

# Logistic Infrastructure and Its Effects on Economic Development

Jyri Vilko, Boris Karandassov, Ekaterina Myller

Lappeenranta University of Technology, Lappeenranta, Finland

The aims of the study are: (1) to illustrate the relationship between the logistic infrastructure, regional accessibility, regional competitiveness and regional economic development; (2) to look at the state of the logistic infrastructure, and (3) to show the view on the logistic infrastructure from the perspective of case companies. Semi-structured interviews with discovery-approach were applied in data collection. The previous studies were complemented by the current indicators and statistics of the Baltic states and Finland. Study illustrates the connection between economic development and the logistic infrastructure. Article also incorporates comparison between the Estonian and Finnish logistic companies, concerning their perception of accessibility and challenges related to logistic infrastructure. The research shows how different levels of logistical infrastructure development produce different perceptions of continuity of doing business. It also shows how the problems caused by insufficient infrastructure could be handled by using of superstructures or technological structures.

*Keywords:* logistics, infrastructure, transport, economic, development, investments

## Introduction

The infrastructure is an essential part of logistic systems and the lack of it has a strong influence on economic growth. Even though the interdependency of these has been acknowledged, an understanding of their effects and causalities is still in its infancy (Lakshmanan, 2010). The Eastern European states have undergone a transformation from planned economies to market orientation, and most of them are now part of the EU. Many of these new member countries have an unevenly developed infrastructure. In the Baltic countries, approximately 1/3 of the population lives near the capital, and the main roads travel in East-West direction rather than from North to South, emphasizing the connection to major Russian cities (Kovács & Spens, 2006). The global economic crisis has posed challenges to the development of the transport infrastructure in many of these countries, causing decisions to delay or cancel many infrastructure-related investments and decreasing the volume of investment inflows. To ensure economic growth in the future, it is essential to acknowledge the impact these decisions may bring.

The state of an economy can be depicted by describing its transport infrastructure. In the Baltic states, a

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Jyri Vilko, MSc (tech.), Junior Researcher, School of Business Department, Lappeenranta University of Technology.

Boris Karandassov, MSc (tech.), Ph.D. candidate, Department of Industrial Management, Lappeenranta University of Technology, and Sales Engineer at Konepaja Factor Oy, Lappeenranta.

Ekaterina Myller, MSc (econ.), Project Researcher, Department of Industrial Management, Lappeenranta University of Technology.

Correspondence concerning this article should be addressed to Jyri Vilko, P.O.Box 20, 53851 Lappeenranta, Finland. E-mail: jyri.vilko@lut.fi.

strong link between investing in the transport infrastructure and a growing GDP can be expected (Kovács & Spens, 2006). According to Simchi-Levi, Kaminsky and Simchi-Levi (2003), economies in transition are characterized by an underdeveloped transport infrastructure, varying supplier operating standards, unavailable information and communication systems support and variably available human resources. The impact of the infrastructure is considered to be different in the developing and developed regions (Lewis, Semeijn, & Vellenga, 2001). Therefore, in our case, the logistic infrastructure development of the Baltic states will be compared to Finland.

Here, the linkage between the economic development and logistic infrastructure is illustrated and a case study comparison between logistic companies' viewpoints on the accessibility and challenges related to the logistic infrastructure are investigated. Estonia and Finland will be analyzed based on interviews with their logistics sectors. The contribution of the study is threefold: (1) its scientific contribution is in illustrating the relationship of the logistic infrastructure, regional accessibility, regional competitiveness and regional economic development; (2) empirical contribution is in looking at the state of the logistic infrastructure, and (3) by giving the viewpoint of the case companies on the logistic infrastructure.

The study is structured as follows: First, the theoretical foundation and the related concepts will be introduced by using the state-of-the-art literature. Then the relations of these concepts will be analyzed and illustrated at the macroeconomic level. Thereafter, the empirical case studying the economic development and the development of the transport infrastructure in the Baltic states and Finland will be presented and analyzed with the help of statistical data, recent reports and discovery-oriented interviews with actors in the field. Finally, conclusions, and practical and scientific implications will be given as well as suggestions for further research.

### **Logistic Infrastructure and Economic Development**

The importance of the infrastructure for productivity, costs and economic growth is widely documented in the academic literature (e.g., Demetriades & Mamuneas, 1999; Kopp & Short, 2005; Agénor, 2010). The recent interest in the wider economic benefits has created a variety of economic models. The offerings of the current literature are mainly focused on macroeconomic studies (Lakshmanan, 2010). Many studies during the last two decades have attempted to quantify the effects of the public infrastructure on the various aspects of the economy. Two of the best-known approaches have included assessments on the impacts of the infrastructure on productivity and on production costs (Cohen, 2010). Generally, a solid transport infrastructure is related to the competitiveness of a region (Pedersen, 2001; Priemus & Zonneveld, 2003) in terms of attracting investments (Goh & Ang, 2000; Kovács & Spens, 2006).

#### **Logistic Infrastructure**

Broadly speaking, the infrastructure could be defined as physical facilities, institutions and organizational structures, i.e., as the social and economic base for the operation of a society (Snieska & Simkunaite, 2009; United Nations Conference of Trade and Development (UNCTAD), 2008). Here we mainly concentrate on the economic infrastructure, which promotes economic activity (Snieska & Simkunaite, 2009). The economic infrastructure, apart from the financial infrastructure, i.e., the physical infrastructure was chosen, because it is directly relevant to the competitiveness of companies and to economic development (UNCTAD, 2008).

