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Steadiness and Mobility of Trade Patterns in the Baltic States

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Author's contribution

This whole work was carried out by author GH.

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ABSTRACT

This paper describes specialisation dynamics in the Baltic States using Revealed Comparative Advantage (RCA) measured. We analyse the development of the distribution of the comparative advantage using descriptive statistics, Galtonian regression, and Gini coefficient. Intersectoral specialisation dynamics is investigated using Markov transition probability matrix. Trade patterns dynamics aggregated by factor endowments are also discussed.

Despite some contradictory results obtained using different methodologies the following general conclusions can be formulated.

Diversification is the general trend in the development of the comparative advantage structure in the Baltic States. The most polarized structure of specialization in the considered period is in Latvia, the most diversified is in Estonia. However the degree of mobility varies significantly between countries. The most mobile structure of specialization is in Latvia. In Estonia the mobility is the lowest.

For all the Baltic States trade patterns are highly persistent for the sectors with strong comparative advantage and strong comparative disadvantage. It is shown that the probability of remaining in the same class for analysed sectors is high. Commodity groups that belong to the intermediate classes exhibit higher mobility.

The share of primary products and the comparative advantage in this group decreased most significantly in Estonia. In Latvia the share of the product groups with a comparative advantage increased. The share of natural-resource intensive products decreased in all three countries, the share of commodity groups with comparative advantage also reduced. Multidirectional dynamics is observed in unskilled labour intensive products.

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While in Estonia this group has lost comparative advantage, the opposite trend is observed in Latvia and Lithuania. The share of technology-intensive goods rises in all countries. However only in Estonia and Lithuania the comparative advantage in this group increased significantly.

Keywords: Comparative advantage, specialisation, trade dynamics, Baltic States.

1. INTRODUCTION

Explaining the structure and development of trade flows is one of the most important tasks of economic analysis. The theory of comparative advantage is still the main theoretical framework used for this analysis. In the literature, there are two main aspects to this problem.

1. Analysing the structure of specialization. Determining which commodity groups have an actual or potential comparative advantage.
2. Analysing the dynamics of comparative advantage and the development of the structure of specialization over time.

In this paper we will focus mainly on the second aspect.

In the recent literature, a lot of theoretical and empirical works have been devoted to the problem of trade dynamics. The interest in this topic has been generated by globalization, deep structural changes, the development of emerging markets and some other problems.

Although the development of specialization pattern is a long-term process, determined by changes in the factor endowments, there are some exceptions, in which structural changes occurred quite quickly. The Baltic States belong to these exceptions.

Before its collapse, the Baltic countries were the part of the Soviet Union and their foreign trade for the greater part was focused on the USSR republics. After obtaining in dependence, over several years the Baltic countries dramatically reoriented their foreign trade towards the counties of the European Union. Further integration into and membership of the European Union, as well as a series of economic crises, made this reorientation even more profound. This was accompanied by deep structural changes in the economy of the Baltic countries, an inflow of foreign investment and institutional development. An analysis of the dynamics of specialization in these circumstances is of great scientific interest.

In line with the above, the aim of this paper is to analyse the trade dynamics in the Baltic States, in particular, the development of a revealed comparative advantage, and the persistence and mobility of trade flows.

For this purpose we used an export data time series from the UNSTAD database for the years 1995-2011. This data is available in the format of the Standard International Trade Classification (SITC) Revision 3 structure and includes 255 commodity sectors in 3 digit level of aggregation.

The rest of the paper is structured as follows. In the second chapter we discuss theoretical framework, in the third chapter measuring problems are considered, in the fourth section

empirical analysis with the appropriate methodology is presented, in the last section we conclude.

1.1 Theoretical Framework

In accordance with the standard Heckscher-Ohlinmodel, the structure of trade flows and the comparative advantages of a country are determined by its relative factor endowments. Accordingly, traditional trade theory predicts changes in the international specialization of the country only if its relative factor endowments change compared with the major trading partners. For example, Redding [1] analysed how the change in factor endowments influence the dynamics of production structure in seven OESD countries. He concluded that development of factor endowments are important determinants of specialisation dynamics but only in the long run.

The new tradetheory emphasizes the importance of the scale effect in explaining the structure of trade flows. The dynamics of specialization, in accordance with this theory, depends on the nature of economies of scale. In the case of internal economies of scale, as shown in the model of Chamberlin-Heckscher-Ohlin, the main implications of the factor proportions theorem do not change [2,3]. In the presence of national external economies of scale, as shown by [4], trade patterns are determined by initial comparative advantage. According to Either [5], if the external economy of scale is international by nature, the scale effect depends on the size of the world market and is expressed in efficiency gain from better international specialisation. In this case increasing return does not influence the trade patterns. Thus, external scale effect reinforces specialisation.

