

Technological Perspective on the Degree of Regional Specialization of Exports

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Abstract: *In analyzing the evolution of the degree of technological specialization of regional exports in Romania in the period of time 2000-2010, we started from the study of the modifications made in the structure of the sections included in the Combined Register (CR) for regional exports. In order to assess the degree of regional specialization, we used the Balassa indexes, and in order to emphasize the sections which have comparative advantages or disadvantages pertaining to the exports, we determined the Dalum specialization index. By assembling the sections included in the Combined Register into four categories of technological groups of products according to the classification used by UNIDO in 2005 [1] (products with low, medium-low, medium-high, medium-high/high technological level – it was impossible to divide two of the CR sections into high or medium-high, since the chapters within the sections used a different classification –), we managed to create a complete image of the technological specialization of regional exports.*

Keywords: *technological specialization, sections of the Combined Register, specialization indexes Balassa and Dalum, comparative advantages*

Introduction

The assessment of the regional inter-industrial specialization processes from the point of view of the extent of using the factors of production and the degree of technological specialization is a necessity in order to know and to be able to diagnose certain regional economies (such as the Romanian economy) which are in the middle of an intensive modernization and development process due to the integration into the economical and institutional structures of the European Union, as well as due to the more frequent involvement into the international trade flow and into the global competition.

1. Evolution of the Structure for Each Section Listed in the Combined Register of Regional Exports, from a Technological Point of View

During the last years, in the **structure of exports on sections listed in the Combined Register (CR)**, the highest percentage – over 20,0% - was that of the section „*Machines, devices and electrical equipment; machines for recording sound and picture and reader machines*”, and the regions with great contribution to the exports included in this section are the North-Western, Western and Central areas. This aspect proves the existence of a certain degree of specialization in manufacturing such goods in the area mentioned above, since this section also has a great percentage in the regional exports. According to figure 1, over 50% of the exports in the north-western region since 2010 consist in products included in this section. We should also mention that the specialization in manufacturing electrical machines and devices in this area took place especially during the last 5 years, since at the beginning of the period subjected to this analysis the section we are talking about had a low percentage in the regional exports (for example: 5,9% in 2000). The same phenomenon happened in the central area, as in 2000 the percentage of such products in the regional exports was of only 5,9%, while in 2010 it increased up to 27,5%. On the other hand, in the western area, the specialization in manufacturing such goods is a tradition of the regional economy, since during the whole period subjected to the analysis the percentage of this section in the regional exports was over 30%, reaching even 46,7% in 2000. However, in figure 1 we can notice that there are great discrepancies of the export structure in this section.

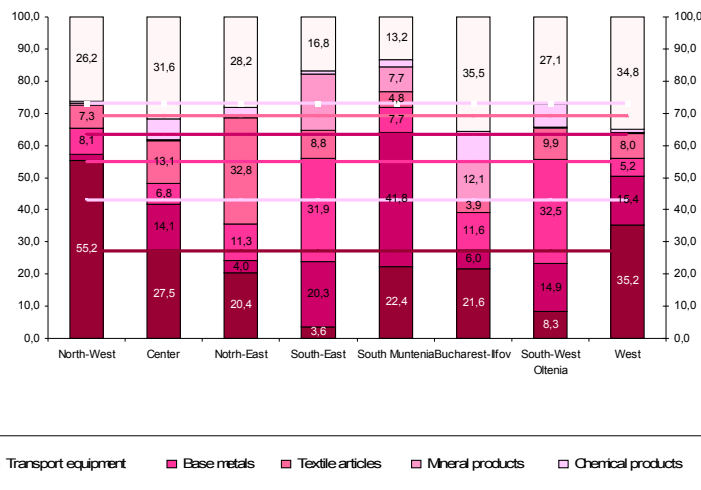


Figure 1. Percentage of the main sections included in the CR in 2010 (%)

Source: personal processing of the data offered by the INS (National Institute of Statistics)

Other sections with high percentage in the total exports registered in Romania are:

- The “*Means of transport*” are over 15% of the total exports, especially during the last few years. The regions with great contribution to the exports in this section, due to the specialization in manufacturing such products, are the south of Muntenia (41,8% of the regional exports in 2010 consists in exports of such products), the South-East (20,3%), the West (15,4%) and the South-West of Oltenia (14,9%);
- The „*Common metals and articles made of these metals*” are about 15% of the total exports over the whole period subjected to the analysis. Contributions over 30% of the total regional exports are registered in the South-East and in the South-West of Oltenia. In these two regions, the specialization in manufacturing metal products is a tradition of the local economy, since there are percentages of over 30% in the regional exports during the whole period analyzed;
- The „*Textile fabrics and textile products*” registered great percentages at the beginning of the period - over 20% - and the regions which still have great contributions to the exports included in this section are the North-East, the Central and the North-West areas.