The logistic infrastructure concept includes transportation and communication infrastructure. Information and communication technology (ICT) is a critical component of a contemporary logistic system. Computerized systems for handling flows of goods bring more options for worldwide intermodal transportation networks within the reach of customers (UNCTAD, 2008). They also create incentives to competition, which reduces the costs of transportation (UNCTAD, 2008). The low quality of ports, airports, roads, railroads, warehousing and ICTs appears to constrain the logistics performance in the developing countries (The World Bank, 2010).

A functional logistic system is essential in enabling trade. The economic openness of a region is typically measured as a share of the total trade volume relative to GDP. The infrastructure is one of the key factors in assessing the functionality of a logistic system. An evaluation model based on an in-depth understanding of the situation of the logistics system in a geographical area is used as the measurement basis for four logistics-related dimensions. A regional or a macro logistics system is formed from four elements: (1) human resources and capabilities; (2) public and private sector logistics and transport service providers; (3) provincial and national institutions, policies and rules; and (4) the transport and communications infrastructure (Banomyong, 2008)

These logistics-related dimensions (see Figure 1) are inter-linked to determine the overall capability of the macro logistics system within the scope of the geographical area under scrutiny in terms of system capability and performance (Banomyong, 2008).

The logistics and transport literature traditionally claim a direct link between regional economic growth and an increase in freight transport (e.g., Kóvacks & Spens, 2006; Bansister & Berechman, 2001). As logistics and transportation are the consequences of trade, the link between freight transport and economic growth seems to exist also in the global scale, as it can be noticed from the IMF statistics measuring the world GDP and trade. In Figure 2, the changes in the world GDP can be noticed to be reflecting the world trade with an emphasis.

Figure 3 illustrates the relation of the transport infrastructure, investments and economic development, represented by GDP-related measures. To keep the figure as simple as possible and to sharpen the focus of our study, the possible mediators of those relations are not shown. The solid arrows indicate the impact direction of our present interest, and the dotted arrows indicate the feedback.

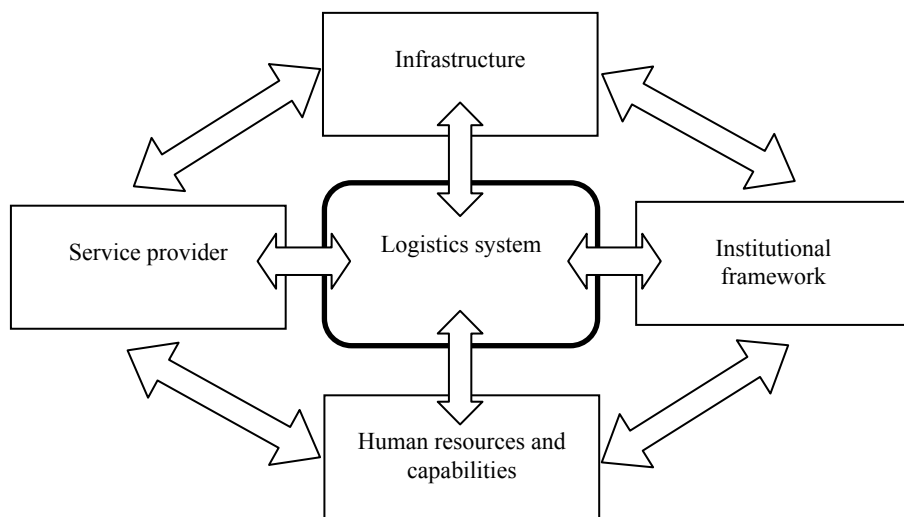


Figure 1. Macro logistics system. Source: Adapted from Banomyong, 2008.

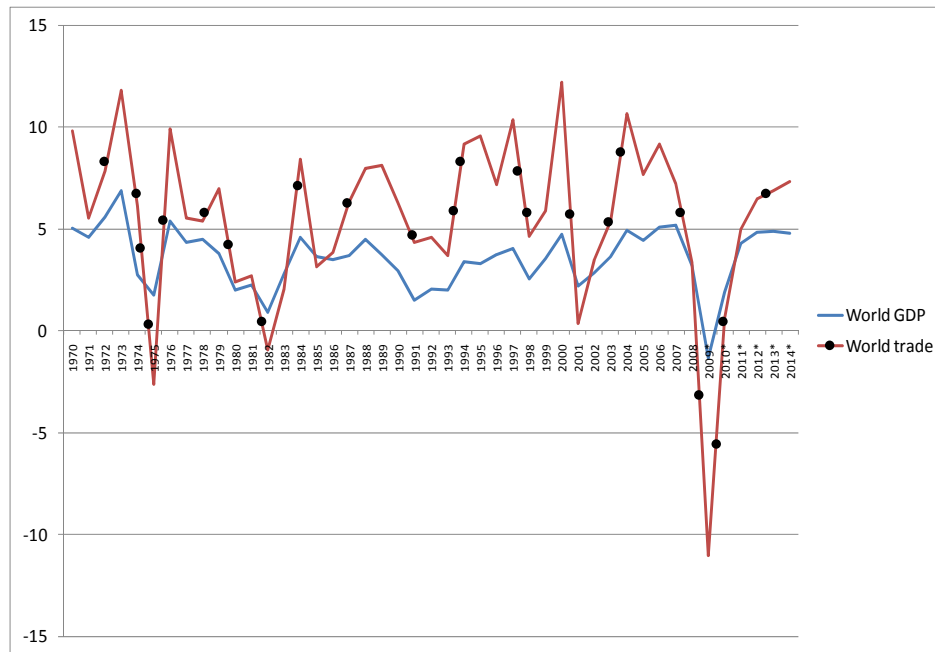


Figure 2. Changes in world GDP and world trade development (IMF, 2010).