Important theoretical framework explaining trade dynamic is the ”new economic geography” approach [6,7,8] to analyse the relationship between transportation costs, relative factor prices, location and specialisation.

Recent literature in the analysis of trade dynamics has also been based on the theory of endogenous growth. In accordance with this approach, the structure of a country’s international specialization is determined by the endogenous growth of each sector of its economy. The literature highlighted a number of factors driving this growth.

First of all, there is learning by doing as a source of dynamic scale effect, an important factor in productivity growth, according to Lucas [9], Krugman [3], and Young [10]. If there is a difference between productivity growth by sector and in the absence of other factors, this development can result in the polarization of the structure of specialization. This difference can be determined by difference in R&D investments and knowledge accumulation between countries.

Another important factor is knowledge spill over. If it is international it can lead to a significant change in the structure of specialization over time because, productivity growth can occur in countries with initially low levels of productivity in the corresponding sectors. There are two channels of this spill over. The first channel is import and FDI [11,12]. The second is the labour mobility as a source of innovations [13,14].

Thus, in accordance with Proudman and Redding [15] sector specific learning by doing is a factor of the persistency of trade flows, whereas international knowledge spill over could be considered as a factor of the mobility of trade patterns. The interaction of these factors is ambiguous and is ultimately an empirical question.

Dynamic concept of comparative advantage is relevant in theoretical discussions on trade and industrial policy. Within the model of endogenous growth the relationship between international trade patterns and rate of economic growth have been analysed. Redding [16] analysed the relation between endogenous comparative advantage, economic growth and welfare. Based on general equilibrium model of endogenous growth and international trade between two large economies developed by Krugman [3] and Lucas [9] he conducted a welfare analysis of the effect of international trade and trade and industrial policy. He derived necessary and sufficient conditions for welfare to decreases under free trade and existing specialization. Further he showed that selective trade and industrial policy can improve welfare by changing specialisation patterns.

1.2 Measuring the Comparative Advantage

Basing on the Ricardian model we can theoretically determine comparative advantage by comparing the autarkic price with the price after trade liberalization for particular goods [17]. However, in real economies, the autarkic price is an unobservable variable. This unobservability is the main reason for the development in the empirical literature of the approach of revealed comparative advantage. This approach compares the national share of the production or export of particular goods with the world share (or with the share in a particular group of countries).

The most popular and widely used in the empirical literature is the Balassa index of revealed comparative advantage (RCA), proposed by Balassa [18]. It is calculated as follows.

$$RCA_i = \frac{X_{ij} \Big/ \sum_i X_{ij}}{X_i^W \Big/ \sum_i M_i^W} \tag{1}$$

Where

X_{ij} is an exports of commodity i in country j

X_i^W is a world export (or export in the reference group of countries) of commodity i

A positive aspect of the Balassa index is that it has a direct and clear economic interpretation. It allows us to analyse the comparative advantage between different product groups in the same country as well as to compare the level of comparative advantage by product groups across countries.

The main problem of the Balassa index is its asymmetry. By definition, the index ranges from zero (lower limit) to infinity (upper bound). The comparative disadvantage zone is defined in the range 0 to 1. The area of comparative advantage is, accordingly, 1 to infinity. As a result, the distribution of the index is skewed towards the right and the average is systematically higher than the median.

The uneven distribution of the index will also influence the outcome in its logarithmic transformation. Small changes in cases of comparative disadvantage will have the same effect as cases of significant change in sectors with comparative advantage.

These problems pose serious limitations in the use of this index in econometric analysis. To overcome these problems, Dalum et al. [19] proposed a revealed symmetric comparative advantage index (RSCA) which is a transformation in the RCA index and is calculated by the following formula

$$RSCA_i = \frac{RCA_i - 1}{RCA_i + 1} \tag{2}$$

This index ranges from -1 to 1 and eliminates the biased distribution and overestimation of sectors with a comparative advantage in the overall dynamics. Despite the preference for this index in econometric studies, it does not imply normality in the error terms in all cases and may hide some of the RCA index dynamics [17].

Although the literature offers many alternative indices of comparative advantage (see for example Laursen [20] and Bojnec [21], in this study we focus on the above two indexes.

2. EMPIRICAL ANALYSIS

2.1 Descriptive Statistics of RCA Index Distribution

We begin our analysis of trade dynamics with the descriptive statistics, from which we can extract a lot of information about the distribution of comparative advantage and its mobility. Tables 1-3 displays the basic parameters of the descriptive statistics for RCA index used in the analysis. Data are presented on the five-year average time intervals (long-term dynamics) and on the initial and last years of the sample. The share of sectors with comparative advantages was also added to the table (RCA more than 1).

