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POTENTIAL OF AIR CARGO MARKET IN BALTIC SEA REGION

Maciej Mączka

Institute of Aviation, al. Krakowska 110/114, 02-256 Warsaw, Poland, maciej.maczka@ilot.edu.pl

Abstract

The estimated gravity model for Baltic Sea Region air cargo flows reveals some general pattern. The most promising origins from where the air cargo could come confirm general trends of last two decades – East Asian industrial zones (China, South Korea, Taiwan, Thailand, Malaysia, Indonesia, Vietnam), far East Asian trading hubs (Hong Kong, Singapore), South Asia (India, Sri Lanka) and –traditionally – USA, Western Europe and Middle East. Also Africa is rising as a origin of air cargo. The estimated aggregated econometric model suggests some general rules associated to air cargo demand in Baltic Sea Region. For example it was confirmed that volume of cargo flow is decreasing with distance – but for the short-haul (up to 3500 km) transport only. On the other hand, numerical transformations of data for the long-haul conveyance (farther than 3500 km) suggest high positive significance of business environment compatibility (expressed as an indicator of time to prepare and pay taxes) among the Baltic Sea Region destinations of trade and their East Asian origins.

Keywords: air transport, air cargo, gravity model, Baltic Sea Region.

1. INTRODUCTION

Air Cargo Market Outlook for the Baltic Sea Region expects a steady growth around 5% per annum as the most likely scenario. A fading surge of c.a. +15% in 2012-2014 is projected by the optimistic scenario. The outlook's conservative scenario, using the naïve forecast, extends currently available data (2010) up until 2020.

The total annual BSR air cargo market (c.a. 650 000 t in 2010) is several times smaller than the volumes of global leaders. (see Table 1) The most likely scenario suggests growth to around 1 000 000t in of air cargo handled (loaded and unloaded) at Baltic Sea Airports the 2016.

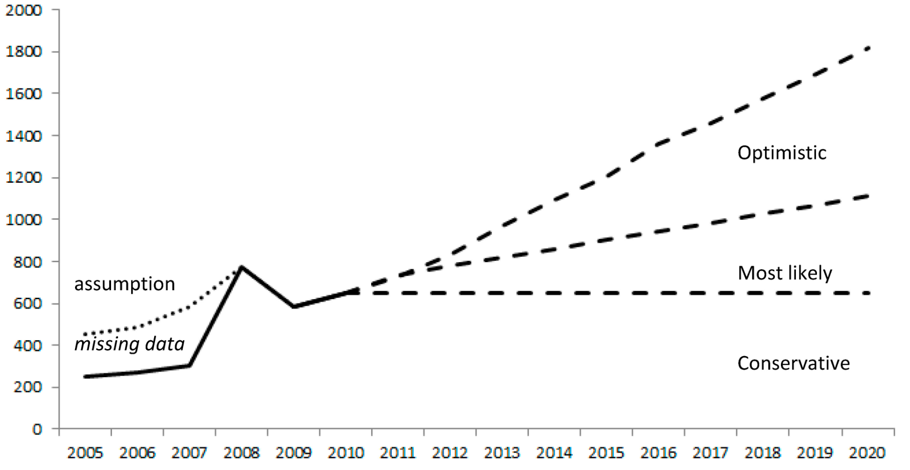


Chart 1. Baltic Sea Region Air Cargo demand in kilotons. Forecast based on EUROSTAT o-d data [avia_gor] (Pr > 0,1, scale coeff.: 0,24)

scenario	2011	2012	2013	2014	2015	2016
optimistic	11,5%	14,6%	16,9%	12,4%	10,5%	12,9%
most likely	6,0%	5,7%	5,4%	5,1%	4,8%	4,6%
conservative	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Table 2. ACI report of January 2013 on global air cargo activity[1].