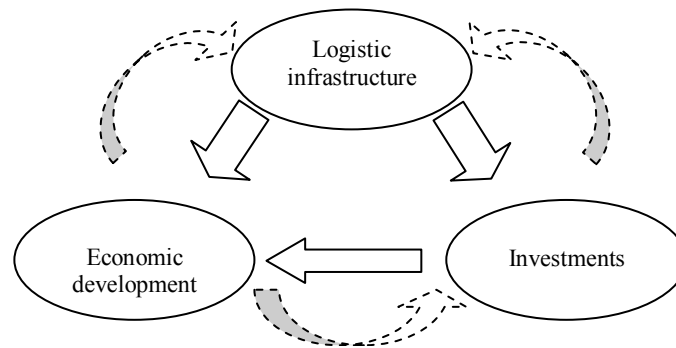


Figure 3. Logistic infrastructure in relation to GDP and investments (Vilko, Karandassov, & Myller, 2010).

### Regional Accessibility, Competitiveness and Economic Development

Accessibility is “the potential of opportunities for interaction” (Hansen, 1959). The accessibility of a region depends on how well a network can be achieved from the region’s key access points (Vickerman, Spiekermann, & Wegener, 1999, p. 8): “It is assumed that accessibility is continuous and changes monotonically along a corridor, but displays discontinuities between regions”. Accessibility is a place-specific property related to the relative location of a place of interest within a space or territory of reference. It can be defined as the attractiveness of the place in question, taking into account the trade and interaction opportunities offered by other locations and the impedances to reach them on a transportation network. (Bruinsma & Rietveld, 1998; Koenig, 1980)

There seems to be a positive correlation between logistic infrastructure endowment or interregional accessibility and the levels of economic indicators, e.g., GDP per capita (Biehl, 1986; Keeble, Owens, & Thompson, 1982; Keeble, Offord, & Walker, 1988). The link between logistic infrastructure investments or differences in accessibility and changes in economic indicators, i.e., economic growth and decline, has been

much less clear (Fullerton & Gillespie, 1988; Rietveld & Nijkamp, 1993). In countries with already a high level of transport infrastructure further improvements may generate only marginal benefits (Vickerman et al., 1999). Logistic improvements have strong impacts on regional development only where they remove bottlenecks (Biehl, 1986, 1991; Blum, 1982).

Accessibility is one of the essential factors of regional competitiveness, and it is influenced by geographical distances as well as by physical frameworks such as infrastructure coverage and its quality (Holma & Kajander, 2010). Vickerman (1996) studied the way in which the infrastructure, transport infrastructure in particular, affects accessibility, industrial location and hence regions' growth and development. He concluded that "improved accessibility does confer some potential advantages, and it may be a failure of businesses to adapt to improvements and to take full advantage of accessibility improvements which is the main restriction on peripheral regions convergence" (Vickerman, 1996). Accessibility to interregional transport infrastructure is also considered to be a fundamental factor influencing the economic development of the region (Puga, 2002). This is due to the assumption that regions, the transport infrastructure of which is lagging behind, will fail to attract firms to locate their business there (Lolos, 2009) when at the same time a remote location that can be reached thanks to a developed transportation infrastructure will attract businesses and headquarters into a few larger centers causing a concentration of businesses (Duranton & Puga, 2001) which in turn increases the competitiveness of the region. The way accessibility is theoretically defined and empirical evidence suggests that there is a link between the accessibility of the region and its competitiveness and, therefore, economic growth as well. The current study will use GDP per capita (at PPP) figures to measure the temporal change in the relative wealth of the inhabitants of each country under consideration.

### **Linkage Between Logistic Infrastructure and Economic Development**

In the literature on transport infrastructure, the investments into infrastructure are often used as a proxy of infrastructural development, when examining its linkage with GDP growth (i.e., economic growth) (Kovács & Spens, 2006). The literature focusing on the effects of new road construction in the USA during the 1960s and 1970s finds strong evidence of the link between investment into new road development and GDP growth (Harmatuck, 1996). However, later literature concentrating on the maintenance of a mature infrastructure did not find as clear links between investments in infrastructure maintenance and GDP growth (Gillen, 1996). There is no simple relation between transport investments and development. In some cases enhanced transport linkages to a peripheral region even reduced local economic activity due to higher competition from imports. (Pedersen, 2001). Figure 4 shows the main idea of the paper, concerning one of the routes by which the logistical infrastructure affects economic development.