As can be seen, the distribution of comparative advantage differs in the Baltic States. While in Estonia and, especially, in Latvia a substantial part of comparative advantage is concentrated in sectors with a high value of the RCA index as indicated by the maximum value and the value of the coefficient of excess, in Lithuania, the comparative advantage is more evenly distributed, as the maximum level of the RCA index is much smaller and less sectors are concentrated in this area, that is also shown by the coefficient of kurtosis. For all the countries under consideration, a decrease in the maximum values of the comparative advantage is observed.

The next general trend is a steady excess of the average over the median, indicating that the distribution of comparative advantage is biased towards the right. As a result of this distribution, the sectors characterized by high values of the RCA index will be over-weighed in terms of the effect on the overall sign of the comparative advantage dynamic. So the evolution of the country's comparative advantage depends mainly on the evolution of its competitive sectors [17]. In all cases, the average is steadily above the unit and the *median* below the unit. This gap is particularly large for Latvia, which also confirms the concentration of comparative advantage in a relatively small number of sectors with a high level of the RCA index. Over time, in all countries the value of the *average* decreases as the value of the *median* increases, indicating a more equal distribution of comparative advantage by sector.

Table 1. Descriptive statistics of RCA index distribution, Estonia

	95-99	00-04	05-09	10-11	1995	2011
Mean	1,68	1,79	1,60	1,56	1,73	1,50
Standard Error	0,27	0,36	0,26	0,24	0,28	0,23
Median	0,46	0,41	0,53	0,53	0,41	0,49
Mode	0,00	0,00	0,00	0,00	0,00	0,00
Standard Deviation	4,32	5,73	4,20	3,77	4,41	3,70
Sample Variance	18,70	32,88	17,64	14,22	19,47	13,66
Kurtosis	72,10	81,65	50,56	33,59	73,06	34,48
Skewness	7,41	8,05	6,54	5,52	7,38	5,57
Range	50,59	69,44	42,49	28,93	52,29	28,80
Minimum	0,00	0,00	0,00	0,00	0,00	0,00
Maximum	50,59	69,44	42,49	28,93	52,29	28,80
Sum	427,80	455,29	408,62	397,09	440,23	381,72
Count	255,00	255,00	255,00	255,00	255,00	255,00
RCA>1,%	27,06	29,80	32,94	33,73	30,60	31,80

Table 2. Descriptive statistics of RCA index distribution, Latvia

	95-99	00-04	05-09	10-11	1995	2011
Mean	2,54	2,23	2,30	2,27	2,11	2,07
Standard Error	1,04	0,55	0,55	0,52	0,62	0,44
Median	0,29	0,31	0,60	0,59	0,27	0,58
Mode	0,00	0,00	0,00	0,00	0,00	0,00
Standard Deviation	16,55	8,82	8,78	8,31	9,91	7,10
Sample Variance	273,90	77,80	77,08	69,00	98,24	50,40
Kurtosis	223,12	56,70	73,73	73,28	153,30	58,26
Skewness	14,54	7,19	8,15	8,03	11,55	7,30
Range	257,20	89,41	96,93	93,26	140,43	69,63
Minimum	0,00	0,00	0,00	0,00	0,00	0,00
Maximum	257,20	89,41	96,93	93,26	140,43	69,63
Sum	647,15	569,09	586,54	579,64	537,98	528,97
Count	255	255	255	255	255	255
RCA>1,%	27,1	27,1	34,1	33,3	27,10	32,50

The steady decrease in the standard deviation and the mean also indicates a decline in the level of specialization. However, if in Lithuania and Estonia the average value of the RCA index decreased by 17 and 13%, respectively, in Latvia it was down by less than 2% and remained at a level of more than 2,which in dicatesa stable polarization of the specialization structure.

Another indicator of comparative advantage diversification is the increase in the median and the share of sectors with the RCA index greater than 1. The largest number of sectors with a comparative advantage in 2011 was in Lithuania – with more than 63% (growth compared to 9.7% in 1995).

Table 3. Descriptive statistics of RCA index distribution, Lithuania

	95-99	00-04	05-09	10-11	1995	2011
Mean	1,50	1,42	1,44	1,36	1,62	1,35
Standard Error	0,19	0,20	0,16	0,13	0,21	0,13
Median	0,50	0,45	0,57	0,60	0,48	0,59
Mode	0,00	0,00	0,00	0,00	0,00	0,00
Standard Deviation	3,03	3,15	2,48	2,09	3,28	2,15
Sample Variance	9,21	9,92	6,17	4,36	10,76	4,64
Kurtosis	26,51	38,75	22,70	7,55	15,88	10,66
Skewness	4,65	5,57	4,11	2,72	3,77	3,08
Range	25,62	27,88	21,02	11,04	22,94	13,94
Minimum	0,00	0,00	0,00	0,00	0,00	0,00
Maximum	25,62	27,88	21,02	11,04	22,94	13,94
Sum	383,07	361,99	367,36	347,44	413,82	343,26
Count	255,00	255,00	255,00	255,00	255,00	255,00
RCA>1,%	32,9	30,2	36,9	36,5	32,9	36,1

In Estonia, this share was 31.8% (an increase of3.9%) and in Latvia 32.5% (an increase of 20%). These data allow us to adjust the previous conclusion about Latvia and talk about some diversification of specialization, although the level of polarization in this country remains the highest among the Baltic States.