SUMMARY WORLDWIDE TRAFFIC RESULTS, January 2013 (% CHANGE)			
	January 2013 Over January 2012	Year to date 2013	12-month rolling year
PaxFlash			
International passenger	3,1	3,1	5,1
Domestic passenger	0,3	0,3	2,3
Total passenger	1,5	1,5	3,5
FreightFlash			
International passenger	5,2	5,2	0,1
Domestic passenger	12,5	12,5	1,7
Total passenger	7,4	7,4	0,8

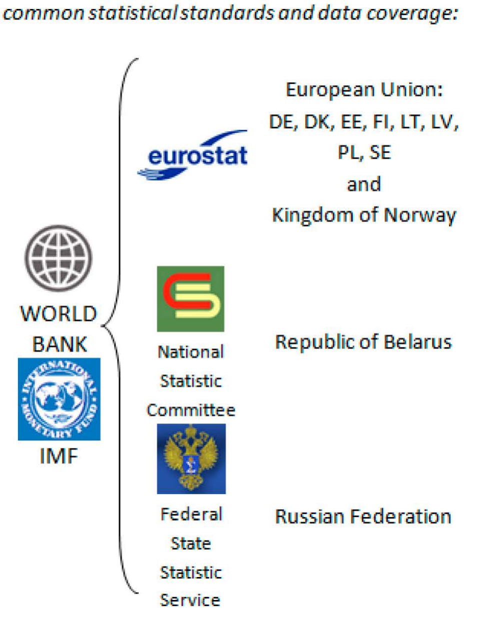
ACI: "PaxFlash and FreightFlash statistics are based on a significant sample of airports that provide regular monthly reports to ACI. They represent approximately 60% of total passenger traffic and 70% of total freight traffic worldwide. Commentary, tables and charts are based on preliminary data submitted by participating airports and are therefore subject to change."

2. METHOD OVERVIEW

The goal of integrating the BSR air cargo demand data was reached by creating an aggregated model[2], a "common denominator" for different airports that was treated as base for drawing

[1] ACI Media Release, Global passenger traffic posts modest growth of 1.5% in January, pp. 2, 5. http://www.aci.aero/News/Releases/Most-Recent/2013/03/11/Global-passenger-traffic-posts-modest-growth-of-15-in-January-

[2] Mączka, M., Modelling air cargo market – a gravity method, 2015.



conclusions. Despite decreasing role GDP indicator in freight forecasting, at an aggregate level, panel data techniques are very promising introducing shifts over time and diversification of relation. [3]

The desirable disaggregate models, that could answer much more questions and could help shape better plans for public money spending or entrepreneurial efforts, require a detailed microeconomic underpinning including information for different commodity groups. The kind of data is expensive and usually proprietary.[4]

A compromise of detail level of analysis was determined by data availability. The "common denominator" of Baltic Sea Region, various, small or large organisations that could provide such data relied upon local possibilities, limitations, resources and the marketing success earned by the project. Considering the available resources, a common standards development was postponed and the available to public free of charge data was used. Only in case of Sweden RFS was considered as air cargo.

DATA

Data on air cargo flows in Baltic Sea Region originates from EUROSTAT [5]. Its "avia_gor_xx" sets that represent the most detailed, publicly available information on origin-destination air cargo

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[3] Meersman, H., Van de Voorde, E., The Relationship between Economic Activity and Freight Transport, in: Recent Developments in Transport Modelling – Lesson for freight sector, 2008, p. 90.

[4] E.g. freight transport data set used in scientific publication of 2008 for estimating disaggregate model was already 20 years old, Ben-Akiva, M., Bolduc, D., Park, J.Q., Discrete Choice Analysis of Shippers', in: Recent Developments in Transport Modelling – Lesson for freight sector, 2008, pp. 135-155.

[5] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Freight_transport_statistics
"The legal framework for air transport statistics is provided by Regulation 437/2003 on statistical returns in respect of the carriage of passengers, freight and mail by air. Air freight statistics are collected for freight and mail loaded and unloaded in relation to commercial air flights. The information is broken down to cover national and international freight transport. Air transport statistics are collected at the airport level by the EU Member States, Norway, Iceland, Switzerland and candidate countries. Annual data are available for most of the EU Member States for the period from 2003 onwards, while some countries have provided data back to 1993. The statistics that are collected are also available for a monthly and a quarterly frequency. Air freight statistics are also collected for a regional analysis (NUTS 2 level)."