The importance of the sections in the CR within the regional exports has changed during the period of time subjected to the analysis, and in order to finish the analysis conducted from this point of view we made up *boxplots* [2] for each development region according to the classification into sections of the exports for 2000 and 2010 (for this type of analysis we used the SPSS program).

In figure 2 we can notice that in *all the regions, the sections in the CR tend to have low values* of exports in 2000 as well as in 2010, with certain differences among the regions, differences pertaining to the values for the exports for the quartile 1, 2 or 3. We must also notice that *the absolute amplitude of the series is higher* in 2010 compared to 2000, fact which proves that the value of exports in each region is increasing.

Moreover, through this graphical presentation we can emphasize the *outliers* for each region, meaning those sections in the CR which have the highest percentages, thus breaking the homogeneity of the series. The main *outliers* are, naturally, the sections already presented here as having the highest percentages in the regional exports: „*Machines, devices and electrical equipment; machines for recording sound and picture and reader machines*”, “*Means of transport*”, „*Textile fabrics and textile products*” and „*Common metals and articles made of these metals*”. In conclusion, the presence of several *outliers* and the fact that *the sections in the CR tend to have low values* of exports are the premises for the existence of a certain degree of specialization on regional level.

The classification on groups of products according to the level of technology involved in manufacturing them (the sections included in the CR were assembled into four categories of

technological groups of products according to UNIDO: products with low, medium-low, medium-high, medium-high/high technological level – it was impossible to divide two of the CR sections into high or medium-high, since the chapters within the sections used a different classification) is asymmetrical in all the regions except for the Bucharest-Ilfov region where the higher development level led to an increased symmetry on types of products.

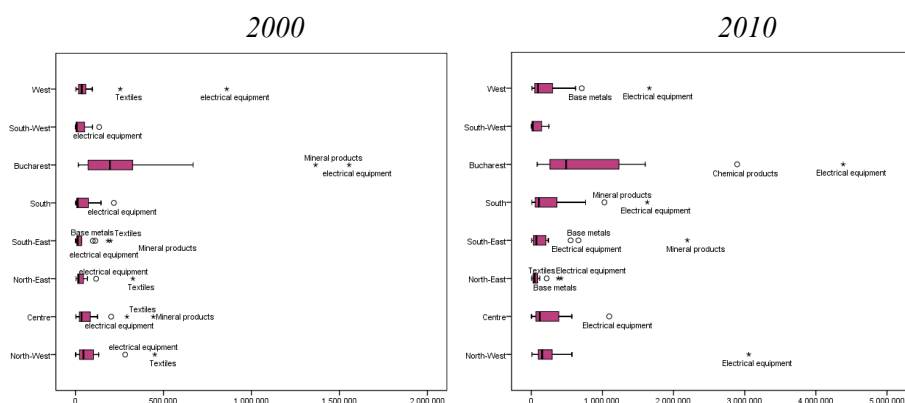


Figure 2. Box plot for the distribution of the sections in the CR within the total regional Source: personal processing of the data offered by the INS (National Institute of Statistics)

Thus, in 2000, the North-West, the Central and the North-East regions exported mainly products with low technological level, while South Muntenia and the Western region exported products with medium-high/high technological level, which constituted about 50% of the total regional exports. In 2010, the only region which was still exporting mainly products with low technological level was the North-East region, the others having much lower values of exports of such goods.

Compared to 2000, in 2010 the evolution of the percentage on each category of products was as follows:

- the export of products with *low technological level* was *decreasing in all the regions* ;
- the export of products with *medium-low technological level* was *increasing in 4 regions and decreasing in 3 of them*, while in only one region it remained unchanged ;
- the export of products with *medium-high technological level* was *increasing in 7 regions and decreasing in only one*;
- the export of products with *medium-high/high technological level* was *increasing in 5 regions and decreasing in 3 of them* .