2.3 Galtonian Regression

Another way to analyse the shape of the distribution of comparative advantage is the Galtonian regression model. This approach was used in the analysis of specialization distribution by Cantwell [22], Dalum et al. [19], Laursen [20], Ferto [23] etc. For reasons described in section 3, in this analysis we used the RCSA index.

The main idea in this approach is to estimate the linear model where the independent variable is a time-lagged value of a dependent variable. This allows us to estimate the level of mobility or convergence of the specialization structure over time:

$$RSCA_j^{t2}=\alpha_j+ \beta_j RSCA_j^{t1}+\varepsilon_j \quad (3)$$

where:

t1 and t2 are the first and last years of the analysis respectively
αand β are the linear regression coefficients
ε is the residual term
j is the number of sectors

The value of β indicates the dynamics of comparative advantage:

A value of β of more than one indicates an increase in specialization, which means that the country is specializing deeper in sectors in which it was initially specialized and decreasing its specialization in sectors with a low initial specialization.

If β is in the range from zero to one, its specialization pattern has weakened. A value of β equal to one means there is a stable pattern of comparative advantage. A special case is when β is less than zero, which points to a change in the sign of the RCSA index.

Several authors have pointed out that β >1 is not a necessary condition for the strengthening of specialization [19], [22]. They show that:

$$\sigma^{2t2}/\sigma^{2t1}=\beta^2/R^2 \quad (4)$$

where:

σ^2 is variance of the dependent variable
R^2 is coefficient of determination
this can be reduced to
$\sigma^{t2}/\sigma^{t1}=|\beta|/|R|$
If β>R specialization increases (which is indicated by increased dispersion over time), in the opposite case, β<R, specialization decreased. In the case of β=R a stable specialization pattern should be observed.

In the Table 4 the results of the Galtonian regression are submitted.

Table 4. Galtonian regression of the RSCA index for 1995-2011 years

	Estonia	Latvia	Lithuania
α	-0.09	-0.05	-0.08
β	0.64	0.5	0.53
t-value	12.02***	10.23***	10.94***
Adj. R^2	0.6	0.3	0.32
F-statistics	144***	105***	119***
β/R	0.83	0.92	0.95

As can be seen, all the results are statistically significant and, in general, confirm the previous analysis. The common tendency is for the diversification of the specialization structure. The most mobile structure of comparative advantage in the period under consideration, according to the β/R relation, was in Estonia.

2.4 Gini coefficients of RCA Index Distribution

An important approach to the analysis of specialization mobility is calculating the Gini coefficient of the RCA index distribution. In this analysis, the Gini coefficient is used as a summary measure of the difference in the structure of specialization between the country being considered and the world or reference group of countries [23]. The smaller the value of the index (closer to zero, the lower limit) the smaller is the difference in the level of specialization of the country compared to the global average. The closer the coefficient is to one (the upper limit) the greater the differences in the structure of the specialization. The dynamics of specialization can be seen from the analysis of the time series of Gini coefficients.

Table 5 shows the calculated Gini coefficients for the Baltic countries for the period considered. As can be seen, in the beginning of the period Latvia was the most specialized and Estonia was the least. By the last year under consideration the picture has changed. Latvia had become the least specialized; the specialization in Estonia, according to the Gini coefficient, was the highest. To analyse the mobility of the structure of specialization were gress the Gini coefficient on the time trend. As can be seen, in general, there is a slight trend

towards greater specialization. The Latvian specialization structure is the most mobile with the highest statistical significance. It is followed by Lithuania. The mobility of the specialization structure in Estonia is the smallest.

