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North- and Westbound Foreign Trade Potential of the Baltic Rim

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Keskusteluaiheita - Discussion papers

No. 678

Anssi Partanen - Inkeri Hirvensalo

**NORTH AND WESTBOUND
FOREIGN TRADE POTENTIAL
OF THE BALTIC RIM**

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ABSTRACT

The Baltic economies have rapidly moved away from the old command-type economies and approached their Western counterparts. The Western nations have usually approached the issue by trying to assess the potential for their exports to the Baltics. Less interest has been exhibited in the export potential of the Baltic countries themselves. The long-run well-being of the Baltics depends on their ability to integrate into the European and world economy through trade ties. The growth in the Baltics' exports also indirectly benefits the Western nations through the increase in the Baltics' income and due to the rise in their purchasing power.

This study tries to assess the potential for trade around the Baltic Rim, specifically potential for exports from the Baltic countries towards the Nordic EU countries and Germany. The study is conducted by using two different gravity models explaining trade patterns and is based on the hypotheses made in previous studies. The study also takes a closer look at potential shortcomings in using gravity models as such and as compared to different versions of gravity models. The main findings are that there definitely exists some unused trade potential in the region, the extent of which depending on the method and assumptions used. The final implication of the study is to stress the importance of other variables, such as foreign direct investment, in explaining differences between actual and potential trade between geographically close countries with large differences in standard of living.

KEY WORDS: Trade potential, gravity model, Baltic Rim.

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Baltian taloudet ovat siirtyneet nopeasti sosialismista kohti markkinataloutta. Länsimaita on kiinnostanut pääasiassa vientimarkkinoiden avautuminen ja viennin potentiaali tulevaisuudessa. Vähemmän huomiota on kiinnitetty Baltian maiden oman vientipotentiaalin arviointiin. Baltian maiden pitkän aikavälin kehitys riippuu kuitenkin niiden kyvystä integroitua Euroopan ja maailman talouteen ulkomaankaupan välityksellä. Baltian maiden kasvanut vienti tulee myös välillisesti hyödyttämään länsimaita Baltian tulotason kohotessa ja ostovoiman kasvaessa.

Tämän tutkimuksen tarkoituksena on arvioida mahdollista kaupan potentiaalia Itämeren alueella, erityisesti Baltian maista Euroopan unioniin kuuluviin Pohjoismaihin ja Saksaan suuntautuvan kaupan potentiaalia. Tutkimuksessa käytetään kahta erilaista kaupan kehittymistä kuvaavaa painovoimamallia, jotka perustuvat aikaisempiin aiheesta tehtyihin tutkimuksiin. Tutkimuksessa otetaan myös kantaa painovoimamallien puutteisiin sekä tutkitaan eri mallien antamien tuloksien vertailtavuutta. Tärkeimmät tulokset vahvistavat, että alueella on käyttämätöntä kaupan potentiaalia. Potentiaalın suuruus riippuu alkuoletuksista ja käytetyistä metodeista. Viimeisenä johtopäätöksenä painotetaan mahdollisten muiden muuttujien, kuten suorien sijoitusten, tärkeyttä selitettäessä maantieteellisesti toisiaan lähellä olevien, mutta elintasoltaan pikkeavien maiden todellisen ja potentiaalisen kaupan eroja.

AVAINSANAT: Kaupan potentiaali, painovoimamalli, Itämeren alue.

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INTRODUCTION

Several studies have been carried out during the 1990's in order to estimate the potential of the eastbound trade within Europe and particularly the Baltic Rim after the economic reforms were started in the Central and Eastern European economies of transition (Wang-Winters, 1991, Hamilton-Winters, 1992, Baldwin, 1993 and 1994, Erkkilä-Widgren, 1994 and 1995, Kala-Rajasalu, 1995, Kaitila-Widgren, 1998 and Partanen, 1998). Such studies have used the so called gravity models, which base their forecast of potential trade on such real variables as distance, population and GNP of the countries in question.

The arguments behind the use of gravity models to evaluate trade potential between countries is the following: large and wealthy countries are likely to conduct more foreign trade than small and poor ones, while an increased distance is likely to diminish the trade¹. When tested empirically the gravity models of trade perform reasonably well, even though they do not have substantial backing from economic theory. The applicability of such an approach to the emerging markets of Central and Eastern European transition economies rests on the assumption that in the long-run these countries will resemble the market economies of the EU both in their economic structure and behavior as well as the level of material well-being.

This study uses the gravity model method in order to estimate the potential of the north- and westbound exports of the three Baltic states in the Finnish, Swedish, Danish and German markets. Whereas the above mentioned studies focussed on the potential of imports of the Baltic countries, this study focuses on the potential of exports. For this purpose it uses two different models, the first estimated by Erkkilä-Widgren (EW, 1994) and the second estimated by Meronen (1997). The first section of this study describes the two models and accounts for the results of their application to the imports of Baltic countries. The second section applies the models to exports of the Baltic countries. Finally the third section discusses the findings and their implications.

1 Two models and their application to imports of the Baltic countries

The EW-model was originally estimated using trade statistics from 17 different Western European countries and used for evaluation of Finland's trade potential trade with the Baltic countries. The model was an abbreviated version of the Wang Winters-approach, which used data from 76 market economies around the world, but was expanded to include Central and Eastern European countries. The EW- model, as a standard Wang-Winters type gravity model, is specified in the appendix 1.

