there are enough official statistical data available regarding the incoming and outgoing of goods across the constituent entities of the Russian Federation (Russian Federal State Statistics Service, 2017). Thus, the overall economic openness indicator is used as an indicator for assessing not just foreign economic but intra-regional integration as well. In essence, the authors customized the indicator to fit it to the regional level, with strict control maintained over fulfilling the conditions of the sufficiency and completeness of information on its components, as well as complying with the principles of hierarchy and consistency across the assessment procedures.

The use of the indicator of overall regional economic openness required resolving two methodological issues: expressing information on the incoming and outgoing of goods in monetary terms and substantiating the lineup of product groups information on importing (exporting) which would form the basis for calculating the level of a region's overall economic openness.

The above issues were resolved in the following way. Due to the fact that statistical monitoring of interregional goods exchange is performed in Russia in physical terms (i.e., by volume), at the preliminary stage of the calculation procedure the authors had to switch to the monetary estimation of the indicator using data on the average prices for particular product groups (Russian Federal State Statistics Service, 2017). Since the level of integration among regions is positioned as an indicator for assessing the state of economic security, in determining the lineup of product groups the authors employed a special approach which formed the basis of the Doctrine on Food Security in the Russian Federation (Decree of the President of the Russian Federation No. 120, 2010). The document suggests assessing the state of food security based on the following food staples: meat, vegetable oil, and sugar (note 1). It helps to diagnose the level of the overall economic openness of Russia's constituent entities through the prism of these specific product groups because they are featured in the export/import flows of absolutely all regions of the country, regardless of the latter's specialization and level of social/economic development, which is why they can serve as an indicator for diagnosing the intensity of interregional interaction.

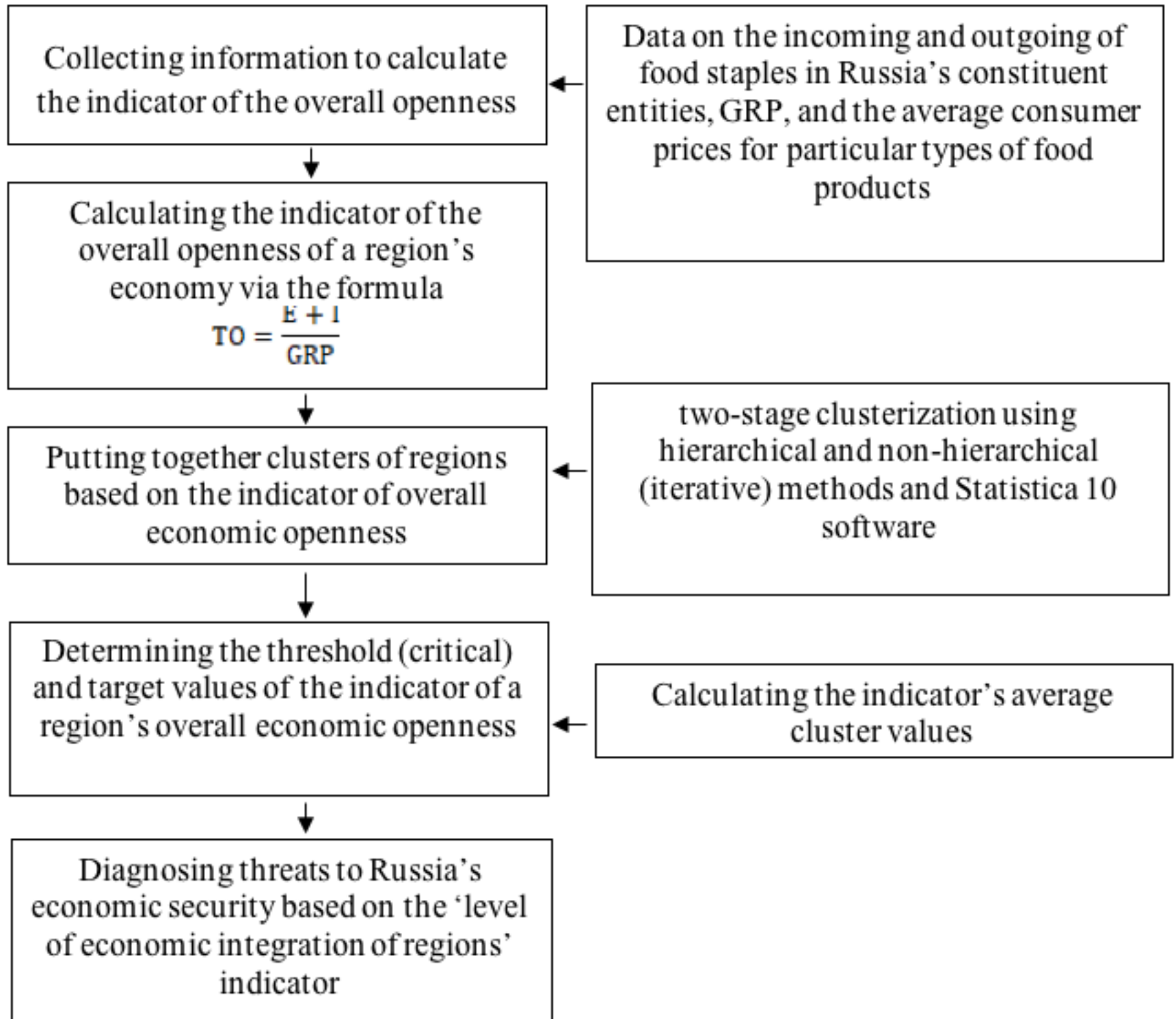
Assessing the level of economic integration among regions using the indicator of the overall openness of regional economy required employing a set of quantitative methods to describe the phenomenon – a set of techniques from the general theory of statistics and cluster analysis. Techniques from the general theory of statistics were used at the stage of collecting information with a view to transforming it into a form convenient for estimation (monetary terms), while clusterization was employed for the purposes of identifying regions that were similar in the level of overall economic openness and determining the clusters' makeup and structure.

