DISTRIBUTION OF ECONOMIC ACTIVITY IN THE BALTIC STATES: CONCENTRATION AND SPECIALIZATION PATTERNS

JŪLIJA BAŠAROVA
NELLIJA TITOVA

University of Southern Denmark

June 2004

YouREC Working Paper
June 2004

Distribution of Economic Activity in the Baltic States: Concentration and Specialization Patterns

Abstract

The Baltic States – Lithuania, Latvia and Estonia – 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 in the long run. The reasons for this lie much deeper than is usually supposed. Looking closer, the three Baltic 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.
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.

Keyword : Baltic States, Transition and Enlargement Processes

Authors:
Jūlija Bašarova, ajiluj@one.lv
Nellija Titova, nellija@eurofaculty.lv
University of Southern Denmark
Campusvej 55
DK-5230 Odense M
Denmark

INTRODUCTION

The Baltic States – Lithuania, Latvia and Estonia – 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 in the long run. The reasons for this lie much deeper than is usually supposed. Looking closer, the three Baltic 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.

The experience of transition together with prospective accession to the European Union offer a natural experiment in how such factors have influenced international location decisions and the Baltics represent a neat laboratory to test the ideas of the theory on spatial distribution of economic activity and the clustering theory.

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.

In Part 1 we have compiled a variety of descriptive statistics some of which we have displayed on maps of the three Baltic countries (analysed in Part 1 below) and others are reported as summary statistics (Part 3). The territorial units of analysis employed in the research are counties in Lithuania and Estonia (10 and 15 respectively) and districts (26 of them) in Latvia.

Using the data of Central Statistical Offices of the three countries, we have faced a number of problems in the process of data synchronisation and analysis, i.e. different methodology and definitions, different time periods for certain statistics, unavailability of all the necessary data at certain aggregation level for all the three countries etc.

In Part 2 of the thesis we give a brief presentation of different theories related to the distribution of economic activity and the determinants of economic location, as well as a short overview of empirical studies on the issue.

Summary statistics on the location of economic activity are calculated and analysed in Part 3. Unfortunately, for the moment the summary statistics are most detailed and comprehensive for Latvia so there remains some work to be done on the other two countries. The disaggregated data set is available only for Latvia and, therefore, makes the analysis of Latvian data more comprehensive. For the investigation of the regions or districts of the Baltic countries and their industries, the Location Quotient method was applied to measure the concentration and importance of an economic activity in regions relative to other selected territories.

Part 4 presents the econometric results on the application of Midelfart-Knarvik et al. (2000) model on determinants of distribution of economic activity and Davis and Weinstein (1998) model on determinants of manufacturing production structure.

The final part of the thesis, Part 5 contains further research proposal, to use in the future when appropriate data will be collected and synchronised. In particular, the analysis of the thesis could be extended to include Stern, Porter and Furman (2000) model on the determinants of national innovative capacity that has to be modified to be applied to the case of the Baltic States.

We would like to stress here that the given paper is just one of the first attempts to elaborate on this theme in Latvia, Lithuania and Estonia. Therefore the rich empirical testing is required to follow up with the theoretical framework.

PART I. GEOGRAPHICAL STRUCTURE OF INDUSTRIAL ACTIVITY AND HUMAN RESOURCES IN THE BALTIC STATES

1.1. Introduction

In this section we provide a visual description of the geographical structure of industrial activity and human resources in the three Baltic States with an aim to find empirically concentration tendencies in the Baltic States using available statistics. For the comprehensive investigation of the distribution of economic activity and human resources in the Baltic States, we take a snapshot of statistics available for the year 1999 (the latest year obtainable for the three countries at the time of the research). The processing of numerous available statistics resulted in creation of an extensive database covering different socio-economic aspects. For easier perception of data, the various statistical indicators were reflected in maps (23 altogether).

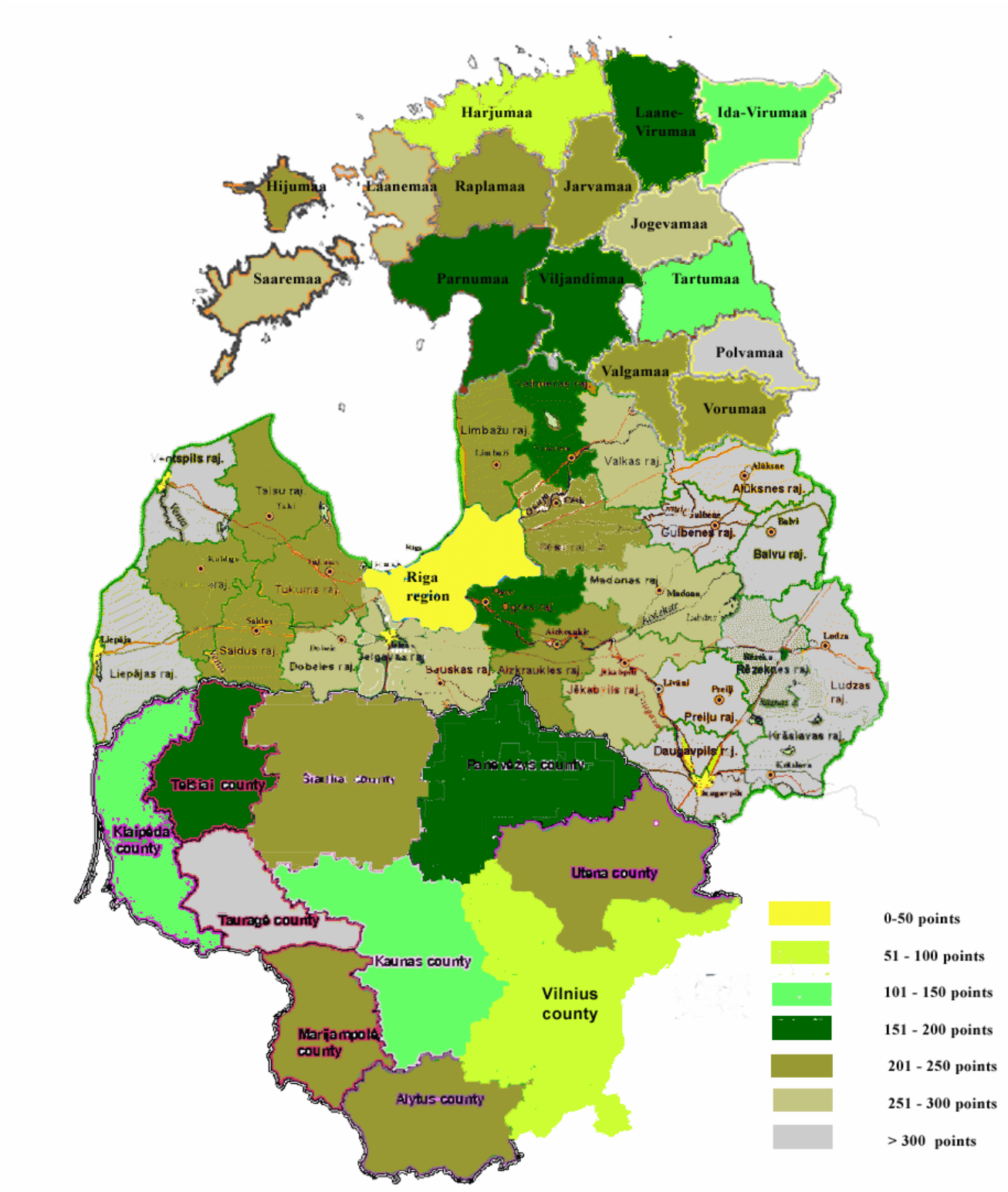
Two notes are important at this point:

1) The choice of variables under analysis is based on the relevance (direct or indirect) of a particular variable to the issues spatial distribution of economic activity and human resources.

2) The reason for choosing statistics for 1999 was the availability of extensive data for this year at the time of the research. Not all the statistics for later years were fully available for public due to delayed calculations and publishing. Due to differences in methodology of data collection and limited and complicated access to data the descriptive part is limited to 23 basic variables to compare.

In order to summarize the statistical information related to the concentration of economic activity and human resources issues, we sorted the data in ascending order for each of the variable of analysis and gave scores to each of the region according to its performance: the minimum score was given to the "best" value of the respective indicator. The scores for a particular variable ranged form 1 (most concentrated region) to 51 (most underdeveloped / problematic region). Then the regions were grouped according to the sums of the scores. (see Annex 1.)

Map 1 Regional scoring model



As a result we have 6 groups of regions depicted on **Map 1**, i.e.:

1. The representatives of the first and second groups of regions show the highest rates of concentration. Not surprisingly we have the groups consisting of the regions where the capitals of the Baltic countries are situated. The dispersion of scores is interested here. The only representative of the first group is undoubtedly **Riga region** in Latvia with only 34 points. Riga holds first place over all the regions in five positions, namely Density of population, universities, vocational and secondary education establishments, employment rate and contribution of region to state industrial production. Riga is in the second position looking at number of economic entities', third speaking about industrial production per employee, fourth for investment per capita, sixths for contribution of region to GDP share. The only weak point of Riga is gross wages situation, where statistics shows Riga being on 14th position but that could be explained by low quality of statistics on real incomes of population.

   The next region with twice as higher scores is **Harju region** (Tallinn included) in Estonia (68 points). Harju region in turn keeps leading positions in number of economic entities, investment per capita, gross wages and contribution of region to GDP terms. Employment rate position is only 14th comparing the regions of the Baltic States and the lowest score is for industrial production per employee showing the effectiveness of production.

   The last in the group is **Vilnius region** with maximum possible point number in the group, namely 100.

3 The third group presents the information on the "second best" in the countries among the regions. Tartu (Estonia), Kaunas and Klaipeda (Lithuania), the second biggest cities and, as a consequence, regions where the cities are situated, are among the regions listed in the third group ranging from 100 to 150 points. What is interesting about the group members – the majority of the regions have quite low employment rates in spite of having significant amount of economic entities and universities in the region, and quite low investments per capita rates compared with the average in the country (except for Tartu). This fact could be partly explained by the high density of population as it usually lowers the per capita ratios. Latvian regions are not present in this group. That reflects the real life situation when we see a big gap between the development of Riga region and other regions of the country.

4 The range of the fourth group including four Estonian, three Lithuanian and three Latvian regions is 151 to 200 points. The regions representing this group not necessarily have universities on the regions' territory. Ogres region in Latvia is compensating lack of education in the region by high investment per capita and, therefore, still is in the fourth group.