¹ Note however, that very large economies in world wide are models expected to behave more like closed economies due to their large internal markets. See also the argumentation on p. 9.

The second model, that of Meronen, is also an abbreviated form of a standard gravity model but it omits population and various cultural and trade bloc related variables. According to Meronen this type of a typified basic model represents reality and the underlying simplistic theory behind the gravity model approach more accurately than the WW-type model. Meronen argues further that in the industrial countries population variables and GDP figures are so homogenous and correlated to such an extent that the omission of population variables produces more reliable results. In this study Meronen's approach was deemed justifiable also due to the fact that none of the countries on the opposite sides of the Baltic Sea belong to the same trading block, and because only Finland and Estonia belong to the same linguistic group.

Meronen also evaluated distance as a weighted average between five biggest cities of the countries in question and did not use the standard measure of distance between capitals and ports. In the Baltic Rim the different points of measuring distance come quite close to each other, however. Meronen estimated his model by using data from 14 different European nations. The Meronen-model used in this study is specified in appendix 2 and the estimated coefficients of the two models are given in appendix 3.

The major difference between the estimated coefficients of the two models lies in the significance of the distance coefficient. In the Meronen model the distance coefficient receives a value four times greater than in the EW-model. Thus, other variables held constant, the Meronen-model could produce larger values when compared to the standard EW-model. However, despite the differences both models have t-values which are statistically significant and which indicate that both models are robust.

The general conclusion of Erkkilä-Widgren after applying the model to Finland's exports to the Baltic states, was that the actual level of exports had potential to increase in the case of Latvia and Lithuania, but Finnish exports to Estonia were already higher than the potential. The conclusions of Meronen also pointed to unused export potential from most of the EU countries to the Baltic states. Distance between the countries seemed to be the deciding factor and outermost regions seemed to have utilized their trade potential least in the Baltics.

Using the same two models for Finnish, Swedish, Danish and German exports Partanen (1998) found, in turn, that there existed some unused potential for exports to the Baltic countries from most of these countries. However, the Finnish and Swedish exports seemed to have surpassed the trade potential particularly in Estonia and Latvia, and the Danish exports in Lithuania. Partanen was also studying trade potential of the same countries in Poland and some regions of the North-Western Russia and found that by far the largest unused potential for exports was in these two large emerging markets.

Partanen's study also confirms the already suggested hypothesis of the importance of distance in the geographical distribution of trade. In case of Finland the predominance of exports to Estonia and in case of Sweden, Denmark and Germany to Poland is mainly based on geographical proximity. When comparing the results of the two models the Meronen-model, which excludes the population, cultural and trading block variables,

shows consistently larger values and in most cases values which are closer to the actual trade flows than the EW-model. For example, in case of Finland's exports to Estonia the EW-model, which includes cultural dummies, produces much smaller values than the Meronen-model, which excludes them. However, the results of both models fall short of the actual level of exports from Finland to Estonia. In addition to highlighting the significance of geographic proximity this situation also points to specific factors, which play a significant role between ethnically close nations of Estonia and Finland, and which are not captured by standard variables denoting just linguistic closeness.

2 The potential of north- and westbound exports of the Baltic states

The two gravity models described above are used in the following analysis in order to evaluate the potential of exports from the Baltic countries to Finland, Sweden, Denmark and Germany. Appendix 4 contains the list of used variables and appendix 5 the numerical results of the export potential calculations in comparison to the actual trade in 1995 and 1997. In this analysis a slightly different method of measuring distance between the trading countries is used in the Meronen-model than in the previous calculations. Instead of measuring the distance as that between major ports of entry and capitals distance is measured as a weighted distance between major cities in two trading countries. The estimated coefficient for distance is somewhat smaller in this model than in the previously used model.²

2.1 Data used

The major variables used in estimating the trade potential are population, geographical distance between countries, and the level of GNP/GDP in respective countries. Population figures are taken from the World Development Report 1997 of IMF, excluding Germany, whose figures are from national statistics. The GNP figures used in the EW-model have been obtained from the World Bank Development Report 1997 and 98/99 and the GDP figures used in the Meronen model were taken from the International Financial Statistics 10/98 of IMF. The Baltic GDP figures in local currencies are taken from the national statistics. These figures correspond accurately with OECD's short-term economic indicators for transition economies for 1995, the latest information available in that source (supplement 4/97).

In the Baltic countries, which have only recently introduced the systemic change from planned economy to market economy, the use of current exchange rates can be somewhat misleading. Therefore the results of both the EW-model and the Meronen-model have been recalculated by using purchasing power parity (PPP)-corrected levels of GNP/GDP. The Baltic Purchasing Power Parity (PPP) conversions for 1995 are taken from OECD/supplement 4/97 and PPP-conversions for 1997 follow the estimates published by

² Because of different distance data, this version of the Meronen-model incorporates slightly different parameter values when compared to the values described and used in the previous analysis found in ETLA DP 645. These estimates should correspond more accurately with the distance data and provide better approximation for the trade potential.

Economist Intelligence Unit. When necessary, exchange rate conversions from national currency to dollars have been carried out at rates prevailing at the time in question.

2.2 Trade potential as estimated by the two models

The EW-model and Meronen-model used in this study give somewhat differing results for the potential of exports from the Baltic countries to countries around the Baltic Rim. For the individual Baltic countries the export potential seems as follows according to the estimates given by the two models.

