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*SCENARIOS FOR REGIONALIZATION: ANALYSIS ON ROMANIA'S SERVICES USING ONICESCU INFORMATIONAL STATISTICS**

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Abstract

As part of a more extended study, we have shown that the decision on Romania's regionalization needs to be taken considering more than one criteria. One of the purposes for regionalization is to stimulate development, and we consider that services are an important criterion to take into account. The aim of this paper is to study Romania's services; the variables we analyse are related to telephone, mail and railway transportation services. Regarding these domains, with the instruments provided by Onicescu's informational statistics, we prove that Romanian regions are not homogeneous, and we conclude that this criterion can be used in a multi-criteria model for deciding on Romania's reorganization.

Keywords: Regionalization, Postal services, Telephone services, Railway, Informational statistics, Informational energy

JEL Classification: C49, L87, L92, L96, R13

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1. Introduction

Since 2013, regionalization has been a frequently discussed subject in Romania, as this was needed in order to stimulate development and give easy access to community funds in the next financial term (2014 - 2020). The so called "development regions" were not administrative units, serving only for statistical purposes, so a decision had to be made fast. Unfortunately, the decision has not yet been made, thus making it even more important, as Romania needs to be prepared for the next term.

Many propositions for organizing Romanian territory were focusing on one criterion only, but we feel that a better formula would be obtained by analysing more criteria. The first two studied subjects were population and industry in Romania. Regarding the subject of population we have found that regions, both in current and proposed versions, are very homogeneous, meaning that the decision on regionalization needs to take other criteria into account as well (Lie, I.R, 2015a, pp. 22-28). Things change when analysing the subject of industry: we found that in this case regions are very heterogeneous, which means this criterion can be used to decide on the optimal formula for regionalization (Lie, I.R, 2015b, pp. 11-18).

After studying the population and industry, we focus on the services sector, mainly telephone, postal and railway transportation services. The study was carried out using Onicescu's informational statistics.

The second section of this paper shortly presents the characteristics of the services sector, and the third part explains the methods used and the source of the data. Section four presents the results of the analysis and it is followed by the conclusion and a preview of further studies.

2. Evolution and general characteristics of Romania's services sector

One of the objectives for regionalization is to stimulate development and the service sector, as Enescu et al. (2014, pp. 116-120) noticed "is a prerequisite for economic development". One of the reasons is that "services are essential inputs for the material goods and to provision of other services" (Enescu et al., 2014, pp. 116-120).

Telephone, postal and railway transportation services were selected for this study because we consider them to be extremely important for development. On one hand their usage is an indicator of the economic and social development of a region, and on the other hand, they stimulate progress.

In spite of the great expansion of mobile phones, tablets and other gadgets and communication via Internet, Plain Old Telephone Service (POTS), or fixed telephone services as we call them, are still very important in Romanian society and they will continue being so for the next 30 years, as the National Authority for Management and Regulation in Communications of Romania suggests in its reports and studies.

The main reason for that is the fact that the fixed telephone is the one common element connecting different generations: as a consequence of a dynamic labour market, children and grandchildren often live in other cities and even other countries than their parents and grandparents, and for most of them fixed telephones are the only way to communicate, as older people are reluctant to learn how to use mobile phones or any other new technology.

Another fact that shows how important POTS still is for Romanians is that many private companies and all public institutions use it as their main way to communicate. This is due to the fact that is easier and more cost-effective for them to install Private Branch Exchanges, which provide lower costs for teleconferences and video-conferences, and also many local firms don't have enough financial resources to provide mobile phones for all their employees in order to help them perform their tasks.

A similar situation occurs with postal services. It is true that the popularity and easiness of electronic communications has led to a diminished work volume for postal services providers, especially for letter mail (Tochkov, K, 2015, pp. 35-42), but some segments are still profitable, for example parcel delivery and express mail (Tochkov, K, 2015, pp. 35-42).

The situation of postal services in Romania is similar to other countries in Central and Eastern Europe: after 1990, "national postal operators in CEE have remained in state ownership and retained their monopolistic positions" (Tochkov, K, 2015, pp. 35-42), but after the market liberalization that followed the EU accession, they faced competition and needed to restructure their activities, which led to cutting costs: " post offices have been closed, and mail boxes dismantled, mail delivery has been cut back, and the workforce has been reduced" (Tochkov, K, 2015, pp. 35-42). In spite of that, some segments are still profitable: parcels delivery, due to the exchange of packages between Romanians who live abroad and their relatives from home, and to online shopping, and registered letters, used especially by public institutions and bailiffs.

