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## Conference Paper

# Industrial and intellectual capital clusters in the Baltic states

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# Industrial and Intellectual Capital Clusters in the Baltic States

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## Introduction

The Baltic states are often perceived as one homogeneous entity. All three states are small open economies, highly dependent on oil products and natural gas, with a similar geographical position and natural resources. But although having so much in common, they have achieved different results during the transition and may have different growth prospects over the long run. The reasons for this lie much deeper than is usually supposed. Looking closer the three states differ in religion and culture, history and political preferences, structure of industry and trade, and many other aspects that influence the behaviour and development of independent units.

In an attempt to understand this diversity we explore and describe the geographic concentration of production and human resources in the three Baltic States and attempt to identify its determinants. Casual evidence suggests that economic activity is less concentrated in Lithuania than in either Latvia or Estonia. The paper seeks to establish more formally whether there are indeed significant differences between the three Baltic states with respect to the spatial dispersion of economic activity in the three Baltic states and in the emergence of clusters. To this end we have compiled a variety of descriptive statistics some of which are reported as summary statistics and others that we have displayed on maps of the three Baltic countries. These are reported and analysed in Part 1. Unfortunately, for the moment the summary statistics are most comprehensive for Latvia so there remains some work to be done on the other two countries

In addition to the descriptive statistic we have created a number of maps that offer a snapshot of statistics available for the year 1999. There are 22 maps altogether, and which are analyzed in Part 2 below, (see Appendix 2 for list of the maps). The maps are very revealing of the differences that appear to follow from the presence of national boundaries. The casual impression that economic activity in Lithuania is distinctly dispersed as compared with Latvia, in particular, is rather vividly demonstrated.

## Part 1: Summary Statistics of Location

### The location of activity

The question we discuss in this Section is: *“How can we describe the geographical structure of production across the regions of the three Baltic States?”*. In theory, following Overman *et al.* (2001), one can look at this problem from the two different, but correlated / interconnected, angles:

**From economic activity (industry) side:** how localised / concentrated is a particular economic activity;

**From location (region) side:** how specialised is a particular geographical unit.

We try to address these questions here by using Latvian and Estonian regional data on gross value added by kind of activity, at current prices of 1996-1998. Unfortunately, the only data available to us is a division of gross value added by kind of activity for 5 bigger regions of Latvia (Riga region, Kurzeme, Vidzeme, Zemgale and Latgale) and 5 aggregated regions of Estonia (Northern, Central, Northeastern,

Western and Southern Estonia). It would be extremely useful to compare the calculations for the regions of Lithuania, but we do not have the necessary data.

We also perform economic base analysis that looks at the distribution of production in the regions of Latvia and Estonia and compares it against national average and with each other. We further examine the changes in the regional production structure over 1996-1998.

The usual measures of activity are employment and production. We use here gross value added as a proxy for production.

*Summary statistics of localization and specialisation*

Based on Overman *et al.* (2001), in the Table 1 below we present coefficients of localisation and specialisation for Latvian regions in 1998.

**Table 1**

<b>i</b>	<b>LOCALISATION</b>					<b>SPECIALISATION</b>				
	<b>localisation of ind k = the share of location i in the total prod. of ind. k</b>					<b>specialisation of loc i = the share of ind. k in the region's total prod. of all industries</b>				
	<b><math>l(k,i) = y(k,i) / \sum(i) [y(k,i)]</math></b>					<b><math>s(k,i) = y(k,i) / \sum(k) [y(k,i)]</math></b>				
	<b>R</b>	<b>V</b>	<b>K</b>	<b>Z</b>	<b>L</b>	<b>R</b>	<b>V</b>	<b>K</b>	<b>Z</b>	<b>L</b>
<b>k</b>										
<b>A</b>	0.176	0.203	0.143	0.358	0.120	0.012	0.096	0.043	0.169	0.058
<b>B</b>	0.124	0.045	0.754	0.059	0.018	0.001	0.001	0.015	0.002	0.001
<b>C</b>	0.304	0.138	0.104	0.356	0.098	0.001	0.003	0.001	0.007	0.002
<b>D</b>	0.638	0.102	0.111	0.082	0.067	0.188	0.214	0.146	0.171	0.142
<b>E</b>	0.505	0.127	0.115	0.125	0.128	0.044	0.079	0.045	0.077	0.081
<b>F</b>	0.621	0.056	0.229	0.050	0.044	0.070	0.045	0.115	0.040	0.036
<b>G</b>	0.706	0.070	0.082	0.073	0.068	0.196	0.139	0.101	0.144	0.136
<b>H</b>	0.837	0.023	0.058	0.023	0.059	0.017	0.003	0.005	0.003	0.009
<b>I</b>	0.532	0.052	0.258	0.054	0.104	0.146	0.101	0.316	0.105	0.204
<b>J</b>	0.699	0.071	0.106	0.044	0.080	0.041	0.030	0.028	0.018	0.034
<b>K</b>	0.858	0.033	0.042	0.031	0.035	0.109	0.030	0.024	0.028	0.032
<b>L</b>	0.571	0.090	0.118	0.089	0.117	0.061	0.068	0.056	0.067	0.090
<b>M</b>	0.442	0.158	0.117	0.140	0.143	0.040	0.102	0.047	0.089	0.093
<b>N</b>	0.561	0.116	0.104	0.103	0.117	0.033	0.048	0.027	0.043	0.049
<b>O</b>	0.644	0.090	0.108	0.079	0.079	0.041	0.041	0.031	0.036	0.036

A – Agriculture, hunting and forestry; B – Fishing; C – Mining and quarrying; D – Manufacturing; E – Electricity, gas and water supply; F – Construction; G – Wholesale and retail trade; etc.; H – Hotels and restaurants; I – Transport, storage and communication; J – Financial intermediation; K – Real estate, renting and other business activities; L – Public administration and defence; M – Education; N – Health and social work ; O – Other activities

*Source: Latvian Statistical Bureau, authors' calculations*

If we look at the localisation of industries in Latvia in 1998 (Table 1 above) we see that agriculture (A) and mining and quarrying (C) are more localised in Zemgale, than in other Latvian regions ( $l_i^k = 0.36$ ; 0.36 respectively), fishing (B) is undoubtedly localised in Kurzeme ( $l_i^k = 0.75$ ), which is easily explained by the easy access to the sea (longest coastal line). All the other activities from D to O are localised in Riga region (coefficients are ranging from 0.44 (M, education) to 0.86 (K, real estate) and could be said to be clustered

On the other hand, looking at the specialization of the 5 region of Latvia, we see the following pattern (every region is specialised to certain activities – D, G and I):

Riga region is specialised in manufacturing (D;  $s_i^k = 0.17$ ), wholesale and retail trade (G; 0.20), transport (I; 0.15), and real estate (K; 0.10). Vidzeme has higher indexes for manufacturing (D; 0.21), wholesale and retail trade (G; 0.14), transport and communication (I; 0.10), and education (M; 0.10). In Kurzeme

manufacturing (D; 0.15), wholesale and retail trade (G; 0.10), and transport (I; 0.32) are important too, as well as construction (F; 0.12). Highest shares of industries in the total production of Zemgale region are agriculture (A; 0.17), manufacturing (D; 0.17), wholesale and retail trade (G; 0.14), and transport and communication (I; 0.11). Last but not the least, Latgale is specialised in manufacturing (D; 0.14), wholesale and retail trade (G; 0.14), and transport and communication (I; 0.20).

The Herfindahl index of absolute specialization has also been calculated and turns to be the highest for Kurzeme ( $h_i = 0.157$ ), implying that this region is more specialised than the others of Latvia. Interestingly enough, this index turned to be the same for Vidzeme, Zemgale and Latgale (0.114). The value of this index for Riga region is in between (0.124).

**Table 2**

<b>SPECIALISATION</b>				
<b>Herfindahl index of absolute specialisation</b>				
<b><math>h(i) = \sum (k) [s(k, i)]^2</math></b>				
<b>R</b>	<b>V</b>	<b>K</b>	<b>Z</b>	<b>L</b>
0.124	0.114	0.157	0.114	0.114

*Source: Authors' calculations*

It is interesting to compare the indexes between the regions.

**Table 3**

<b>SPECIALISATION</b>				
<b>for bilateral comparison of the specialisation of two different loc.</b>				
<b>Krugman (1991) computes the abs.value of the difference in production shares</b>				
<b><math>K(i,j) = \sum (k)   [s(k,i) - s(k,j)]  </math></b>				
<b>R vs. V</b>	<b>V vs. K</b>	<b>K vs. Z</b>	<b>Z vs. L</b>	<b>L vs. R</b>
0.46	0.60	0.62	0.32	0.48

*Source: Authors' calculations*

#### *Economic base analysis*

A commonly used methodology for locational analysis is economic base analysis. The central idea of this method is that if the region that is being studied has a higher concentration of an economic activity

than the benchmark, this indicates an activity that exports its 'surplus', that is, produces goods and services in a volume that is higher than required to meet the consumption needs of the local population. Accordingly it is termed a *basic activity*. If the concentration is less than the benchmark, the activity is *non-basic* and the region can be considered an importer of that product or service, that is, the region produces less than it is required to meet the consumption need of the local population. If the concentration is similar to the benchmark, the activity is non-basic and the region is neither an exporter nor importer, but is more or less "self-sufficient" in the provision of that product or service. However, this interpretation assumes that demand is uniform throughout the benchmark area, which may not always be justified.

Basic activities are characterized by a location quotient (LQ) in excess of 1, where the location quotient shows the localisation of industry  $k$  in  $i$ , relative to the localisation of activity as a whole in  $i$ . Alternatively, it measures location  $i$ 's specialisation in industry  $k$  relative to its share of the total benchmark area activity.

Based on Latvian 1998 gross value added data (see Table 4 below), we calculate the LQ for Latvian regions and 2-digit industries..