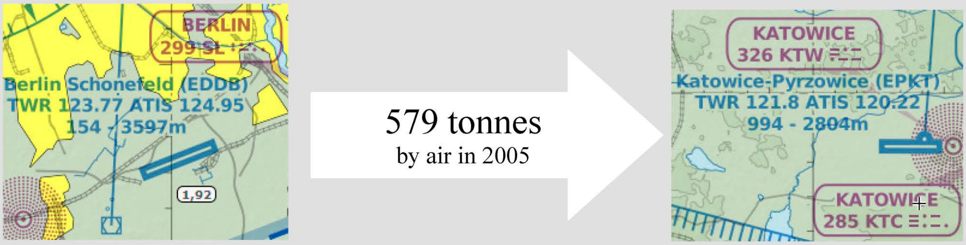
volumes were gathered into one “avia_gor_BSR” set. Neither NNSCRB (BY), nor RFFSSS (RU) websites offer any equivalent data sets[6], therefore these countries, together with Kingdom of Norway are treated as extra-BSR destinations in the modelling. See example below to understand data structure.

unit,tra_meas,airp_pr\time	2010	2009	2008	2007	2006	**2005**
T,FRM_LD,DE_EDDB_PL_EPKT	:	:	:	:	:	**579**

(“:” means lack of data in EUROSTAT database, data extracted on 2013-02-19)

Figure 1. An example from EUROSTAT “avia_gor_de” package,

<u>Interpretation</u>:
In **2005**, **579** tons (“T”) of cargo were loaded (“FRM_LD”) onto an aircraft at **Berlin-Schonefeld** (“EDDB”) and transported to **Katowice-Pyrzowice** (“EPKT”) in several (or one) flights (not the “flying trucks”).[7]



(VFR map by skyvector.com)

Figure 2. Visualisation of EDDB-EPKT example

According to the rough order of magnitude estimates about 40% data (marked as “:”) is missing. Nevertheless the package “avia_gor_BSR” was used for further analysis, as no equivalent was available.

Model was chosen in methodological deliberations paper[8]. It was assumed that long-haul and short-haul routes air cargo is affected by the variables in a different way. The panel data was divided into two subsets including routes not farther than 3500km (for a “short-haul”) and 3500km or farther (for a “long-haul”).[9]

For modelling the **short-haul** (see Eq. 5[10]) air cargo routes (predominantly intra-European), the inflation and tariff variables were excluded as irrelevant. European Economic Area countries do not significantly differ in inflation levels[11] and are participants of the Single

[6] See RU AND BY DATA SOURCES in Appendix below

[7] KS-RA-10-028-EN,http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-10-028/EN/KS-RA-10-028-EN.PDF F.V-25 Freight loaded or unloaded - Any freight loaded onto or unloaded from an aircraft. Direct transit freight is excluded. F.V-35 Total freight/mail - The sum of the total freight and mail, both loaded and unloaded, at the reporting airport. **All trucking operations using an air waybill should be excluded**. Freight and mail together are sometimes referred to as cargo. [bolding by the author]

[8] Mączka, M. (2015a).

[9] according to the EC 261/2004 regulation establishing common rules on compensation and assistance to passengers in the event of denied boarding and of cancellation or long delay of flights, that clearly distinguishes flights on routes 3500km or farther from the others.

[10] Mączka, M. (2015a), p. 4.

[11] the convergence criteria, required by Stability and Growth Pact in all 27 EU Member States

Market (no tariffs).[12] **DIST** (distance in 1000s of km) plays some role in this model, but was excluded as irrelevant for long-haul. The recently notorious public debt variable (**DTD**, debt at destination) and a level of credit for private sector (**CTO**, at origin) were included to enrich information on the related economies. The **long-haul** specification (see Eq. 6[13]) assumes a pure exponential functional form was.

3. THE GRAVITY METHOD APPLICATION

ESTIMATION

Two models were estimated using Unrestricted Normal Maximum Likelihood (UNML) method.[14] The open source software (R package[15], see appendix below) was used to obtain results of UNML application to panel data organized in functional forms. The goodness of fit measure was the non-linear R^2.