Table 5. Gini coefficients of RCA index distribution

	Estonia	Latvia	Lithuania
1995	0,749	0,786	0,764
1996	0,742	0,777	0,744
1997	0,751	0,780	0,742
1998	0,748	0,786	0,754
1999	0,749	0,794	0,760
2000	0,759	0,786	0,759
2001	0,757	0,777	0,754
2002	0,749	0,783	0,768
2003	0,760	0,782	0,757
2004	0,761	0,790	0,745
2005	0,739	0,777	0,752
2006	0,740	0,761	0,753
2007	0,743	0,756	0,756
2008	0,750	0,742	0,735
2009	0,736	0,746	0,743
2010	0,745	0,737	0,729
2011	0,749	0,738	0,743
betta	-0,0004	-0,003	-0,001
t	-1,050	-5,080	-2,300
R square	0,070	0,690	0,260

2.5 Intra-Distribution Dynamics of Trade Patterns

To analyse the dynamics of specialization for a particular product group, we consider the Marcov transition probability matrix.[1] This approach was applied to specialization analysis by Quah [24], [25]. We analyse the distribution of the RCA index by commodity group over time. The value of the RCA index is divided into four classes:

A: from 0 to 0.5 –strong comparative disadvantage.
B: from 0,5 to 1 – weak comparative disadvantage.
C: from 1 to 2 - weak comparative advantage.
D: from 2 to ∞ - strong comparative advantage.

Then we constructed a stochastic matrix counting the number of transitions into and out of each class. The Markov chain shows the probability of the transition of a commodity group from one class to another in a considered period. We also calculated the limit of the distribution which can be interpreted as an evolution of inter- sectoral RCA index distribution in an unlimited time-interval.

Tables 6-8 present the Markov transition probability matrixes for the Baltic States.

[1] *All calculations were made in MATLAB. See for example Feres, [26].*

Table 6. Markov Transition matrix of RCA. Estonia, 1995-2011

	a	b	c	d
a	0,908	0,075	0,015	0,003
b	0,227	0,628	0,134	0,012
c	0,035	0,177	0,660	0,128
d	0,016	0,016	0,103	0,864
Limit distribution	0,520	0,179	0,142	0,160

Table 7. Markov Transition matrix of RCA. Latvia, 1995-2011

	a	b	c	d
a	0,916	0,067	0,015	0,002
b	0,227	0,566	0,180	0,027
c	0,049	0,176	0,641	0,135
d	0,007	0,013	0,120	0,860
Limit distribution	0,507	0,148	0,158	0,187

Table 8. Markov Transition matrix of RCA. Lithuania, 1995-2011

	a	b	c	d
a	0,914	0,074	0,010	0,002
b	0,203	0,631	0,153	0,013
c	0,026	0,170	0,657	0,147
d	0,011	0,011	0,119	0,859
Limit distribution	0,483	0,175	0,156	0,186

According to the limit distribution of comparative advantage, the Estonian specialization structure is potentially the most polarized and the Latvian the least.

The main diagonal of the matrix gives information about the persistency of trade patterns. It is quite high for the sectors with strong comparative advantage and also with strong comparative disadvantage. It indicates the high probability of the considered sectors remaining in the same class. The highest probability of remaining in the class of strong comparative advantage is in Estonia. The highest persistence of commodity groups with strong comparative disadvantage is in Latvia.

Commodity groups which belong to the intermediate classes show a higher mobility. The highest is the probability of passing from class B to class A (20 to 23%). Also, there is a high probability of transitioning from a weak comparative advantage product group into the category of weak comparative disadvantage. It is particularly high in Latvia, which is additional evidence of the more polarized structure of comparative advantage in this country.

2.6 Factor Endowments

We analyse here the structural changes in the export specialization structure based on factor endowments. We use here the UNSTAD classification system which divides SITS rev. 3 codes into five factor intensity groups

1 group- Primary products
2 group – Natural resource-intensive products
3 group –Unskilled labour-intensive products
4 group – Technology-intensive products
5 group - Human capital-intensive products

Annexes 1-3 reports the development of the export share of the groups considered above, RCA indexes aggregated according to the same classification and the share of sectors with comparative advantage according to the factor endowments for the Baltic States. All these data are closely related, so we analyse this dynamic by country.

2.6.1 Estonia

The share of primary products in total exports decreased by a quarter in the considered period which corresponds to the RCA index dynamic of a movement from a rather significant comparative advantage in 1995 to a comparative disadvantage in 2011. The share of sectors with comparative advantage did not change significantly.

The share of natural resource-intensive products decreased the most – by almost double. The index of comparative advantage did not decrease much and that says more about the impact of general structural changes than about the reduction in international competitiveness. This is also confirmed by small decrease in the share of sectors with comparative advantage.

The share of goods based on unskilled labour is quite small and did not change significantly. The index of comparative advantage fluctuated around unity; the share of sectors with comparative advantage also did not change significantly. This is due to the fact that during the considered period wages reached such a level as to destroy the international competitiveness of this type of product.

The share of technology-intensive products increased significantly (by 60%, if comparing the last year with the first). In recent years, these products have attained some comparative advantage that, given the share of these goods in exports (21-25%), is a major structural shift in the Estonian economy.

The share of high-tech goods fluctuated arounda level of 20%. The share of sectors with comparative advantage also varied from14 to 20% without a clear trend.