**Table 4**

<b>LOCATION QUOTIENT</b>					
<b>a measure of localisation of industry k in i, relative to the localisation of activity as a whole in i</b>					
<b><math>LQ(k,i) = \frac{y(k,i) / \sum(i) [y(k,i)]}{\sum(k) [y(k,i)] / \sum(i) \sum(k) [y(k,i)]}</math></b>					
<b>i</b>	<b>R</b>	<b>V</b>	<b>K</b>	<b>Z</b>	<b>L</b>
<b>k</b>					
<b>A</b>	0.289	2.377	1.049	4.172	1.422
<b>B</b>	0.205	0.524	5.535	0.684	0.211
<b>C</b>	0.501	1.623	0.762	4.143	1.155
<b>D</b>	1.052	1.196	0.813	0.952	0.791
<b>E</b>	0.832	1.489	0.844	1.454	1.517
<b>F</b>	1.023	0.655	1.679	0.586	0.523
<b>G</b>	1.164	0.823	0.601	0.854	0.807
<b>H</b>	1.379	0.269	0.428	0.269	0.693
<b>I</b>	0.877	0.606	1.895	0.632	1.223
<b>J</b>	1.152	0.830	0.774	0.514	0.950
<b>K</b>	1.414	0.384	0.311	0.366	0.419
<b>L</b>	0.941	1.052	0.866	1.039	1.378
<b>M</b>	0.729	1.854	0.861	1.624	1.687
<b>N</b>	0.924	1.355	0.762	1.200	1.381
<b>O</b>	1.061	1.054	0.793	0.922	0.929

A – Agriculture, hunting and forestry; B – Fishing; C – Mining and quarrying; D – Manufacturing; E – Electricity, gas and water supply; F – Construction; G – Wholesale and retail trade; etc.; H – Hotels and restaurants; I – Transport, storage and communication; J – Financial intermediation; K – Real estate, renting and other business activities; L – Public administration and defence; M – Education; N – Health and social work; O – Other activities

Source: Latvian Statistical Bureau, authors' calculations

Table 5 ranks the coefficients in each region in descending order of LQ.

**Table 5**

<b>R</b>		<b>V</b>		<b>K</b>		<b>Z</b>		<b>L</b>	
<b>K</b>	1.414	<b>A</b>	2.377	<b>B</b>	5.535	<b>A</b>	4.172	<b>M</b>	1.687
<b>H</b>	1.379	<b>M</b>	1.854	<b>I</b>	1.895	<b>C</b>	4.143	<b>E</b>	1.517
<b>G</b>	1.164	<b>C</b>	1.623	<b>F</b>	1.679	<b>M</b>	1.624	<b>A</b>	1.422
<b>J</b>	1.152	<b>E</b>	1.489	<b>A</b>	1.049	<b>E</b>	1.454	<b>N</b>	1.381
<b>O</b>	1.061	<b>N</b>	1.355	<b>L</b>	0.866	<b>N</b>	1.200	<b>L</b>	1.378
<b>D</b>	1.052	<b>D</b>	1.196	<b>M</b>	0.861	<b>L</b>	1.039	<b>I</b>	1.223
<b>F</b>	1.023	<b>O</b>	1.054	<b>E</b>	0.844	<b>D</b>	0.952	<b>C</b>	1.155
<b>L</b>	0.941	<b>L</b>	1.052	<b>D</b>	0.813	<b>O</b>	0.922	<b>J</b>	0.950
<b>N</b>	0.924	<b>J</b>	0.830	<b>O</b>	0.793	<b>G</b>	0.854	<b>O</b>	0.929
<b>I</b>	0.877	<b>G</b>	0.823	<b>J</b>	0.774	<b>B</b>	0.684	<b>G</b>	0.807
<b>E</b>	0.832	<b>F</b>	0.655	<b>N</b>	0.762	<b>I</b>	0.632	<b>D</b>	0.791
<b>M</b>	0.729	<b>I</b>	0.606	<b>C</b>	0.762	<b>F</b>	0.586	<b>H</b>	0.693
<b>C</b>	0.501	<b>B</b>	0.524	<b>G</b>	0.601	<b>J</b>	0.514	<b>F</b>	0.523
<b>A</b>	0.289	<b>K</b>	0.384	<b>H</b>	0.428	<b>K</b>	0.366	<b>K</b>	0.419
<b>B</b>	0.205	<b>H</b>	0.269	<b>K</b>	0.311	<b>H</b>	0.269	<b>B</b>	0.211

A – Agriculture, hunting and forestry; B – Fishing; C – Mining and quarrying; D – Manufacturing; E – Electricity, gas and water supply; F – Construction; G – Wholesale and retail trade; etc.; H – Hotels and restaurants; I – Transport, storage and communication; J – Financial intermediation; K – Real estate, renting and other business activities; L – Public administration and defence; M – Education; N – Health and social work ; O – Other activities

Source: Latvian Statistical Bureau, authors' calculations

For Riga region, the highest coefficient is for real estate activities (1.414), closely followed by hotels and restaurants (1.379). These do not have a straightforward economic base interpretation. Real estate is almost certainly high because of, on the one hand, a higher demand in Riga than anywhere else and secondly because higher property prices make for higher value added in Riga as compared with. Trade (1.164) and financial intermediation (1.152) are also basic activities in Riga. The concentration of real estate and financial intermediation in the region around capital is not surprising, since Riga is the financial centre of the country. Additionally, the development of these sectors is related to the rapid development of Riga in the last years.

Manufacturing (1.052) and construction (1.023) are marginally basic. However, despite the severe industrial contraction of the last decade, Riga has managed to maintain its position as the major industrial centre in the region, although Vidzeme has a higher LQ for manufacturing.

One would expect public administration to be highly concentrated in Riga region, since national government and ministries are located in the capital, but this activity here falls into the non-basic category (0.941). One should not forget, that we use here gross value added data, not employment, and public administration is not the activity that creates large value added. Another reason to expect LQ for public administration sector to be high in Riga region is the need for large local public administration in a region with more than 40 per cent of Latvia's population. (and more than 40 percent of those employed in public administration work in Riga). In Vidzeme, Zemgale and Latgale public

administration has an LQ in excess of 1. This probably reflects the fact that these are the poorest regions of Latvia with low private sector value added.

Health and social work (0.924) is also not that different from national shares. Therefore Riga region does not have a comparative advantage in this sector. That is not bad – it suggests that health and social work as an economic activity is not necessarily concentrated in Riga region.

Surprisingly, transport and communication (0.877), electricity, water and gas supply (0.832) and education (0.729) appeared to be underrepresented in Riga region compared with Latvia. We were expecting a high LQ for transport and communication for the capital city and its surroundings – there is a big port and developed railway lines. This result does not go in line with high employment in this sector in Riga region – around 17% as compared to approximately 8-10% in the whole Latvia.

Value added in the primary sectors (0.289 for agriculture and 0.205 for fishing) is substantially underrepresented in Riga region compared to Latvia, these activities are non-urban in nature. Similarly for mining and quarrying (0.501).

#### *Employment vs value added*

It is of interest to compare our results with Francis (1999) who used employment as the measure of activity. His results are briefly presented in Table 6.

**Table 6**

Branch of economy		LQ Riga-Latvia (employment)
Mining, agriculture, forestry	A+B+C	0.06
Manufacturing	D	1.29
Construction	F	0.74
Whole- and retail trade	G	0.90
Transportation and communications	I	1.88
Education	M	0.95
Health and social care	N	0.94
Public administration	L	1.53
Financial sector	J	1.88
Real estate	K	1.47
Other services	O	0.96

*Source: Francis (2000)*

Table 7 offers a comparison of our results to Francis's: it ranks LQ:

**Table 7**

<b>Francis</b>		<b>This paper</b>	
<b>I</b>	1.88	<b>K</b>	1.414
<b>J</b>	1.88	<b>H</b>	1.379
<b>L</b>	1.53	<b>G</b>	1.164
<b>K</b>	0.97	<b>J</b>	1.152
<b>D</b>	0.96	<b>O</b>	1.061
<b>O</b>	0.96	<b>D</b>	1.052
<b>M</b>	0.95	<b>F</b>	1.023
<b>N</b>	0.94	<b>L</b>	0.941
<b>G</b>	0.90	<b>N</b>	0.924
<b>F</b>	0.74	<b>I</b>	0.877
<b>A+B+C</b>	0.06	<b>E</b>	0.832
		<b>M</b>	0.729
		<b>C</b>	0.501
		<b>A</b>	0.289
		<b>B</b>	0.205

A – Agriculture, hunting and forestry; B – Fishing; C – Mining and quarrying; D – Manufacturing; E – Electricity, gas and water supply; F – Construction; G – Wholesale and retail trade; etc.; H – Hotels and restaurants; I – Transport, storage and communication; J – Financial intermediation; K – Real estate, renting and other business activities; L – Public administration and defence; M – Education; N – Health and social work ; O – Other activities

*Source: Francis (2000), authors' calculations*

Our calculations differ from those of Francis in three ways:

- Francis uses employment data, while we are using gross value added.
- Francis calculates LQ for the Riga city, we do the calculation for Riga region, which is eventually bigger and comprises also rural areas.
- Francis used 1999 data, we calculate for 1998 (he captured some consequences of the Russian crises on the economy of Latvia).

We consider the last two differences as minor, but the choice of the analytical factor is really important for the calculation of LQs.

The main points of comparison are:

- Both methods produce LQs in excess of 1 for financial intermediation, real estate and manufacturing, although the employment method produces a substantially higher LQ for manufacturing.

- The employment method generates transportation-communication and public administration as basic activities, but these results fit our own hypothesis.
- Trade and construction appear as basic activities using value added but not when employment is the basis of calculation.

### *Latvia's other regions*

According to the Table 5, the basic sectors of Vidzeme in 1998 were Agriculture, hunting and forestry (2.377), Education (1.854) [probably due to Vidzeme High school located Valmiera], Mining and quarrying (1.623), Electricity, gas and water supply (1.489), Health and social work (1.355), Manufacturing (1.196) (that has the highest LQ among all Latvian regions), Other activities (1.054), and Public administration and defence (1.052). Other sectors are not that different from national shares or show no particular concentration in this region.

Kurzeme has only 4 sectors with the LQs above one - Fishing (5.535) – being the region with the longest coastal line, Transport, storage and communication (1.895) – Liepāja and Ventspils ports are the centres of transit (especially, oil), Construction (1.679) (seems due to big amounts of construction works in Ventspils port area), Agriculture, hunting and forestry (1.049). Manufacturing (0.813) appeared to be non-basic sector, though there are number of factories in this region.

Zemgale turned to be the agricultural region (with the highest LQ for agriculture among Latvian regions - 4.172). Mining and quarrying (4.143), Education (1.624) [Latvian Agricultural university is located in the city of Jelgava], Electricity, gas and water supply (1.454), Health and social work (1.200), and Public administration and defence (1.039) are basic activities in Zemgale region.

Education with LQ of 1.687 is the basic activity of Latgale region (Pedagogical university of Daugavpils) is followed by Electricity, gas and water supply (1.517). Agriculture (1.422), Health and social work (1.381), Public administration and defence (1.378), Transport, storage and communication (1.223), and Mining and quarrying (1.155) are also basic activities for Latgale region.