Heteroscedastic Normal PDF Model for **short-haul BSR air cargo transport**			
Y = 1000s of tons of air cargo loaded annually			
N = 3147			
Log-likelihood = - 5241,373			
Analysis of Entropy-Based Dispersion			
R = 0,076			
Source	*Dispersion*	*Test Statistic*	
Model	252,645	chi-square	505,289
Error	5275,185	df	10
Total	5527,830	P value	0,000
Parameter	*Estimate*	*Standard Error*	*Z Ratio*
For μ link function			
CONSTANT (α)	0,287	0,261	1,098
GDPi (β1)	3,578	0,286	12,528
GDPj (β2)	2,934	0,285	10,301
populationi (β4)	-1,623	0,198	-8,196
populationj (β5)	-1,007	0,233	-4,317
DTD (β6)	-3,489	0,495	-7,054
CTO (β7)	0,639	0,140	4,553
IDOC (β8)	-0,360	0,090	-4,014
TTM (β9)	-9,389	1,302	-7,210
DIST (β10)	-2,008	0,287	-7,003
For σ^2 link function			
CONSTANT (γ0)	-0,122	28,071	-0,004
logWeights (γ1)	0,913	40,265	0,023

Specification of the short-haul model between all explanatory variables and observed demand V accounts for 7,544% of the entropy of air cargo demand V.

The entropy accounted for by the model is not Chi-square distributed ($|Z\ ratio| < t_{0,05}$) and the null hypothesis is rejected that there is no association between explanatory variables and the demand V.

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12) EEC 2913/1992 regulation establishing the Community Customs Code

13) Mączka, M. (2015a), p. 4.

14) Mączka, M. (2015a), p. 5.

15) http://www.r-project.org

Heteroscedastic Normal PDF Model for **long-haul BSR air cargo transport**			
Y = 1000s of tons of air cargo loaded annually			
N = 920			
Log-likelihood = -2099,245			
Analysis of Entropy-Based Dispersion			
R = 0,046			
Source	*Dispersion*	*Test Statistic*	
Model	171,289	chi-square	342,577
Error	2099,244	df	11
Total	2270,533	P value	0,000
Parameter	*Estimate*	*Standard Error*	*Z Ratio*
For μ link function			
CONSTANT (α)	5,743	3,014	1,906
GDPi (β1)	0,065	0,042	1,533
GDPj (β2)	0,057	0,027	2,108
populationi (β4)	1,757	0,214	8,221
populationj (β5)	3,260	0,640	5,097
DTO (β6)	-1,497	0,438	-3,417
CTO (β7)	0,017	0,208	0,082
IDOC (β8)	-0,311	0,100	-3,104
TTM (β9)	-2,392	0,414	-5,784
INF (β10)	-0,081	0,034	-2,386
TRF (β11)	-0,126	0,113	-1,118
For σ^2 link function			
CONSTANT (γ0)	-684,713	46,462	-14,737
logWeights (γ1)	985,036	68,983	14,279

Specification of the model between all explanatory variables and demand V accounts for 4,571% of the entropy of V

The entropy accounted for by the model is not Chi-square distributed (P value<0,05) and the null hypothesis is rejected that there is no association between explanatory variables and the demand V.

GDP at origin and credit at origin are statistically insignificant ($|Z\ ratio| < t_{0,05}$) for the long-haul model.

4. DISCUSSION AND VALIDATION

The validation is done by comparing the sums (aggregated route volumes) at airport level to the actual annual data reported at airports websites, where air cargo loading or unloading occurred. Year 2010 was chosen as the most often reported and latest reference point. A scale coefficient is used to adjust the result. Chart 2 shows the global validation. Model has to be re-scaled by a coefficient.

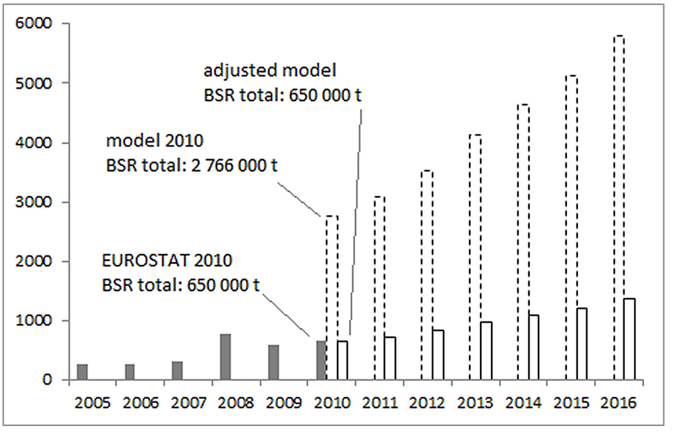


Chart 2. Validation of model output. A scale coefficient (k= 0,24, Pr>0,1)