5. The fifth and six groups scoring 200-300 points represent the middle level regions in the Baltic States. These are the two biggest groups in our distribution and we have to make a deeper analysis to formulate some conclusions on region similarities and specific features.

6. The seventh groups in our table are the poorest and less concentrated region. What is shocking here is the fact that Ventspils and Daugavpils regions in Latvia and especially Vilnius region in Lithuania showing impressive results as cities are the poorest as regions. Another sad fact is the composition of the group, i.e. mainly Latvian regions down the table.

The general conclusion:

Looking at the distribution of the regions we can see that countries have different patterns of allocation and concentration of economic activities. Latvia shows the most extreme case being at the same time the first and the last in the range. Dissimilarities of Riga region and border regions could be seen at the first glance from general statistics for the regions. Lithuania, by contrast, is presenting the example of equally spread activities showing the average level results for the majority of the regions. Estonia shows the middle line tendency having undoubtedly top region Harju (Tallinn) being the centre and the number of well developed regions as well as loosing positions in the peripheral regions.

PART 2. SPATIAL DISTRIBUTIONS OF ECONOMIC ACTIVITY: THEORETICAL BACKGROUND AND EMPIRICAL EVIDENCE

There is a growing literature documenting spatial distributions of industries at country and regional levels, which focuses predominantly on the United States and the European Union. In this section we present some of the findings and results of these studies, as well as we try to apply these theories to the Baltic case.

2.1. Location Theory

The impact of economic integration on regional specialisation and location of industrial activity has been analysed using three theoretical approaches[1]. While offering different explanations of patterns of specialisation, all three theoretical models predict **increasing specialisatio**n as a result of trade liberalization and economic integration. It is impossible to give a full presentation of a vast body of theoretical thinking in a summary of a couple of pages, thus we present here a simple categorisation of intellectual contributions, which can give structure to the following analysis of dispersion of economic activity in the Baltic countries. (see Table 2.1.)

The **neo-classical theory** predicts that trade liberalization (economic integration) will result in production re-location and increasing specialization according to comparative advantages. The consequent changes in demands for factors of productions will tend to equalize factor prices across countries and regions. The neo-classical trade models can explain a substantial proportion of inter-industry specialization. While relevant, comparative advantage is however not sufficient as the only explanation of specialisation. In reality, different production structures are found in similar regions and the bulk of trade takes place among countries with similar factor endowments and production technologies. Most of trade between industrialised countries takes the form of intra- industry trade that is an exchange of differentiated goods that fall into the same product category.

[1] Recent surveys of theoretical literature include: Amiti (1998), Venables (1998), Brülhart (1998), Aiginger et al. (1999), Hallet (2000).

Table 2.1. Three Strands of Location Theory

	Neo-Classical Theory (NCT)	New Trade Theory (NTT)	New Economic Geography (NEG)
Seminal papers	Ricardo (1817)[a], Heckscher (1919), Ohlin (1933), Weber (1909), Vanek (1986)	Krugman (1979, 1980, 1981), Dixit and Norman (1980), Helpman and Krugman (1985), Weder (1995)	Marshall (1920)[b], Krugman (1991a, b), Krugman and Venables (1995a, b), Venables (1996), Markusen and Venables (1996), Puga and Venables (1997), Fujita, Krugman and Venables (1998)
Market structure	Perfect competition	Monopolistic competition	Monopolistic competition
Determinants of location	• Technological differences • Natural resource endowments • Factor endowments and factor intensities	• Degree of plant-level increasing returns • Substitutability of differentiated goods • Size of home market [c]	• Pecuniary externalities (labour-market pooling, input-output linkages, migration-induced demand linkages) • Technological externalities [d] • Trade costs
Location of industry	• Overall distribution of economic activity (labour) determined by given endowments • Inter-industry specialisation • Unique equilibria	• Overall distribution of economic activity (labour) exogenously given • Intra- and inter-industry specialisation • Unique equilibria	• Overall distribution of economic activity (labour) endogenous • Centripetal agglomeration forces • Intra- and inter-industry specialisation • Multiple equilibria • "u curve"
Trade structure	Inter-industry trade [e]	Intra- and inter-industry trade	Intra- and inter-industry trade
Welfare effects of nondiscriminatory trade liberalisation	• Net welfare gains • All countries gain • Owners of scarce factors lose	• Net welfare gains • Large countries benefit more than small ones • Possibility that owners of all factors gain	• Net welfare gains • "u curve": periphery/ core can lose at intermediate/ advanced stages of integration

[a] Strictly speaking, Ricardo's work is part of pre-Marshallian "classical" economic theory.
[b] Recent work on NEG theory mainly amounts to a formalisation of Marshall's ideas.
[c] Some authors consider models with non-zero trade costs (a la Krugman, 1980) as part of NEG.
[d] This is not formally an element of NEG models, but implicitly cannot be disassociated from other concentration forces.
[e] Davis (1995) has shown that IIT can be compatible with a Ricardian trade model.

Source: Brülhart 1998

The prediction of **new trade theory** regarding the distribution of economic activity between the core and periphery is relevant in the case of the accession of Central and East European countries to the European Union. The current economic integration situation could be seen as one with "intermediate trade costs". A further integration could result in re-location of manufacturing towards these countries due to factor cost considerations.

New economic geography models: If trade costs are sufficiently low, demand linkages outweigh the trade costs of servicing a non- local market. In this case, regions with an initial scale advantage in a particular sector would see their advantage reinforced in those sectors. Supply-

side linkages: manufacturing firms benefit from locating in a region where they have access to suppliers providing a range of specialised. In this case, one would expect European integration to simply bring about massive concentration and specialisation in sectors where supply-side and demand-side linkages are important. However, the simple agglomeration result seems unrealistic in a European context where inter-EU country mobility is extremely low and even intra-EU country mobility is less than perfect. Agglomeration effects emerging around border regions could be observed: by locating closer to border regions, firms might be able to exploit supply-side linkages with firms in other EU countries whilst still attracting their own national work force without increasing labour demand and setting off a large increase in labour costs.

Previously mentioned models of comparative advantages and/or increasing returns make a number of predictions about the characteristics of the industries we should expect to become geographically concentrated, and the characteristics of the countries where these locate. The main deficiency of many (if not of all) theories is restrictive and unrealistic assumptions. Therefore, one should look at the question: which theory is best at approximating real-world events at a particular time, in a particular sector and/or at a particular location?

2.2. Empirical Evidence

The spatial distribution of economic activity in itself is one of the most important research topics in economics. Hence, much of the relevant empirical literature is not designed as an explicit test of competing theories, but mainly as a descriptive account of locational structures and trends. Compared to the theoretical literature, empirical analysis of the impact of economic integration on regional specialisation and geographic concentration of industries is still at an early stage of analysis. There is no consensus on conceptual issues and evidence appears partly contradictory. In this Section, we provide some characteristics and results of recent work in this field.

The most interesting studies have focused on the US and the European Union (EU) and have established the following stylised facts (Traistaru et. al (2002:6)):

a) Regional specialization and industrial concentration are higher in the US than in EU (Krugman, 1991b; Midelfart-Knarvik et al., 2000; Aiginger et al., 1999)

b) Production specialisation has increased in EU Member States while trade specialisation has decreased (Sapir, 1996; Amiti, 1997; Haaland et al., 1999; Midelfart-Knarvik et al., 2000; Brulhart, 1996, 2001)

c) Slow growing and unskilled labour intensive industries have become more concentrated in the EU (Midelfart-Knarvik et al., 2000)

d) Medium and high technology industries have become more dispersed in the EU (Brulhart, 1996, 2001)

e) Industries with large economies of scale have been concentrated close to the European core during the early stages of European Integration but have become more dispersed in the 1980s (Brulhart, 1998; Brulhart and Torstensson, 1996)

The main features of studies on the EU can be briefly summarised as follows:

- Most studies use national data, i.e. data at Member States level;
- Time periods taken into account are 10 to 25 years due to the limited availability of comparable earlier data (in comparison to the USA);
- Variables analysed are mostly on production, employment or trade in the manufacturing sector;
- Indicators used vary considerably, although all of them take either a sectoral perspective ("concentration") or a geographic perspective ("specialisation");
- Most authors add a statistical analysis to explain the results by specific industry characteristics (factor, scale and R&D intensities etc.) or country characteristics (centrality, income etc.).
- Most studies find a (weak) tendency towards less specialisation and concentration in manufacturing in the 1970s and a slight reversal of this tendency since the 1980s. However, we still do not avail of a consistent and comprehensive description of specialisation trends in the EU. There is an evident contradiction between the specialization results based on trade data, which show rising intra-industry trade, and those based on production data, which suggest increasing concentration.

With respect to the EU accession countries, existing evidence based on trade statistics suggests that these countries tend to specialise in labour and resource-intensive sectors following an inter-industry trade pattern (Landesmann, 1995). Despite the dominance of the inter-industry (Heckscher-Ohlin) type of trade, intra-industry trade has also increased, more evident for the Czech Republic and Hungary (Landesmann, 1995, Dobrinsky, 1995). This increase however,

may be associated with the intensification of outward processing traffic. Most of the research on regional issues in transition economies has focused on patterns of disparities with the aim to identify policy needs at the regional level (for instance Spiridonova 1995, 1999 - for Bulgaria, Nemes-Nagy, 1994, 1998 - for Hungary, Constantin, 1997 - for Romania). It has been claimed that the processes of internationalisation and structural change in transition economies tend to favour metropolitan and western regions, as well as regions with a strong industrial base (Petrakos, 1996). In addition, at a macro-geographical level the process of transition will increase disparities at the European level, by favouring countries near the East- West frontier (Petrakos, 1999). Increasing core-periphery differences in Estonia are documented in Raagmaa (1996). Regional determinants of new private firms in Romania have been investigated in Traistaru (1999). Using the approach of the "new economic geography", Altomonte and Resmini (1999) investigated the role of foreign direct investment in shaping regional specialisation in accession countries. [Traistaru *et al.* (2002)]

Yet to date, there is no comprehensive study on the impact of the economic integration with the European Union on regional specialisation and location of industrial activity in accession countries.

PART 3. SUMMARY STATISTICS OF LOCATION OF ECONOMIC ACTIVITY IN THE BALTIC STATES

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". This problem could be viewed 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 the following data:

- Gross value added regional data by kind of activity, Latvia and Estonia, current prices, 1996-1998;
- Employment regional data by kind of activity, Latvia and Lithuania, 1996-2001.