2.3 Estonian export potential

According to figures 1 and 2, which depict Estonian export potential to the four markets around the Baltic Sea in 1995 and 1997, actual exports seem to have already exceeded the potential in Finland, Sweden and Denmark whereas there is considerable potential to increase exports to Germany. For Finland the situation is somewhat intriguing, as even the estimated largest potential in 1995 was smaller than the actual exports but in 1997 the largest potential as estimated by the Meronen-model is higher than the actual exports and indicates increased export potential for Estonia in Finland.

Figure 1

Estonia's export potential in Finland, Sweden, Denmark and Germany in 1995

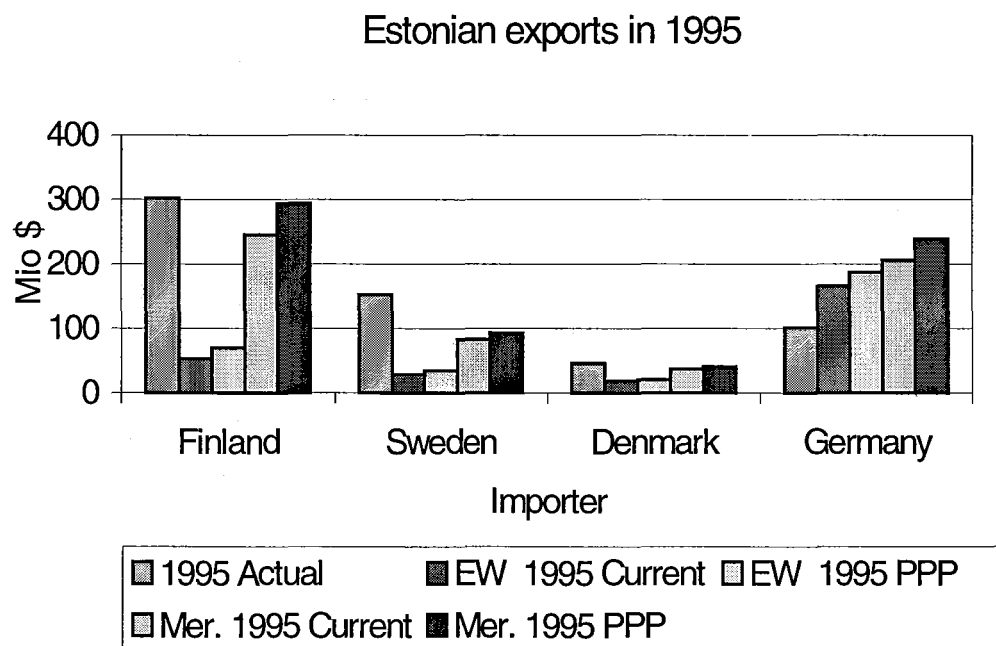
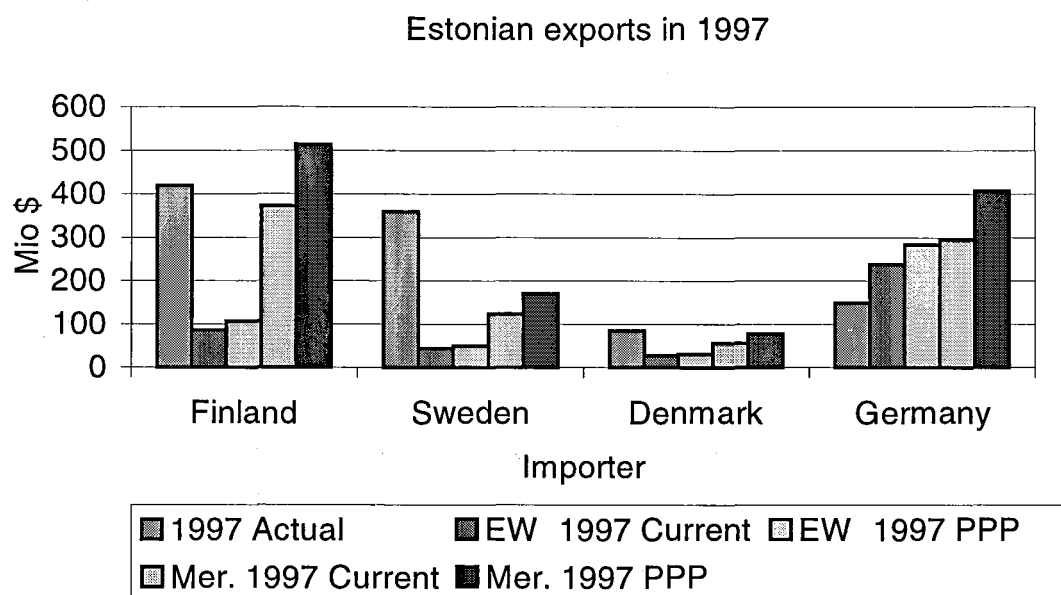


Figure 2

Estonia's export potential in Finland, Sweden, Denmark and Germany in 1997



2.4 *Latvian export potential*

For Latvian exports, as indicated by figures 3 and 4, the potential for increasing exports into the four target countries exceeds the actual level of exports by all model calculations in Finland and Germany. In Sweden and Denmark the actual level of exports reached in 1997 is above the level estimated by the EW- model but clearly below the level estimated by the Meronen-model.