The ease of use of the model is, unfortunately, hindered by the need to re-scale each output. At the airport level, the validation is done on an example of Copenhagen-Kastrup (EKCH) demand volume and model output (see Table 3 and Chart 3)

Table 3. Air cargo statistics for Copenhagen-Kastrup (EKCH).[16]

	2010	2009	20008	2007	2006	2005
Cargo in Metric Tonne						
Inbound	41 603	41 542	47 425	51 153	48 330	42 130
% incr. year before	0,1%	-12,4%	-7,3%	5,8%	14,7%	1,7%
Outbound	53 580	50 443	54 261	61 318	50 628	54 987
% incr. year before	6,2%	-7,0%	-11,5%	21,1%	-7,9%	-14,4%
Transfer	214 052	220 193	245 470	283 034	281 066	257 970
% incr. year before	-2,8%	-10,3%	-13,3%	0,7%	9,0%	12,2%
Grand Total	309 236	312 179	347 156	395 506	380 024	355 087
% incr. year before	-0,9%	-10,1%	-12,2%	4,1%	7,0%	5,8%

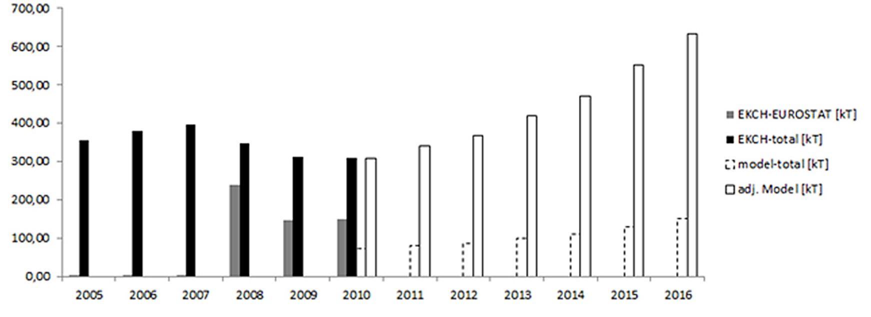


Chart 3. Confrontation of two data sources and model output adjustment. (k=4,22)

5. AIR CARGO MARKET POTENTIAL

Multiple sources, including the ICAO Forecasting Manual, list various forecasting methodologies[17]:

- naïve methods
- trend projections
- econometric methods
- market and industry surveys

Forecasting method used here generate three potential scenarios:

- optimistic, using econometric method (non-liner o-d modelling and extrapolating the explanatory data)
- most likely, done by extrapolating trends of annual volumes with inertial limits defined by the confidence interval
- conservative, prepared by extending the last known annual volume into the near future

[16] http://www.cph.dk/CPH/UK/B2B/Cargo/Traffic+Statistics/2010/

[17] ICAO Doc 8991-AT/772/2, 2nd edition,1985. Morrel, S. P., Moving Boxes by air, 2011, p. 285

Since the last two methods are simple in their formulation, are treated as tacit knowledge. The first one, as the most sophisticated, is described below.

The method generates annual o-d volumes of air cargo by annual summing of the estimated non-linear aggregate demand function model fed with the exponential trends of EUROSTAT, WORLD BANK and IMF explanatory data. Summing up annual demand to total (BSR volume), country volume or airport volume includes routes that exceed probability $P_{ijm}>0,1$ (estimated using Logit classification using the entropy paradigm applied in other domains[18] of aviation at the Institute of Aviation[19]). Where i is the notation for node of origin, j for destination and m for year. Elasticity of demand in optimistic scenario[20]

Short-haul model:		Long-haul model:	
1% increase of:	changes demand by:	1% increase of:	changes demand by:
GDPi	3,578%	GDPi	0,065* GDPi%
GDPj	2,934%	GDPj	0,057* GDPj%
populationi	-1,623%	populationi	1,757* populationi%
populationj	-1,007%	populationj	3,260* populationj%
DTD	-3,489* DTD%	DTO	-1,497* DTO%
CTO	0,639* CTO%	CTO	0,017*CTO%
IDOC	-0,360* IDOC%	IDOC	-0,311*IDOC%
TTM	-9,389* TTM%	TTM	-2,392*TTM%
DIST	-2,008* DIST%	INF	-0,081* INF%
		TRF	-0,126* TRF%

6. CONCLUSIONS

Air cargo plays an important role in the global economy[21]. About 5 trillion USD in goods are transported around the world every year. However, the airline industry including air cargo airlines in general continue to suffer downfalls. The past two years (2011 and 2012) have been hard on the carriers and partners as they have seen a two percent decrease in yields and air cargo demand.