2.6.2 Lativa

The share of primary products fell by not very much (10%); the aggregated RCA index for this group also decreased slightly, but the share of sectors with a comparative advantage grew steadily. This may be due to the expansion of the nomenclature of exports in this group.

As in Estonia, the share of natural resource-intensive products decreased the most (40%), but the B index for this product group did not significantly decrease, nor did the share of sectors with comparative advantage. A reduction in this share only occurred during the last 3 years.

The upward trend in the share of unskilled labour-intensive products (about 25%) is quite interesting. At the same time, a steady increase in the RCA index for this group as both the proportion of sectors with comparative advantage was observed.
The share of technology-intensive goods also increased, but the dynamics of the RCA index and the share of sectors with a comparative advantage did not show a stable trend. It can be concluded that this trend is due to general structural changes, in particular, a decrease in natural resource-intensive products.

The share of high-tech products grew the most, which is, first of all, due to its initial low level (9% in1995). In the absence of a comparative advantage, in this group almost a two fold increase in the RCA index can be noted. The share of commodity groups with a comparative advantage ranged from 12 to 16%.

2.6.3 Lithuania

The share of primary products did not change significantly and, even in recent years, slightly increased. The RCA index and the share of goods with a comparative advantage follow the same trend.

The share of natural resource-intensive products decreased by more than half, which was accompanied by a decrease in the share of goods with a comparative advantage by about a third. The RCA index for this group did not change significantly.

The share of unskilled labour-intensive products and the RCA index did not change significantly, but the proportion of goods with a comparative advantage grew by a third.

The share of technology-intensive goods grew by about 20% with a slight increase in the RCA index. The share of goods with a comparative advantage more than doubled - an important structural shift.

The share of human capital-intensive products is decreased by approximately 10%, with a similar dynamic in the RCA index. However, the share of goods with a comparative advantage even rose slightly.

3. CONCLUSIONS

Despite some discrepancies in the ranking of the Baltic States in depth and mobility of specialization using different statistical methodologies, the main results obtained are consistent. Based on these results the following general conclusions can be formulated:

* Diversification is the general trend in the development of the structure of comparative advantage of the Baltic states in the period considered.
* The most polarized structure of specialization in the period under consideration was in Latvia, the most diversified in Estonia.
* However, the degree of mobility in general, and at different time intervals, varies significantly between countries. The most mobile structure of specialization was in Latvia. It evolved from the most polarized structure in the early period to the most diversified in the end. Particularly strong diversification occurred in the last four years. Substantial diversification of comparative advantage occurred also in Lithuania. In Estonia, the mobility of the structure of specialization was the lowest. If, at the beginning of the period, the concentration of comparative advantage was the

smallest, then, in the last years Estonia had the most polarized structure of specialization, according to the Gini coefficient.

* According to the limit distribution of comparative advantage of the Marcovian matrix, the Estonian specialization structure is potentially the most polarized and the Latvian the least.
* For all the Baltic States, the persistency of trade patterns is quite high for the sectors with strong comparative advantage and also with strong comparative disadvantage. It indicates the high probability of the considered sectors remaining in the same class. The highest probability of remaining in the class with a strong comparative advantage is in Estonia. The highest persistency of commodity groups with a strong comparative disadvantage is in Latvia.
* Commodity groups which belong to the intermediate classes show a higher mobility. The highest is the probability of passing from class B to class A. Also, there is a high probability of transitioning from the weak comparative advantage product group into the category of weak comparative disadvantage.
* Comparing the structural changes in the Baltic countries on the basis of factor endowments the following conclusions can be drawn:

    - The share of primary products and the comparative advantage within this group fell the most in Estonia. In Latvia, the share of product groups with a comparative advantage increased.
    - The share of natural resource-intensive products decreased in all three Baltic countries, the share of commodity groups with comparative advantage was also reduced.
    - Multidirectional dynamics is observed in unskilled labour-intensive products. While in Estonia, this group lost the comparative advantage, in Latvia and Lithuania, we see the opposite trend. The main factor behind this is probably the level of wages.
    - The share of technology-intensive goods rose in all countries. However, only Estonia and Lithuania significantly increased their comparative advantage in this group.
    - The Baltic countries still do not possess a comparative advantage in high-tech goods. However, the share of goods with a RCA index of more than 1has expanded, which is an important trend.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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ANNEX I SPECIALISATION DYNAMIC BASED ON FACTOR ENDOWMENTS