Interestingly enough, there are four sectors that are non-basic in all four non-Riga regions - Financial intermediation (LQs: 0.514-0.95), Wholesale and retail trade; etc. (LQs: 0.601-0.854), Hotels and restaurants (LQs: 0.269-0.693) and Real estate, renting and business activities (LQs: 0.311-0.419). These sectors show the highest concentration in Riga region.

### *Change over time*

We have data available for the two previous years (unfortunately not from the beginning of the 1990's), but the differences are not that significant, though some changes may seem interesting. For instance, in 1996 in Riga region there were more basic sectors than in 1997 and 1998: 9, 6 and 7 respectively; in 1996 sectors like Electricity, gas and water supply (1.211), Fishing (1.103), meaning that fishing in 1996 was more developed in the region than in 1997 and 1998, and Health and social work (1.038) were basic activities in Riga region, while in 1997 and 1998 these sectors turned to be totally non-basic.

Vidzeme region was characterised by a gradual increase in the basic sectors from 5 in 1996 to 8 in 1998. The main difference between the three years is that Education was not different from the national shares in 1996 (LQ of 0.985), while it turned to be basic in the next two years (of 1.86). this could be explained by the foundation of Vidzeme College.

Transport, storage and communication was much more important for Kurzeme in 1996 (with LQs of 2.248 9in 1997 – 1.926, 1998 – 1.895), while Fishing was only on the second place – 1.633 (1997 –

4.930, 1998 – 5.535). Agriculture, hunting and forestry turned to be basic only in 1998. In 1997 Public administration and defence (1.101) was also among the basic sectors.

Zemgale region experienced an increase in the number of basic sectors (from 4 to 6), but the most strange change is the appearance of the fishing sector as a basic sector (with LQ of 1.138).

There were interesting changes in Latgale: in 1996 the highest LQ was for Public administration and defence (1.410), and only then Education follows (1.295). Another significant difference – LQ of 1.131 for Manufacturing (in all other years Manufacturing was basic activity only for Riga and Vidzeme regions). On the other hand, Agriculture was basic in 1997 and 1998, but not in 1996.

## **Manufacturing**

We also calculated LQs for manufacturing sub-sectors for the 5 Latvian regions for 1998. The results. The detailed results are reported in Appendix 1

The Riga region has a big number of basic activities in manufacturing – 16 out of 23 sub-sectors have  $LQ > 1$  (Vidzeme – 3, Kurzeme – 5, Zemgale – 6, Latgale – 7). Manufacturing of tobacco products (1.567), office machinery and computers (1.567), medical, precision and optical instruments, watches and clocks (1.551), electrical machinery and apparatus n.e.c. (1.475), chemicals and chemical products (1.455), pulp, paper and paper products (1.426), leather articles (1.365), coke, refined petroleum products and nuclear fuel (1.360), furniture (1.269), radio, television and communication equipment and apparatus (1.267), motor vehicles, trailers and semi-trailers (1.246), publishing, printing and reproduction of recorded media (1.238), other transport equipment (1.143), rubber and plastic products (1.110), food products and beverages (1.077), wearing apparel; dressing and dyeing of fur (1.077) show highest concentration in Riga region.

Manufacture of textiles (3.989), wood and of products of wood and cork (1.824) as well as manufacture of fabricated metal products, except machinery and equipment (1.252) are concentrated in Vidzeme.

Manufacture of basic metals (8.759) shows a particularly high concentration in Kurzeme, followed by manufacture of other non-metallic mineral products (3.625), manufacture of textiles (2.009), manufacture of wood and of products of wood and cork, except furniture (1.356), manufacture of fabricated metal products, except machinery and equipment (1.227).

In Zemgale, first place is taken by recycling (1.895), then manufacture of wearing apparel; dressing and dyeing of fur (1.775), manufacture of motor vehicles, trailers and semi-trailers (1.632), manufacture of food products and beverages (1.335), manufacture of fabricated metal products, except machinery and equipment (1.048), manufacture of wood and of products of wood and cork, except furniture (1.043).

The fifth region Latgale seems to be concentrated in the manufacture of machinery and equipment n.e.c. (7.233), and recycling (3.982), manufacture of other transport equipment (3.198), manufacture of coke, refined petroleum products and nuclear fuel (1.506), manufacture of wearing apparel; dressing and dyeing of fur (1.500), manufacture of other non-metallic mineral products (1.345), manufacture of rubber and plastic products (1.313).

Looking back (1996 and 1997 data) does not indicate many changes in the concentration of sub-sectors of manufacturing: some regions show the same “top concentration” sub-sectors, while there are some minor differences in ranking. Interestingly, in Latgale there was an increase in the number of “concentrated” sub-sectors – from 4 to 7.

## Estonia

Table 8 below we presents our calculations of location and specialisation indexes for Estonia in 1998.

Table 8

i k	LOCALISATION					SPECIALISATION				
	localisation of ind k = the share of location i in the total prod. of ind. k					specialisation of loc i = the share of ind. k in the region's total prod. of all industries				
	$l(k,i) = y(k,i) / \sum(i) [y(k,i)]$					$s(k,i) = y(k,i) / \sum(k) [y(k,i)]$				
	N	C	NE	W	S	N	C	NE	W	S
A+B	0.137	0.229	0.068	0.228	0.338	0.017	0.230	0.060	0.179	0.148
C+D	0.474	0.105	0.143	0.106	0.172	0.152	0.278	0.337	0.219	0.198
E	0.485	0.027	0.286	0.058	0.144	0.030	0.014	0.130	0.023	0.032
F	0.651	0.055	0.059	0.103	0.132	0.074	0.051	0.049	0.075	0.054
G*	0.735	0.043	0.043	0.062	0.117	0.561	0.272	0.241	0.308	0.320
L*	0.539	0.061	0.080	0.098	0.223	0.167	0.155	0.182	0.195	0.248

A – Agriculture, hunting and forestry; B – Fishing; C – Mining and quarrying; D – Manufacturing; E – Electricity, gas and water supply; F – Construction; G – Wholesale and retail trade; etc.; H – Hotels and restaurants; I – Transport, storage and communication; J – Financial intermediation; K – Real estate, renting and other business activities; L – Public administration and defence; M – Education; N – Health and social work ; O – Other activities

**G\*=G+H+I+J+K** \* Wholesale and retail trade; hotels and restaurants; transport, communication; financial intermediation; real estate, renting and business activities

**L\*=L+M+N+O** \* Public administration and compulsory social security, education; health and social work; other community, social and personal service activities

Source: Estonian Statistical Bureau, authors' calculations

It seems that Northern Estonia is specialised in private services (G\*) with a specialisation coefficient of 0.561. Since G\* comprises such a different services as trade; hotels and restaurants; transport, communication; financial intermediation; real estate, renting and business activities, and since the capital Tallinn is in this region, then it is self-evident, that this sector will have a big share. Northern Estonia is also specialised in Public administration and defence that is also not surprising in the light of the fact that the national government and parliament are situated in the capital. The third economic sector, in which Northern Estonia is specialised, is manufacturing (that usually tends to be located near big market and Tallinn is relatively big in Estonian terms) although with a coefficient of 0.152 this is smaller than in the other regions.

Central Estonia is specialised in Manufacturing + Mining and quarrying (0.278), private services (0.272), and, surprisingly, in Agriculture and fishing (0.230) [all the main sectors are equally present in this region].

Northeastern Estonia is also very industrialised (0.337 – the highest share of Mining and quarrying and Manufacturing among all the Estonian region). The shares of private and public services are rather high as well (0.241 and 0.182 respectively).

Western Estonia is more specialised in private services (0.308), and in Mining and quarrying and Manufacturing (0.219). The share of Agriculture and Fishing is rather high (0.179), but smaller than the share of public services (0.195)

The last region, Southern Estonia, is also specialised in services (for private 0.320; for public 0.248). The share of Mining and quarrying and Manufacturing is 0.198, and the share of Agriculture and Fishing is 0.148.

Looking at the localisation of industries in Estonia in 1998 we see that Agriculture and Fishing are more localised in Southern Estonia than in other Estonian regions ( $l_i^k = 0.338$ ). All the other economic sectors are undoubtedly localised in Northern Estonia: coefficient for Mining and quarrying and Manufacturing is  $l_i^k = 0.474$  – almost half of the Mining and quarrying and Manufacturing production comes from this region. Electricity, gas and water supply (0.485) is also localised in the region around the capital. 65% of all the value added from the transport and communication is produced here. 73.5% of the value added of private services and 53.9% of the value added of public services comes from Northern Estonia. A similar tendency was found in Latvia, where most of the industries were localised around Riga.

The Herfindahl index of absolute specialisation turns to be the highest for Northern Estonia ( $h_i = 0.372$ ), implying that this region is more specialised than the others of Estonia. For other regions, the index does not differ too much (see the table below).

**Table 9**

<b>SPECIALISATION</b>				
<b>Herfindahl index of absolute specialisation</b>				
<b><math>h(i) = \sum(k) [s(k, i)]^2</math></b>				
<b>N</b>	<b>C</b>	<b>NE</b>	<b>W</b>	<b>S</b>
0.372	0.231	0.228	0.219	0.229

*Source: Authors' calculations*

Turning to the Location Quotient, the Table 10 shows the calculations based on Estonian value added data for 1998.

Table 10

**LOCATION QUOTIENT**

a measure of localisation of industry k in i, relative to the localisation of activity as a whole in i					
$r(k,i) = \frac{y(k,i) / \sum(i) [y(k,i)]}{\sum(k) [y(k,i)] / \sum(i) \sum(k) [y(k,i)]} = \frac{y(k,i) / \sum(k) [y(k,i)]}{\sum(i) [y(k,i)] / \sum(k) \sum(i) [y(k,i)]}$					
i	N	C	NE	W	S
k					
A+B	0.265	2.906	0.671	2.485	2.057
C+D	0.789	1.530	1.641	1.178	1.105
E	0.727	0.526	4.349	0.713	0.777
F	1.019	1.124	0.731	1.289	0.847
G*	1.241	0.629	0.555	0.694	0.696
L*	0.918	0.800	1.057	1.019	1.340

A – Agriculture, hunting and forestry; B – Fishing; C – Mining and quarrying; D – Manufacturing; E – Electricity, gas and water supply; F – Construction; G – Wholesale and retail trade; etc.; H – Hotels and restaurants; I – Transport, storage and communication; J – Financial intermediation; K – Real estate, renting and other business activities; L – Public administration and defence; M – Education; N – Health and social work ; O – Other activities

**G\*=G+H+I+J+K** \* Wholesale and retail trade; hotels and restaurants; transport, communication; financial intermediation; real estate, renting and business activities

**L\*=L+M+N+O** \* Public administration and compulsory social security, education; health and social work; other community, social and personal service activities

Source: Estonian Statistical Bureau, authors' calculations

Thus private services, with an LQ of 1.241, is Northern Estonia's basic sector, while Construction almost does not differ from the national share (1.019). Other sectors are underrepresented in this region.