Figure 3

Latvia's export potential to Finland, Sweden, Denmark and Germany in 1995

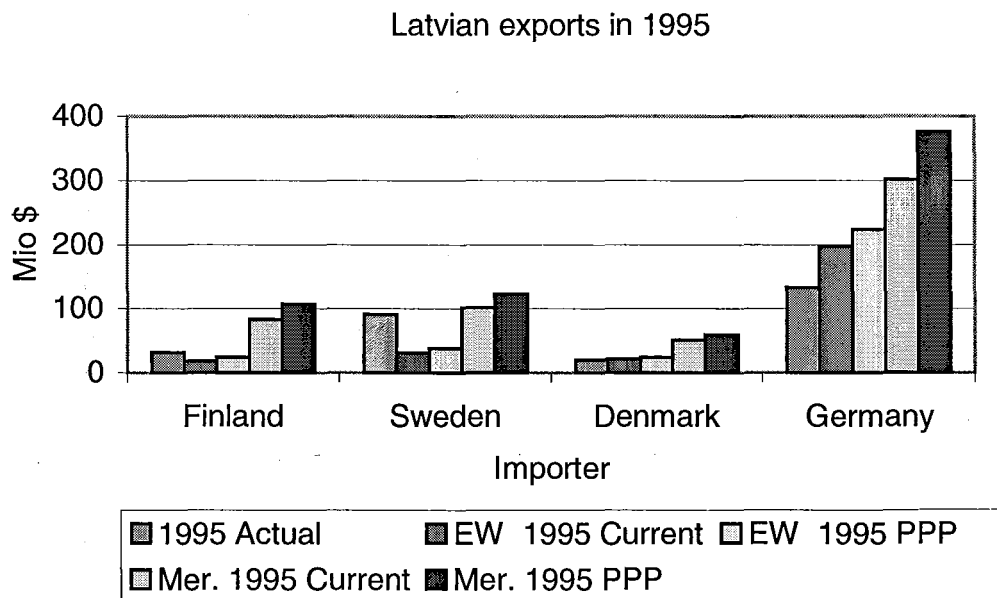
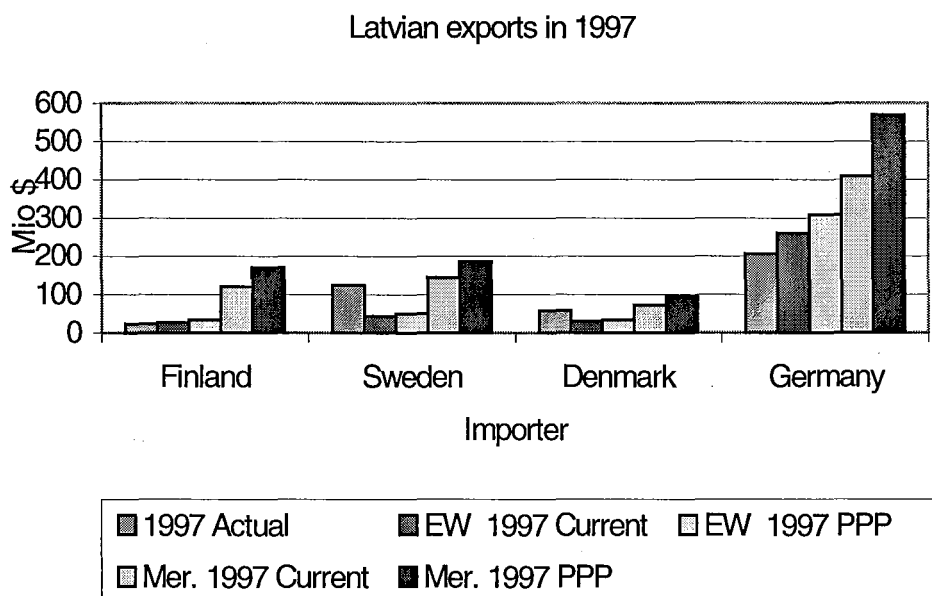


Figure 4

Latvia's export potential to Finland, Sweden, Denmark and Germany in 1997



2.5 Lithuanian export potential

In case of Lithuanian export potential the situation as estimated by the two models has changed the least from 1995 until 1997. As figures 5 and 6 indicate there is potential for exports to grow in all four countries by almost all model calculations. In relative terms largest export potential is in the most distant Finnish markets but in absolute terms largest potential, especially when estimated by the Meronen-model, is found in the German market. Exports to the Danish markets are closest to the estimated potential by all models.