On the 12 March 2013, at the World Cargo Symposium in Doha, IATA CEO and Director General, Tony Tyler, stated that in order to take advantage of this opportunity the entire supply chain must come together and increase the competition by modernizing, increasing supply chain security, ensuring compliance with dangerous goods regulations and environmental sustainability within the industry.[22]

New ideas as for example an implementation of a complementary small aircraft transportation system[23] analogous to suggested EPATS[24] or information exchange platform

[18] Wiśniowski, W., 2014.

[19] Kasianov, V., et alii, 2013.

[20] Demand forecasted using scientific guess (e.g. the model in this document), can come out as wrong as the time comes and data becomes available. It is fully aligned, however, to the paradigms of information entropy or rational behaviour assumption. Demand may suddenly peak at unexpected place due to unexpected publicity or promotional campaigns. Production schedules are suddenly delayed due to material supply problems, labour disputes or bad weather, and so forth.[...] The perceived risk depends on the uncertainty about the outcome of a carrier selection decision and the magnitude of the consequences of a wrong choice.", Ben-Akiva, M. et alii, 2008, pp. 148-149.

[21] Mączka, M. (2015b).

[22] http://www.iata.org/pressroom/pr/Pages/2013-03-12-01.aspx

[23] Piwek, K. (2010).

[24] Baron, A., et alii (2010).

could boost the performance outcome. Such an air cargo information exchange platform embodied e.g. by Baltic.AirCargo.Net project could facilitate operations and optimise cost of air cargo transport. It is well recognized that providing transparency, real-time advance of logistic operations and performance analysis feedback significantly contributes to air cargo and general demand growth benefiting Baltic Sea Region countries as well as the global economy.[25)]

Air cargo market demand in the Baltic Sea Region has good prospects, suggested by econometric modelling and confirmed by the headlines of 2013 (see Introduction).

Aggregated econometric model revealed some general rules associated to air cargo demand (see ESTIMATION)[26)]:

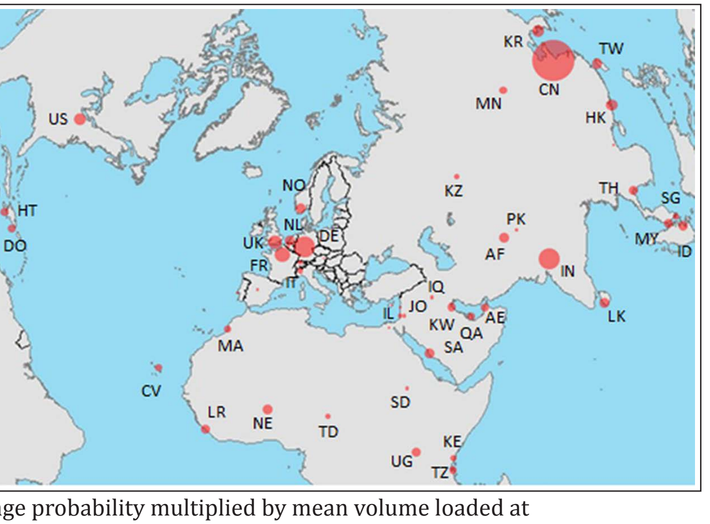
For short-haul (up to 3500km)

- The demand is **negatively** influenced by distance[27)] as well as population increase at origin and destination, public debt at destination, number of required import documents, time to prepare and pay taxes
- GDP volumes at origin and destination as well as domestic credit to private sector influence on demand is statistically significant and **positive**

For long-haul (more than 3500km)

- distance does not determine the demand level at all[28)]
- **GDP volumes at origin** and **domestic credit available to private sector at origin** (as % of GDP) and tariff level at destination for incoming goods form origin are statistically **irrelevant**
- Increase of GDP at destination and increase of population at origin and destination has **positive** influence on demand.
- public debt at origin, number of required import documents, time to prepare and pay taxes, economic distance (inflation levels) are statistically significant **negative** factors.