3. Results

The process of assessing the level of economic integration among regions was formalized as an algorithm (Figure 1) reflecting a succession of operations on calculating the indicator and diagnosing threats to national economic security.

Figure 1

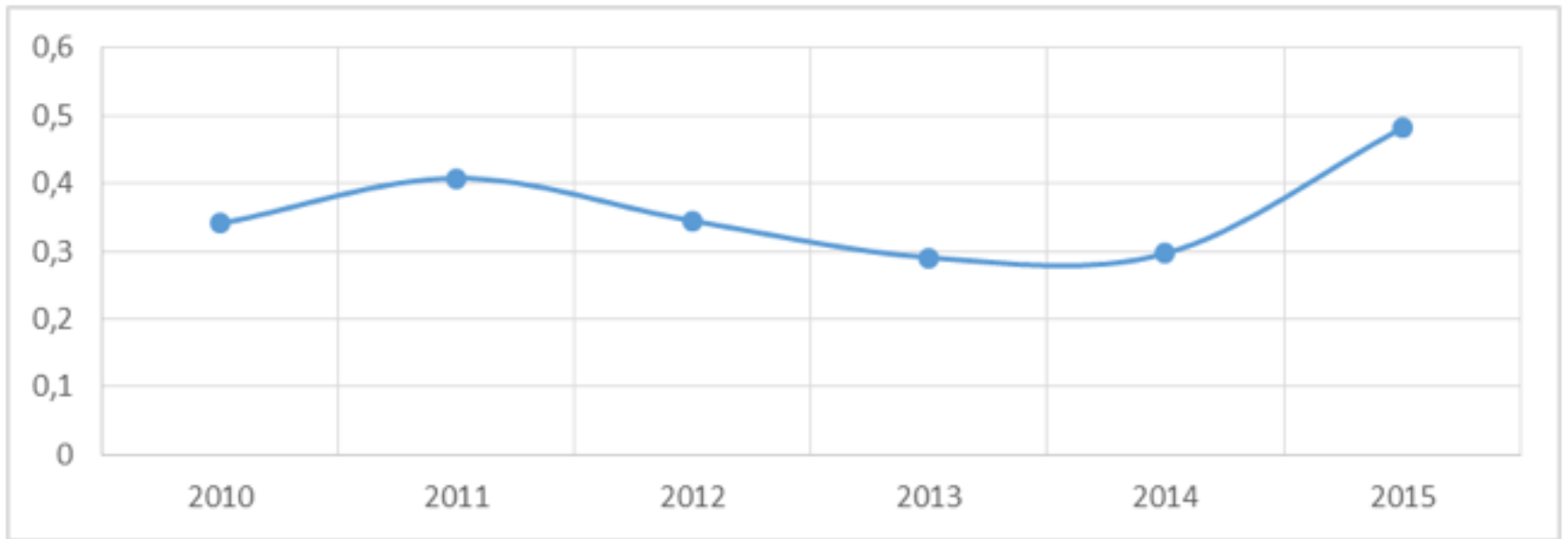
Algorithm for diagnosing threats to economic security based on the 'level of economic integration of regions' indicator