Figure 5

Lithuanian export potential to Finland, Sweden, Denmark and Germany in 1995

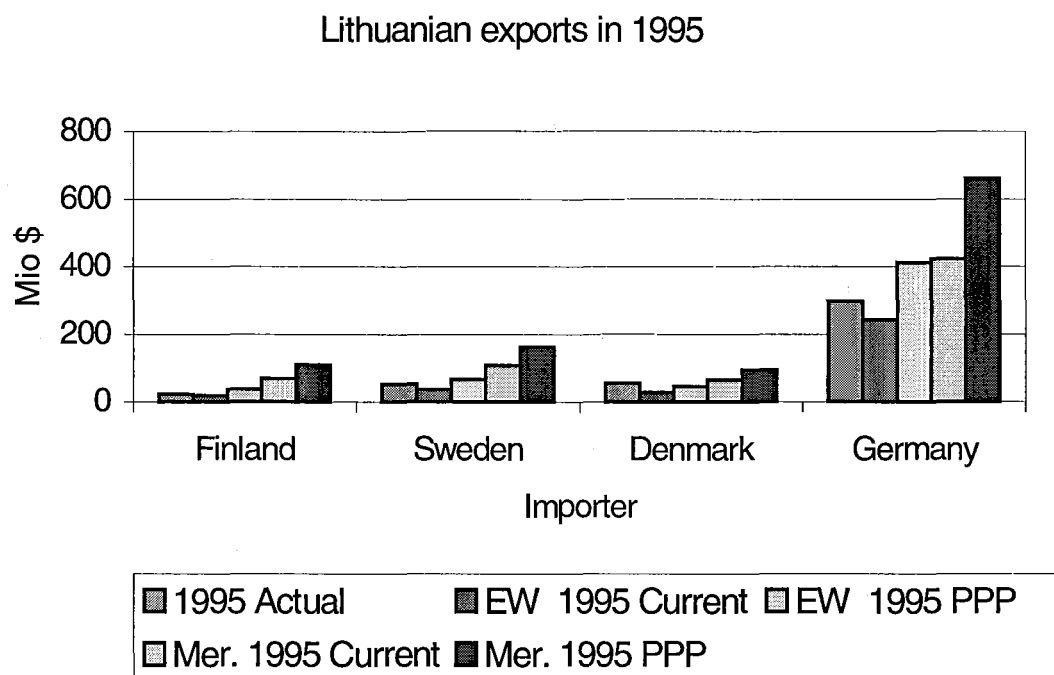
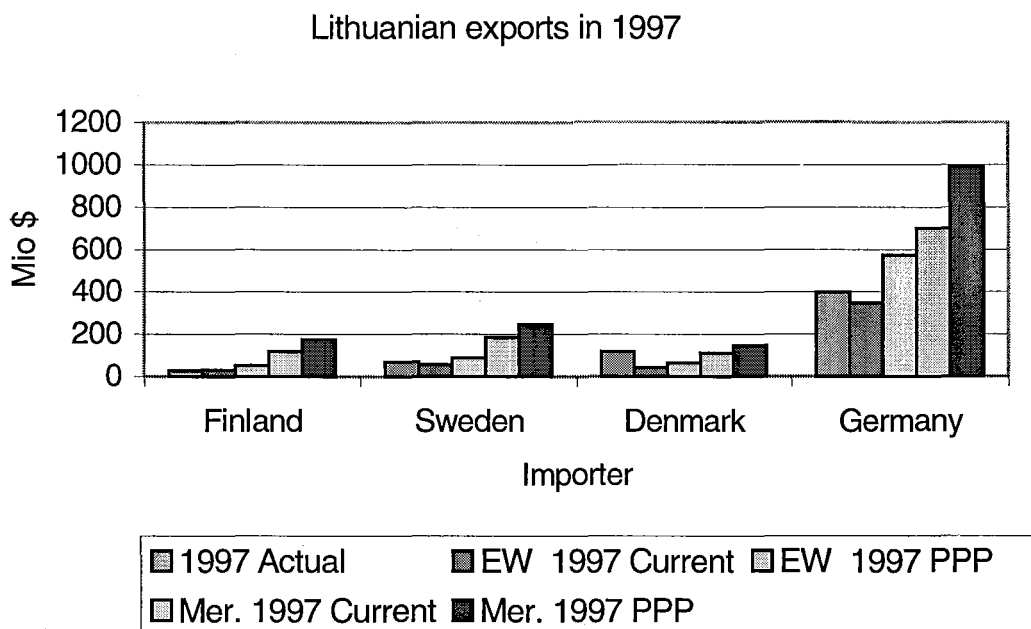


Figure 6

Lithuanian export potential to Finland, Sweden, Denmark and Germany in 1997



3 Comparison between the two models and discussion of the results

The parameters of the two models were results of earlier estimations. Thus both models represent reality according to their inherent presumptions, leaving the reader the role of an interpreter. The major differences between the two models can be summarized as follows:

1. The inclusion of population variables in the EW-model and the omission of the said variables in the Meronen-model.
2. The data for the estimates in the EW-model is from 1993 and from 1996 in the Meronen-model.
3. The use of GNP/GDP figures in the respective models.
4. Different ways to estimate distances.
5. Different currencies in the models; USD in the EW-model and ECU in the Meronen-model.

How are these differences likely to influence the outcome of the trade potential calculations? The potential influences are evaluated in the following account, which also deals with some basic qualities of the models.

The original idea and theoretical base for the inclusion of population variables by Wang-Winters was that very large countries, like Japan, USA, China, etc., are likely to behave more independently and essentially represent close economies, ie. such countries would trade less with foreign countries than smaller ones. The coefficients for the population variables should, thus, be negative if we are to believe the argument. However, there is usually a strong positive correlation (0.95 according to Meronen) between GNP and population, the variables essentially competing for the explanatory role in the models. Thus it is very unlikely to obtain the expected negative sign for the population coefficients. As most of the countries included in the present study belong to the category of small or medium sized countries, excluding the population variables seems justified.

Different base years give rise to another potential bias. As usually is the case, trade between nations increases at a faster rate than rate at which the GNP is growing. Trade figures from 1995 are most likely smaller than in 1996, and it is thus possible that larger trade potential is 'built into' the Meronen-model by default. This is because the ratio of trade to GNP is likely to be larger in 1996 than in 1993. The exact amount of the possible discrepancy is hard to estimate, but it should not be overly large. The 1996 figures naturally represent more closely the present reality.