In Central Estonia the basic sectors are Agriculture and Fishing (2.906), Mining and quarrying and Manufacturing (1.530) and Construction (1.124). The highest LQ for Northeastern Estonia produces Electricity, gas and water supply sector (4.349); Mining and quarrying and Manufacturing (1.641) and public services (1.057) are basic for this region. These sectors are basic for Western Estonia: Agriculture and Fishing (2.485), Mining and quarrying and Manufacturing (1.178) and Construction (1.289); public services (1.019) does not differ much from national shares. Similarly, Agriculture and Fishing (2.057), public services (1.340) and Mining and quarrying and Manufacturing (1.105) are basic sectors of Southern Estonia.

Analysis of LQs for 1996-1998 shows that there are no changes in ranking, implying that Estonian industrial structure is more stable than the Latvian one. However this could be a consequence of a higher level of aggregation.

## Part 2: Maps

In this section we provide a visual description of the geographical structure of industrial and human activity in the three Baltic states.

**Map 1** provides the region and population size information on Baltic States region. Concerning the questions of territory units we have in most cases used 10/26/15 system (**Appendix 3 – Maps 1-22**).

That is:

1. The territory of Estonia is divided in to 15 counties: Harju, Hiiu, Ida-Viru, Jõgeva, Järva, Lääne, Lääne-Viru, Põlva, Pärnu, Rapla, Saare, Tartu, Valga, Viljandi, Voru. The counties are divided into towns and rural municipalities.

For GDP comparison the data was grouped according to regional structure, that is:

- *Nothern Estonia*: Harju county (incl Tallinn);
  - *Central Estonia*: Jõgeva, Järva, Rapla, Viljandi counties;
  - *Northeastern Estonia*: Ida-Viru, Lääne-Viru counties;
  - *Western Estonia*: Hiiu, Lääne, Pärnu, Saare counties;
  - *Southern Estonia*: Põlva, Tartu, Valga, Võru counties.
2. The territory of Latvia is divided into 26 districts: Aizkraukle, Aluksne, Balvi, Bauska, Cēsis, Daugavpils, Dobele, Gulbene, Jelgava, Jekabpils, Kraslava, Kuldīga, Liepāja, Limbazi, Ludza, Madona, Ogre, Preiļi, Rēzekne, Rīga, Saldus, Talsi, Tukums, Valka, Valmiera and Ventspils. The districts are divided into towns and rural municipalities.

For GDP comparison the data was grouped according to regional structure, that is:

- *Rīga region*: Rīga district;
  - *Kurzeme*: Aluksne, Cēsis, Gulbene, Limbazi, Madona, Ogre, Valka and Valmiera districts;
  - *Vidzeme*: Kuldīga, Liepāja, Saldus, Talsi and Ventspils districts;
  - *Latgale*: Balvi, Daugavpils, Kraslava, Ludza, Preiļi, and Rēzekne districts;
  - *Zemgale*, Aizkraukle, Bauska, Dobele, Jelgava, Jekabpils, and Tukums districts.
3. The territory of the Republic of Lithuania is divided into the following 10 counties: Alytus (the centre is Alytus town); Kaunas - (the centre is Kaunas city); Klaipėda -

(the centre is Klaipeda town); Marijampole - (the centre is Marijampole town); Panevezys - (the centre is Panevezys town); Siauliai - (the centre is Siauliai town); Taurage - (the centre is Taurage town); Telsiai - (the centre is Telsiai town); Utena - (the centre is Utena town); Vilnius - (the centre is Vilnius city).

### *Population*

The regional picture of population size and densities is clearly seen from **Map 2** (Resident Population in the Baltic States by regions, 1999) and **Map 3** (Population Density in the Baltic States, 1999). As it follows from the statistical data Lithuania is the biggest and most populous country among the Baltics with highest population density. Then, according to the total area, and population comes Latvia, followed by Estonia.

Most populated regions in the Baltic States are Riga region, Latvia (1001718 in 1999), Vilnius county, Lithuania (894289), Kaunas county, Lithuania (753915), Harju county, Northern Estonia (535131). On the whole, Lithuanian counties are more populated than Latvian and Estonian (more “grey regions” on the map with population below 100,000 people).

The highest population density is in Visagino town district of Utena county, Lithuania (3746.6 per km<sup>2</sup>), followed by Panevezis town district of Panevezis county, Lithuania (2672.8) and Kaunas town district of Kaunas county, Lithuania (2638.1). In Latvia the highest population density is in Riga city (2595.2) and in the city of Rezekne, Latgale region (2385.7). The highest population density of Estonia is in Harju county, Northern Estonia – only 123.5 inhabitants per km<sup>2</sup>.

The demographic situation is similar for Baltic countries. A decline in the birth rates, together with natural emigration (especially sound in Latvia and Estonia, reflecting non-nationals returning to country of origin after the reestablishment of independence in the Baltics) and that due to worsening economic conditions as well as rising number of suicides led to population shrinking. On the other hand, the life expectancy has been growing. As it is in most European countries, population in the Baltics is ageing.

### *Education*

From the soviet times the Baltics inherited obliged and strong elementary and lower-secondary education resulted in quite high initial literacy level in the Baltics. In the beginning of transition, one of the advantages of the Baltics was well educated, especially in exact sciences (like engineering, also textile), and relatively cheap labour force. On the other hand there was an initial lack of certain labour resources, common in the West – managers, economists, analysts, financial specialists, etc. Initially there were also some problems with foreign languages, recently the knowledge of foreign languages has improved.

According to M. Chandler (2001) despite the decrease in population, number of people involved into different levels of education has increased, with exception for primary and pre-primary levels.

According to the paper by S. Alvheim and N. Groth on The Role of Universities in Developing the Baltic Sea Region: “It has become a conventional wisdom that universities are in position to play a more important role in stimulating regional economic life by meeting regionally embedded needs for knowledge and technology transfer.

What is interesting about this paper is the research on the connections between universities and enterprises: “When it comes to direct action on development programmes, only one third

of the universities in our sample co-operate with local regional development agencies (RDAs). However, more than twice as many (72%) state they take part in other local activities” (S. Alvheim and N. Groth, 1999).

Nevertheless: “Although we have not found clear empirical evidence for a close relationship between universities and local regions on regional development issues other sources of information indicate that such relations are given high priority in many countries as a measure of modern regional policy”. (S. Alvheim and N. Groth, 1999).

The paper by B. Rivza “Higher education as a challenge for development of Baltic Countries” provides the statistics on the number of institutions of higher education and students on January 1, 1999:

**Lithuania:** 15 institutions of higher education (all of them State) were authorized to provide higher education and confer higher education diplomas. A May 3, 1999 resolution of the Lithuanian Government granted the first license to a non-public institution of higher education, Vilnius Saint Joseph Seminary, and a September 8, 1999 resolution, to the International Higher Business School.

The total number of students in 1999/2000 academic year was 74532 and it was 2% of inhabitants. The number of students per 10000 inhabitants was equal to 201 people. The students were divided in undergraduates - 57862 (77.7% ), second level students - 14795 (19.9%) and doctoral students - 1875 (2.5%).

**Latvia:** There are 19 state higher education establishments and 14 private education establishments in Latvia.

The total number of 89510 students of whom 72035 (80%) were undergraduates, 16472 (18.4 %) master degree students and 1003 (1.1 %) doctoral students. Students constituted 3.4% of inhabitants, i.e. 342 per 10000 inhabitants.

**Estonia:** There are two types of higher education in Estonia:

- Universities, giving academic higher education and applied, professionally oriented diploma-study programmes (public universities – 6, private universities – 6)
- Applied higher education institutions, giving applied, professionally oriented diploma-study (State applied education institutions - , private – 5).

The total number of students was 46409 of whom 41720 (90%) were undergraduates, 3447 (7%) master degree students and 1251 (3%) doctoral students. The share of students was 3.2% of inhabitants. In Estonia there are 320 students per 10000 inhabitants.

The regional distribution of highest education establishments and students is shown on **Map 4** (Higher Education Institutions and Number of Students in the Baltic States, 1999).

The biggest number of students of universities in 1999 was in Riga region (71308) (including Riga city with 70687students). The second educational centre is Vilnius city district (38581), followed by Kaunas county (33006) (Kaunas city district – 27556). Harju county (26972) (Tallin city – 25849) and Tartu county (15893) are the educational centres of Estonia. As it possible to see from the map, there are lot of “white spots”, higher education institutions are concentrated in the bigger cities. Latvia looks more educationally concentrated than the other two countries.

Since the size of the regions is quite different, it is more important to look at the shares of students in the region (**Map 5** (Students in Higher Education Institutions in the Baltic States,

per cent of the resident population of the region, 1999)) – the ranking of regions in absolute and relative number of students are really different.

As it is perfectly seen from the map, the highest shares of students in the respective region are in Kaunas county, Lithuania (13.11 per cent of students in the region), Tartu, Southern Estonia (10.52) and in Jelgava district, Latvia (10.45). In fact, these cities are often called ‘city of students’ in the respective countries. Here Riga is only number four in the rank (9.93 for Riga district and 8.87 for the city). Again, as it is seen from the maps, education in Latvia is very concentrated, while it is more dispersed in the other two countries.

As regards the development of vocational and professional education and training policy, the Baltics achieved different results. For example, in the 2000/2001 school year in Latvia there were registered 120 educational institutions providing vocational training (against 133 in 1995), in Estonia – 78 (against 85 in 1995) and in Lithuania – only 84 (as compared to 106 in 1995). (SOE, YOLa YOLi) The following **Map 6** (Students in Secondary special and Vocation Education Institutions in the Baltic States, per cent of the resident population of the region, 1999) shows the spread of vocational and secondary education institutions. As it follows from the map all the regions in Baltic States provide this type of studies. In relative numbers there were 1.83% Latvian, 2.44% Lithuanians and 2.15% Estonians obtaining secondary special and vocational education.