### **Evidence From the Baltic States and Finland**

The logistic infrastructure consists of the transportation and communication infrastructure, which enable regional accessibility. In the following, the state-of-the-art literature, statistics and reports are being used to evaluate and compare the current state of the logistic infrastructure in the Baltic states and Finland. Finland, as well as the Baltic states, are neighbors of Russia (Lithuania has a common border with the Kaliningrad region). The Baltic states and Southern Finland all have access to the Baltic Sea, and are quite sparsely populated

(Statistics Finland, 2010; Eurostat, 2010). The Baltic states and Finland also have the same railroad gauge width with Russia, which has its positive and negative consequences for international transportation. Finland is a region of developed economy and the Baltic states have a background of transitional economies. This historical difference can still be seen in the level and development of the infrastructure and wealth of those regions.

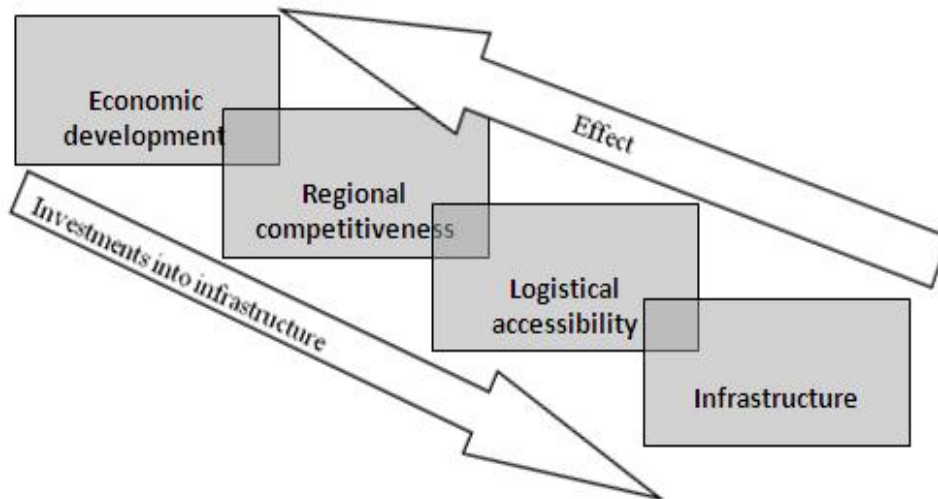


Figure 4. Regional accessibility through logistical infrastructure.

### Logistic Infrastructure and Performance

There is no unanimity among researchers on the common set of infrastructure variables (Snieska & Simkunaite, 2009). The length of roads and rail tracks are usually used as a proxy for the quantity of transportation infrastructure. The motorway or railway density per square kilometer or inhabitant is sometimes used in comparing the coverage of transport networks in different countries (Steer Davies Gleave, 2009).

The main transport modes of freight in the Baltic states and Finland are the roads, railroads and maritime transport. In the Baltic states the modal share of inland waterways is negligible (European Commission, 2010).

Rail transport is the dominating transportation mode in the Baltic states, where rail density is quite high (31 km/1,000 sq. km in 1995) (Kovács & Spens, 2006). Although, most of them are poorly maintained, single track railroads run with minimal electrification (European Commission, 2003). In Finland, roads are the main ways of freight transportation (European Commission, 2010).

The difference in the width of track gauges in the Baltic states and in Finland compared to other EU countries is seen as a challenge to regional interconnectivity. One solution to the interconnectivity problem is the use of rail transport that can be used in both track gauge systems. The need of transshipment on the border of the Baltic states creates additional costs (Kovács & Spens, 2006) and weakens their competitiveness as a logistic corridor.

Another peculiarity of the railways in the Baltic states, as somewhat also in Finland, is the emphasis of the East-West axis, which is the legacy of main transport flows in the Soviet era. At the same time, there were practically no railroad tracks connecting the Baltic states (Ojala, Nauli, & Queiroz, 2004). The Rail Baltica project is aimed at connecting Poland, Lithuania, Latvia and Estonia by railroad as well as Finland to Estonia by

train ferry or a tunnel. The project continues despite the economic downturn, but it is a long-term project, and the construction of the last leg of tracks is planned to start in 2013 (Telička, 2009).

The roads were in better condition than railroads in 1995, but road density in the Baltic states is among the lowest in the EU (Steer Davies Gleave, 2009). The share of roads paved with asphalt is low, and there is only a limited number of motorways in the Baltic countries. Motorways are mainly located around major cities, and there is none in Latvia (European Commission, 2010). The length of motorways in the Baltic states has not changed during 2004-2008 (European Commission, 2010). Moreover, in road connections the East-West link is better than the North-South route (Buchhofer, 1995). Nevertheless, road connections around the cities have been enhanced after EU accession (Ojala et al., 2004). An increase in the weight of road vehicles creates additional needs for road maintenance in the Baltic countries (Kovács & Spens, 2006). In Finland, the coverage of the road network is vast and the condition of the roads is fairly good. The basic road infrastructure in Finland is also in good condition.

The Finnish Port Association has 28 member ports, of which 23 are seaports (Finnish Port Association (FPA), 2010). The freight volume of the four biggest seaports of Southern Finland (Sköldvik, Helsinki, Kotka, Hamina) accounted for over 40% of the freight volume in all Finnish ports during August 2009-July 2010 (FPA, 2010).