Such an evolution in the export of products according to the technological level is beneficial for the regional economy, since the intensification of exports of human-capital intensive products and high technology products and abandoning the specialization in natural-resource-intensive and labor-intensive products constitute the premise for economic growth.

The first conclusion pertaining to the regional specialization *from the point of view of the percentage of the respective CR sections within the total regional exports* are the following:

- *in most regions* there is an increase of the specialization in the manufacture of **electrical machines and devices**, since the export of such products have important percentages in the total regional exports (except for the South-East and South-West Oltenia regions). *The specialization of the regional production structures for the manufacturing of such products leads to great benefits for the regional economy, due to the intensive use of the human capital existing in the region.*
- *In all the regions* there is *decrease* of the specialization in manufacturing **textile products**, since the exports of such goods have lower and lower percentages in the total regional exports. The only region where the degree of specialization in manufacturing textile products remains high is **the North-East** region. As a consequence, this region is the only one in Romania that exports mainly textile products, which are labor-intensive products and have a low

technological level. *A decrease of specialization in manufacturing natural-resource-intensive and labor-intensive products means in fact giving up the production of goods which do not bring great benefits to the economy during the process of economic growth.*

- however, there are *regions in which the degree of specialization in manufacturing certain products is very high.* For example, the **South Muntenia** region specialized in **manufacturing means of transport** (the export of such products is 41,8% of the total exports in 2010), and the **North-West** region specialized in manufacturing **electrical machines and devices** (the export of such products is 55,2% of the total exports in 2010). *A high degree of specialization in human-capital intensive goods creates, on one hand, the premise for economic growth but, on the other hand, it could lead to an increase in the degree of vulnerability of the regional economy.*
- in all the regions, in the period of time 2000-2010, there was *a trend of increasing the degree of symmetry of the structure on groups of products*, according to the technological level; however, there are great discrepancies from one region to another.

2. Assessment of the Technological Specialization Using the Balassa Index

In order to express in digits the *degree of specialization of the exports for each section included in the Combined Register* we calculated, for each region, the **Balassa index of specialization** [3]. It is determined by reporting the export percentage of that product within the total exports in the region to the export percentage of the product within the total exports in Romania. When the index has positive values, the region has a high degree of specialization in manufacturing a certain product; when the index is higher than 1, the percentage of the regional exports of the product on the external market is higher than the average calculated on national level. Consequently, this index calculated on the level of a region is influenced by the specialization processes in other regions.

As it was shown in the first part of this analysis, the section *„Machines, devices and electrical equipment; machines for recording sound and picture and reader machines”* has a high percentage in most regional exports; consequently, we can state that the regions specialized in manufacturing such products, and by calculating the Balassa index we can establish the degree of specialization in each region. According to figure 3, *the highest values of the degree of specialization in the export of electrical machines and devices*, during most of the whole period subjected to the analysis, is recorded only in the regions North-West and West, the other regions having a higher degree of specialization in other products.

Another section with high percentage in the structure of regional exports, especially during the last period of time, is the section *“Means of transport”*. *The increased specialization of the South Muntenia region* in manufacturing these products is obvious, as it follows from figure 3. Ever since 2005, the region has greatly increased its degree of specialization, the evolutionary trend being an ascending one.

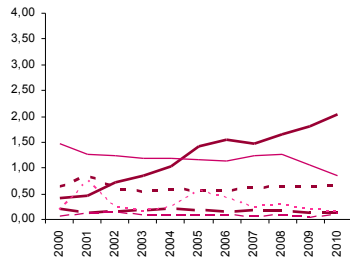
As for the section *“Textile fabrics and textile products”*, over the whole period of time, it has the highest level of specialization only in the North-East region, the other regions having a low degree.