Comparison between GNP and GDP figures reveals that GNP figures by WB are slightly smaller than GDP figures (see appendix for sources) in case of the EU/Nordic-countries, but larger in case of the Baltic countries. With these figures the Meronen-model automatically produces slightly larger values than if similar figures were used for both models. This also explains partly the large values Latvian/Lithuanian export potential receives in 1997. Converted PPP-figures do not correct this bias but depict better the real differences in the GDP/GNP levels between the countries.

The distance operator is crucial in both models. In the EW-model part of the relevance of the distance operator has been diluted by the introduction of the cultural/linguistic/border dummies. As the countries in question are situated around the Baltic Rim, only the Estonia/Finland -pair receives a nonzero value for any dummy (in this case for cultural and linguistic dummies). In all other cases this situation slightly decreases the amount of trade potential compared to the situation where the different countries were situated in a closer proximity to each other, as in Central Europe.

The measuring of the distance is also different. The EW-model uses trade routes, whereas the Meronen-model uses the distance between capitals/'theoretical' centers. In most of the countries of this study the observation points are quite close to each other, the notable exception being Germany, whose 'theoretical' center lies deeper inland than the capital. In case of the EW-model the original distance data is non-recoverable, but the practice of using capitals and sea routes (closest way to reach the other shore of the

Baltics) plus land transport 'addition' in case of Germany should closely approximate the original. Meronen has provided his calculations for the distances³.

The final short remark is about exchange rates. The PPP-method has already removed some potential sources of distortion (see appendix including GNP/GDP –figures), producing more reliable results than the usage of current rates as noted above. However, it does not remove the distortion caused by the depreciation of the ECU between 1995 and 1997. The ECU depreciation from 1.31 dollars to ECU in 1995 to 1.1 dollars to ECU has obviously increased the ECU-values of trade potentials (and actual values) somewhat. The effect affects both models in approximately the same way, but nevertheless increases the 1997 potential calculated by the Meronen-model more than the use of dollar-based notification based on EW-model.

In summary, the comparison of the qualities and data used for the two models, shows that practically all differences between the two models would produce higher results for export potential when carrying out the calculations by the Meronen-model than by the EW-model. So, the considerably higher export potential calculations by the Meronen-model are partly a result of the data used as well as the inbuilt qualities of the model. In particular, the Meronen-model is more sensitive to the measurement of distance. On the other hand, the lower results of the EW-model, even though they are more difficult to interpret as the model is using both the GNP-figures and population-figures as separate variables, could be regarded as a benchmarking point of comparison. As both models produce consistently similar results for the three countries in question, the apparent conclusions of the results can also be considered relatively well founded.

The main conclusions for the three countries are: 1) that there is ample potential for their exports to grow into the more distant trading partners within the Baltic Sea region; 2) as calculated export potential has been surpassed in some close markets, as for example Estonian exports into Sweden, the situation cannot be interpreted as not sustainable in the medium or longer term. As the economies develop, the variables influencing trade potential calculations also change rapidly. This is illustrated by the results, which show that Estonian exports into Finland were above their calculated potential in 1995 but slightly below that in 1997.

Finally a note about the theoretical implications; as the Baltic economies have rapidly taken large steps towards a western European type of market economy, such basic assumptions underlying both of the models used can be considered valid. The rapidity at which these countries redirected their foreign trade in the first half of 1995's also testifies to this. However, the basic assumptions underlying both models that trade would be determined mostly by GNP/GDP/size of population and proximity, should be questioned particularly in the case, where there is such a large difference in the standard of living

³ Although correct and not technically difficult, his calculations have to be interpreted as part of the 'whole study', as they are permanently integrated in the configuration of his model. That notion is also potentially troublesome in the future, if one might want to use the model in a situation including countries not present in the original study. In that case one would be forced to estimate a new model with new distance calculations. The same goes for the EW-model also, as one can not be sure that transportation aspects/distance behave the same way in 'added' countries also.

and cost level between geographically very close countries. One could at least hypothesize that the reason why the actual trade surpasses the calculated potential especially in the case of close neighbors, could be due to trade created by low cost seeking foreign direct investments made into the Baltic countries. In this respect more empirical research would be needed in order to create a model that would take such variables into account.