The Estonian Port Association has 27 member ports (Estonian Port Association, 2010). However, the share of the Tallinn port of all the Estonian freight volume was 88% in 2008 (Eurostat, 2010). The biggest share of the freight moving through the ports of the Baltic states is in liquid form (oil), and more goods are loaded than unloaded in the Baltic ports, indicating the importance of the Baltic states as transit countries for Russian natural resources (Buchhofer, 1995; Ojala et al., 2004). The ports of the Baltic countries together accounted for some 50% of the cargo moved in East-West direction in the Baltic Sea (Laurila, 2003). The poor material handling in the ports of the Baltic states has led many companies to use Finnish ports (Laurila, 2003). Recently, also the old or newly built Russian and Estonian ports have started to attract transport flows (Ojala et al., 2004). One possibility of enhancing the competitiveness of the ports of the Baltic states could be to improve co-operation among them (Buchhofer, 1995).

The performance of a transportation infrastructure can be measured by the volume of freight transport, in tonne-kilometers, which is the unit of measure representing the transport of one tonne of goods by a given mode of transport over one kilometer (Eurostat, 2009). The freight volumes transported by road grew in all the Baltic countries during the years 2004-2008 reflecting the development of road transport in the Union (European Commission, 2010). In Finland, freight transport by road has slightly dropped in the same period. At the same time, the development of the volume of freight transport by railway was unstable. Especially in Estonia the volume of rail transport decreased by 50% in 2006-2008, while Latvian and Lithuanian rail transport increased nearly by the same volume. In Finland, freight transported by rail stayed quite the same during the period 2004-2008.

The figures may suggest that the Southern neighbors have attracted at least some freight volumes on rail from Estonia, which in turn succeeded in increasing its freight volumes transported by road.

Lithuania was the leading nation among the Baltic states in its volumes of freight transported by road, and in

2008, the volume was as big as in Latvia and Estonia together. If the volume of freight transport by road in Lithuania in 2008 is taken as an index of 100%, in Estonia the volume is 36% and Latvia is 60% of Lithuania's level. The level of Finland would be some 150% compared to Lithuania's level (European Commission, 2010).

Latvia was the leading country among the Baltic states in its volumes of freight transported by railway, and in 2008 it has transported nearly as much as the freight volume of Estonia and Lithuania together. If the volume of freight transported in Latvia was 100%, the figure in Estonia would be 30% and in Lithuania 75% of the level in Latvia. In Finland, the level of freight transport via rail was some 50% of Latvia's level (European Commission, 2010).

The share of road transport in all freight transportation (via road, railroad, inland waterways and pipelines) has changed in different ways in different Baltic states and in Finland. In Lithuania, the share of road transport volumes grew from 44% to 57% during 2004-2008, when in Latvia, the share of road transport volumes grew from 25% to 36%. But the most marked change happened in Estonia, where the share of road transport grew from 33% to 55% in the same period. In Finland, the share of freight transport by road slightly diminished from 76% to 73% in 2004-2008 (European Commission, 2010).

In 2006, Estonia and Latvia had the highest modal share of rail transport compared to other EU25 countries, and to the EU25 average of 18% (Eurostat, 2009). After that the share of rail transport witnessed the most dramatic drop in Estonia, where in 2004 the share was 67% and in 2008 only 45%. In Finland, the modal share of railway in freight transport was the lowest (less than 30%) among the countries under examination (European Commission, 2010).

In Lithuania, the share of rail transport stayed at 41% during 2004-2008. In Latvia, the share of rail transport diminished from 64% to 58% during the first five years of EU membership (2004-2008). In Finland, the share of freight transport by rail slightly grew during 2004-2008 (European Commission, 2010).

The quality of logistic performance could be measured by a recently developed Logistic Performance Index (LPI) (The World Bank, 2007, 2010). The LPI is a multidimensional measure of logistic performance, rated in a scale from one (the lowest) to five (the highest). The performance is assessed by some 1,000 freight forwarders for a comparison of the trade logistic profiles of 155 countries (The World Bank, 2010). The World Bank (2007, 2010) uses two kinds of LPIs: the international LPI and domestic LPI. The former is the quantified summary indicator of logistic performance, whereas for the latter, each respondent company is asked to rate eight overseas markets on six core dimensions measuring logistic performance. Domestic LPI is an instrument collecting qualitative information on the logistic environment in the country of the respondents' employment (The World Bank, 2010).

The authors found the infrastructural dimension of the international LPI as the most relevant indicator, when examining the relationship between the development of the logistic infrastructure and economic development. The infrastructure dimension of the LPI measures the quality of the infrastructure, related to trade and transport, i.e., the quality of ports, airports, roads, railroads, warehousing and transloading, and information and communication technologies (ICTs), on a Likert scale from one (very low) to five (very high) (The World Bank, 2010). In the 2007 LPI survey, the infrastructure instrument measured the transportation infrastructure and communication infrastructure without more exact specification (The World Bank, 2010).



Table 1

*Logistic Performance Index (LPI) for Years 2005 and 2008 (The World Bank, 2007, 2010)*

	LPI, 2005	LPI, 2008	Infrastructure, 2005	Infrastructure, 2008
Finland	3.82	3.89	3.81	4.08
Estonia	2.95	3.16	2.91	2.75
Latvia	3.02	3.25	2.56	2.88
Lithuania	2.78	3.13	2.30	2.72

Table 1 shows that between 2005 and 2008, the logistic performance of every Baltic state and Finland improved. During the same time the infrastructure dimension of logistic performance in Estonia diminished, and the quality of the infrastructure in Lithuania was nearly at the same level as in Estonia. Between 2005 and 2008, Latvia took the lead in infrastructure quality over Estonia. Finland is clearly leading in both the total logistic performance and infrastructure quality. The possible reasons for the drop in the quality of the infrastructure in Estonia need to be investigated in further studies.