The main trends, on regional level, in the evolution of the degree of specialization of exports for each section in the CR, are:

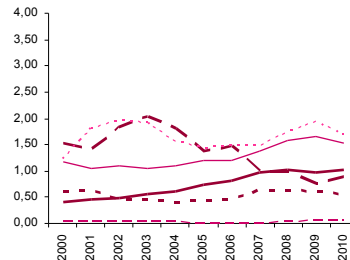
- *in most regions there is an increase in the degree of specialization for the exports of **electrical machines and devices** (except for South Muntenia and the West region, where the degree of specialization is greatly reduced). The highest enhancement of specialization for the export of such products is recorded in the North-West (from 0,42 in 2000 to 2,03 in 2010) and the Central region (from 0,42 in 2000 to 1,01 in 2010). Great decrease in the degree of specialization is recorded in South Muntenia (from 2,00 in 2000 to 0,82 in 2010) and the West region (from 3,31 in 2000 to 1,29 in 2010).*
- *in most regions there is a decrease in the degree of specialization for the exports of **means of transport**. The greatest decrease is registered in the South-East (from 3,81 in 2000 to 1,30 in 2010) and South-West Oltenia (from 3,35 in 2000 to 0,95 in 2010), and the enhancements are recorded in South Muntenia (from 0,53 in 2000 to 2,67 in 2010) and the West region (from 0,41 in 2000 to 0,98 in 2010).*

- *in all the regions* there is a *slight* fluctuation of the degree of specialization for the export of **textile products**. The greatest enhancement of specialization for the export of such products is registered in the North-East region (from 1,98 in 2000 to 3,85 in 2010), while in the other regions the degree of specialization was relatively constant or slightly decreased during the period of time subjected to the analysis.

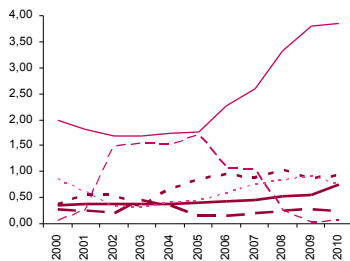
The North - West Region



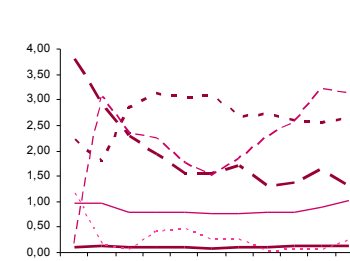
The Central Region



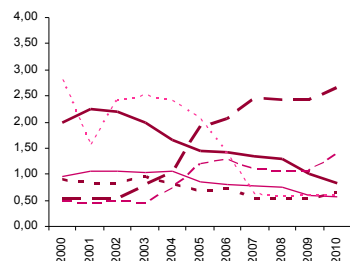
The North – East Region



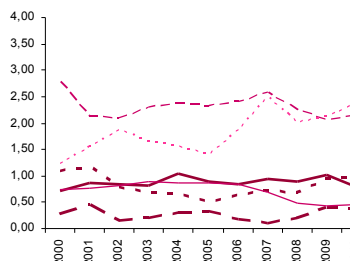
The South-East region



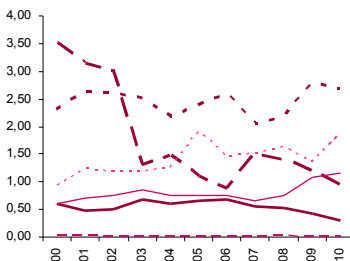
South Muntenia Region



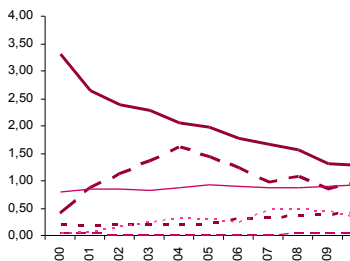
Bucharest – Ilfov Region



South – West Oltenia Region



The West Region



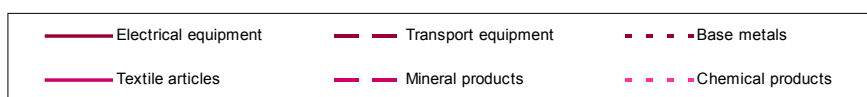


Figure 3. Evolution of the Balassa index of regional specialization on each section in the CR
Source: personal processing of the data offered by the INS (National Institute of Statistics)

- *in most regions* there is an *increase* in the degree of specialization for the export of **chemical products** (except for the South-East and South Muntenia regions). The highest enhances of the specialization for the export of such products are registered in Bucharest-Ilfov (from 1,21 in 2000 to 2,36 in 2010), South-West Oltenia (from 0,93 in 2000 to 1,85 in 2010) and in the Central region (from 1,23 in 2000 to 1,69 in 2010). Great decreases in the degree of specialization are registered in South Muntenia (from 2,81 in 2000 to 0,60 in 2010) and in the South-East region (from 1,18 in 2000 to 0,23 in 2010).