The authors' primary source of information for calculating the indicator of overall regional economic openness was data from official statistics on the incoming and outgoing of food products in Russia's regions, GRP, and the average consumer prices for particular types of food products. Based on these data, the authors calculated the coefficient of the overall regional economic openness of 83 constituent entities of the Russian Federation (exclusive of the Republic of Crimea and the city of Sevastopol), the information basis being data for the period 2010–2015.

The findings indicate the following: in the period under examination, Russia's overall economic openness, assessed based on the dynamics of the coefficient of the overall regional economic openness of its constituent entities, had demonstrated a downtrend up until 2015 (Figure 2):

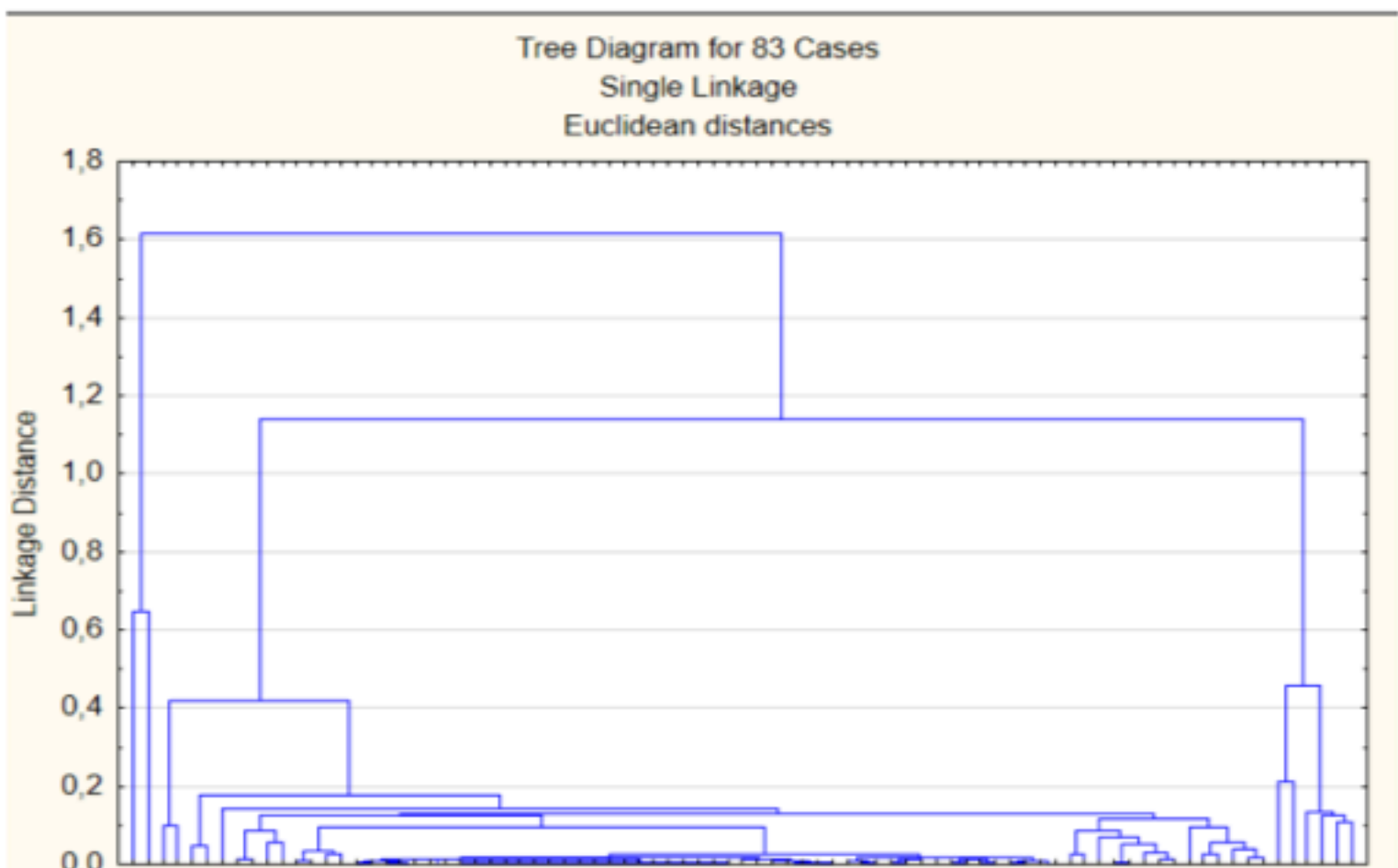
Figure 2
Dynamics of the coefficient of Russia's overall economic openness