### Regional Accessibility, Competitiveness and Economic Development

Regional accessibility could be measured by the distance to markets, time to markets and cost to market. The domestic logistic performance index (LPI) is a suitable measure for this purpose. Table 2 illustrates the export time and costs in the Baltic states and Finland as of 2008.

Table 2

*Domestic LPI for Export Time and Cost, 2008 (The World Bank, 2010)*

	Port or airport logistics <sup>a</sup>			Land logistics <sup>b</sup>		
	Distance (km)	Lead time (days)	Cost <sup>c</sup> (US \$)	Distance (km)	Lead time (days)	Cost <sup>c</sup> (US \$)
Finland	262.23	1.59	579	411.57	2.1	758
Estonia	300.00	4.00	2,000	150.00	1.00	194
Latvia	75.00	1.26	483	75.00	1.00	274
Lithuania	300.00	2.00	354	482.74	2.00	356

*Notes.* <sup>a</sup> From the seller's factory to the (air)port of loading or equivalent, e.g., international shipping (EXW to FOB); <sup>b</sup> From the seller's factory to the buyer's warehouse (EXW to DDP); <sup>c</sup> Typical charge for a 40-foot dry container or a semi-trailer (total freight).

The best performing countries in accessibility for export are presented next. Companies in Latvia have on average the shortest distance to the export market in port, airport and land logistics. In addition, Latvia has the shortest lead time in port and airport logistics and the shortest lead time together with Estonia in land logistics. Lithuania has the smallest cost of exports in port/airport logistics, but it comes second after Estonia in the export cost of land logistics.

The countries with not as good accessibility indicators are presented next. When looking at the port/airport logistics for exports, companies in both Lithuania and Estonia have the longest distance to exports. Estonia has the longest lead time and the highest cost in the same logistics. In land logistics for exports Lithuania has the longest distance to export, but Finland has disadvantages in both lead time and the cost of export.

The national and regional competitiveness are measured by different indices, which are listed for the Baltic states and Finland (also Southern Finland) in Table 3. Finland and Southern Finland have quite high competitiveness ranks, varying between 6-12, which is higher than in any of the Baltic states. Estonia gets the highest ranks among the Baltic states in all three mentioned indices. Lithuania is in general higher than Latvia,

but they have very close ranks in the enabling trade index (ETI).

Table 3

*Regional and National Competitiveness Indices (World Economic Forum, 2010a, 2010b; Annoni & Kozovska, 2010)*

	GCI <sup>a</sup> rank	GCI <sup>a</sup> score	ETI <sup>b</sup> rank	ETI <sup>b</sup> score	RCI <sup>c</sup> rank	RCI <sup>c</sup> score
South Finland	n/a	n/a	n/a	n/a	6	1.013
Finland	7	5.37	12	5.25	n/a	n/a
Estonia	33	4.61	23	4.90	162	-0.178
Latvia	70	4.14	46	4.39	216	-0.700
Lithuania	47	4.38	41	4.48	200	-0.538

*Notes.* <sup>a</sup> Global competitiveness index 2010 (World Economic Forum); <sup>b</sup> Enabling Trade Index 2010 (World Economic Forum); <sup>c</sup> EU Regional Competitiveness Index 2010 (European Commission).

Regional competitiveness creates potential for economic development, which is here illustrated by GDP per capita at PPP (thousand) (see Table 4). During 2005-2008 Finland generated nearly twice as much wealth per capita than any of the Baltic states. However, all the Baltic states are approaching Finland at the level of wealth. One of the reasons for this may be the cohesion policy of the European region, which enabled the further improvements of the logistic infrastructure in the transition economies of the EU.

Table 4

*Economic Development in 2005-2008, GDP per Capita at PPP (Thousand) (Eurostat, 2010)*

	2005	2006	2007	2008
Finland	25.7	27.0	29.4	29.4
Estonia	13.8	15.4	17.1	16.9
Latvia	10.9	12.2	13.9	14.3
Lithuania	11.9	13.1	14.8	15.5

Kovács and Spens (2006) suggest that there is a strong need for new road construction along with maintaining the existing ones in the Baltic states. They also argue that a strong link between investments in the transport infrastructure and the economic development of the Baltic states, measured by GDP, could be expected. The Baltic countries have traditionally largely neglected their investments in the infrastructure. The low investments in the maintenance of the transport infrastructure in the Baltic states have even led to the degradation of their infrastructure (Jauernig & Roe, 2001). This has increased the cost of vehicle maintenance (Jauernig & Roe, 2001; Queiroz, 2003) and made other countries of the Baltic Sea region more competitive as logistic centers (Vigede, 2003; Matthiessen, 2004).

However, after their EU accession in 2004, the investments of the Baltic nations into their transport infrastructure began to grow steadily (see Figure 5). The investment figures grew thanks to regional financing from the EU, meant for local infrastructure development, and from the cohesion program, which is focused on developing transport corridors within the Union. In addition to the EU funds, also the state investment in the Baltic countries started to grow in 2004 (Steer Davies Gleave, 2009).