Unsurprisingly, the biggest number of students is in Riga region, Harju county and Vilnius counties with 46.93%, 38.73% and 36.84% share of students in total region population.

The representatives of the second group, i.e. 20-30%, is Kauno region in Lithuania and NORTHEASTERN ESTONIA.

Southern and Central Estonia, Klaipėdos and Šiauliai regions (Lithuania) and three big regions of Latvia (Latgale, Vidzeme, Kurzeme) are in the third group, with 14.8%, 13.23%, 14.53%, 10.37%, 18.44% (Latgale), 14.38% (Vidzeme), 11.55% (Kurzeme) respectively.

Pärnu and Tartu regions (Estonia), Kurzemes region (Latvia) and Panevėžys and Alytus (Lithuania) are in fourth group educating 5 to 10% of region population in Secondary special and vocational type of schools.

The rest of the regions are included in 5 group with less than 5% of students.

### *Employment and the Labour market*

During the transition period there were similar trends in the market for labour in all Baltic countries. Restructuring and privatisation processes had a large impact on the situation in the labour market. There was a drop in the employment in state sector (for instance, in 1990 state sector was 74.7% of the total employment in Estonia, 80.5% in Latvia and 77.7% in Lithuania, and in 1999 it constituted only 30.3%, 30.0%, 31.0% respectively). Along this process, there was the reallocation of workers: the share of people employed in industry fell down in almost all transition economies, and the Baltics were not an exception, while the share of workers employed in services substantially increased.

**Map 7** (Population of working age) shows the regional distribution of inhabitants of the working age, while **Map 8** (Labour Force Participation Rate in the Baltic States = Economically Active Population, per cent of the resident population of the region, 1999) depicts the distribution of economically active population.

The highest shares (above 80 per cent) of the working age population are in Estonia (explained by a much wider age spread): Järva, Central Estonia, Ida-Viru, Northeastern Estonia, Lääne, Western Estonia, Lääne-Viru, Northeastern and others. In Lithuania Vilnius county has this rate of 83 per cent, and some others (Alytus, Panevėžys, Klaipėda and Šiauliai) around 80 percent. This indicator turned to be much lower for Latvia, for example, 62 per cent for Riga region.

The results seem suspicious. The only possible reason for such figures is ageing of population. If so, Lithuania seems to have much better demographic situation than Latvia. Estonia in turn due to wider limits for working age could not be compared with Latvia and Lithuania.

According to **Map 7**, the highest rates of labour force participation are in Latvia: most of the regions are in the interval above 70% (the highest rates are in Madona, Ludza and Preiļi regions). Interestingly enough, labour force participation in Rezekne city is 100% - all the inhabitants in the working age are either employed or unemployed (82 and 18 per cent respectively). Labour force participation rates are much lower in Estonia and Lithuania – 52-64 per cent.

It can be clearly seen from the map that regions around big cities show the modest labour Force participation rate while the area in poor regions show up to 80% of active working age people who are either officially employed or officially registered unemployed people. This fact could be the reason to suggest that official labour Force participation rate is a one of the indicators of poverty of the region, i.e. the higher the official participation rate the poorer the region. There is obvious hidden employment and unemployment in the areas around big cities.

Maps 9 (Employment rate: per cent of the Economically Active of the region) and 10 (Unemployment rate: per cent of the Economically Active of the region) show the composition of officially registered active labour Force.

The explanation for the map 8 could be definitely used also for explanation to the **Map 9** (Employment rate: per cent of the Economically Active of the region) according to which the highest employment rates are in Latvia, these are also most unequally spread. The highest rate is in Riga district (81.3), than follow Madona, Saldus and Valka districts (69.2, 68.9 and 68.6 respectively).

Quite interesting data on Labour force education rate are provided in OECD report 2000.

**Table 11 Employment and education**

Received education level	ESTONIA		LATVIA		LITHUANIA	
	Labour force participation	Unemployment	Labour force participation	Unemployment	Labour force participation	Unemployment
<i>A. Aged from about 15 y.o. *</i>						
Primary or lower	14	15	16	23	12	15
Lower secondary	38	16	35	20	51	19
Upper secondary	74	11	71	15	76	18
Tertiary	81	5	79	7	82	9
<i>Average</i>	<i>65</i>	<i>10</i>	<i>59</i>	<i>15</i>	<i>62</i>	<i>14</i>
<i>B. 25-64 y.o.</i>						
Lower than upper secondary	57	15	60	13	61	11
Upper secondary	83	10	79	9	79	7
Tertiary	87	5	88	6	87	4

Note: Labour force participation as a share of total adult population mass. Unemployment as a share of the labour force.

\* 15-74 y.o. for Estonia, 15 and older for Latvia, 14 and older for Lithuania.

Source: OECD 2000

As seen from Table 11, the average level of education in the Baltics is relatively high. Persons with completed secondary school education and more educated persons constitute 80-90 per cent from the respective labour force (for comparison, in OECD countries the average is 2/3). In all the three countries persons with relatively high education usually are more protected against the unemployment than persons with lower education.

Sharp interregional contrasts in unemployment rates could be noticed in all three countries. (see **Map 10** (Unemployment rate: per cent of the Economically Active of the region)). The areas of risk are usually former industrial regions, structural changes or rural areas, that or historically were outliers of centres with high labour demand. These areas in Lithuania are Druskininkai, Pasvalio region, in Latvia - North-Eastern part, where big industries are concentrated (electricity power plants, oil- shale mines, chemical industry) and Southern - agricultural - region in Estonia. In rural area, the breakdown of collective farms has caused massive unemployment. The most successful regions are surrounding capitals: Tallinn and Harjumaa in Estonia, Riga in Latvia, and Vilnius in Lithuania. Another explanation of a gap among regional unemployment levels is different labour demand and regional skill mismatch in certain regions. In addition, the situation worsens taking in mind low mobility of population.

#### *Wages*

Currently, as follows from **Map 11** (Gross monthly wages and salaries, USD, 1999), the highest wages in the Baltic states receive Estonian workers, though just recently the development dynamics were most active in Lithuania.

Wages above average level are seen mainly in financial intermediation, public administration and in other sectors with a high share of state ownership (like electricity and water supply), as well as transport and communication. (OECD 2000, Hazans 2001)

On the other hand there is still a tendency to underreport wages and to pay wages in envelopes in order not to pay taxes. So one should be really careful with data on wages.

#### *Industry and Production*

The production decline was a characteristic feature for first years of transition and was some of the deepest among other Republics of the Former Soviet Union (FSU). The fall in production in the short run was heavily influenced by collapse of trade between the FSU. With trade recovery, started in the end of 1993 (Estonia)-beginning of 1994 (Latvia and Lithuania), production ceased to decline sharply. On the other hand, Baltics inherited rather a prospective economic potential. The productivity level of Baltic countries, compared to other Soviet republics was much above average.

Before analysing the industrial structure of the Baltic states let us present a brief analysis of the regional composition of GDP.

Looking at figures for the **map 12**, that is Gross Domestic Product (mln USD) in the Baltic States, at current prices, 1998, the GDP at market prices appear to be the highest for Riga region and Riga in particular, 3691.91 and 3256.14 million USD respectively.

The second best is Zarasai district (Utenos region, Lithuania) where region produces 3373.08 million. USD GDP. Harju in Estonia shows 3106.05 millions and Kauno and Klaipėdos regions in Lithuania still being in leader group show 5<sup>th</sup> and 6<sup>th</sup> “result”, i.e. 2131.48 and 1297 millions USD.

The second group, namely 500-1000 mln USD include Rokiskio (Panevezys, Lithuania), Vilkaviskio (Marijampole region, Lithuania) and Telsio region (Lithuania), all four (except for Riga) big Latvian regions and Southern Estonia area (incl. Tartu).

Alytus, Taurage and Marijampole Lithuanian regions, Central and Eastern Estonia are in group with less than 500 mln USD GDP at market price.

Recalculation the shares of regions' contribution to the GDP (**map14**, Gross Domestic Product (mln. USD) in the Baltic States, per cent distribution in the country, 1998) all the regions are split up in five groups:

- >50%. The only regions contributing more than 50% of GDP are Riga region and Northern Estonia (Harju region, incl. Tallinn) with 60.7% and 59.4% numbers.
- The second group contributing 20-30% includes only Vilnius (31.4%) and Kaunas region (19.8%).
- Crèmes big region (Latvia), Southern Estonia and Klaipedos region (Lithuania) are in-group showing 10 up to 20%. The respective numbers are 13.6%, 16.3% and 12.1%.
- All four big Latvian regions (except for Riga), Central, Western and northeastern parts of Estonia and two regions in Lithuania (Siauliai and Panevezys) belong to the fourth group with 5-10% share of GDP.
- Finally the rest of Lithuanian regions, namely Utenos, Alytus, Telsiai, Marijampole and Taurage are contributing less than 5% of GDP.

The data provided in statistical books could not be really compared because of different size of the regions, nevertheless shows the general clustering tendencies in the Baltics.

**Map 13** (Gross Domestic Product (USD) in the Baltic States, at current prices, per capita, 1998) shows the impressive results for rearranging the order in the range of the top regions. Ventspils region being in third group for GDP contribution to the State GDP is undoubtedly leader in inhabitants' wealth terms. The GDP per capita number for Ventspils city exceeds the second best residence place at least twice, the number being 8131 USD per person.

On average GDP per capita for Estonian and Lithuanian regions is bigger than the one for Latvian regions.

Unsurprisingly Harju (incl. Tallinn), Riga (not Riga region) and two Vilnius and Klaipedos regions represent the second group ensuring around 3000 USD per capita GDP.

The poorest regions in turn North eastern region of Estonia (also the most industrialized as will be seen later), Taurages region in Lithuania and Latgales big region in Latvia (southeast of Latvia).

**Map 17** (Industrial production / sale, mln. USD, 1999) shows the clear picture of the industrial production in Baltic States. What is interesting that in terms of clustering each of Baltic states represent it is own pattern of allocation of industrial sales/production. Lithuanian is undoubtedly a "green zone" for industrial production. Latvia in turn shows unambiguous cluster around Riga region, with "dead ends" to the west and to the east with exception with minor industrial city centres like Liepaja and Daugavpils. Estonia represent the medium level of clusterization. Partly concentrated industry in Tallinn area nevertheless is balanced by moderate distribution of industry enterprises on the rest of territory.

The biggest contributors of state industrial production as it can be seen from **Map 18** (Industrial production / sales in the Baltic States, per cent distribution in the country, 1999) are Riga region, Latvia (61.8%), Harju county, Estonia (42.8) and Kauno district, Lithuania (22.2%).