The increase in interregional exchange in 2015, which, without question, is a positive trend, may be viewed as the result of Russia implementing its policies of protectionism and import substitution and as an internal positive effect of the technological and financial sanctions imposed on Russia, which have led to boosts in goods exchange among the regions and growth in the internal market.

In accordance with the developed algorithm for diagnosing threats to economic security based on the 'level of economic integration of regions' indicator, the authors implemented a two-stage clusterization procedure which implied the use of hierarchical and non-hierarchical (iterative) methods. The first stage involved diagnosing the measurement of distance between the objects and choosing a classification method to determine the structure of the clusters obtained. The second stage involved grouping the objects based on the chosen parameters for hierarchical clusterization. Based on an analysis of data on the existing structure underlying the set of objects, it was decided to employ the single-linkage method and Euclidean distances (Soshnikov, Tamashevich, Uebe, & Schaefer, 1999) (Figure 3). The authors utilized Statistica 10 software.

Figure 3
Dendrogram illustrating a hierarchical clusterization of Russia's constituent entities



The authors' visualization, shown in Figure 2, helped put forward a hypothesis about the

possibility of distributing the regions into three groups (clusters). To test this hypothesis, the authors resorted to iterative cluster analysis using the k-means method. This method lets you obtain non-overlapping clusters and does not impose any limitations in terms of the number of objects to be explored and indicators characterizing them. The k-means method has substantiated the validity of the supposition put forward and helped identify three major groups of clusters:

- Cluster 1 comprises regions which are active participants in interregional goods exchange and have posted high values of the indicator of the overall openness of the regional economy;
- Cluster 2 incorporates regions with a medium level of overall openness of the regional economy;
- Cluster 3 is composed of regions which are poor participants in processes of regional interaction and are characterized by low levels of openness of the regional economy.

Thus, employing cluster analysis has helped form several homogeneous groups of regions based on establishing the similarity between quantitative values characterizing their participation in processes of interregional interaction. The results of this clusterization procedure are provided in Table 1:

Table 1
Dynamics of the three Clusters of Russian Regions based on the 'Level of Economic Integration of Regions' Indicator

| Cluster | Number of regions | | | | | |
|---------|-------------------|------|------|------|------|------|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
| 1 | 6 | 2 | 7 | 2 | 5 | 19 |
| 2 | 12 | 7 | 16 | 7 | 9 | 8 |
| 3 | 65 | 74 | 60 | 74 | 69 | 56 |

Note. Compiled by the authors.

The data in Table 1 indicate poor levels of economic integration among Russia's regions, the overwhelming majority of them being in Cluster 3 with low levels of overall openness of the regional economy. The most active participants in interregional exchange are Oryol Oblast, Kursk Oblast, and Penza Oblast, as well as Altai Krai (Table 2). High lineup stability levels have been posted by Cluster 2, made up of regions which are the largest consumers of food products, including the city of Moscow and Moscow Oblast.

Table 2
Distribution of Russian Regions across the 3 Clusters (2015)

| Cluster 1 | Cluster 2 | Cluster 3 |
|--|---|---|
| Altai Krai, Bryansk Oblast, Volgograd Oblast, Saint Petersburg, Kursk Oblast, Leningrad Oblast, Nizhny Novgorod Oblast, Novosibirsk Oblast, Oryol Oblast, Penza Oblast, Altai Republic, Republic of Bashkortostan, Mari El Republic, Republic of Tatarstan, Samara Oblast, Saratov Oblast, | Belgorod Oblast, Voronezh Oblast, Moscow, Krasnodar Krai, Lipetsk Oblast, Moscow Oblast, Rostov Oblast, Tambov Oblast | Khanty-Mansi Autonomous Okrug – Yugra, Amur Oblast, Arkhangelsk Oblast, Astrakhan Oblast, Vladimir Oblast, Vologda Oblast, Jewish Autonomous Oblast, Zabaykalsky Krai, Ivanovo Oblast, Irkutsk Oblast, Kabardino-Balkar Republic, Kaliningrad Oblast, Kaluga Oblast, Kamchatka Krai, Karachay-Cherkess Republic, Kemerovo Oblast, Kirov Oblast, Kostroma Oblast, Krasnoyarsk Krai, Kurgan Oblast, Magadan |