The gross value added statistics is preferable calculating the indexes. Due to the lack of poor diversity of data on gross value added describing geographical structure of production across the region we have used also the employment data. The employment data also reflect the cluster structure and due to a richer range of data available the employment-based calculations are analyzed and presented in the paper together to the value added method. Therefore, we can compare the geographical structure of the Baltic States using value added and employment proxies for production that appear to provide quite different results in many aspects.

We calculated location and specialisation coefficients and other indicators for 5 big Latvian regions for 15 NACE industries with value added data for 1996-1998 and with employment data for 1996-2001. Estonian regional value added data allowed us to calculate the mentioned statistics for 6 sectors of economy, while Lithuanian data limited the analysis to 10 regions and only 4 economic sectors. The given short version of paper presents only some fragments of analysis – results of economic base analysis for the regions and industries of the three Baltic countries.

Box 3.1. Summary Statistics of Location Definitions

- ✓ ***Production specialisation*** is the (distribution of the) shares of an industry in total manufacturing in a specific country *i*.

  If we denote y_i^k as production of industry *k* in location *i* then

  The *specialisation* of a location can be studied by looking at y_i^k relative to the total production of that location, $s_i^k = y_i^k / \Sigma_k y_i^k$. This measures the share of industry *k* in region *i*'s total production of all industries.

- ✓ Geographic ***concentration*** (alternatively – ***localization***) is the (distribution of the) shares of countries or regions in an individual industry *k*.

  The *concentration* (or *localisation*) of industry *k* can be addressed by looking at y_i^k relative to total production of that industry: $l_i^k = y_i^k / \Sigma_i y_i^k$. This measures the share of location *i* in the total production of industry *k*.

- ✓ ***Location Quotient:*** Since regions and industries differ in size, it is necessary to normalise these two measures. If we normalise the first by the share of the location in overall activity and the second by the share of the industry in overall activity we end up with a measure which is called the *location quotient,*

$$r_i^k = \frac{y_i^k / \Sigma_i y_i^k}{\Sigma_k y_i^k / \Sigma_i \Sigma_k y_i^k} = \frac{y_i^k / \Sigma_k y_i^k}{\Sigma_i y_i^k] / \Sigma_k \Sigma_i y_i^k}$$

  These are two equivalent expressions or interpretations of the location quotient. The first is as a measure of the localisation of industry *k* in *i*, relative to the localisation of activity as a whole in *i*. The second is as a measure of location *i*'s specialisation in industry *k* relative to the share of the industry in total world output. It is important to be clear that economic geography models make statements about both localisation and specialisation. We shall refer to statements about the distribution of r_i^k across locations *i* for given industry *k* as statements about the localisation of industry *k*, noting that *k* could be an aggregate of many or all sectors. And we shall refer to statements about the distribution of r_i^k across industries for a given location as describing the specialisation of location *i.*

- ✓ ***Herfindahl*** **(H)**: This measure is popular in industrial economics and in competition policy. It sums up the squared share of each sector or industry in total manufacturing. For example, the Herfindahl index of absolute specialisation, takes the form $h_i = \Sigma_k (s_i^k)^2$. Though the measure formally makes use of all information, its value is heavily influenced by the largest (market, export, country) shares.

3.1. Economic Base Analysis for LATVIAN Regions and Sectors

*3.1.1. **Value added data***

A commonly used methodology for location 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 en economic activity than the benchmark, this indicates an activity that exports it 'surplus', that is, produces goods and services in a volume that is higher then 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, we calculate the LQ for Latvian regions and 2-digit industries. Each region's coefficients are ranked in descending order of LQ in Table 3.1.

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 other regions. 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.

Table 3.1. Location Quotients and Basic Activities of the Regions

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

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 much poorer regions of Latvia with low private sector value added than Riga region.

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 whole Latvia, these activities are non-urban in nature. Similarly for mining and quarrying (0.501).

According to Table 3.10., 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) – Liepaja 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.

3.1.2. ***Employment data***

Table 3.2. provides the calculation results by ranking the coefficients in a descending order – we get the information on basic activities in five big Latvian regions in the year 1998 using employment as a proxy.

Table 3.2. Location Quotients and Basic Activities of the Regions

R		V		K		Z		L	
K	1.490	**A**	2.130	**B**	3.852	**A**	2.704	M	1.280
H	1.346	**C**	1.439	**A**	1.257	**C**	1.982	L	1.242
J	1.268	**M**	1.304	**F**	1.224	**M**	1.308	N	1.175
G	1.137	**E**	1.296	**I**	1.136	**E**	1.145	E	1.129
F	1.123	**L**	1.193	**E**	1.128	**N**	1.076	D	1.033
I	1.102	**N**	1.074	**L**	1.095	**L**	1.042	A	1.025
O	1.068	**D**	1.047	**M**	1.074	**O**	0.981	I	1.016
D	0.982	**O**	0.972	**D**	1.031	**D**	0.958	G	0.886
N	0.941	**G**	0.864	**O**	0.935	**G**	0.819	O	0.843
L	0.857	**J**	0.757	**N**	0.903	**F**	0.814	J	0.821
E	0.831	**F**	0.701	**H**	0.881	**I**	0.752	F	0.768
C	0.788	**I**	0.658	**G**	0.863	**H**	0.643	C	0.713
B	0.782	**H**	0.482	**C**	0.838	**J**	0.626	H	0.580
M	0.765	**B**	0.471	**J**	0.674	**B**	0.485	K	0.540
A	0.276	**K**	0.445	**K**	0.510	**K**	0.479	B	0.203

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: authors' calculations

Riga region shows the highest coefficient in Real Estate Business followed by Hotel and restaurant business, thus matching the gross value added results. Trade and Financial interpretation changing the rank still appear as one of Riga region basic activities.

As for differences, Manufacturing drops from the list of basic activity in employment case. In contrast to value added interpretation it could be seen that Riga region could not be considered industrial region in 1998. The second difference appearing in table 3.2. is Transport and Storage coefficient among the basic activities of Riga region. That could be logical as Transport and storage activity is one of the sound business areas, Riga being the crossroad of the West-East, North-South corridors.

Vidzeme in employment terms shows one additional activity, but unfortunately we cannot interpret the activity as it is Other activities which is quite broad category.

Comparison of **Kurzeme** value added bases and employment based calculations shows drastic decrease in the number of basic activities from employment point of view. The number of basic activities reduces from 8 in value added case to 4 in employment one excluding 4th, 5th, 6th and 7th activity from the list, namely Electricity, gas and water supply, Public Administration, Manufacturing and Education.

Zemgale column shows perfectly identical results to the value added ones.

In **Latgale** column the number of basic activities remains the same Construction being subtracted by mining and quarrying activity. Therefore we can logically conclude that value added statistics extracts manufacturing as basic activity mining and quarrying as low value added activity while in labour terms mining and quarrying employs more people than manufacturing.

3.1.3. Economic Base Analysis for LATVIAN Manufacturing

In order to get a more detailed and comprehensive picture of the distribution of economic activit in Latvia, we calculated LQs for manufacturing sub-sectors for the 5 Latvian regions for 1998.

In value added terms, **Riga** region has a big number of basic activities in manufacturing – 16 out of 23 sub-sectors have LQ > 1, while in employment terms – only 10. Basic sectors in Riga region only in value added are: manufacturing of tobacco products, office machinery and computers, chemicals and chemical products, pulp, paper and paper products, motor vehicles,

trailers and semi-trailers, food products and beverages, wearing apparel, dressing and dyeing of fur. Medical, precision and optical instruments, watches and clocks, electrical machinery and apparatus n.e.c., leather articles, coke, refined petroleum products, furniture, radio, television and communication equipment and apparatus, publishing, printing and reproduction of recorded media, other transport equipment, and rubber and plastic products show highest concentration in Riga region both in value added and employment terms.

Manufacture of textiles, wood and of products of wood and cork as well as manufacture of fabricated metal products, except machinery and equipment are concentrated in **Vidzeme** (value added data). Employment data suggest that only food products and beverages is basic activity in the region.

Manufacture of basic metals shows a particularly high concentration in **Kurzeme**, followed by manufacture of other non-metallic mineral products, manufacture of textiles, manufacture of wood and of products of wood and cork, except furniture, manufacture of fabricated metal products, except machinery and equipment. (value added data)

In **Zemgale**, first place is taken by recycling, then manufacture of wearing apparel; dressing and dyeing of fur, manufacture of motor vehicles, trailers and semi-trailers, manufacture of food products and beverages, manufacture of fabricated metal products, except machinery and equipment, manufacture of wood and of products of wood and cork, except furniture. (value added data)

The fifth region **Latgale** seems to be concentrated in the manufacture of machinery and equipment n.e.c., and recycling, manufacture of other transport equipment, manufacture of coke, refined petroleum products and nuclear fuel, manufacture of wearing apparel; dressing and dyeing of fur, manufacture of other non-metallic mineral products, manufacture of rubber and plastic products. (value added data)

According to our calculations and empirical evidence from the maps, we see that there is a tendency for location clustering in Latvia; at the same time specialization of regions is rather week. All the regions have the standard set of "survival industries" where people are mostly employed. Riga region and Zemgale region show a bigger number of basic activities compared to other big regions thus becoming perspective regions in terms of employment level in the state.

3.2. Economic Base Analysis for ESTONIAN Regions and Sectors (value added, no employment data)

Turning to the Location Quotient, Table 3.3. shows the calculations based on Estonian value added data for 1998.

Table 3.3. Location Quotient

	LOCATION QUOTIENT				
	N	**C**	**NE**	**W**	**S**
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.

3.3. Economic Base Analysis for LITHUANIAN Regions and Sectors (only employment, no value added)

Location quotient analysis crystallizes out the basic activities of the regions.

Table 3.4. Location Quotient

	LOCATION QUOTIENT									
	Alytus	**Kaunas**	**Klaipeda**	**Marijam -pole**	**Paneve- zys**	**Siauliai**	**Taurage**	**Telsiai**	**Utena**	**Vilnius**
Agr, Hunt, Forestry	1.160	0.921	0.808	1.898	1.420	1.806	0.787	0.610	0.954	1.029
Industry	1.385	1.162	0.977	0.807	1.001	0.867	0.180	0.649	0.575	3.102
Construction	0.941	1.090	1.033	0.674	0.780	0.800	0.227	0.583	0.889	3.525
Services	0.791	0.957	1.084	0.745	0.855	1.202	0.295	0.453	0.436	3.870

1) A – Agriculture, hunting and forestry; B – Fishing;
2) C – Mining and quarrying; D – Manufacturing; E – Electricity, gas and water supply;
3) F – Construction;
4) 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: Lithuanian Central Statistical Bureau, authors' calculations

Industry and agriculture are the basic activities in Alytus, Kaunas, Klaipeda, Panevezys and Sauliai region. The two extreme cases are the regions without basic industries (Taurage, Telsi, Utena) and with all the activities as basics (Vilnius regions).