To lesser extent but still remarkable contributions are made by Vilnius region (19%) and Klaipeda region (17%) (Lithuania) and Ida-Viru, Estonia (17.5%).

**Map 19** (Employed in Industry, per cent of region population, 1999) clearly indicate that Estonian workers are almost equally distributed between the regions, the share of workers constituting on average 13% (9.93 to 20% ) of certain Estonian region population except for Harju region. Where 25,74% of people are involved in manufacturing.

Lithuania shows the comparatively concentrated industrial employment centres, namely Vilnius, Kauno, Klaipeda and Panevezys regions where on average 10% of people are employed.

Latvia in turn represent the extreme case when except for cities of Jelgava, Ventspils, Liepaja and Daugavpils the only region employing industrial workers is Riga region with 6.33% of population are employed in manufacturing.

If we look at **map 20** (Share of industrial employees of industrial workers in state, 1999) we will see interesting picture. Compared with Baltic average Latvia has “few” workers but still in all districts probably representing some basic industries like food production, while Lithuania and Estonia have quite noticeable areas of concentration.

And the most striking results comes from **map 21** (Industrial production per employee, 1999) where it can be easily seen that the Latvian industry labour force is the most productive on average in Baltic States. Therefore there smaller number of workers in Latvia and smaller amount of goods produced but the effectiveness of their work is still here. Thus we can conclude that proper industrial policy can still change the things using the industry potential. As we have analysed the industry variables it was of our interest just to look at agriculture map trying to explain what is the main occupation of inhabitants in rural areas where according to statistics the industry is not widely spread.

The importance of agriculture as a field of production for the Baltics was evident: arable land is accounted for 31.7% of total land stock in Estonia, 38.5% in Latvia and 60.4% in Lithuania. In the late 80ties, only food production accounted around 25 percent of industrial production, and agriculture produced about 20% in Latvia and Estonia, and 27% in Lithuania. The distribution of land in use is given on the **Map 22** (Registered land (in use) , per cent of total area). As we see, the highest shares of land in use are in Lithuania and then in Estonia. As it concerns Latvia, we see two centres, where agriculture is more or less developed. Returning to the **Map 17** (Industrial production / sale, mln. USD, 1999) and analysing these two maps simultaneously, the question arises – what is going on there, how people are surviving?

### *Investments*

FDI has been concentrated geographically in the Baltics. In Lithuania 62% of the stock is found in the city of Vilnius, 11% in the city of Kaunas, and 9% in the city of Klaipeda. In Latvia data on foreign investment stock in the fixed assets of enterprises in 1998 shows a concentration of 51% in the city of Riga, and 8% in the city of Daugavpils [CSB (2000)]. It varied in intensity from 601 lats per capita in the city of Ventspils to a complete lack of foreign capital in Rezekne district.

All three countries provide different categories of Investments. As a result only investments in fixed assets could be compared - **Map 16** (Investments in fixed assets, per capita, 1999). As it follows from the map, the highest levels of non-financial investments concentrate in the capital cities with Riga attracting more: Riga region – 812.71 mln USD, Vilnius county – 625.67, and Hajru county 617.36.

The data for the enterprises is shown in the **map 15**. The data for economic entities concentration supports the GDP data. We will not focus on that because the data is not really comparable. Knowing the number of firms in certain areas we do not know the number of people employed or the size of the firms. Therefore the only conclusions we can make is on concentration in general but not the size of the concentration.

Even taking into account the mentioned above reasons the graphical illustration of statistical data is shocking for Latvia. The enterprises are mostly concentrated in Riga region and Venstpils, Lipaja, Daugavpils cities, while Lithuanian enterprises are spread around the country and in Estonia holding the medium position part enterprises being concentrated in Tallinn at the same time second part being dispersed on the rest of territory.

## Conclusions

The cities of the Baltic states, in contrast to structural problems of mono-enterprise regions, are blooming, specially in the respect to their strategic role in the Eastern-Western trade traffic corridor.

Estonian capital Tallinn and its surroundings turned to be the flagship of growth in Estonia. The city with one third of total Estonian population and Northeastern Estonia are the most wealthy regions in the country. In Tallinn region there is the fastest dynamics in terms of wages, per capita turnover and per capita retail prices. There are located more than 59 per cent of all registered enterprises. 80-90 per cent of all FDI are concentrated in Tallinn and more than 80n per cent of all registered foreign companies. Private firms in Tallinn show much better results than anywhere else in the country.

The difference between the capital region of Latvia and the rest territory is even more marked than in Estonia. About one third of the whole population of Latvia live in Riga and it is the biggest city in the Baltics. Economic concentration around such a big city in such a small country as Latvia can be very effective and serve as a base for many opportunities, but it also magnifies regional imbalances. In the rest of Latvia the wood industry and agricultural small-scale production are dominant.

Latvia has maintained its position as an East – West transport corridor, and the government has tried to use the transport sector in order to diversify allocation of economic activities, to attract foreign investments, to create new plants and to improve business environment in the regions

In contrast to both Estonia and Latvia, in Lithuania there was not created any growth aureole around its capital Vilnius. Partly this is because Vilnius is located away from the Baltic sea. Hence trade is not as important as in as in the other Baltic capitals. Economic activity on the whole country territory is distributed rather uniformly, where the differences between agricultural and heavily industrialised regions are clearly seen. Nevertheless, bigger shares of FDI are concentrated in the capital (61 per cent), Klaipeda port (11 per cent) and Kaunas (10 per cent). The fact that in Lithuania there are three big cities Vilnius, Klaipeda and Kaunas, as well as various important urban settlement centres and good system of roads, can promote labour mobility and exchange. In contrast to Estonia and Latvia, in Lithuania there is no geographical concentration of minorities.

The work reported so far describes various aspects of some quite remarkable geographical diversity in the apparently homogeneous Baltic states. The next stage of the project is to dig deeper and seek explanations

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## Appendix 1

Here we would like to present our findings – a more detailed analysis of manufacturing in 1998.

**Table A.1: LQs for manufacturing, LV 1998**

<b>i</b>		<b>R</b>	<b>V</b>	<b>K</b>	<b>Z</b>	<b>L</b>
<b>k</b> <b>(D)</b>						
<b>15</b>	Manufacture of food products and beverages	1.077	0.785	0.583	1.335	0.873
<b>16</b>	Manufacture of tobacco products	1.567	0.000	0.000	0.000	0.000
<b>17</b>	Manufacture of textiles	0.490	3.989	2.009	0.611	0.116
<b>18</b>	Manufacture of wearing apparel; dressing and dyeing of fur	1.077	0.351	0.277	1.775	1.500
<b>19</b>	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	1.365	0.228	0.105	0.581	0.687
<b>20</b>	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0.828	1.824	1.356	1.043	0.743
<b>21</b>	Manufacture of pulp, paper and paper products	1.426	0.443	0.198	0.255	0.025
<b>22</b>	Publishing, printing and reproduction of recorded media	1.238	0.684	0.393	0.798	0.464
<b>23</b>	Manufacture of coke, refined petroleum products and nuclear fuel	1.360	0.000	0.000	0.380	1.506
<b>24</b>	Manufacture of chemicals and chemical products	1.455	0.016	0.059	0.942	-0.207
<b>25</b>	Manufacture of rubber and plastic products	1.110	0.516	0.670	0.938	1.313
<b>26</b>	Manufacture of other non-metallic mineral products	0.545	0.785	3.625	0.974	1.345
<b>27</b>	Manufacture of basic metals	0.042	0.008	8.759	0.004	0.016
<b>28</b>	Manufacture of fabricated metal products, except machinery and equipment	0.969	1.252	1.227	1.048	0.477
<b>29</b>	Manufacture of machinery and equipment n.E.C.	0.611	0.279	0.597	0.372	7.233
<b>30</b>	Manufacture of office machinery and computers	1.567	0.000	0.000	0.000	0.000
<b>31</b>	Manufacture of electrical machinery and apparatus n.E.C.	1.475	0.000	0.346	0.250	0.000
<b>32</b>	Manufacture of radio, television and communication equipment and apparatus	1.267	0.464	0.671	0.847	0.000
<b>33</b>	Manufacture of medical, precision and optical instruments, watches and clocks	1.551	0.000	0.096	0.000	-0.012
<b>34</b>	Manufacture of motor vehicles, trailers and semi-trailers	1.246	0.696	0.000	1.632	0.000
<b>35</b>	Manufacture of other transport equipment	1.143	0.000	0.458	0.065	3.198
<b>36</b>	Manufacture of furniture; manufacturing n.E.C.	1.269	0.569	0.382	0.776	0.392
<b>37</b>	Recycling	0.787	0.009	0.668	1.895	3.982

*Source: Latvian Statistical Bureau, authors' calculations*

**Table A.2: Riga manufacturing LQs by rank**

16	Manufacture of tobacco products	1.567
30	Manufacture of office machinery and computers	1.567
33	Manufacture of medical, precision and optical instruments, watches and clocks	1.551
31	Manufacture of electrical machinery and apparatus n.E.C.	1.475
24	Manufacture of chemicals and chemical products	1.455
21	Manufacture of pulp, paper and paper products	1.426
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	1.365
23	Manufacture of coke, refined petroleum products and nuclear fuel	1.360
36	Manufacture of furniture; manufacturing n.E.C.	1.269
32	Manufacture of radio, television and communication equipment and apparatus	1.267
34	Manufacture of motor vehicles, trailers and semi-trailers	1.246
22	Publishing, printing and reproduction of recorded media	1.238
35	Manufacture of other transport equipment	1.143
25	Manufacture of rubber and plastic products	1.110
15	Manufacture of food products and beverages	1.077
18	Manufacture of wearing apparel; dressing and dyeing of fur	1.077
28	Manufacture of fabricated metal products, except machinery and equipment	0.969
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0.828
37	Recycling	0.787
29	Manufacture of machinery and equipment n.E.C.	0.611
26	Manufacture of other non-metallic mineral products	0.545
17	Manufacture of textiles	0.490
27	Manufacture of basic metals	0.042