| | | |
|---|--|---|
| Sverdlovsk Oblast, Stavropol Krai, Chelyabinsk Oblast | | Oblast, Murmansk Oblast, Nenets Autonomous Okrug, Novgorod Oblast, Omsk Oblast, Orenburg Oblast, Perm Krai, Primorsky Krai, Pskov Oblast, Republic of Adygea, Republic of Buryatia, Republic of Dagestan, Republic of Ingushetia, Republic of Kalmykia, Republic of Karelia, Komi Republic, Republic of Mordovia, Sakha (Yakutia) Republic, Republic of North Ossetia-Alania, Tuva Republic, Republic of Khakassia, Ryazan Oblast, Sakhalin Oblast, Smolensk Oblast, Tver Oblast, Tomsk Oblast, Tula Oblast, Tyumen Oblast, Udmurt Republic, Ulyanovsk Oblast, Khabarovsk Krai, Chechen Republic, Chuvash Republic, Chukotka Autonomous Okrug, Yamalo-Nenets Autonomous Okrug, Yaroslavl Oblast |
|---|--|---|

Note. Compiled by the authors.

It should be noted that Russia's regions are not yet exploiting to the fullest the potential of interregional interaction, synergetic effects from which are an internal source of economic growth for the regional economies. At the same time, it is worth noting that the findings from the authors' cluster analysis are confirming the emergence of a trend of increase in regional integration. To be specific, in 2015 the number of Russia's constituent entities in Group 1 rose by more than three times, while there was a decline in the number of regions in Cluster 3.

Diagnosing threats to economic security requires determining the threshold (critical) and target values of the indicator of a region's overall economic openness. A threshold (critical) value is the indicator's level having attained which serves as testimony to there being threats to the nation's economic security, which are caused by poor interaction among the regions and low levels of interregional integration. Establishing this value is a crucial tool for strategic analysis, forecasting, and planning which helps diagnose the degree to which trends in the social/economic development of Russia and its regions, with all their industries, match (or do not match) the country's national interests. When the threshold value is reached, as well as when one is close to reaching it, one may need to take proper managerial decisions aimed at ensuring the conditions for boosts in interregional interaction. The indicator's target value, as a desired benchmark, is the indicator's level having attained which matches the objectives for the development of the regional social/economic system and the national economy as a whole and is a crucial condition for minimizing threats to the national economic security of the Russian Federation.

In establishing the indicator's critical and target values, which help diagnose threats to economic security, the authors made use of data for 2015, as it is this time period that is of the greater interest from a perspective of determining relevant areas for propping up the emerging positive trend in the dynamics of the economic integration of Russian regions.

As an ordering attribute, the authors employed the average value of the indicator of the overall economic openness of regions making up a cluster. Below are a set of rules that were followed.

Rule 1: in establishing the target values of the 'level of economic integration of Russia's regions' indicator, a differentiated approach is to be used, which implies that:

- for regions in Cluster 1, the indicator's target value needs to be established at the level of the cluster's top region with the highest level of participation in interregional integration processes. In 2015, this region was Penza Oblast, with an overall regional economic openness indicator of 1.402;

- for regions in the rest of the clusters, it is advisable to set the target indicator at the level

of the average cluster value of the indicator of the overall economic openness of regions making up Cluster 1. This will help ensure a focus on growth and continual improvements in the social and economic performance parameters of specific regions of the Russian Federation. In 2015, this value was 0.819.

Rule 2: it is advisable to set the threshold (critical) value of the 'level of economic integration of Russia's regions' indicator at the level of the average cluster value of the indicator of the overall economic openness of regions making up Cluster 3. Being the biggest one, comprising 56 of the nation's 83 regions, this cluster is characterized by low levels of participation in processes of interregional goods exchange. In 2015, the value was 0.104.

Thus, the proposed approach helps diagnose threats to economic security based on the 'level of economic integration of regions' indicator relative to 34 Russian regions. This makes it possible to assert that in present-day conditions low levels of overall openness of regional economies are a significant source of threats to Russia's economic security, a factor that impedes the sustainable social/economic development of regions.