Two maps below shows the general, combined outcome of the Baltic Sea Region econometric modelling.



to Baltic Sea Region

1st forecast – average probability multiplied by mean volume loaded at

25) Ruijgrok, C. (2008), pp. 231-240.

26) The ease of use of the model is, unfortunately, handicapped by the need to re-scale each output (see DISCUSSION AND VALIDATION). Some compromise of detail level of analysis was determined by data availability and EUROSTAT data set used for modelling was far from being complete. (see DATA)

27) as it is traditionally assumed and confirmed many times in transport modelling

28) except maximum distance limit not considered by the modelling

from Baltic Sea Region

2nd forecast – average probability multiplied by mean volume unloaded at

The most promising origins from where the air cargo could come confirm general trends of last two decades – East Asian industrial zones (China, South Korea, Taiwan, Thailand, Malaysia, Indonesia, Vietnam), far East Asian trading hubs (Hong Kong, Singapore), South Asia (India, Sri Lanka) and traditionally USA, Western Europe and Middle East. Africa is rising as a origin of cargo. Iraq's data are unreliable.

The most promising destinations are East Asia (China, Hong Kong, Japan and Taiwan), India, and traditionally, USA and Western Europe. Africa or Middle East still lacks the potential (except re-export).

SOURCES

EU regulations:

[1] EEC 2913/1992 - Council Regulation (EEC) No 2913/92 of 12 October 1992 establishing the Community Customs Code

[2] EC 261/2004 - REGULATION (EC) No 261/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 February 2004 establishing common rules on compensation and assistance to passengers in the event of denied boarding and of cancellation or long delay of flights, and repealing Regulation (EEC) No 295/91

EU Policy:

[3] Stability and Growth Pact in all 27 EU Member States - TREATY ON STABILITY, COORDINATION AND GOVERNANCE IN THE ECONOMIC AND MONETARY UNION BETWEEN THE KINGDOM OF BELGIUM, THE REPUBLIC OF BULGARIA, THE KINGDOM OF DENMARK, THE FEDERAL REPUBLIC OF GERMANY, THE REPUBLIC OF ESTONIA, IRELAND, THE HELLENIC REPUBLIC, THE KINGDOM OF SPAIN, THE FRENCH REPUBLIC, THE ITALIAN REPUBLIC, THE REPUBLIC OF CYPRUS, THE REPUBLIC OF LATVIA, THE REPUBLIC OF LITHUANIA, THE GRAND DUCHY OF LUXEMBOURG, HUNGARY, MALTA, THE KINGDOM OF THE NETHERLANDS, THE REPUBLIC OF AUSTRIA, THE REPUBLIC OF POLAND, THE PORTUGUESE REPUBLIC, ROMANIA, THE REPUBLIC OF SLOVENIA, THE SLOVAK REPUBLIC, THE REPUBLIC OF FINLAND AND THE KINGDOM OF SWEDEN

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[4] KS-RA-10-028-EN (2009) - Illustrated Glossary for Transport Statistics, EUROSTAT Methodologies and
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[9] Mączka, M. (2015a), Modelling air cargo market – a gravity method, Prace Instytutu Lotnictwa, Nr 239, s. 23-29.
[10] Mączka, M. (2015b), Air cargo market flows in Baltic Sea Region 2005-2010, Prace Instytutu Lotnictwa, Nr 239, s. 7-22.
[11] Meersman, H., Van de Voorde, E. (2008), The Relationship between Economic Activity and Freight Transport, in: Recent Developments in Transport Modelling – Lesson for freight sector, p. 90.
[12] Kasianov, V., Szafran, K., Goncharenko, A., Shipitiak, T. (2013), Entropy paradigm in the theory of hierarchical active systems. Elements of conflict theory, Prace Instytutu Lotnictwa 233, s. 94-108.
[13] Piwek, K., Iwaniuk, A., Gnarowski, W., The European Personal Air Transportation System (EPATS) Study Project A Systematic Approach Based on Small Aircraft and Small Local Airports, Prace Instytutu Lotnictwa, Nr 205, s. 133-158.
[14] Ruijgrok, C. (2008), Intelligent Freight Transport Systems: Opportunities and Practice, in: Recent Developments in Transport Modelling – Lesson for freight sector, pp. 231-240.
[15] Wiśniowski, W. (2014), Specjalizacje Instytutu Lotnictwa – przegląd i wnioski, Prace Instytutu Lotnictwa, Nr 235, s. 7-16.