Investments in the infrastructure were on a quite low level in the Baltic states, but after EU accession the share of public and EU-based investments into the infrastructure were in all three countries at least on the level of

1.5% of GDP (see Figure 5). In Latvia the share was even slightly over 2%. The railroads are privatized in Estonia, so Figure 5 does not include this part of investments. Some 1%-2% of GDP for road expenditure is considered necessary for adequate road maintenance, not to mention new road construction (Queiroz, 2003). In Finland the share of infrastructure funds (public and EU) were close to 1.5% of GDP throughout the period 2000-2006.

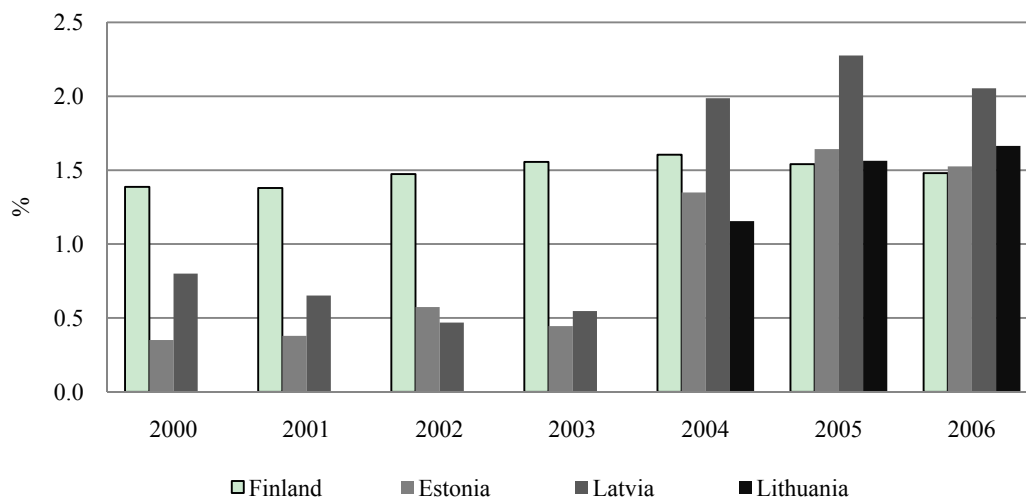


Figure 5. Share of infrastructure investments (from public and EU sources) in GDP (at market ECU prices), % (Eurostat, 2010; Steer Davies Gleave, 2009).

### Empirical Interviews and Their Findings

As part of this study the interviews were conducted with a cross-section of companies that acted in the logistic chains from the Gulf of Finland to the Finnish and Estonian logistic centers. In order to tap into the logistic professionals' experience and knowledge about the operational environment, a discovery-oriented approach was applied with semi-structured interviews as the primary method of data collection (Zaltman, LeMasters & Heffring, 1982; Yin 1989). The interviewees were selected from the companies best representing their field, and with high significance to the area of operations. The interviews were conducted with persons from a range of logistics manager related duties. The position of the interviewees varied by the company, but all had an extensive understanding of their company's operations. The interviews were conducted by researchers of different specialization backgrounds to get as broad a view of the subject as possible and to ensure the reliability of the study and its viability as the basis for further work. In the beginning of each interview, the interviewees were promised anonymity and their permission to use a recorder was solicited. Afterwards the recorded interviews were transcribed and sent to the interviewed parties for possible correction and acceptance.

The interviews were conducted in the most important ports of Finland on the Gulf of Finland with global and local logistics operators and with some logistics companies operating from cargo transportation to distribution. Overall 20 interviews were conducted in both Finland and Estonia. The scale of conceptual understanding and comprehension about the infrastructure varied highly between the interviewees. The best understanding was found among the companies acting as port authorities in Finland and working as a logistic service provider in Estonia. One of the most remarkable concerns noticed in the interviews was the perspective that the different

level operators had; the global logistics operator networking in many countries had the widest perspective on the infrastructure. The benefits of good infra- or super-structures were clearly understood at this level—as were the challenges of not having one in the logistics field. The lower level actors could clearly not see the big picture and struggled with problems case by case.

From the interviews conducted, some clear differences were noticed between the Estonian companies and the Finnish ones. The better infrastructure of Finland was recognized in both countries, however, the benefits created by them seemed to be more visible from the Estonian side in some cases—probably because their own infra was lacking.

The vulnerability of the transportation infrastructure seemed to be well noticed on the Estonian side and some of the interviewed companies had their own ways of surviving; some companies had acknowledged the poor condition of the road networks and the risks it posed to the predictability of logistic operations. For better predictability and controllability, superstructures were used for better resilience against risks caused by an insufficient infrastructure. ICT systems, e.g., GPS, were used to follow the logistic flows and to reroute the cargo if there were some problems in the roads. However, in Estonia the road network is not extensive in some rural areas and their mapping is still at its infancy, which seemed to cause problems, especially for inexperienced transporters. The innovative use of superstructures and technological structures, however, seemed to enable a fairly good performance in cases where the infrastructure was inadequate.

In Finland, the good condition of the logistic infrastructure was taken as self-evident and the companies in many cases had little need to establish any systems to ensure continuity. The vast Finnish road network and its benefits were well acknowledged. The most concerns that the companies referred to in the infrastructure usually related to vandalism or terrorism in some critical points. These were believed to be manageable with small delays in most of the situations because of the resilience of the vast road network. In both countries, the railroad infrastructure was thought to have a weaker ability to cope with possible disturbances. This was mainly due to the inflexibility of the scheduling system which disabled rerouting in many cases.