Unfortunately, the data available for Estonian and Lithuanian industries and/or regions does not allow to make a full and comprehensive analysis of the distribution of economic activity within these countries.

PART 4 ECONOMETRIC ANALYSIS ON SPATIAL DISTRIBUTIONS OF ECONOMIC ACTIVITY IN THE BALTIC STATES

4.1. Determinants of Regional Specialization and Industrial Concentration Patterns

This section presents the results of our econometric analysis on determinants of regional specialization and industrial concentration patterns based on Midelfart-Knarvik et al. (2000) model.

4.1.1. Midelfart-Knarvik et al. (2000) Model

According to the empirical model proposed by Midelfart-Knarvik et al. (2000), location and specialization patterns are determined by "multivariable interactions between industry and country characteristics". The reason for evaluating the interaction between regional and industry characteristics lies in the fact that firms evaluate the same kind of production factors differently (Fujita, 1999). Industries will try to locate as close as possible to the place where their most important inputs are available, and will therefore be over represented in that location. Industries for which the same production factor is less important will instead be underrepresented.

Midelfart-Knarvik et al. (2000) apply the model to data for 13 EU countries and 36 industries, from 1970 to 1997. The basic unit of analysis was the activity level measured by the gross value of output – of industry k in country i at time t. The estimation of the model revealed factors that have become more important in determining location. For instance, they find that skilled and scientific labour abundance are becoming more important considerations in determining industrial location, and that the pull of centrality is becoming more important for industries that are intensive users of intermediate goods, although less important for industries with high returns to scale.

To uncover determinants of manufacturing location and explain regional manufacturing production structures differentials in the five accession countries Traistaru et al. (2002) estimate a model similar to Midelfart-Knarvik's et al. (2000). In this paper they analyse patterns of regional specialization and concentration of manufacturing and their determinants using regional manufacturing employment data and other variables at NUTS III level for Bulgaria, Estonia,

Hungary, Romania and Slovenia. The maximum period covered is 1990-1999. The regression analysis supports the prediction that industries in accession countries under investigation tend to locate where productivity factors are abundant and/or costs are low. Labour intensive industries tend to locate in regions with labour abundance while research oriented industries are concentrated in regions with higher shares of researchers in employment. Lager regions have lager shares of manufacturing activity. Industries with economies of scale are positively and significantly correlated with shares of industries. Finally, geographic proximity to European core matters for location of industries in accession countries.

We try to estimate the model similar to Midelfart-Knarvik et al. (2000) and Traistaru et al. (2002) using available regional data of Latvia in 1997, 1998, and 1999. We use the same hypotheses, i.e. regional specialization and industrial concentration patterns are determined by the interaction of regional and industry characteristics. We analyse changes in regional specialization and industry location by regressing the log share of industry i in region j (s_{ij}^S) on regional and industry characteristics, after controlling for the size of regions by means of the log share of population living in region j (pop_j) and of the log total manufacturing located in region j (man_j), using the following specification:

$$\ln(s_{ij}^S) = c + \alpha \ln (pop_j) + \beta \ln (man_j) + \Sigma_k \beta [k])y[k]_j - \gamma [k]) (z[k]^i - \kappa[k]),$$

where s_{ij}^S: the share of industry i in region j;
pop_j: the share of population of region j;
man_j: the share of total manufacturing located in region j;
$y[k]_j$: the level of kth region characteristics in the jth region;
$z[k]^i$: the level of the kth industry characteristics in the industry i;
α, β, β [k], γ [k] and κ[k]: the coefficients to be estimated.

Note:

- the kth region characteristics is matched with k^{th} industry characteristics;
- the share of industry i in region j (s_{ij}^S) is computed using value added data. For comparison purposes, the same regressions were run with s_{ij}^S computed using employment data.

This general simulation model incorporates both **factor abundance** and **new economic geography** models. The first two variables appearing on the right hand side (ln (pop_j) and ln (man_j)) capture regional size effects – all else equal, we would expect larger countries to have a larger industrial share in any given industry. These variables are therefore needed to correct for

the disparity in the size of the regions. The remaining terms should capture the interaction between regional and industry characteristics. Details on regional and industry characteristics are shown in Table 4.1.

Table 4.1. Regional and Industry Characteristics

Variable name	Description
REGIONAL CHARACTERISTICS	
Market potential (MP)	Average regional wages (deflated at national level) divided by the average distances from country capital to district towns and cities of the region (in km)
Labour Abundance (LA)	Sum of employment and unemployment, divided by the population in working age (15-65 years)
Agricultural land Abundance (ALA)	Share of agricultural land in the region
INDUSTRIAL CHARACTERISTICS	
Scale economies (SE)	1 = low, 2 = medium, 3 = high (definition by Pratten, 1988)
Technology level (TL)	1 = low, 2 = medium, 3 = high (definition by OECD, 1994)
Labour intensity (LI)	Labour Intensity dummy (definition by OECD, 1994) [LI 1]
	Alternative: estimated share of employment in industry i based on Latvian Labour Force Survey raw data [LI 2]
Agricultural input intensity (AII)	1 = low, 2 = medium, 3 = high (definition by OECD, 1994)

Note: Since the available classification of industries is quite aggregated we were sometimes forced to 'average' the qualitative characteristics proposed by Pratten (1988) and by the OECD (1994).

Source: author's presentation

Midelfart-Knarvik et al. (2000) also suggest using R&D and Research orientation data, as well as shares of persons with secondary and higher education in total population and shares of non-manual relative to manual workers for analysis, but, unfortunately, data for these pairs of variables was not fully available for Latvia at regional/industry level.

Theory tells us which regional characteristics should be interacted with which industry characteristics. We focus on just three regional characteristics and four industry characteristics, giving the six interactions listed in Table 4.2. Two facts drive our choice of these particular interactions. First, they are emphasised by theory. Second, they all had a significant effect in other empirical studies.

Table 4.2. Interaction Variables: Industry/Regional Characteristics Interactions

REGIONAL CHARACTERISTICS	INDUSTRY CHARACTERISTICS
Market potential (MP)	Scale economies (SE)
Market potential (MP)	Technology level (TL)
Labour Abundance (LA)	Labour intensity (LI)
Agricultural land Abundance (ALA)	Agricultural input intensity (AII)

Source: author's presentation

We first briefly consider the interaction variables. The last two pairs of variables are factor abundance and factor intensity measures. Theory dictates the obvious pairing of each quantity measure of factor abundance with a measure of the share of that factor in each industry.

The labour abundance (LA) is used to identify the relative regional abundance this input factor. The labour abundance factor is interacted with the importance of labour as a production factor (LI). The interaction variable LALI should be interpreted on the basis of the idea that industries that highly value some production factors, for example, labour abundance for labour-intensive firms, tend to locate in areas in which labour is abundant. Since we are focussing only on the structure of manufacturing, we take into account 'agriculture abundance' of each region measured by land. As for intensity measure we employ agricultural input intensity in an industry to be interacted with agriculture land abundance of the respective region. We do not have a separate interaction for capital endowments and intensities, because of rather high degree of capital mobility.

The first two pairs of variables are interactions suggested by some of the work on new economic geography. Market potential measures the centrality of each location, it intends to compare regions inside the same country in the context of a closed economy[2], and the two corresponding industry characteristics capture the following arguments. Interaction between market potential and economies of scale give an indicator of proximity to markets that captures the idea that industries with higher economies of scale (and perhaps also, therefore, less intense competition) may tend to concentrate in relatively central locations (Krugman, 1980; Midelfart-Knarvik, 2000). Interaction between market potential and the technology level captures similar tendency to concentrate closer to the centre. Unfortunately we could not check the hypothesis of forwards

[2] Traistaru et al. (2002) also computes market potential indicator in relation to EU to check whether increasing integration with the EU has led to reallocation of activity (industries) from central to regions bordering the EU. We do not employ this indicator here since none of regions of Latvia is bordering with the EU.

linkage (location close to producers of intermediate goods) or backward linkage (location near their customers to minimise transport costs on final sales) due to rather poor data available.

Notes on estimation:

1. The data requires that we estimate a single relationship over all industries and regions. Estimating industry by industry is ruled out, since there are only 5 regional observations; we cannot increase the number of observations by pooling across time due to a short data period available – a typicall problem for a transition economy. The regressions are run separately for each year using OLS pooling across industires;
2. The models are estimated using early data due to limited time period covered as well as search for structural breaks and regional business (production) cycles.
3. Contrary to Midelfart-Knarvik et al. (2000), for various reasons we estimated our models on level data instead of computing a 4-years moving average. The first reason for this choice is the limited time period covered by our data set. Secondly, we compare regions instead of countries: it is plausible that regional differences in business cycle are lower than differences that may be observed among countries. Finally, this approach may enable us to better identify structural breaks that may occur in our data set.

When we estimate the equation, we derive estimates of the three key parameters for each interaction variable - that is, estimates of β [k], γ [k] and κ[k]. We also derive estimates for the impact of the two scale variables - that is, estimates of α and β. In the discussion of our results, we concentrate on the β [k]'s that measure the sensitivity of all industries to variations in the location characteristics. Taking as an example of labour intensity (LI), if LI is an important determinant of location patterns, then we should see a high value of β [LI]. The estimate of κ [LI] tells us the level of labour intensity that separates industries in to 'high' and 'low' labour intensive industries. The estimate of γ [LA] tells us the level of labour abundance that separates regions in to 'abundant' and 'scarce' labour regions. Industries that are highly intensive (relative to κ [LI]) will be attracted to regions that are relatively abundant (relative to γ [LA]). Likewise, industries that have low intensity (again, relative to κ [LI]) will be attracted to regions where labour factors are scarce (again, relative to γ [LA]). To emphasise, this need to consider both high and low intensities and high and low abundance is a result of the general equilibrium nature of the system that makes estimating these relationships so complex.

4.1.2. Estimation Results

Results are given in Table 4.3.We present only standardized coefficients here.