Table I-1 Share in total export, Estonia

	1 group	2 group	3 group	4 group	5 group
1995	0,397	0,252	0,057	0,129	0,151
1996	0,382	0,271	0,056	0,120	0,159
1997	0,394	0,232	0,053	0,139	0,169
1998	0,360	0,243	0,066	0,122	0,195
1999	0,380	0,249	0,058	0,117	0,183
2000	0,354	0,193	0,041	0,102	0,302
2001	0,322	0,232	0,051	0,134	0,250
2002	0,342	0,249	0,061	0,151	0,184
2003	0,292	0,248	0,070	0,170	0,207
2004	0,298	0,209	0,086	0,167	0,201
2005	0,300	0,171	0,070	0,178	0,226
2006	0,359	0,156	0,066	0,184	0,185
2007	0,318	0,173	0,081	0,241	0,124
2008	0,302	0,166	0,086	0,251	0,131
2009	0,334	0,161	0,068	0,239	0,127
2010	0,314	0,147	0,074	0,223	0,179
2011	0,301	0,131	0,060	0,211	0,235

Table I-2 Share in total export, Latvia

	1 group	2 group	3 group	4 group	5 group
1995	0,401	0,269	0,088	0,126	0,091
1996	0,377	0,315	0,077	0,108	0,089
1997	0,412	0,304	0,072	0,097	0,088
1998	0,415	0,317	0,077	0,080	0,081
1999	0,436	0,319	0,084	0,058	0,080
2000	0,442	0,304	0,085	0,066	0,083
2001	0,411	0,318	0,086	0,073	0,084
2002	0,423	0,310	0,088	0,078	0,078
2003	0,412	0,304	0,101	0,082	0,087
2004	0,379	0,273	0,139	0,088	0,089
2005	0,408	0,226	0,116	0,108	0,092
2006	0,369	0,215	0,125	0,131	0,111
2007	0,360	0,195	0,129	0,144	0,124
2008	0,338	0,174	0,142	0,149	0,146
2009	0,360	0,165	0,113	0,148	0,158
2010	0,390	0,158	0,113	0,135	0,152
2011	0,378	0,145	0,109	0,133	0,144

Table I-3 Share in total export, Lithuania

	1 group	2 group	3 group	4 group	5 group
1995	0,423	0,213	0,054	0,105	0,200
1996	0,398	0,232	0,036	0,134	0,193
1997	0,396	0,240	0,037	0,146	0,172
1998	0,385	0,263	0,038	0,144	0,161
1999	0,345	0,318	0,044	0,112	0,170
2000	0,397	0,273	0,047	0,110	0,164
2001	0,416	0,247	0,043	0,145	0,141
2002	0,356	0,235	0,112	0,153	0,133
2003	0,369	0,227	0,102	0,151	0,142
2004	0,421	0,208	0,064	0,147	0,150
2005	0,438	0,177	0,062	0,151	0,156
2006	0,417	0,174	0,061	0,179	0,152
2007	0,350	0,175	0,064	0,198	0,192
2008	0,439	0,134	0,056	0,157	0,194
2009	0,433	0,156	0,055	0,150	0,178
2010	0,445	0,148	0,055	0,154	0,172
2011	0,454	0,137	0,046	0,161	0,175

Table I-4 RCA index, Estonia

	1 group	2 group	3 group	4 group	5 group
1995	1,78	1,77	0,86	0,52	0,59
1996	1,66	1,92	0,89	0,48	0,62
1997	1,78	1,65	0,85	0,56	0,63
1998	1,83	1,73	1,02	0,46	0,70
1999	1,89	1,80	0,98	0,45	0,63
2000	1,62	1,49	0,73	0,42	1,04
2001	1,48	1,78	0,90	0,54	0,87
2002	1,60	1,89	1,05	0,60	0,64
2003	1,34	1,94	1,16	0,68	0,73
2004	1,30	1,75	1,30	0,68	0,71
2005	1,17	1,52	1,06	0,75	0,81
2006	1,35	1,48	0,98	0,79	0,67
2007	1,17	1,68	1,13	1,03	0,47
2008	1,00	1,73	1,15	1,13	0,54
2009	1,21	1,55	1,03	1,12	0,47
2010	1,08	1,48	1,12	1,04	0,68
2011	0,96	1,33	0,90	0,99	0,95

Table I-5 RCA index, Latvia

	1 group	2 group	3 group	4 group	5 group
1995	1,80	1,89	1,33	0,51	0,35
1996	1,64	2,24	1,22	0,43	0,35
1997	1,86	2,16	1,15	0,38	0,33
1998	2,11	2,26	1,19	0,31	0,29
1999	2,17	2,31	1,41	0,23	0,28
2000	2,02	2,34	1,51	0,27	0,28
2001	1,89	2,43	1,51	0,29	0,29
2002	1,98	2,35	1,51	0,31	0,27
2003	1,88	2,39	1,67	0,33	0,31
2004	1,66	2,29	2,11	0,36	0,31
2005	1,60	2,01	1,76	0,46	0,33
2006	1,39	2,03	1,86	0,57	0,41
2007	1,33	1,88	1,80	0,61	0,47
2008	1,12	1,81	1,89	0,67	0,60
2009	1,31	1,58	1,72	0,69	0,59
2010	1,35	1,59	1,71	0,63	0,57
2011	1,20	1,48	1,63	0,63	0,58