Even though the road network was more developed in Finland, the sparsely populated country with long distances and long winter posed great challenges to the companies. In Estonia, most of the population lives centered in major cities which could be seen to decrease the companies' need for a wider road network. One of the few problems that were seen in the Finnish infrastructure related to traffic in some specific areas at specific times. This posed some challenges to the companies with a delicate scheduling system. Overall, the better functionality of the infrastructure in Finland also seemed to highlight the vulnerability of ICT systems, which was not seen as a problem in Estonia.

The concerns caused by the infrastructure to the continuity of business seemed to be stronger in the companies in Estonia than in Finland. In Finland, the highest concerns usually related to the intense competition, breakdown of infrastructure in case of emergency or to the challenges caused by weather conditions for the functionality of the infrastructure in the winter time. The lately occurred financial crisis together with the stevedores' strike clearly had a strong effect on the Finnish managers. This was due to the remarkable decrease in the important Russian transit traffic as the financial crisis began. This, however, was not considered to cause as much problems in Estonia, and in some companies the firm growth of transportation volumes continued

throughout the crisis. The restlessness of May 2007, however, caused a strong decline in some companies which indicated the volatility of Russian transit.

In the ports, competition was clearly visible in both countries. In Estonia, the ports were typically smaller and surprisingly had in some cases specialized their superstructure in the same cargo type which increased competition in the region. In Finland, the ports were typically specializing their superstructures to handle different types of cargo which would decrease competition in the area, improve efficiency and create some economies of scale for these individual ports. The specialization could, however, cause problems to the security of supply in some areas in cases where individual ports were unable to receive or send cargo. This could seriously affect the companies' business continuity in such cases. In Estonia, the rerouting of maritime cargo flows could, therefore, be seen easier to handle as the ports could more easily replace each other in some cases. The cold winters were seen beneficial in Estonia as its ports would stay free of ice longer than the Finnish ones. When Finnish ports were surrounded by ice, much of the cargo would go to Estonia. The stevedores' strike seemed to have the same effect.

Another sign of the increasing competition between the Finnish and Estonian ports was the superstructure in some Estonian ports that was bought from Finland when the Finnish ports were modernizing their superstructures and therefore sold their old unloading equipment to Estonia. Competition was mainly concentrated on the Russian transit traffic, which was the focus of the Estonian ports.

Even though the need to improve the infrastructure is seen as the most important subject from the viewpoint of accessibility and competitiveness, getting the projects through the political system is not open-and-shut. Estonia, as the other new EU countries have received a lot of investment aid for their infrastructure from the EU's cohesion fund. The improvement of the infra in some cases were still struggling as the interviews revealed that the personal disputes of politicians had delayed or even prevented some infrastructure-related improvements.

### **Conclusions**

The scale and measure of the impact of the transport infrastructure on economic development has been a popular topic in the literature. A linkage with these two concepts has been widely acknowledged in the scientific community, but their direction and magnitudes have varied greatly and there is still a lack of a deeper understanding of the phenomenon. Kovács and Spens (2006) called for more intensive investment in the transportation infrastructure from the Baltic countries to regain their regional competitiveness. The global economic crisis has posed challenges to the development of the infrastructure in many Eastern European countries, causing decisions to delay or cancel many investments and decreasing the volume of investment inflow. To ensure economic growth in the future, it is essential to acknowledge the impact these decisions may bring.

In this study, we contributed to the subject by illustrating the interconnectivity of the logistic infrastructure as an enabling element of economic development. The used indicators were GDP per capita, accessibility, logistic system performance and infrastructure. The contribution of the study is threefold: Firstly, the relations between the concepts were illustrated as a contribution to the scholarly discussion. Secondly, the current state and developments of the transportation infrastructure in the Baltic states were presented with comparison to Finland. Thirdly, the connection between the theory and empirical data was illustrated with the help of a logistic performance index and economic development measures as well as a qualitative interview analysis of Finnish

and Estonian logistic companies.

In our study, the Baltic states and Finland were used as a case. Estonia, Latvia and Lithuania underwent a transformation from planned economies to market orientation, and have been a part of the EU since 2004. This has benefited them greatly, at least in the light of their infrastructural investments. In the Baltic countries a strong link between investing in the transport infrastructure and the growth of GDP was expected in 2006 by Kovács and Spens, and this indeed seems to have happened in the light of our study.

The conducted interviews revealed that the companies adapt to the infrastructure around them or the lack of it. In the case where Finnish and Estonian logistic companies were interviewed it was noticed that in Estonia where the infrastructure was not as developed as in Finland, some companies attempted to compensate the lack by extensively using superstructures or technological structures. This implies that in some cases investments in these could bring more benefits than investments made in the infrastructure. Carefully considered investments in the superstructures or technological structures could therefore increase the accessibility of the region and furthermore improve the competitiveness and economic development.

The logistic performance of Finland is the highest among the studied countries, and in all the countries except Estonia the quality level of infrastructure increased between 2005 and 2008. Accessibility varies highly between the compared countries: in airports and ports, Estonia has a clear disadvantage, but land logistics work with short lead times and low costs. The economic development is positive in all the studied countries. The fact that the logistic performance of Estonia has still risen would seem to concur with our findings from the interviews which suggest that the insufficiencies of the infrastructure can be compensated through the innovative use of super structures.

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