The first two rows give results for the two size variables - measures of population share (share in total population of Latvia) and manufacturing share (share in total Latvian manufacturing). The next three rows (**regional chars**.) give the estimated coefficients on y[k], the regional characteristics. From the estimating regression, we see that this is an estimate of - β [k] κ[k]. If we divide through by the estimate of β [k] this will provide an estimate of the cut-off point defining high and low intensity. The next four rows (**industry intens**.) give the estimated coefficients on z[k], the industry intensities. Again, from the estimating regression, we see that this is an estimate of - β [k] γ [k]. Now, if we divide through by the estimate of β [k] we get an estimate of the cut-off point defining high and low 'abundance'. Finally, the next six rows (**interactions**) give the coefficients on the interaction variables. From the estimating equation, we see that this is an estimate of β [k] – the sensitivity of industry location to the various country characteristics. In the discussion that follows we concentrate on these sensitivity estimates, which capture the changing importance of the various factors driving industrial location patterns.

The columns of the results table also need some clarifications. Column 2 and 3 provide signs of the respective variables in Midelfart-Knarvik et al. (2000) and Traistaru et al. (2002) estimations for comparison purposes. These signs determine our expectations of signs of our variables. Columns 4-10 depict regression results for different time periods, with different dependent variables (Gross Value Added vs. Employment) and alternative definitions of labour intensity variable ([LI 1] and [LI 2], see Table 4.1.).

Table 4.3. Regression Results

Model / Variable			Regression 1	Regression 2	Regression 3	Regression 4	Regression 5	Regression 6	Regression 7
			1997 GVA [LI 1]	**1998 GVA** [LI 2]	**1998 EMPL** [LI 2]	**1998 GVA** [LI 1]	**1998 EMPL** [LI 1]	**1999 GVA** [LI 1]	**1999 EMPL** [LI 1]
	Sign MK	**Sign Tr**	**Stand. Coef. (t)**	**Stand. Coef. (t)**	**Stand. Coef. (t)**	**Stand. Coef. (t)**	**Stand. Coef. (t)**	**Stand. Coef. (t)**	**Stand. Coef. (t)**
Constant	+		(0,516)	(0,442)	(0,327)	(0,899)	(,997)	(-0,764)	(-0,647)
SIZE VARIABLES									
$\ln(pop_i)$	+	0/+	0,211 (0,410)	0,107 (0,343)	-0,017 (-0,051)	0,752 (1,241)	0,781 (1,293)	-0,592 (-0,441)	-0,434 (-0,365)
$\ln(man_i)$	+	0/+	-0,568 (-0,704)	-0,088 (-0,137)	-0,343 (-0,502)	-0,337 (-0,448)	-0,683 (-0,914)	excluded	excluded
REGIONAL CHARACTERISTICS									
Market potential	-	0/-	excluded	excluded	excluded	-0,649 (-0,855)	-0,886 (-1,173)	0,561 (0,335)	0,319 (0,213)
Labour abundance		+/-	0,050 (0,304)	-0,029 (-0,253)	-0,041 (-0,324)	0,144 (0,855)	excluded	0,358 (1,111)	0,276 (0,939)
Agricultural land abundance	-		-0,409 (-0,863)	-0,409 (-0,998)	-0,470 (-1,094)	-0,614 (-1,072)	-0,744 (-1,314)	-0,202 (-0,583)	-0,205 (-0,636)
INDUSTRY CHARACTERISTICS									
Economies of scale	-	-	-0,168 (-0,863)	-0,119 (-1,121)	-0,190 (-1,773)*	-0,024 (-0,156)	-0,166 (-1,084)	-0,027 (-0,159)	-0,165 (-1,084)
Technology level		+	0,429 (2,936)***	0,087 (0,942)	0,094 (0,922)	0,304 (2,295)**	0,359 (2,616)***	0,339 (2,299)**	0,359 (2,620)***
Labour intensity		0	0,189 (0,495)	0,213 (1,754)*	0,203 (1,525)	0,378 (1,082)	0,278 (0,758)	0,424 (1,084)	0,278 (0,759)
Agricultural input intensity	-		-0,074 (-0,308)	-0,084 (-0,501)	-0,046 (-0,248)	-0,034 (-0,146)	0,071 (0,269)	-0,037 (-0,143)	0,071 (0,297)
INTERACTIONS									
Market potential * Economies of scale	+	+	0,312 (2,825)***	0,068 (0,892)	0,025 (0,314)	0,197 (1,958)**	0,293 (2,869)***	0,221 (1,961)*	0,293 (2,871)***
Market potential * Technology level			0,242 (1,267)	0,036 (0,278)	0,080 (0,586)	0,135 (0,770)	0,242 (1,357)	0,153 (0,778)	0,243 (1,360)
Labour abundance * Labour intensity		+	-0,326 (-0,846)	0,481 (4,439)***	0,564 (4,762)***	-0,557 (-1,571)	-0,649 (-1,746)*	-0,624 (-1,573)	-0,649 (-1,747)*
Agricultural land abundance * Agricultural input intensity	+		-0,059 (-0,254)	-0,094 (-0,556)	-0,168 (-0,07)	-0,156 (-0,680)	-0,324 (-1,360)	-0,176 (-0,684)	-0,324 (-1,361)
Dependent variable			$\ln(s_{ij}^s)$=the share of **gross value added** of ind. j in reg. i	$\ln(s_{ij}^s)$=the share of **gross value added** of ind. j in reg. i	$\ln(s_{ij}^s)$=the share of **employment** of ind. j in reg. i	$\ln(s_{ij}^s)$=the share of **gross value added** of ind. j in reg. i	$\ln(s_{ij}^s)$=the share of **employment** of ind. j in reg. i	$\ln(s_{ij}^s)$=the share of **gross value added** of ind. j in reg. i	$\ln(s_{ij}^s)$=the share of **employment** of ind. j in reg. i
R^2			0,213	0,677	0,575	0,396	0,295	0,245	0,295
Adjusted R^2			0,091	0,625	0,512	0,299	0,191	0,124	0,191
Number of observations			115	115	115	115	115	115	115

Notes: 1) excluded the variable was excluded by the econometric programme while running the regression
2) * = significant at 10% level, ** = significant at 5% level, *** = significant at 1% level

Source: authors' calculations

As shown in Table 4.3., the first two independent variables of the model ln(pop) and ln(man) soak up regional size differences, as expected. Unfortunately, these variables turned to be not significant.

Concerning the **regional characteristics**, the coefficient of market potential variable, that is an increasing function of the wage level, should be negative meaning that the industry share (s_{ij}^{S}) is lower in these regions where wages are higher – in general industries tend to locate in regions where wages are lower. On the other hand, the MP variable is also a decreasing function of distances with the core of the market. The negative sign imply that the industry share (s_{ij}^{S}) is lower in regions that are located near the core. Our results provide both positive and negative coefficients, but none are really significant. The reason for this contradiction in Latvia could be the location of most industries around the capital and higher wage in the capital in comparison to other regions.

The negative labour abundance (LA) coefficients may mean in general that regions are not labour intensive and may therefore attach a low value to the labour as productivity factor. Second, labour may be abundant in every region and therefore the relative abundance of this production factor may not influence the choice of location of industries. Further analyses are then needed in order to confirm these hypotheses. The significantly positive LA coefficient means that labour intensive industries tend to locate in regions where labour is relatively abundant. Again, we have both positive and negative coefficients in our regressions, but not significant.

We expected a negative agricultural land abundance (ALA) coefficients, meaning land abundance in every region and therefore the relative abundance of this production factor may not influence the choice of location of industries. Our coefficients turned to be negative, but not significant.

Concerning the **industry characteristics**, Table 4.6. shows that the coefficient of the scale economies (SE) variable is negative and even significant for Regression 3. The negative coefficient for SE may be related to our rough classification of industries in three levels of scale economies. Alternatively, the negative coefficient may be due to the post-communist transition, which has probably led to a general reduction of the size of single industries with a consequent inability of profiting of scale economies. The technology level (TL) coefficient is instead mostly significantly positive at 1% level. The labour intensity (LI) coefficient is generally positive and

significant for Regression 2. Finally, the agricultural land intensity (ALI) coefficient is generally negative and not significant.

Many regional and industry characteristics have expected coefficients. But, given the general equilibrium nature of the economic system, these coefficients are of little direct interest. We concentrate on the coefficients β [k], which measure the effect of the interactions and capture the sensitivity of location patterns to the various regional and industry characteristics.

1) **Market potential * economies of scale**: The coefficient on this interaction is positive and generally significant. Theory predicts that market forces induce industries with high returns to scale to locate near the core, and that these forces are stronger at intermediate levels of transport costs. Although, as mentioned above, some more research is needed to better identify the variables identifying the market potential of regions, the fact that these forces are not weakening in the country and in the period of our analysis supports the idea that the transport costs are still at an intermediate level.

2) **Market potential * technology level**: coefficients seem to be not significantly different from zero

3) **Labour abundance * labour intensity**: interestingly enough, there are significantly positive (Regressions 2 and 3) and significantly negative (Regressions 5 and 7) relationships. We may interpret this finding as supportive for the idea of regional specialisation in less labour intensive industries.

4) **Agricultural land abundance * agricultural input intensity**: This interaction does not have the correct sign and is not significant.

As we mentioned in earlier sections, Latvia is a kind of extreme case in the area of production location and regional specialization – in Soviet times the plan dictated the distribution of economic activities within the country and Riga region with its central position and good infrastructure and highly qualified labour was chosen as a major manufacturing centre in the Republic. This pattern of production distribution does explain the results of the applying the model to the real life situation in Latvia. The production potential is still there, after more than a decade passed from the independence restoration. With a closer integration with European Union we still expect changes in the location pattern of manufacturing in the direction of a more evenly spread economic activities.

Summarising then, the econometrics paints a sometimes contradictory picture of the changing interaction between factor endowment and economic geography determinants of location. The results indicate an importance of industry characteristics – economies of scale, technology level and labour intensity, as well as of interactions of industry and regional characteristics – market potential * economies of scale (industries with high economies of scale are locating in central locations) and labour abundance * labour intensity (regional specialisation in less labour intensive industries).

Location shifts take place very slowly and a long time series of data is usually necessary in order to appreciate real changes in industrial relocation and regional specialisation. Unfortunately, rather short history of independent Latvia and short data history does not allow us to perform a fully comprehensive analysis more research is still needed to be able to really appreciate the changes in relocation that their "transition" is implying.

4.2. Davis and Weinstein (1998) Model, Baltic States

In this section we present the model based on paper by Davis and Weinstein (1998) on "Market access, economic geography and comparative advantage: an empirical assessment".

The paper addresses the issue of a richer geography directly on international data. The authors caution the readers that no single analytic model contemplates even the minimal range of issues that the empirical researcher must confront. The previous version of the paper (1996) presents the implementation of Krugman (1980) quite close to the analytic model. The paper discussed in this section takes a larger step away from the formal framework.