Web sources:

[16] www.aci.aero
[17] www.aircargoworld.com
[18] www.joc.com/air-cargo/cargo-airlines
[19] www.r-project.org

Data sources:

[20] EUROSTAT (avia_gor_xx , nama_r_e3gdp, demo_r_gind3)
[21] WORLD BANK (NY.GDP.MKTP.CD, SP.POP.TOTL)

POTENCJAŁ TOWAROWEGO LOTNICTWA CYWILNEGO W REGIONIE MORZA BAŁTYCKIEGO

Abstrakt

Oszacowany model grawitacyjny dla Regionu Morza Bałtyckiego ujawnia pewien wzorzec. Najbardziej obiecujące lokalizacje skąd mógłby być realizowany lotniczy transport towarowy potwierdzają ogólne tendencje ostatnich dwóch dekad – są to wschodnioazjatyckie strefy uprzemysłowione (Chiny, Korea Południowa, Tajwan, Tajlandia, Malezja, Indonezja i Wietnam), dalekowschodnie centra handlowe (Hong Kong, Singapur), kraje Azji Południowej (Indie, Sri Lanka) i – tradycyjnie – USA, Europa Zachodnia i Bliski Wschód. Kierunki afrykańskie również zyskują na znaczeniu. Szacunki na podstawie zagregowanego modelu ekonometrycznego sugerują prawdziwość ogólnych zasad dla popytu na lotniczy transport towarowy. Jest to np. potwierdzenie istotności tezy, że wraz z odległością zmniejsza się intensywność przepływu

towarów drogą lotniczą, ale tylko dla transportu krótkodystansowego (do 3500 km). Natomiast transformacje numeryczne dla transportu długodystansowego (dalszego niż 3500 km) wskazują na wyższe i pozytywne znaczenie innych czynników takich jak spójność otoczenia biznesowego (wyrażonego różnicą w czasie potrzebnym na rozliczenie należności skarbowych) w handlu między punktami docelowymi w Regionie Morza Bałtyckiego i ich źródłami pochodzenia.

Słowa kluczowe: transport lotniczy, lotniczy transport towarowy, model grawitacyjny, Region Morza Bałtyckiego.

APPENDIX. RUSSIAN AND BELARUSSIAN DATA SOURCES

1.1. Russian Federation Federal State Statistic Service available data on air cargo[29)]

18.1. TRANSPORTATION OF GOODS BY TRANSPORT MODES[1)]

(mln. tons)

	1992	1995	2000	2005	2007	2008	2009	2010	2011
Transport - total	**15737**	**8814**	**7907**	**9167**	**9450**	**9451**	**7469**	**7750**	**8339**
of which by modes:									
railway	1640	1028	1047	1273	1345	1304	1109	1312	1382
motor	12750	6786	5878	6685	6861	6893	5240	5236	5663
pipeline	947	783	829	1048	1062	1067	985	1062	1131
maritime	91	71	35	26	28	35	37	37	34
inland water	308	145	117	134	153	151	97	102	128
air	1.4	0.6	0.8	0.8	1.0	1.0	0.9	1.1	1.2

1) Here and in table 18.2, diagram 18.3 - cargo shipment and passenger turnover for motor, maritime and inland water of organizations of all kinds of activities; maritime and inland water transport for 1992 - public transport.

Russia in figures - 2012

1.2. National Statistic Committee of Republic of Belarus available data on air cargo[30)]

Freight turnover by types of transport

(mln. tons-km)

	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Freight turnover of all transport types (excluding pipeline transport)	35 242	36 495	35 146	40 923	46 777	49 429	53 059	54 863	60 033	62 925	56 387	62 401	67 728
of which:													
railroad	25 510	31 425	29 727	34 169	38 402	40 331	43 559	45 723	47 933	48 994	42 742	46 224	49 406
motor road	9 539	5 026	5 350	6 658	8 181	8 867	9 351	8 939	11 941	13 742	13 512	16 023	18 152
inland water	133	26	41	59	160	182	90	109	93	132	83	110	143
air	60	18	28	37	34	49	59	92	66	57	50	44	27

29) http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/en/main/

30) http://belstat.gov.by/homep/en/main.html