Table I-6 RCA index, Lithuania

	1 group	2 group	3 group	4 group	5 group
1995	1,90	1,50	0,81	0,42	0,78
1996	1,73	1,65	0,56	0,53	0,75
1997	1,78	1,71	0,59	0,58	0,64
1998	1,95	1,87	0,59	0,55	0,58
1999	1,72	2,30	0,74	0,43	0,59
2000	1,82	2,11	0,83	0,45	0,57
2001	1,91	1,89	0,76	0,58	0,49
2002	1,67	1,78	1,91	0,61	0,46
2003	1,69	1,78	1,68	0,60	0,50
2004	1,84	1,75	0,97	0,60	0,53
2005	1,71	1,57	0,94	0,64	0,56
2006	1,57	1,64	0,90	0,77	0,56
2007	1,29	1,69	0,90	0,84	0,73
2008	1,45	1,39	0,75	0,70	0,79
2009	1,57	1,50	0,84	0,70	0,66
2010	1,54	1,49	0,83	0,72	0,65
2011	1,45	1,40	0,68	0,76	0,71

Table I-7 Share of sectors with RCA>1, Estonia

	1 group	2 group	3 group	4 group	5 group
1995	37,5	57,1	27,3	16,3	16,0
1996	32,3	54,3	22,7	14,0	14,0
1997	36,5	48,6	18,2	9,3	20,0
1998	37,5	48,6	31,8	9,3	16,0
1999	33,3	48,6	36,4	9,3	16,0
2000	32,3	48,6	22,7	11,6	12,0
2001	34,4	57,1	22,7	18,6	14,0
2002	35,4	57,1	27,3	18,6	16,0
2003	36,5	60,0	22,7	18,6	16,0
2004	34,4	51,4	22,7	20,9	12,0
2005	37,5	48,6	22,7	25,6	16,0
2006	40,6	45,7	22,7	23,3	16,0
2007	37,5	51,4	22,7	27,9	16,0
2008	41,7	48,6	22,7	37,2	18,0
2009	36,5	40,0	27,3	32,6	16,0
2010	39,6	45,7	27,3	37,2	14,0
2011	37,5	34,3	22,7	37,2	20,0

Table I-8 Share of sectors with RCA>1, Latvia

	1 group	2 group	3 group	4 group	5 group
1995	32,3	54,3	27,3	16,3	12,0
1996	30,2	54,3	31,8	18,6	16,0
1997	31,3	51,4	27,3	9,3	12,0
1998	30,2	57,1	27,3	14,0	10,0
1999	29,2	60,0	27,3	11,6	10,0
2000	29,2	51,4	27,3	16,3	10,0
2001	32,3	48,6	31,8	16,3	14,0
2002	31,3	51,4	31,8	14,0	12,0
2003	31,3	51,4	45,5	16,3	12,0
2004	37,5	57,1	50,0	18,6	12,0
2005	39,6	60,0	54,5	16,3	16,0
2006	39,6	60,0	50,0	16,3	16,0
2007	38,5	54,3	50,0	23,3	12,0
2008	41,7	57,1	50,0	20,9	14,0
2009	43,8	42,9	50,0	27,9	14,0
2010	45,8	45,7	50,0	23,3	12,0
2011	42,7	42,9	54,5	14,0	14,0

Table I-9 Share of sectors with RCA>1, Lithuania

	1 group	2 group	3 group	4 group	5 group
1995	42,7	65,7	27,3	11,6	18,0
1996	38,5	62,9	18,2	16,3	22,0
1997	41,7	62,9	22,7	9,3	20,0
1998	40,6	62,9	22,7	9,3	18,0
1999	39,6	65,7	18,2	9,3	18,0
2000	39,6	65,7	13,6	11,6	18,0
2001	36,5	62,9	18,2	14,0	10,0
2002	35,4	54,3	27,3	14,0	8,0
2003	39,6	45,7	31,8	9,3	12,0
2004	39,6	51,4	31,8	11,6	10,0
2005	41,7	51,4	40,9	16,3	16,0
2006	44,8	51,4	40,9	27,9	20,0
2007	49,0	54,3	36,4	32,6	24,0
2008	46,9	48,6	31,8	23,3	20,0
2009	46,9	48,6	31,8	23,3	20,0
2010	46,9	45,7	36,4	27,9	22,0
2011	43,8	45,7	36,4	30,2	24,0

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