The key parameter of the model is the effect of idiosyncratic demand on production. The authors pursue a two-step procedure: first, they estimate a gravity model to derive industry-specific parameters on the dissipation of demand across space; these economic distance parameters are then used to calculate the idiosyncratic demand, taking into account the derived demand from geographic neighbours, which then enters into tests for the home market effect.

The objective is to distinguish a world in which trade arises due to increasing returns as opposed to comparative advantage. That is also the question to answer in Baltic States finding the reasoning for the situation described in Part 1 of the given thesis. Increasing returns to scale as an issue was discussed in Section 4.3. when applying Midelfart-Knarvik et al. (2000) model to Latvian data. This model presented in this section is based on the Baltic States data.

The approach of Davis and Weinstein (1996, 1998) is to hew as closely as possible to the theory, and so provide a highly-structured interpretation of the models. Where it is not possible to provide a full solution, authors make what they consider the most sensible match between theory and specification.

The geography implicit in Davis and Weinstein (1996, 1998) can be thought of as an effort to stay close to the analytic model of Krugman (1980). Where Krugman has two countries with fixed costs of trade between them, Davis and Weinstein have N countries (Estonia-Latvia-Lithuania in our case), any pair of which have the same costs of trade between them. Latvia being in the centre seems to have the same costs of trade with Estonia and Lithuania.

Authors may think of the determination of the output of the various goods within an industry in two stages. Absent idiosyncratic elements of demand, each country allocates its resources across the goods within a particular industry in the same proportion as all other countries. This

provides the country with a base level of production for each good in an industry that authors denote SHARE. The second component arises when there are idiosyncratic elements of demand across the goods — what authors term IDIODEM. These gives rise to home market effects, here a more than one-for- one movements of production in response to idiosyncratic demand.

In order to make this precise, authors must distinguish between a country's demand for a good produced in many locations, which authors denote D_g^{nc}, from the derived demand facing producers in a particular locale which forms the basis for the construction of IDIODEM, the latter of which authors denote $\tilde{D}_g^{nc}$. Authors may denote the correlate for the rest of the world as $\tilde{D}_g^{nROW}$. Because output and demand shares figure prominently in the discussion, it is convenient to define some additional variables. Let $\gamma_g^{nc} \equiv \frac{X_g^{nc}}{X^{nc}}$ and $\tilde{\delta}_g^{nc} \equiv \frac{\tilde{D}_g^{nc}}{\tilde{D}^{nc}}$. With these definitions in hand, the specification may be written in a general form as:

(3) $$X_g^{nc} = \alpha_g^n + \beta_1 \, SHARE_g^{nc} + \beta_2 \, IDIODEM_g^{nc} + \epsilon_g^{nc}$$

where $$SHARE_g^{nc} \equiv \gamma_g^{nc} \, X^{nc}, \quad IDIODEM_g^{nc} \equiv \left(\tilde{\delta}_g^{nc} - \tilde{\delta}_g^{n\,ROW} \right) X^{nc}$$

IDIODEM is authors' measure of the extent of idiosyncratic derived demand. The term in parentheses measures the extent to which the relative demand for a good within an industry differs from that in the rest of the world. If all countries demand goods in the same proportion, then IDIODEM is identically zero. When relative demand for producers of a good in one country is higher (lower) than that in the rest of the world, IDIODEM is positive (negative). Multiplying this term by X^{nc} gives IDIODEM the correct scale and units to include in the regression.

If instead authors believe that endowments may matter for the structure of 4-digit production, then Davis and Weinstein (1996) show that an appropriate way of nesting the models is as follows:

(4) $$X_g^{nc} = \alpha_g^n + \beta_1 \, \gamma_g^{n\,ROW} X^{nc} + \beta_2 \left(\tilde{\delta}_g^{nc} - \tilde{\delta}_g^{n\,ROW} \right) X^{nc} + \Omega_g^n \, V^c + \epsilon_g^{nc}$$

or

(4') $$X_g^{nc} = \alpha_g^n + \beta_1 \, SHARE_g^{nc} + \beta_2 \, IDIODEM_g^{nc} + \Omega_g^n \, V^c + \epsilon_g^{nc}$$

The model allows us to use the estimate of β_2 to distinguish three hypotheses. In a frictionless world (comparative advantage or increasing returns), the location of demand does not matter for the pattern of production, so authors would predict $\beta_2 = 0$. When there are frictions to trade, demand and production are correlated even in a world of comparative advantage, reacting exactly one-for-one when the frictions force autarky. However production does not rise in a more than one-for-one manner. Accordingly, if authors find $\beta_2 \in (0, 1]$, authors conclude that authors are in a world of comparative advantage with transport costs. Finally, in the world of economic geography, authors do expect the more than one-for-one response, hence $\beta_2 > 1$.

Summarizing, the estimate of $\boldsymbol{\beta_2}$ allows us to distinguish three hypotheses:

$\beta_2 = 0$ Frictionless World (Comparative Advantage or IRS)

$\beta_2 \in (0,1]$ Comparative Advantage with Frictions

$\beta_2 > 1$ Economic Geography

These form the basis for our hypothesis tests.

Direct estimation of Equation (4) is not possible because of the simultaneity problem arising from having industry output on the right-hand side and the output of a good within that industry on the left. Authors can eliminate this simultaneity by remembering that, in our framework, endowments determine industry output. Using endowments as instruments for X^{nc} eliminates the simultaneity problem.

There are a number of ways in which authors can estimate Equation (4) in addition to estimating the full system. If one believes that endowments do not matter at the goods level, then one can force Ω to equal zero for every factor and industry. In the absence of factor endowments, one should expect the coefficient on β_1 to equal unity. This is due to the fact that *ceteris paribus* one expects the share of goods production within an industry to be the same across countries. While Davis and Weinstein (1996) confirm this, the parameter often has much larger standard errors and deviates far from unity in specifications including endowments. This owes to the high degree of multicollinearity between SHARE (which is formed in part using endowment instruments) and the endowments. Since authors found that the crucial coefficient on β_2 in specifications with endowments is largely invariant to the inclusion of SHARE, authors dropped the latter from our specifications with endowments.

The main departure that authors contemplate in this paper is the construction of IDIODEM. In Davis and Weinstein (1996), the demand employed in the construction of IDIODEM is simply equal to the demand for the good within a given country. However, as authors noted earlier, this is not the appropriate measure of demand idiosyncrasies relevant to local producers in a world in which real geography is asymmetric. The structure of demand in Germany and France affects the incentives for producers locating in Belgium more strongly than the demand in Japan and Australia. Authors must introduce these aspects of real world geography. They enter in the specification of $\tilde{D}_g^{nc}$.

The main question for empirics is how to estimate the effect of distance on demand.

Leamer (1997) suggests using a parameter from a gravity equation to indicate the impact of distance on demand. Here authors attempt a slightly more refined approach, one that allows each industry to have a different level of trade costs. Specifically, authors assume that the volume of trade in industry *n* between two countries *c* and *c'* is described by the following equation:

$$\ln\left(T_{cc'}^{n}\right) = \phi + \lambda \ln\left(GNP_c\, GNP_{c'}\right) + \psi \ln\left(DIST_{cc'}\right) + \eta_{cc'}^{n}$$

where $T_{cc'}^{\ n}$ is the volume of trade in industry *n* between countries *c* and *c',* GNP_c is the GNP of country c, $DIST_{cc'}$ is the distance between *c* and *c'*. The Greek letters are parameters to be estimated and η is the normally distributed error term. Bergstrand (1990) shows that the gravity model has extremely good predictive power even on an industry level. This no doubt is a result of the high degree of specialization in international production. For our purposes, however, authors want to focus on the distance parameter. This coefficient measures the degree to which distance causes the demand for a product to decline.

Once authors estimate this parameter authors can then calculate the derived demand (domestic plus international) that a producer in a given location faces. Let this be given as $\tilde{D}_g^{nc}$. Let local demand in c for this type of good (from all locations) be D_g^{nc}. Then authors may represent this derived demand for local producers as:

$$\tilde{D}_g^{nc} = k_g^n \sum_{c'} D_g^{nc'}\, DIST_{cc'}^{\psi_n}$$

World demand is then

$$\tilde{D}_g^{nW} = k_g^n \sum_{c,\, c'} D_g^{nc}\, DIST_{cc'}^{\psi_n}$$

If authors require that this redistribution of world demand does not change aggregate world demand, then this is equivalent to requiring that

$$k_g^n = \frac{\sum_c D_g^{nc}}{\sum_{c,\,c'} D_g^{nc} DIST_{cc'}^{\psi_n}}$$

This transformation enables us to redistribute world demand in order to take into account the fact that demand in one country can spill over into another country. The only remaining question is how far countries are from themselves. Authors solve this in a standard way, following Leamer (1997). Assume all countries are circular in shape. If producers are evenly distributed across the circles, then the expected distance between any two randomly selected points equals the radius of the circle. In this case the distance a country is from itself equals the square root of its area divided by π.

The final formula, components descriptions and sources of information that were used for econometric analysis for Baltic States is provided in Box 4.1. The attempt to estimate the demand on the basis of price indexes has resulted in the inappropriate result. Therefore the second attempt was to try to estimate demand on the basis of local and foreign data.