Implementing the proposed approach to assessing the level of economic integration among regions in the context of ensuring economic security in the practice of regional governance will facilitate:

- firstly, the effectuation of an efficient managerial cycle in respect of the tracked indicator via the timely informing of the authorities of the emergence of threats of adverse, critical, and unacceptable changes in the dynamics of regional social/economic systems;
 - secondly, the timely development of recommendations on eliminating (restraining) negative and propping up positive trends in the area of the economic security of the nation and its regions, aimed at ensuring the conditions for the nation's sustainable spatial and regional development and bolstering the unity of Russia's economic space;
 - thirdly, the resolution of Russia's priority strategic objectives – ensuring the country's territorial integrity and achieving well-balanced social/economic development based on economic soundness and sustainable social/economic development in the regions.
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4. Discussion

Critically speaking, it should be noted that the findings are relevant with respect to regions which are taking an active part in the food product exchange process. Note that the conclusions are also fair in relation to both regions which export food products to the internal market and regions which consume food products. Data from official statistics (Russian Federal State Statistics Service, 2017) indicate that there is currently no constituent entity of the Russian Federation that is not taking part in intra-regional food product exchange, the focus being on such food staples as meat and vegetable oil. That said, reducing intra-regional exchange to just food products is not very well substantiated. In this regard, a promising step for the development of research into the characteristics of the economic integration of Russian regions is adding to the roster of product groups across which to assess the level of interregional interaction consumer durable goods and industrial goods as well.

5. Conclusion

1. At present, there is a keen focus on research into economic integration, as the process of Russia's regions drawing together at the subnational level, with scholars exhibiting particular interest in exploring such issues as promoting interaction among the regions, cultivating interregional differentiation, securing balanced economic growth territorially, and, most recently, ensuring economic security in those areas.

2. Economic integration among regions ought to be viewed as the process of interregional interaction which helps stimulate internal processes underlying the areas' positive social/economic dynamics. Under this kind of approach, regional integration serves as a condition for ensuring the nation's economic and national security and as a guarantor for its long-term sustainable social/economic development.

3. The special nature of statistical reporting practices followed in the Russian Federation has impeded full-scale use of foreign best practices in diagnosing the level of economic integration among regions – more specifically, assessing the level of interregional interaction using the Grubel-Lloyd index. In this regard, it may be worth organizing systematic statistical monitoring of the various components of exports and imports. This approach will make it possible to calculate indexes of intra-industry trade at the regional level and on that basis make well-substantiated conclusions about the level of interregional interaction in the nation and potential threats to the economic security of Russia and its regions.
4. The authors propose assessing economic integration using an indicator of the overall economic openness of regions for which there is data available from official statistical reports on the incoming and outgoing of goods across the constituent entities of the Russian Federation. For this purpose, the authors have developed a methodology for assessing the level of economic integration among regions, which is formalized as an algorithm that reflects a succession of operations on calculating the above indicator and diagnosing potential threats to national economic security.
5. The level of overall openness of Russia's economy, assessed based on the dynamics of the coefficient of the overall regional economic openness of its subjects, had been characterized by a downtrend up until 2015. The boosts in the indicator of interregional exchange observed in 2015 may be viewed as the result of implementation in Russia of policies of protectionism and import substitution.
6. As part of this study, the authors have implemented a two-stage clusterization procedure using Statistica 10 software, which has helped identify 3 clusters of Russia's regions differing in the intensity of interregional interaction. The authors have diagnosed the issue of poor economic integration among Russia's regions and identified threats to economic security based on the 'level of economic integration of regions' indicator relative to 34 Russian regions.
7. The dynamics of the 'level of economic integration of regions' indicator make it possible to diagnose the strengthening (or weakening) of integration ties between the regions and on that basis make well-substantiated conclusions about the augmentation (or mitigation) of threats to national economic security and work out proper measures of regional social/economic policy aimed at boosting positive and alleviating negative trends in the dynamics of the social/economic development of the Russian Federation and its regions.
8. Based on the logic of the approach proposed herein, economic integration among the regions of the Russian Federation is a crucial factor for the augmentation of centripetal trends and promotion of integrative regionalization, which implies an aspiration to foster a strong national economy through factoring in a region's interests and needs, and creation of the conditions for the sustainable development of the nation as a whole and its regions.

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Notes

The Doctrine also establishes threshold values with respect to grain, milk, fish products, potatoes, and cooking salt. However, for these food groups there are no data available on the incoming and outgoing of products across Russia's constituent entities.

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