3. Assessment of the Comparative Advantages in Technology, Using the Dalum Index

In order to be able to offer a comprehensive image of the phenomenon of export specialization, we also need **the assessment of the comparative advantages or disadvantages on each type of product exported**. In order to express in digits the comparative advantage in the export of a product from a certain region, we calculated **the specialization index used by Dalum** [4] (which is an enhanced Balassa formula). It is determined by the report between the difference and the sum of the Balassa index and 1. The indicator has values between -1 and 1 and is positive when the region has a comparative advantage in that particular product. Consequently, the index calculated for one region is influenced by the processes of specialization in other regions.

As it was shown in the first part of this analysis, the section „*Machines, devices and electrical equipment; machines for recording sound and picture and reader machines*” has a high percentage in most regional exports, the regions specializing in the manufacture of such goods, according to the Balassa index, and by calculating the Dalum index we can determine which regions have comparative advantages in these products. According to figure 4, only the North-West, South Muntenia and West regions have *comparative advantages in the export of electrical machines and devices* for most of the period of time subjected to the analysis, while the other regions have great (the South-East and the North-East regions) or smaller (the Central and the Bucharest-Ilfov regions) disadvantages.

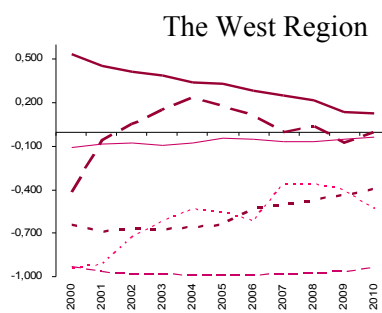
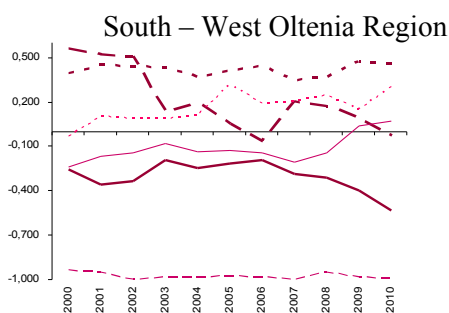
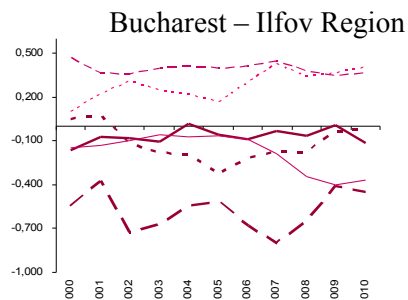
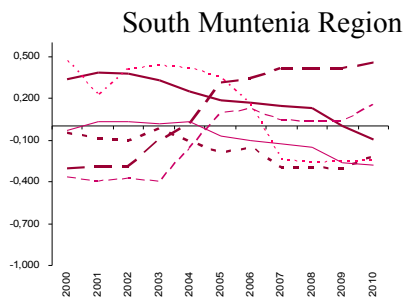
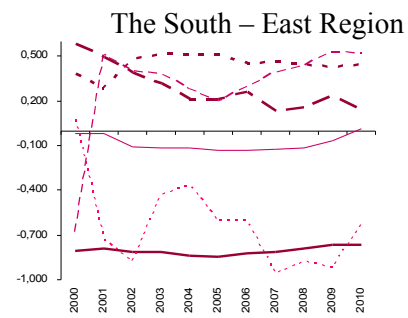
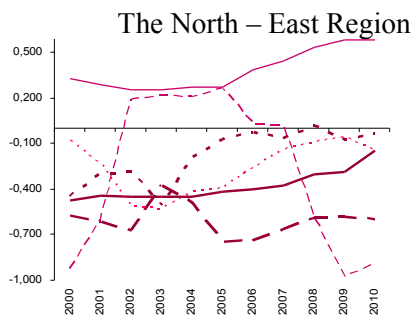
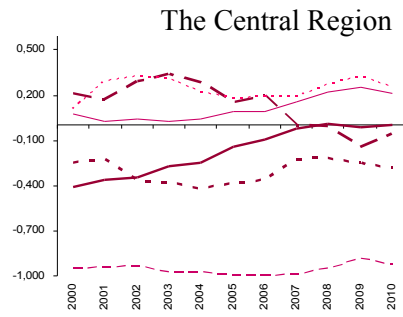
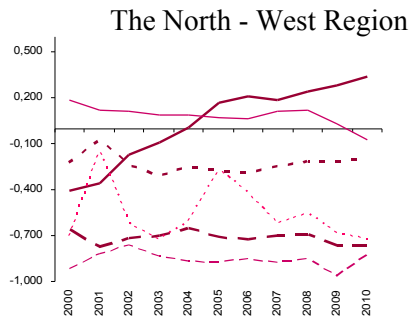
Another section with great percentages in the regional exports, especially during the last period of time, is the section “*Means of transport*”. The specialization of South Muntenia, the South-East and the West regions in manufacturing these products is obvious, as it follows from figure 3. These regions which specialized in manufacturing means of transport have, according to figure 4, comparative advantages in the export, but their evolution is different. Thus, South-East Muntenia region gained great comparative advantages in the export of such goods – especially during the last period of time -, while the South-East region has a descending trend. The increase of the specialization in manufacturing these products, and moreover gaining comparative advantages in their export, is a premise for *the intensive use of the human capital in the region, as well as for attracting major benefits for the trade of products with medium-high and high technological level*.