The results of the regression estimating the idiodencrastic demand impact on the output of various goods (see Table 4.7.) show β_2 equal to **0.13** that is belonging to the **interval [0;1]** that according to the Davis and Weinstein (1998) model indicate the hypothesis of the Baltic States as the **"world of comparative advantage with transport costs"**. **Demand matters in Baltic States and influences the structure of production.**

Table 4.7.Results of Regression Estimating the Output through the *Idiodencrastic* Demand

Dependent Variable: XNC_GDP_EST
Method: Least Squares
Included observations: 8

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	337.0695	803.2750	0.419619	0.6894
IDIODEM	0.120500	0.027005	4.462139	0.0043

R-squared	0.768435	Mean dependent var	2798.404
Adjusted R-squared	0.729841	S.D. dependent var	3177.621
S.E. of regression	1651.626	Akaike info criterion	17.86923
Sum squared resid	16367207	Schwarz criterion	17.88909
Log likelihood	-69.47690	F-statistic	19.91068
Durbin-Watson stat	1.533583	Prob(F-statistic)	0.004273

Source: authors' calculation

Box 4.1. Estimated Equation (Summary on the Calculating Procedures)

Base level of production of each good

Measure of the extent of idiosyncratic derived demand

Technology matrix

$$X_g^{nc} = \alpha_g^{n} + \beta_1 * SHARE_g^{nc} + \beta_2 * IDIODEM_g^{nc} + \Omega_g^{n} * V^c + \varepsilon_g^{nc}$$

The key is interpretation of β_2 **coefficient (see below)**

Region' s output of any good

Vector of factor endowments may matter for the 4-digit production

$$= \gamma_g^{nROW} * X^{nc} = X_g^{nROW} / X^{nROW} * X^{nc}$$

$$\gamma_g^{nROW} = X_g^{nROW} / X^{nROW}$$

Note: SHARE variable has been dropped (see the text)

$$= (\delta_g^{nc} - \delta_g^{nROW}) * X^{nc} = (`D_g^{nc} / D^{nc} - `D_g^{nROW} / D^{nROW}) * X^{nc} \rightarrow$$

$$\delta_g^{nc} = `D_g^{nc} / D^{nc}$$

$$= k_g^{n} \sum_{c,c'} D_g^{nc'} * DIST^{\psi n}_{cc'}$$

country's demand for a good

derived demand (domestic plus international) facing producers in particular locale

$$\ln(T^{n}_{cc}) = \varphi + \lambda \ln(GNPcGNPc') + + \psi \ln(DIST_{cc'}) + \acute{\eta}^{n}_{cc'}$$

estimated distance coefficient =>

$$`D_g^{nc} = k_g^{n} \sum_{c'} D_g^{nc'} * DIST^{\psi n}_{cc'}$$

$$= \sum_{c} D_g^{nc} / (\sum_{c,c'} D_g^{nc} * DIST^{\psi n}_{cc'})$$

β_2=0: Frictionless Comparative Advantage World
$\beta_2 \in [0;1]$: Comparative Advantage World with transport costs
$\beta_2 > 1$: Economic Geography

where,

$\mathbf{D^{nc}}$		Country C local demand for this type of good produced anywhere;
	Data:	Wholesale and Retail Trade (Estonia)
$\mathbf{D_g^{nROW}}$		Rest of the world (Baltic States in this particular case) demand for this type of good produced anywhere;
	Data:	Wholesale and Retail (Latvia) and Produced – Export + Import (Lith)
$\sum_{c} \mathbf{D_g^{nc}}$**:**		Country C local demand for goods locally produced in country C;
	Data:	Wholesale and Retail (Estonia) – imports (Estonia)
$\sum_{c'} \mathbf{D_g^{nc'}}$:		Country C' local demand for goods locally produced in country C';
	Data:	Wholesale and Retail (Latvia) – imports (Latvia)
$\sum_{c, c'} \mathbf{D_g^{nc}}$:		total C&C' demand for goods produced in country C;
	Data:	$\sum_{c} \mathbf{D_g^{nc}}$ and Estonian export to Latvia
$\sum_{c, c'} \mathbf{D_g^{nc'}}$:		total C&C' demand for goods produced in country C';
	Data:	Estonian imports from Latvia and $\sum_{c'} \mathbf{D_g^{nc'}}$

PART 5. FURTHER RESEARCH

The theoretical model to apply in the long run is the research by Stern, Porter and Furman (2000) on the determinants of national innovative capacity. Location appears to be one of the determinants in the process of long-run economic growth. Similarly to these authors, authors try to develop the national innovative capacity framework by drawing on three distinct areas of prior research: endogenous growth theory (Romer, 1990), the cluster-based theory of national industrial competitive advantage (Porter, 1990), and the literature on national innovation systems (Nelson, 1993). Due to lack of data authors were forced to leave this model for the future.

CONCLUSIONS

In the thesis we explore and describe the geographic concentration of production and human resources that are one of the determinants of the regional economic development. We would like to stress that the paper is merely one of the first attempts to elaborate on these issues in the Baltic States.

Interesting theoretical forecast by Krugman states that as integration proceeds, the process becomes reversed: as trade costs become small, firms are less willing to pay the higher central wages, and industry will re-locate to peripheral regions where production conditions are more favourable. A closer economic and political integration with the European Union will cause the trade costs to fall and the relocation of economic activities will follow.

If so … we expect some changes in the patterns of specialization and concentration in the Baltic States in the light of accession to the European Union.

Data for a longer period needs to be collected and the research on the spatial distribution of economic activity and specialisation in the Baltics should be continued!

References

Aiginger,K., M. Boeheim, K. Gugler, M. Pfaffermayr, Y.Wolfmayr-Schnitzer (1999) *Specialisation and (Geographic) Concentration of European Manufacturing,* Background paper for "the Competitiveness of European Industry: 1999 Report" European Commission Enterprise DG and WIFO - Austrian Institute of Economic Research

Alvheim, S. and N.B. Groth (2000) *The Role of Universities in Developing the Baltic Sea Region*; "6th Nordic-Baltic conference in Regional Science. Riga, Latvia, October 4-7 2000. Reports", pp.13-19

Amiti, M. (1997) *Specialisation Patterns in Europe*, *CEP Discussion Paper*, No. 363, London School of Economics

Amiti, M. (1998) *New Trade Theories and Industrial Location in the EU: A Survey of Evidence*, Oxford Review of Economic Policy, vol. 14(2), pp. 45-53

Brülhart, M. (1996) C*ommerce et Specialisation geographique dans l'Union Europeenne*; Economie Intarnationale, vol.65, pp.169-202

Brülhart, M. (1998) *Economic Geography, Industry Location and Trade: The Evidence;* The World Economy, vol. 21, 1998

Brülhart, Marius (2001) *Growing Alike or Growing Apart? Industrial Specialisation on EU Countries;* in C.Wyplosz (ed.) *The Impact of EMU on Europe and the Developing Countries*; Oxford University Press

Brülhart, M. and J. Torstensson (1996) *Regional Integration, Scale Economies and Industry Location in the European Union*, CEPR Discussion Paper, No. 1435, Centre for Economic Policy Research, London.

Central Statistical Bureau of Latvia (2000) *Macroeconomic Portrait of Latvian Regions*; Riga 2000

Central Statistical Bureau of Latvia (2001) *Latvian Regions in Figures 2000*

Central Statistical Bureau of Latvia (2002) *Latvian Regions in Figures 2001*

Chandler, M., J. Rojaka and I. Vetlov (2001) *Growth: Experience of and Prospects for the Baltic Economies; CERGE-EI research project;* (http://www.cerge.cuni.cz/pdf/gdn/baltics.pdf)

Counties of Lithuania. Economic and Social Development. Vilnius, 1995, 1996, 1997, 1998, and 1999

Davis, D.R. and D.E. Weinstein (1996) *Does Economic Geography Matter for International Specialization?* NBER Working Paper W6093

Davis, D.R. and D.E. Weinstein (1997) *Economic Geography and Regional Production Structure: An Empirical Investigation*; NBER Working Paper W6093

Davis, D.R. and D.E. Weinstein (1998) *Market Access, Economic Geography, and Comparative Advantage: An Empirical Assessment*; NBER Working Paper W6787

Davis, D.R. and D.E. Weinstein (2001) *Bones, Bombs and Break Points: The Geography of Economic Activity*; NBER Working Paper W8517

Dixit, A. and V. Norman (1980) *Theory of International Trade*. Cambridge University Press.

Dobrinsky, R. (1995) *Economic transformation and the changing patterns of European East-West Trade*, in R.Dobrinsky and M.Landesmann (eds), *Transforming economies and European integration,* Aldershot: Edward Elgar, pp. 86-115

Ellison, G. and E. L. Glaeser (1997) "Geographic Concentration in U.S. Manufacturing Industries: A Dartboard Approach". *Journal of Political Economy*, vol. 105, pp. 889-927.

Francis, I. (2000) *Basic Analysis of Riga's Economy*; "6th Nordic-Baltic conference in Regional Science. Riga, Latvia, October 4-7 2000. Reports", pp.111-115

Gallup, J.L., J.D. Sachs and A.D. Mellinger (1998) *Geography and Economic Development*; NBER Working Paper W6849

Hallet, M. (2000) *Regional Specialisation and Concentration in the EU*, Economic Papers No 141, European Communities, Brussels

Hanson, G.H. (1996) "Economic Integration, Intra-industry Trade and Frontier Regions". *European Economic Review*, vol. 40, pp. 941-949.

Hanson, G.H. (1997a) "Localisation economies, vertical organisation, and trade" *American Economic Review*, vol. 87, pp. 1266-1278

Hanson, G.H. (1997b) "Increasing Returns, Trade and the Regional Structure of Wages". *Economic Journal*, vol. 107, pp. 113-133.

Hanson, G.H. (1998) *Market Potential, Increasing Returns, and Geographic Concentration*; NBER Working Paper W6429

Hanson, G.H. (2000) *Scale Economies and the Geographic Concentration* of Industry; Working paper 8013

Heckscher, E.F. (1919) "The Effect of Foreign Trade on the Distribution of Income" (in Swedish). *Ekonomisk Tidskrift*, vol. 21, pp. 1-32.

Helpman, E. and P. Krugman (1985) *Market Structure and Foreign Trade*. Cambridge (Mass.), MIT Press.

Hudson, R.(1999) *What makes economically successful regions in Europe successful? Implications for transferring success from west to east*; EGRG Working paper 99/01

Kim, S. (1995) *Expansion of Markets and the Geographic Distribution of Economic Activities: The Trends in U.S. Regional Manufacturing Structure, 1860-1987*. Quarterly Journal of Economics, vol. 110, pp. 881-908.

Krugman, P. (1979) *Increasing Returns, Monopolistic Competition, and International Trade*. Journal of International Economics, vol. 9, pp. 469-479.

Krugman, P. (1980) *Scale Economies, Product Differentiation, and the Pattern of Trade*. American Economic Review, vol. 70, pp. 950-959.

Krugman, P. (1981) *Intraindustry Specialization and the Gains from Trade*. Journal of Political Economy, vol. 89, pp. 959-973.

Krugman, P. (1991a) *Increasing Returns and Economic Geography*. Journal of Political Economy, vol. 99, pp. 483-499.

Krugman, P. (1991b) *Geography and Trade*, Cambridge (Mass.), MIT Press.

Krugman, P. (1993a) *First Nature, Second Nature, and Metropolitan Location Theory*. Review of International Economics, vol. 1, No. 2, pp. 110-122.

Krugman, P. (1993b) *On the Relationship between Trade Theory and Location Theory*. Review of International Economics, vol. 1, No. 2, pp. 110-122.

Krugman, P. (1994) *Empirical Evidence on the New Trade Theories: The Current State of Play*. In: CEPR Conference Report, *New Trade Theories*, London.