REFERENCES

- Alho-Erkkilä-Kotilainen-Widgren:** EU:n kehitys Suomen näkökulmasta, ETLA B121, 1996.
- Baldwin, Richard E.:** Towards an Integrated Europe. CEPR 1994.
- Baldwin, Richard E.:** The potential for trade between the countries of EFTA and Central and Eastern Europe. EFTA Occasional Paper No.44, 1993.
- Central statistical office of Poland:** Demographic Yearbook, 1997.
- EIU:** Country Report: Estonia. The Economist Intelligence Unit, 1998.
- EIU:** Country Report: Latvia. The Economist Intelligence Unit, 1998.
- EIU:** Country Report: Lithuania. The Economist Intelligence Unit, 1998.
- EIU:** Country Report: Poland. The Economist Intelligence Unit, 1998.
- Erkkilä, Mika and Widgren, Mika:** Baltian ja EU-maiden kauppa: todellisuuden ja mahdollisuuksien vertailua. Kansantaloudellinen aikakauskirja 91, 1995.
- Erkkilä, Mika and Widgren, Mika:** Suomen ja Baltian kaupan potentiaali ja suhteellinen etu. ETLA B101, 1994.
- Eurostat:** Internal and external trade of the EU. 1996.
- Hamilton, C. and Winters, A.:** Opening Up International Trade with Eastern Europe. Economic Policy 14, 77-116, 1992.
- Hazley, Colin and Hirvensalo, Inkeri:** Barriers to foreign direct investment in the Baltic Sea region. ETLA Discussion Papers No. 628, 1998.
- Hernesniemi, Hannu:** Barriers to economic cooperation of Baltic Rim countries. ETLA Discussion Papers 555, 1996.
- IMF:** International Financial Statistics Yearbook. International Monetary Fund, 1996, 1998.
- Kaitila, Ville and Widgren, Mika:** Baltian maiden EU-jäsenyys ja Suomi. ETLA B139, 1998.
- Kala, Ants and Rajasalu, Teet:** Economic integration and subregional cooperation in the Baltic states. Estonian Academy of Sciences, Discussion Paper No.2, 1995.
- Meronen, Juha:** Gravitaatiomalli kansainvälisen kaupan tutkimuksessa - Baltia avautuu länteen. Kansantaloustieteen pro gradu-tutkielma, Helsingin yliopisto, 1997.
- OECD:** Short-term economic indicators. Transition economies, supplement 4, 1997.
- OECD:** Main Economic Indicators, December 1996, 10/98.
- Partanen, Anssi:** Trade Potential around the Baltic Rim: A Two-model Experiment, ETLA Discussion paper No. 645, Helsinki 1998
- Statistisches Jahrbuch für das Ausland,** 1997.
- Statistisches Jahrbuch für die Bundesrepublik Deutschland,** 1997.
- Wang, Z. and Winters, A.:** The Trading Potential of Eastern Europe. CEPR Discussion Papers No: 610, 1991.
- World Bank:** World Development Report 1997 and 1998/99: The State in a changing world. World Bank, 1997, 1998.

Appendix 1

The Erkkilä-Widgren model

The first approach adopted in the study is a standard Wang-Winters type gravity model of the following composition:

$$X_{ij} = CD_{ij}^{b_1} N_i^{b_2} N_j^{b_3} Y_i^{b_4} Y_j^{b_5} P_{ij}^{b_6} A_{ij}^{b_7},$$

where

X_{ij} = the value of exports from country i to country j,

C = constant,

D_{ij} = the distance between the two countries,

N_m = the population in country m (m=i,j),

Y_m = the GNP per capita in country m (m=i,j),

P_{ij} = “block dummy”, indicating whether the countries i and j belong to the same regional trade block,

A_{ij} = “cultural dummy”, indicating whether the countries i and j belong to the same linguistic group.

For the purposes of estimation it is more useful to convert the model into a logarithmic form, yielding the following additive expression:

$$x_{ij} = c + b_1 d_{ij} + b_2 n_i + b_3 n_j + b_4 y_i + b_5 y_j + b_6 p_{ij} + b_7 a_{ij}$$

where the symbols indicate natural logarithms of the variables indicated by capital letters above.

The model above, or its various versions, have already been used in several studies assessing the potential trade flows between different countries, most notably in the original Wang-Winters study (1991), but also in Hamilton-Winters (1992), Baldwin (1993, 1994), Erkkilä-Widgren (1994, 1995b), Kala-Rajasalu (1995) and Kaitila-Widgren (1998).

Appendix 2

The model by Meronen

Meronen (1997) has created an abbreviated form of a standard gravity model, omitting population variables and including only GDP figures and distance.

Meronen also discarded the standard method of evaluating distance as between capitals and ports, and used a weighted average between five biggest cities instead. His method was likely to shift the distance point closer to the 'theoretical' center of the country.

The following typified model by Meronen is used in this study:

$$t_{ij} = \beta_0 + \beta_1 y_i + \beta_2 y_j + \beta_3 d_{ij} + u_{ij},$$

where the equation is in logarithmic form as with the EW-model and where

t_{ij} = the value of trade between the respective countries,

y_i = the GDP of the exporting country,

y_j = the GDP of the importing country,

d_{ij} = the distance between the two countries,

and where the β 's represent the respective coefficients.

Meronen estimated his model by using 1996 data from 14 different European nations and produced a total of 182 observations.

Appendix 3

Estimates of the two models

The following table shows the estimated coefficients for the two models:

Table 1: The values of coefficients

	Erkkilä- Widgren		Meronen	
	coefficients	t-values	coefficients	t-values
constant	-15.2	16.6	6.0	18.0
y_i	1.08	20.5	0.78	19.0
y_j	0.95	18	0.80	19.5
n_i	0.79	20.9		
n_j	0.84	22.2		
p_{ij}	0.67	5.7		
a_{ij}	1.19	8.5		
d_{ij}	-0.25	-7.1	-1.18	-14.9
RR	0.87		0.87	

The estimated coefficients are obtained from the original studies by Erkkilä-Widgren and Meronen. The estimated coefficients differ markedly due to the construction of the models, although both the models have an almost equal correlation coefficient, explaining roughly 87% of results.

The major difference between the models seems to be the importance of the distance coefficient. In the Meronen-model the distance coefficient receives a four times greater value than with the EW-model. The large distance coefficient with the Meronen-model indicates that within a relatively confined geographical area, and with all the other variables held *ceteris paribus*, the Meronen-model could produce larger values when compared to the standard EW-model.

Despite the differences, both models have statistically significant t-values. The values range from 5.7 to 22.2 with the EW-model, and from -14.9 to 19.3 with the Meronen-model. The obtained t-values indicate that both the models are robust and could be used as such without further modifications.