The last services segment considered in this paper is railway transportation, "an important industry in the EU, as the sector accounts for 5% of the GDP and employs around 10 million persons" (Lehtinen, J, Bask A. H., 2011, pp. 96-108). Railway transportation is not only important for other Europeans, but also for Romanians, as some authors consider that "Romania's socio-economic development was and will be indissoluble linked to transport infrastructure development" (Popescu, T., Fistung, F. D., 2015, pp. 304-312). The problem is, as in most of the countries on our continent, the fact that most of the railway network, even if

improved in the last years, was established in the 1900's (Marti-Henneberg, J., 2013, pp. 126-138), which creates efficiency and safety issues.

Railway transportation will continue to be an important sector for Romania's economy, and a factor for development as the current policy in Europe is to stimulate it, as it is cheaper and environmentally friendly than road transportation (Lehtinen, J, Bask A. H., 2011, pp. 96-108; Popescu, T., Fistung, F. D., 2015, pp. 304-312).

3. Methodology and data

The data used in this paper comes from a report published in 2013 by the Romanian National Institute of Statistics, called "Regional economic and social highlights: Territorial Statistics".

As mentioned before, there are three variables considered for this study: number of letters, packages and similar items send by mail, number of minutes spent on the phone and on dial-up Internet, using landlines, and the third one, the length of the railway in each Romanian county.

For each of the regions in Romania we have calculated the informational energies for each of these variables. For this purpose, for each of the variables we have taken into consideration several levels or categories, as following:

- Postal services were divided into four categories: mail and print, parcels, registered letters, and insured items.
- For telephone services, there were also four categories: internal long-distance calls, internal local calls, international calls, and Internet by dial-up.
- When analysing the length of the railway, we used two categories: electrified railway and non-electrified railway.

The next step was to calculate, for each variable and for each county the informational energy (E), using the formula:

$$E=\sum_{j=1}^{n} p_j^2, \quad (1)$$

wherep_j is the weight of each category and n, the number of categories (Onicescu, O., Ştefănescu, V., 1979, pp. 14).

After that, we also needed the adjusted informational energy (E_a), calculated as following (Mihăiţă, N. V., 2003, pp. 179-189):

$$E_a = \frac{n*E-1}{n-1}. \quad (2)$$

The influence of each county on the region it pertains to was calculated by multiplying the adjusted informational energy and the weight of that county in the region. For the whole region the influence is the sum of the counties' influences. By subtracting the adjusted informational energy of each region from its influence we obtained the information gained presented in tables in Section four of this paper.

By applying the properties of informational energy we were able to draw conclusions about the homogeneity of the Romanian counties regarding telephone, mail and railway transportation services.

4. Data analysis

The first step of our analysis was to study the homogeneity of Romanian regions regarding postal services. The main categories these services are divided in are: mail and print, parcels, registered letters, and insured items. We have calculated the informational energies, adjusted informational energies and the information gained, for the current regions, and also for the versions we previously proposed (Lie, I. R, 2015). Table 1 presents the results of these calculations.

Table 1: Informational energies and information gained by regions, counties, and postal services

Region	Structure	Information gained (%)
Northwest	Current: BH, BN, CJ, MM, SJ, SM	0.013
	Version: BH, MM, SJ, SM	0.014
West	Current: AR, CS, HD, TM	2.598
	Version: AR, CS, TM	1.176
Center	Current: AB, BV, CV,HR, MS, SB	0.335
	Version 1: AB, BV, CV,HR, MS, SB, CJ, BN	0.222
	Version 2: AB, BV, CV,HR, MS,	0.979

	SB, HD	
	Version 3: AB, BV, CV,HR, MS, SB, CJ, BN, HD	0.681
Southeast	Current: BR, BZ, CT, GL, TL, VN	2.40
	Version: BR, BZ, GL, VN	2.61
South Muntenia	Current: AG, CL, DB, GR, IL, PH,TR	0.96
	Version: AG, DB, GR, PH,TR	0.51
New region in the Southeast	CL, CT, IL, TL	1.30

Source: *Excel calculations based on data from Regional economic and social highlights: Territorial Statistics, 2013*

As we look at the results, we can draw the following conclusions:

- The information gained in all of the cases is under 5%, which means that in both current and proposed versions, Romanian regions are very homogeneous from the point of view of postal services. In some cases there are slight differences between the current situation and the other versions. It is important to mention that this homogeneity means that the structure of these segments is very similar in most of the counties, not that the values registered for the variables are identical.

- Northwest and Southeast are more homogeneous in their current form, than in the one where Cluj and Bistriţa-Năsăud, respectively Constanţa and Tulcea counties, are removed.

- West and South Muntenia regions are more homogeneous in the proposed versions, which exclude Hunedoara, respectively Călăraşi and Ialomiţa counties.

- For the Centeral region the most homogeneous structure from the tested ones, is the one that adds Cluj and Bistriţa-Năsăud counties to those that are currently forming it.

- By putting together Călăraşi, Constanţa, Ialomiţa, and Tulcea counties, a very homogeneous region would be created.

The second part of the study is an analysis on the homogeneity of the regions in Romania, taking into account the telephone services. The categories for this variable are: internal long-distance calls, internal local calls, international calls, and Internet by dial-up. Table 2 presents the results obtained when calculating the information gained for this variable.