Krugman, P. and A.J. Venables (1990) *Integration and the Competitiveness of Peripheral Industry*. In: Bliss, C. and de Macedo, J. (ed.) *Unity with Diversity in the European Community*, Cambridge University Press, pp. 56-75.

Krugman, P. and A.J. Venables (1995a) *Globalization and the Inequality of Nations*. Quarterly Journal of Economics, vol. 110, pp. 857-880.

Krugman, P. and A.J. Venables (1995b) *The Seamless World: A Spatial Model of International Specialization*. NBER Discussion Paper, No. 5220.

Landesmann, M. (1995) *The patterns of East-West European integration: catching up or falling behind?*, in R.Dobrinsky and M.Landesmann (eds), *Transforming economies and European integration,* Aldershot: Edward Elgar, pp. 116-140

Luik, A. and R. Kuttner (2000) *Development of Estonian National Innovation System, Challenges and Tasks for Universities*; "6th Nordic-Baltic conference in Regional Science. Riga, Latvia, October 4-7 2000. Reports", pp.351-353

Markusen, James and Venables, Anthony (1996) *The Theory of Endowment, Intra- Industry and Multinational Trade*, CEPR Discussion Paper, No. 1341, Centre for Economic Policy Research, London.

Marshall, Alfred (1920) *Principles of Economics*, Macmillan, London.

Midelfart-Knarvik, K.H., Overman, H.G., Redding, S.J., Venables, A.J., (2000) *The Location of European Industry*, Economic Papers No. 142 – Report prepared for the Directorate General for Economic and Financial Affairs, European Commission

Molle, W. (1997)The economics of European Integration: Theory, practice, policy, in Peschel, K. (ed.), Regional growth and regional policy within the framework of European Integration, Physica Verlag, Heidelberg, pp. 66-86, .

Norman, V.D. and A.J. Venables (2001) *Industrial Clusters: Equilibrium, Welfare, and Policy;* mimeo, London School of Economics

OECD (1994) *Manufacturing Performance: A Scoreborard of Indicators*, OECD, Paris

Ohlin, B. (1933) *Interregional and International Trade*. Harvard University Press, Cambridge (Mass.).

Overman, H., S. Redding and A. Venables (2001) *Trade and Geography: A Survey of Empirics;* mimeo, London School of Economics

Petrakos, G. (1996) *The regional dimension of transition in Eastern and Central European Countries: An Assesment,* Eastern European Economics, vol.34 (5), pp.5-38

Petrakos, G. (1999) *The spatial impact of East-West integration,* in G.Petrakos, G.Maier and G.Gorzelak (eds) Integration and Transition in Europe: The Economic Geography of Interaction, London: Rutledge

Phare project :Support to European Integration in Lithuania", Industry impact studies, 2000

Phare project "Support to Industrial Cluster Restructuring" (2001), News Letters, Riga, Latvia

Pratten C. (1988) *A Survey of the Economies of Scale*, in Commission of the European Communities, Research on the 'Cost of non-Europe', Volume. 2: Studies on the Economics of Integration, Luxembourg

Porter, M.E. (1998) "Clusters and the New Economics of Competition"*; Harvard Business Review*, 76:6

Puga, Diego and Venables, Anthony J. (1997) *Preferential Trading Arrangements and Industrial Location.* Journal of International Economics, vol. 43, pp. 347-368

Regional Statistics of Estonia 1998, 1999, 2000, 2001.

Ricardo, David (1817) *On the Principles of Political Economy and Taxation*. Penguin, Harmondsworth (1971 edition).

Rivza, B. and I. Stokmane (2000) *Economic and Social Analysis of the Baltic Countiries*; "6th Nordic-Baltic conference in Regional Science. Riga, Latvia, October 4-7 2000. Reports", pp.293-296

Statistical Yearbook of Estonia 1999, 2000, 2001. Eesti Statistika aastaraamat. Statistical Office of Estonia, Tallinn

Statistical Yearbook of Lithuania 1995, 1999, 2000, 2001. Lietuvos statistikos meetraštis. Statistical Office of Lithuania, Vilnius

Stern, S., M.E. Porter and J.L. Furman (2000) *The Developments of National Innovative Capacity*; NBER Working Paper W7876

The Baltic States: A Regional Economic Assessment. OECD, 2000

Traistaru, I., P. Nijkamp and S. Longhi (2002) *Regional Specialisation and Concentration of Industrial Activity in Accession Countries;* ZEI Working Paper No B16 2002

Vanek, J. (1968) *The Factor Proportions Theory: The N-Factor Case*. Kyklos, vol. 21, pp. 749-756.

Venables, A.J. (1996) *Equilibrium Locations of Vertically Linked Industries*. International Economic Review, vol. 37, pp. 341-359.

Venables, A.J. (1998) *The Assesment: Trade and Location; Oxford Review of Economic Policy*, vol. 14(2), pp. 1-6

Vircavs, I, (2000) *The role of Transportation in the Development Process of Riga City*; "6th Nordic-Baltic conference in Regional Science. Riga, Latvia, October 4-7 2000. Reports", pp.135-139

Weber, A. (1909) *Über den Standort der Industrien*. J.C.B. Mohr, Tübingen.

Weder, R. (1995) "Linking Absolute and Comparative Advantage to Intra-Industry Trade Theory". *Review of International Economics*, vol. 3, pp. 342-354.

Annex 1. Regional scoring model

		Density	Universities	Voc&Sec. students	Economic Entities	Empl. Rate	Inv. Per capita	Gross wages	Contr. Of reg. to state ind. prod.	Ind. prod per employee	Contr. of region to GDP	Total
Rīīgas region	**LV**	1	1	1	2	1	4	14	1	3	6	**34**
Harju	**EST**	2	4	2	1	14	1	1	2	40	1	**68**
Vilniaus apskritis	**LT**	4	2	3	3	25	7	9	4	41	2	**100**
Tartu	**EST**	7	5	8	6	27	2	5	9	37	13	**119**
Kauno apskritis	**LT**	3	3	4	4	35	29	21	3	35	4	**141**
Klaipedos apskritis	**LT**	5	8	6	5	37	23	20	7	29	3	**143**
Ida-Viru	**EST**	6	13	5	9	43	20	7	5	26	16	**150**
Telsio apskritis	**LT**	10	23	17	14	45	9	17	6	2	9	**152**
Parnu	**EST**	22	19	10	10	36	8	2	11	32	8	**158**
Laane-Viru	**EST**	20	16	14	11	34	5	8	13	31	16	**168**
Panevezio apskritis	**LT**	11	12	9	8	46	36	23	15	27	5	**192**
Viljandi	**EST**	28	14	15	15	32	19	10	16	36	11	**196**
Ogres rajons	**LV**	13	24	18	29	18	3	27	24	22	19	**197**
Valmieras rajons	**LV**	17	17	25	28	5	24	29	20	15	19	**199**
Siaulio apskritis	**LT**	8	7	7	7	38	48	28	10	40	15	**208**
Jarva	**EST**	33	20	16	20	21	18	12	19	42	11	**212**
Rapla	**EST**	46	24	24	19	30	13	3	22	24	11	**216**
Cesu rajons	**LV**	24	24	20	26	11	26	34	23	17	19	**224**
Utenos apskritis	**LT**	15	24	12	12	47	32	15	14	46	7	**224**
Talsu rajons	**LV**	29	24	46	31	9	16	33	21	7	10	**226**
Valga	**EST**	26	24	32	24	28	11	11	25	34	13	**228**

(continuation – next page)

Source: authors calculations

(continuation)

		Density	Universities	Voc&Sec. students	Economic Entities	Empl. Rate	Inv. Per capita	Gross wages	Contr. Of reg. to state ind. prod.	Ind. prod per employee	Contr. of region to GDP	Total
Tukuma rajons	**LV**	19	24	36	30	15	25	40	17	4	18	**228**
Alytaus apskritis	**LT**	12	24	11	16	48	33	22	12	38	12	**228**
Hiiu	**EST**		24	48	27	20	6	4	46	47	8	**230**
Marijampoles apskritis	**LT**	9	24	13	13	33	47	32	8	44	14	**237**
Aizkraukles rajons	**LV**	34	24	26	37	7	12	25	39	16	18	**238**
Voru	**EST**	27	24	21	21	49	27	18	18	25	13	**243**
Limbazu rajons	**LV**	37	24	31	36	13	22	26	26	9	19	**243**
Saldus rajons	**LV**	30	24	45	34	3	21	38	28	10	10	**243**
Dobeles rajons	**LV**	18	24	37	43	6	39	31	27	8	18	**251**
Bauskas rajons	**LV**	16	24	42	33	12	35	36	31	5	18	**252**
Saare	**EST**	45	22	22	17	39	15	6	30	48	8	**252**
Laane	**EST**	47	21	43	22	24	10	16	29	39	8	**259**
Valkas rajons	**LV**	42	15	29	41	4	38	24	33	18	19	**263**
Jogeva	**EST**	36	24	19	23	41	14	13	37	50	11	**268**
Kuldigas rajons	**LV**	40	24	33	38	19	28	35	34	19	10	**280**
Jekabpils rajons	**LV**	25	24	23	32	23	42	37	36	21	18	**281**
Madonas rajons	**LV**	43	24	39	35	2	37	47	32	13	19	**291**
Jelgavas rajons	**LV**	21	6	47	45	22	44	41	40	14	18	**298**
Polva	**EST**	32	24	38	25	51	17	19	35	49	13	**303**
Taurages apskritis	**LT**	14	24	27	18	40	51	30	38	51	17	**310**
Gulbenes rajons	**LV**	39	24	41	42	16	31	46	43	11	19	**312**
Preilu rajons	**LV**	23	24	40	39	17	43	39	41	30	20	**316**
Ludzas rajons	**LV**	41	24	30	46	8	46	48	50	33	20	**346**
Aluksnes rajons	**LV**	49	24	49	44	29	34	44	47	12	19	**351**
Daugavpils rajons	**LV**	31	9	35	50	50	30	49	49	6	20	**329**
Liepajas rajons	**LV**	44	10	34	40	42	41	42	42	28	10	**333**
Ventspils rajons!!!	**LV**	51	18	50	51	10	50	43	51	1	10	**335**
Kraslavas rajons	**LV**	35	24	44	47	26	40	50	45	45	20	**376**
Balvu rajons	**LV**	48	24	51	48	31	45	45	44	23	20	**379**
Rezeknes rajons	**LV**	38	11	28	49	44	49	51	48	20	20	**358**