*Source: Latvian Statistical Bureau, authors' calculations*

**Table A.3: Vidzeme manufacturing LQs by rank**

17	Manufacture of textiles	3.989
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1.824
28	Manufacture of fabricated metal products, except machinery and equipment	1.252
15	Manufacture of food products and beverages	0.785
26	Manufacture of other non-metallic mineral products	0.785
34	Manufacture of motor vehicles, trailers and semi-trailers	0.696
22	Publishing, printing and reproduction of recorded media	0.684
36	Manufacture of furniture; manufacturing n.E.C.	0.569
25	Manufacture of rubber and plastic products	0.516
32	Manufacture of radio, television and communication equipment and apparatus	0.464
21	Manufacture of pulp, paper and paper products	0.443
18	Manufacture of wearing apparel; dressing and dyeing of fur	0.351
29	Manufacture of machinery and equipment n.E.C.	0.279
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	0.228
24	Manufacture of chemicals and chemical products	0.016
37	Recycling	0.009
27	Manufacture of basic metals	0.008
16	Manufacture of tobacco products	0.000
23	Manufacture of coke, refined petroleum products and nuclear fuel	0.000
30	Manufacture of office machinery and computers	0.000
31	Manufacture of electrical machinery and apparatus n.E.C.	0.000
33	Manufacture of medical, precision and optical instruments, watches and clocks	0.000
35	Manufacture of other transport equipment	0.000

*Source: Latvian Statistical Bureau, authors' calculations*

**Table A.4: Kurzeme manufacturing LQs by rank**

27	Manufacture of basic metals	8.759
26	Manufacture of other non-metallic mineral products	3.625
17	Manufacture of textiles	2.009
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1.356
28	Manufacture of fabricated metal products, except machinery and equipment	1.227
32	Manufacture of radio, television and communication equipment and apparatus	0.671
25	Manufacture of rubber and plastic products	0.670
37	Recycling	0.668
29	Manufacture of machinery and equipment n.E.C.	0.597
15	Manufacture of food products and beverages	0.583
35	Manufacture of other transport equipment	0.458
22	Publishing, printing and reproduction of recorded media	0.393
36	Manufacture of furniture; manufacturing n.E.C.	0.382
31	Manufacture of electrical machinery and apparatus n.E.C.	0.346
18	Manufacture of wearing apparel; dressing and dyeing of fur	0.277
21	Manufacture of pulp, paper and paper products	0.198
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	0.105
33	Manufacture of medical, precision and optical instruments, watches and clocks	0.096
24	Manufacture of chemicals and chemical products	0.059
16	Manufacture of tobacco products	0.000
23	Manufacture of coke, refined petroleum products and nuclear fuel	0.000
30	Manufacture of office machinery and computers	0.000
34	Manufacture of motor vehicles, trailers and semi-trailers	0.000

*Source: Latvian Statistical Bureau, authors' calculations*

**Table A.5: Zemgale manufacturing LQs by rank**

37	Recycling	1.895
18	Manufacture of wearing apparel; dressing and dyeing of fur	1.775
34	Manufacture of motor vehicles, trailers and semi-trailers	1.632
15	Manufacture of food products and beverages	1.335
28	Manufacture of fabricated metal products, except machinery and equipment	1.048
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1.043
26	Manufacture of other non-metallic mineral products	0.974
24	Manufacture of chemicals and chemical products	0.942
25	Manufacture of rubber and plastic products	0.938
32	Manufacture of radio, television and communication equipment and apparatus	0.847
22	Publishing, printing and reproduction of recorded media	0.798
36	Manufacture of furniture; manufacturing n.E.C.	0.776
17	Manufacture of textiles	0.611
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	0.581
23	Manufacture of coke, refined petroleum products and nuclear fuel	0.380
29	Manufacture of machinery and equipment n.E.C.	0.372
21	Manufacture of pulp, paper and paper products	0.255
31	Manufacture of electrical machinery and apparatus n.E.C.	0.250
35	Manufacture of other transport equipment	0.065
27	Manufacture of basic metals	0.004
16	Manufacture of tobacco products	0.000
30	Manufacture of office machinery and computers	0.000
33	Manufacture of medical, precision and optical instruments, watches and clocks	0.000

*Source: Latvian Statistical Bureau, authors' calculations*

**Table A.7: Latgale manufacturing LQs by rank**

29	Manufacture of machinery and equipment n.E.C.	7.233
37	Recycling	3.982
35	Manufacture of other transport equipment	3.198
23	Manufacture of coke, refined petroleum products and nuclear fuel	1.506
18	Manufacture of wearing apparel; dressing and dyeing of fur	1.500
26	Manufacture of other non-metallic mineral products	1.345
25	Manufacture of rubber and plastic products	1.313
15	Manufacture of food products and beverages	0.873
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0.743
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	0.687
28	Manufacture of fabricated metal products, except machinery and equipment	0.477
22	Publishing, printing and reproduction of recorded media	0.464
36	Manufacture of furniture; manufacturing n.E.C.	0.392
17	Manufacture of textiles	0.116
21	Manufacture of pulp, paper and paper products	0.025
27	Manufacture of basic metals	0.016
16	Manufacture of tobacco products	0.000
30	Manufacture of office machinery and computers	0.000
31	Manufacture of electrical machinery and apparatus n.E.C.	0.000
32	Manufacture of radio, television and communication equipment and apparatus	0.000
34	Manufacture of motor vehicles, trailers and semi-trailers	0.000
33	Manufacture of medical, precision and optical instruments, watches and clocks	-0.012
24	Manufacture of chemicals and chemical products	-0.207

*Source: Latvian Statistical Bureau, authors' calculations*

**Table A.8: LQ > 1 (basic sectors in every region)**

Riga region			Vidzeme region			Kurzeme region			Zemgale region			Latgale region		
16	Manufacture of tobacco products	1.567	17	Manufacture of textiles	3.989	27	Manufacture of basic metals	8.759	37	Recycling	1.895	29	Manufacture of machinery and equipment n.E.C.	7.233
30	Manufacture of office machinery and computers	1.567	20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1.824	26	Manufacture of other non-metallic mineral products	3.625	18	Manufacture of wearing apparel; dressing and dyeing of fur	1.775	37	Recycling	3.982
33	Manufacture of medical, precision and optical instruments, watches and clocks	1.551	28	Manufacture of fabricated metal products, except machinery and equipment	1.252	17	Manufacture of textiles	2.009	34	Manufacture of motor vehicles, trailers and semi-trailers	1.632	35	Manufacture of other transport equipment	3.198
31	Manufacture of electrical machinery and apparatus n.E.C.	1.475				20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1.356	15	Manufacture of food products and beverages	1.335	23	Manufacture of coke, refined petroleum products and nuclear fuel	1.506
24	Manufacture of chemicals and chemical products	1.455				28	Manufacture of fabricated metal products, except machinery and equipment	1.227	28	Manufacture of fabricated metal products, except machinery and equipment	1.048	18	Manufacture of wearing apparel; dressing and dyeing of fur	1.500

21	Manufacture of pulp, paper and paper products	1.426							20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1.043	26	Manufacture of other non-metallic mineral products	1.345
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	1.365										25	Manufacture of rubber and plastic products	1.313
23	Manufacture of coke, refined petroleum products and nuclear fuel	1.360												
36	Manufacture of furniture; manufacturing n.E.C.	1.269												
32	Manufacture of radio, television and communication equipment and apparatus	1.267												
34	Manufacture of motor vehicles, trailers and semi-trailers	1.246												
22	Publishing, printing and reproduction of recorded media	1.238												
35	Manufacture of other transport equipment	1.143												

25	Manufacture of rubber and plastic products	1.110											
15	Manufacture of food products and beverages	1.077											
18	Manufacture of wearing apparel; dressing and dyeing of fur	1.077											

Source: Latvian Statistical Bureau, authors' calculations

## **Appendix 2: List of maps**

### ***Population***

- 1 Resident Population and Area in the Baltic States by regions, 1999
- 2 Resident Population in the Baltic States by regions, 1999
- 3 Population Density in the Baltic States, inhabitants per km<sup>2</sup>, 1999

### ***Education***

- 4 Higher Education Institutions and Number of Students in the Baltic States, 1999
- 5 Students in Higher Education Institutions in the Baltic States, per cent of the resident population of the region, 1999
- 6 Students in Vocational and Secondary Education Institutions in the Baltic States, per cent of the resident population of the region, 1999

### ***Labour market***

- 7 Population of working age
- 8 Labour Force Participation Rate in the Baltic States = Economically Active Population, per cent of the resident population of the region, 1999
- 9 Employment rate
- 10 Registered unemployment rate
- 11 Gross monthly wages and salaries, USD, 1999

### ***GDP and related variables***

- 12 Gross Domestic Product (mln. USD) in the Baltic States, at current prices, 1998
- 13 Gross Domestic Product (USD) in the Baltic States, at current prices, per capita, 1998
- 14 Gross Domestic Product (mln USD) in the Baltic States, per cent distribution in the country, 1998
- 15 Economically active enterprises in the Baltic States, end 1999
- 16 Investments in fixed assets, per capita, 1999

### ***Industry***

- 17 Industrial production / sale, mln. USD, 1999
- 18 Industrial production / sales in the Baltic States, per cent distribution in the country, 1999
- 19 Employed in Industry, per cent of region population, 1999