Table 2: Informational energies and information by regions, counties, and telephone services

Region	Structure	Information gained (%)
Northwest	Current: BH, BN, CJ, MM, SJ, SM	0.529
	Version: BH, MM, SJ, SM	0.870
West	Current: AR, CS, HD, TM	0.771
	Version: AR, CS, TM	0.700
Center	Current: AB, BV, CV,HR, MS, SB	0.419
	Version 1: AB, BV, CV,HR, MS, SB, CJ, BN	0.400
	Version 2: AB, BV, CV,HR, MS, SB, HD	0.416
	Version 3: AB, BV, CV,HR, MS, SB, CJ, BN, HD	0.419
Southeast	Current: BR, BZ, CT, GL, TL, VN	0.13
	Version: BR, BZ, GL, VN	0.05
South Muntenia	Current: AG, CL, DB, GR, IL, PH,TR	1.32
	Version: AG, DB, GR, PH,TR	1.26
New region in the Southeast	CL, CT, IL, TL	0.55

Source: *Excel calculations based on data from Regional economic and social highlights: Territorial Statistics, 2013*

These results show that:

- As in the case of postal services, the information gained below 5% suggests that there are no major differences between the counties in each region regarding telephone services. The main reason for this homogeneity is the fact that Romanians speak the same language all over the country and their communication habits are the same.

- Northwest region is the only one that is more homogeneous in the current form, than in proposed versions.

- From the three versions proposed for the Centeral region, the most homogeneous is again the one that also includes Cluj and Bistriţa-Năsăud counties, besides the existing ones.

- Also in this case, Călăraşi, Constanţa, Ialomiţa, and Tulcea counties form a very homogeneous region.

The third part of the study focuses on the length of the railway in Romanian counties. The two categories for this variable are electrified and non-electrified railway. In this case we also calculated informational energies and the information gained, and the results can be found in Table 3.

Table 3: Informational energies and information by regions, counties, and telephone services

Region	Structure	Information gained (%)
Northwest	Current: BH, BN, CJ, MM, SJ, SM	27.729
	Version: BH, MM, SJ, SM	0.000
West	Current: AR, CS, HD, TM	18.139
	Version: AR, CS, TM	6.513
Center	Current: AB, BV, CV,HR, MS, SB	12.718
	Version 1: AB, BV, CV,HR, MS, SB, CJ, BN	9.239
	Version 2: AB, BV, CV,HR, MS, SB, HD	14.381
	Version 3:	

	AB, BV, CV,HR, MS, SB, CJ, BN, HD	10.724
Southeast	Current: BR, BZ, CT, GL, TL, VN	22.19
	Version: BR, BZ, GL, VN	10.68
South Muntenia	Current: AG, CL, DB, GR, IL, PH,TR	20.88
	Version: AG, DB, GR, PH,TR	27.65
New region in the Southeast	CL, CT, IL, TL	3.55

Source: *Excel calculations based on data from Regional economic and social highlights: Territorial Statistics, 2013*

The results in Table 3 show the following:

- In contrast to the other two types of services, Romanian regions are not homogeneous regarding the length and type of railway.

- Except for South Muntenia, whose homogeneity decreases when Călăraşi and Ialomiţa are removed from its structure, the other regions are more homogeneous in the proposed versions than in the current ones.

- In the proposed version, Northwest region is the most homogeneous, with 0% information gained, followed by West region, with 6.51% information.

- Again, for the Centeral region the most homogeneous version is the one that contains the current counties and also, Cluj and Bistriţa-Năsăud.

- The little information gained for the new region formed by Călăraşi, Constanţa, Ialomiţa, and Tulcea counties shows that this is a very homogeneous structure.

All these results show that there are differences between the Romanian regions, depending on the type of service we take into consideration. Postal and telephone services are very homogeneous in all counties and regions, which means they cannot be used in order to decide the optimal formula for regionalization. On the other hand, with much more disparity, the length of the railway can be used as a variable that could help to decide on the new administrative organization of Romania.

5. Conclusions

In an attempt to develop an extensive research aiming to find the optimal formula for Romania's regionalization, in this paper we focus on the situation of postal, telephone and railway transportation services in our counties.

With the help of statistical instruments coming from informational statistics, we studied the homogeneity of Romania's regions, in both current and proposed versions, regarding the sectors mentioned before.

The results show that, regarding telephone and postal services, there is great homogeneity in all analysed versions, especially due to the similar archetype of the inhabitants of all counties. The difference comes when we focus on the railway transport, where we find far less homogeneity in terms of transportation infrastructure. This leads to the conclusion that this variable can be successfully included in a model for designing Romania's territorial organization, along with industry variables (discussed in a previous paper) and other variables regarding commerce, tourism, and education. This will be the subject of further investigations.

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