Appendix 4 List of variables and sources of information

GNPs	GNP\$	percapita current'95	total mio\$	percapita PPP'95	total mio\$	percapita current'97	total mio\$	percapita PPP'97	total mio\$	Actual Exports Mio ECUs			
										Estonia 1995	Latvia 1995	Latvia 1997	Lithuania 1995
FINLAND	20580	104958	17760	90576	24080	122808	18980	96798	302,14	418,36	31,6	23,1	22,2
SWEDEN	23750	209000	18540	163152	26220	230736	19030	167464	152,6	358,6	91,1	124,4	52,5
DENMARK	29890	155428	21230	110396	32500	169000	22740	118248	46,2	85,1	19,8	58,1	54,9
GERMANY	27510	2253069	20070	1643733	28260	2314494	21300	1744470	101,2	148,4	133,2	206,2	297,1
ESTONIA	2860	4290	4220	6330	3330	4995	5010	7515					
LATVIA	2270	5675	3370	8425	2430	6075	3650	9125					
LITHUANIA	1900	7030	4120	15244	2230	8251	4510	16687					

Source: World Bank Development Report 1997 and 98/99

GDPs	Bio local currency	exch.rates\$ periodend	1995 Bio \$	PPP exchrates	1995 PPP\$	Bio local currency	exch.rates\$ periodend	1997 Bio \$	PPP exchrates	1997 PPP\$	Population
SWEDEN	1649,90	6,66	247,80	9,77	168,87	1738,90	7,88	220,76	9,61	180,95	8,8
DENMARK	1013,50	5,55	182,74	8,45	119,94	1120,90	6,83	164,21	8,31	134,89	5,2
GERMANY	3459,60	1,43	2413,39	2,02	1712,67	3646,30	1,79	2034,65	2,00	1823,15	81,9
ESTONIA	40,71	11,46	3,55	6,72	6,06	65,08	13,88	4,69	EIUEstim	7,10	1,5
LATVIA	2,35	0,54	4,37	0,28	8,27	3,21	0,59	5,44	EIUEstim	9,30	2,5
LITHUANIA	24,10	4,00	6,03	1,60	15,06	38,20	4,00	9,55	EIUEstim	16,80	3,7

Local currency figures are from IMF's International Financial Statistics 10/98, as well as period-end exchange rates for the EU-countries.

PPP-exchange rates/conversions are from OECDs Main Economic Indicators 10/98.

Baltic local currency GDPs are from their national statistics obtained from private local

sources. The figures correspond accurately with

OECDs short-term economic indicators for transition economies, supplement 4/97, which has only 1995 figures. The EIU numbers correspond with OECD.

The Baltic PPP-conversions for 1995 are from OECD/supplement 4/97. PPP-conversions for 1997 follow the EIU estimates.

In both methods it is interesting to notice that although current GDP/GNP-figures behave somewhat erratically and misleadingly due to exchange rate fluctuations (ie. dollar's strengthening), the PPP-figures reflect accurately the positive growth rates of all the countries between 1995 and 1997.

Appendix 5 Estimation Results

	Estonia				Latvia				Lithuania			
	Erkkiilä-Widgren		Meronen		Erkkiilä-Widgren		Meronen		Erkkiilä-Widgren		Meronen	
	1995 EW	1995 EW	1995 EW	1995 Mer.	1995 EW	1995 EW	1995 Mer.	1995 Mer.	1997 EW	1997 EW	1997 Mer.	1997 Mer.
Finland	302,14	52,70761	69,74823	244,7138	293,405	Finland	418,36	85,88493	106,4902	372,1438	513,4002	
Sweden	152,6	28,222783	33,95967	82,4724	92,57857	Sweden	358,6	43,52525	49,89902	123,3597	170,1839	
Denmark	46,2	18,28022	20,10464	36,82448	40,10331	Denmark	85,1	27,78203	30,76173	55,46138	76,51311	
Germany	101,2	165,3132	186,4977	205,6619	238,4376	Germany	148,4	238,0389	282,8655	294,3047	406,0153	
	Actual	Current	PPP	Current	PPP		Actual	Current	PPP	Current	PPP	
Finland	31,6	18,01341	23,9953	83,05986	107,059	Finland	23,1	26,80539	33,17809	119,7456	171,3307	
Sweden	91,1	31,23403	37,82546	101,7796	122,8772	Sweden	124,4	43,98192	50,334	144,3249	187,04	
Denmark	19,8	21,83	24,16791	50,6819	59,36155	Denmark	58,1	30,29834	33,489	72,36405	93,94712	
Germany	133,2	196,7878	223,4779	301,393	375,805	Germany	206,2	258,7744	306,9657	408,8766	568,9956	
	Actual	Current	PPP	Current	PPP		Actual	Current	PPP	Current	PPP	
Finland	22,2	18,46389	37,03019	67,65693	109,2412	Finland	26	30,34713	51,79249	118,7821	173,7865	
Sweden	52,5	35,45949	64,65341	107,2717	162,163	Sweden	68,2	55,1502	87,02706	185,2406	245,4813	
Denmark	54,9	27,08609	45,14755	63,3264	92,87383	Denmark	118,6	41,52215	63,2824	110,1096	146,1756	
Germany	297,1	240,9585	411,9848	422,1961	659,1737	Germany	398,8	349,9723	572,4297	697,4996	992,5439	
	Actual	Current	PPP	Current	PPP		Actual	Current	PPP	Current	PPP	

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