Although the comparative advantages/disadvantages for several sections are presented in figure 4, we considered that the section “*Textile fabrics and textile products*” should be analyzed, since these products have great percentages in the regional exports, especially during the first part of the period of time subjected to the study. According to figure 4, the manufacturing of textile products does not bring the region great comparative advantages in the exports, but it doesn’t bring great disadvantages either. During the whole period of time analyzed, only the North-East, North-West and Central regions have *comparative advantages for the export of textile products*, while the other regions have small and increasing comparative disadvantages.

Consequently, a decrease of the specialization in manufacturing textile products means a positive evolution of the regional economy, since they are labor-intensive products, their benefits for the process of economic growth being small.

In conclusion, the evolution of the comparative advantages on each region according to the technological level of the products and the use of the factors of production has the following aspects:

- most of the 9 sections included in the category “low technological level” have comparative disadvantages in the South-East, South Muntenia, Bucharest-Ilfov, South-West Oltenia and the West regions. Comparative advantages can be noticed in the North-West, Central and North-East regions, but the general trend is towards the decrease of these advantages.



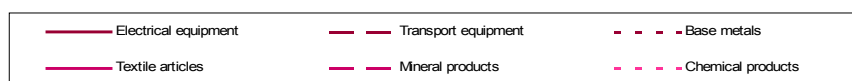


Figure 4. Evolution of the comparative advantage/disadvantage in the exports for the main sections
Source: personal processing of the data offered by the INS (National Institute of Statistics)

- most of the 4 sections included in the category “medium-low technological level” have *comparative disadvantages* in the North-West, Central, South-East, South Muntenia and West regions. *Comparative advantages* are in the North-East and Bucharest-Ilfov regions, while in South-West Oltenia the situation is well-balanced. During the period of time subjected to the analysis, *there is no clear trend* of increasing or decreasing these comparative advantages.
- most of the 4 sections included in the category “medium-high and high technological level” have *comparative disadvantages* in all the regions of Romania. The exceptions are the West region, where the situation is well-balanced, and the Central region, where *comparative advantages* have been gained in the export, especially during the last period of time, the *trend* being *to keep these advantages* or even slight increases of the advantages.

Conclusions

Such an evolution of the technological specialization in the regional exports, with slight fluctuations in the case of products with low technological level and with increase in the case of the products with medium-high or high technological level is beneficial for the regional economy, since the increase in the market share for the human-capital-intensive products and for the products with high technological level are the premises for the enhancement of the economic development.

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