20 Share of industrial employees of country's industrial workers, 1999

21 Industrial production per employee

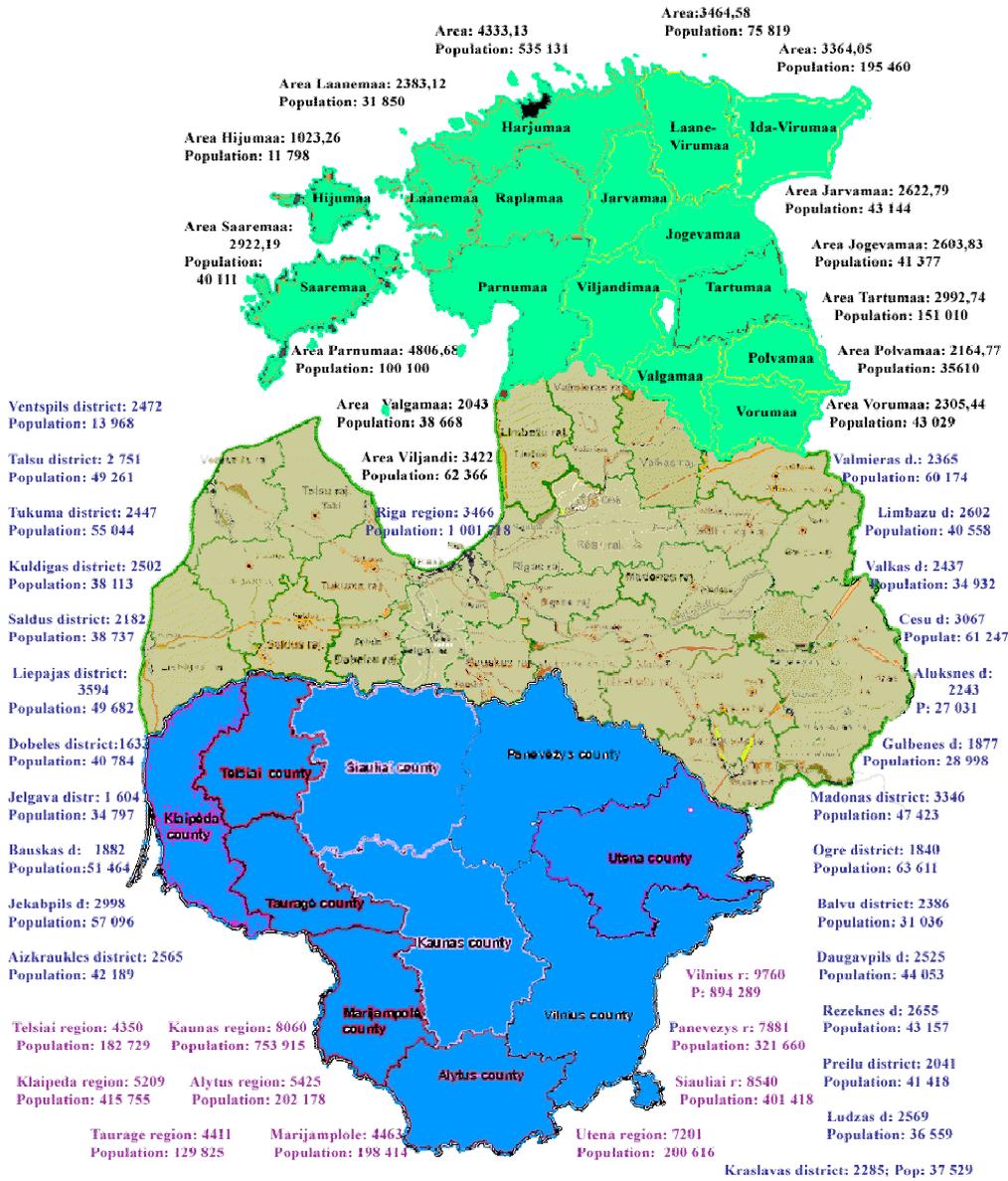
*Agriculture*

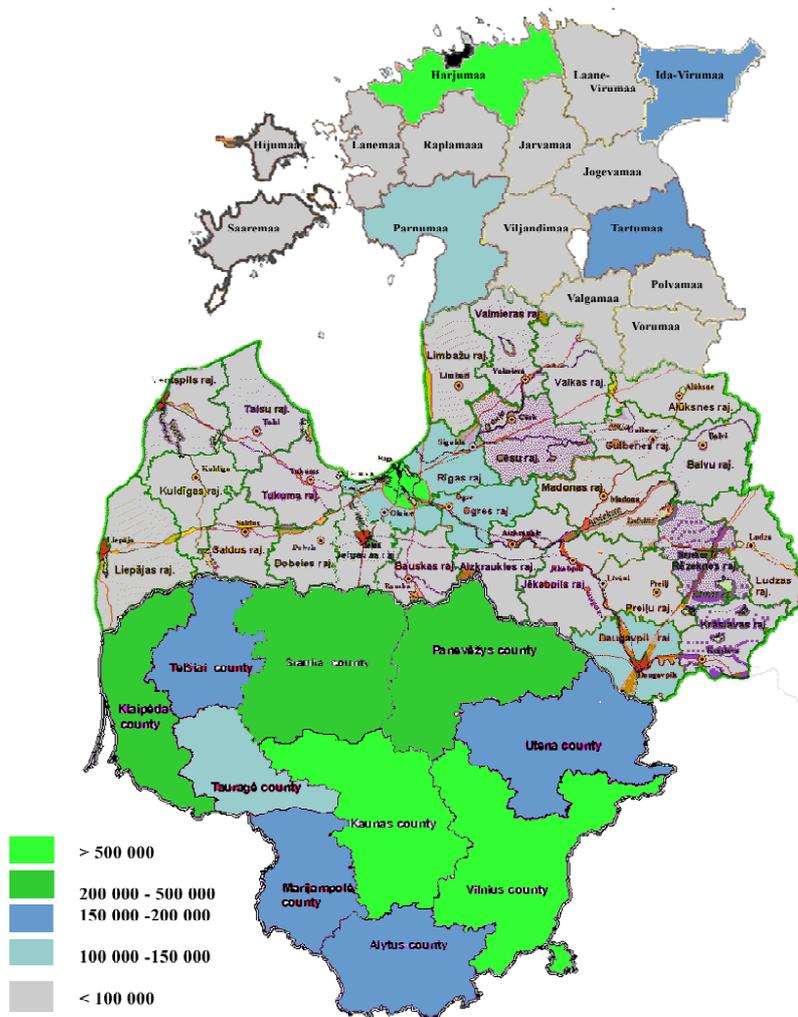
22. Registered land (in use) , per cent country area 1999





### Baltic States regions







Map 4. Higher Education Institutions and number of Students in Baltic States, 1999



Students share of region population 1999

Map 5. Students in Higher Education Institutions in the Baltic States, per cent of the resident population of the region, 1999





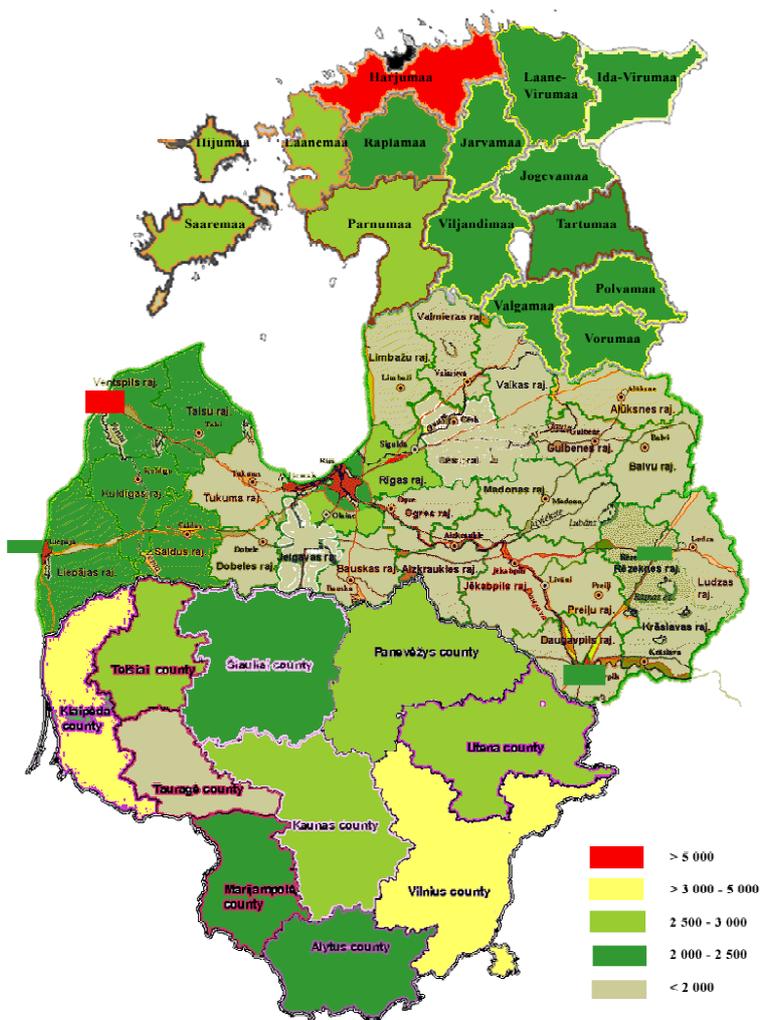




Map 11. Gross montly wages and salaries, 1999

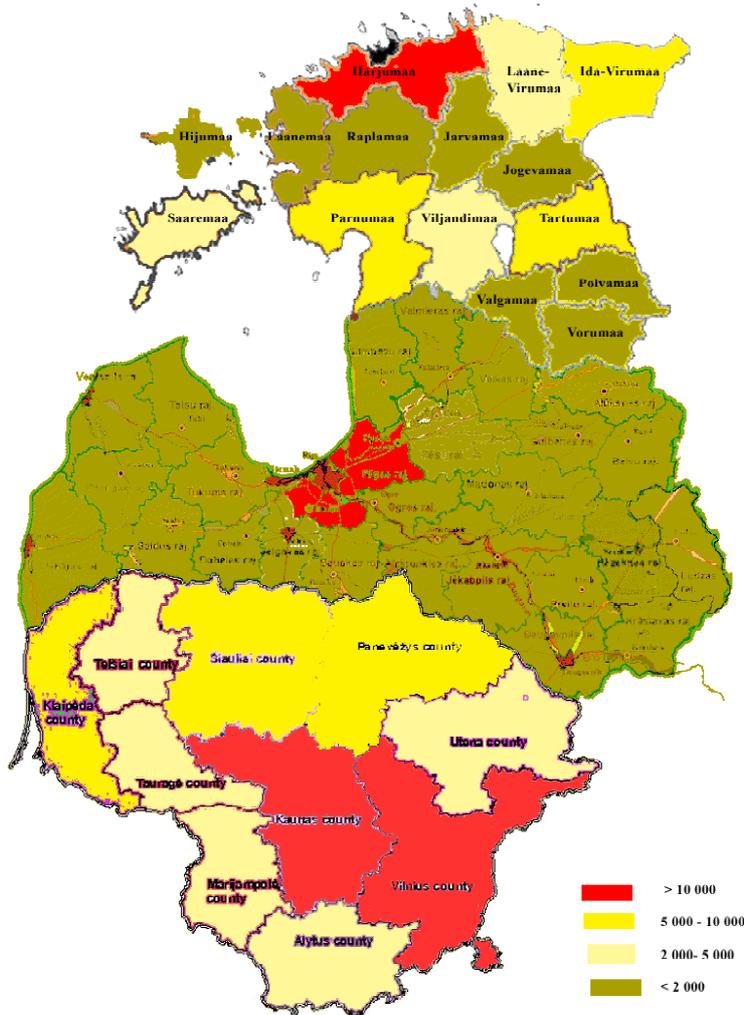


GDP per capita, 1998, USD





Map 15. Economic entities, 1999







Map 18. Industrial production/sales in the Baltic States, per cent distribution in the country, 1999



Map 19. Employed in industry, per cent of country population 1999.







