

## THE ANALYSIS OF KEY FACTORS THAT INFLUENCE THE CONTAINERISED CARGO FLOWS ON “CHINA-BALTIC STATES” SHIPPING ROUTE

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The overarching importance of the “China-Baltic States” shipping route is best illustrated by the fact that about 80% of containerised cargoes handled in ports of the Baltic States are transit flows and majority of cargoes are produced in China. “China-Europe” and “China-CIS Countries” trade has increased dramatically in recent years and import from China is especially significant. It is currently important for the Baltic States because they are transit gate for containerised cargoes from China to CIS countries. But transit experts predict that in terms of future prospects the Baltic States could lose some transit cargo flows because of strong competition between ports and clear-cut ascendancy of alternative routes. That’s why an integral, comprehensive view on the specifics of containerised cargo movements on “China-Baltic States” shipping route should be created for further development of competitive transit container freight traffic management schemes. This paper presents an analysis of the containerised cargo flows on “China-Baltic States” shipping route with identification and conversion of key factors that influence the flows. The principles on which the selection of above-mentioned factors has been done are presented in this paper. The results allow seeing the formation laws of containerised cargo flows on “China-Baltic States” shipping route, to understand competitive advantages and disadvantages of the route “China-Baltic States” as opposed to other routes, to understand the variability dynamics of cargo flows inside mentioned network that is necessary for further development of competitive transit container freight traffic management schemes.

**Keywords:** Key factors, Containerised cargo shipments, Analysis, Shipping network

### 1. “China-Baltic States” Shipping Route on the Main Trade Line “China-Russia”

The Baltic Sea has always been an important sea route connecting China and Russia. For the Baltic States it is very topically mainly because they also have transit ports (Riga, Klaipeda, and Tallinn) for containerised cargoes shipped from China to CIS (Commonwealth of Independent States) and especially to Russia. About 80% of containerised cargoes handled in ports of the Baltic States are transit flows and majority of cargoes are produced in China. The Russian cargo has made up 12 percent of overall cargo handling in the port of Klaipeda. In the ports of Riga and Tallinn, it makes up to 70 percent. “China-Russia” trade has increased dramatically in recent years and especially import from China in containers is significant.

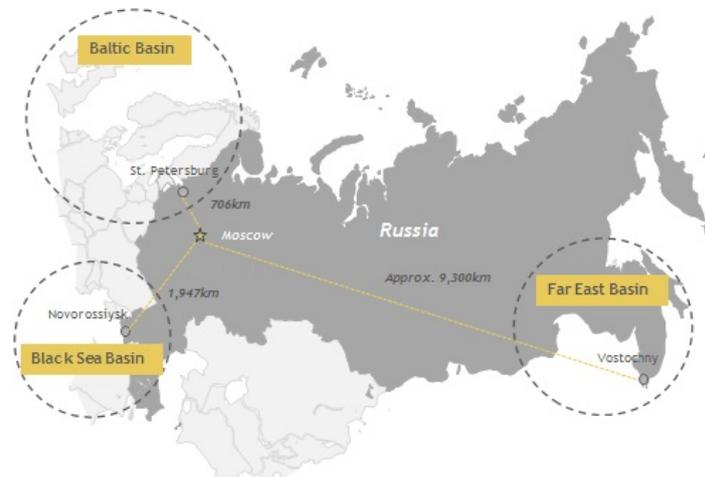


Figure 1. Key Russian gateways [1]

The Russian container market is one of the fastest growing markets in the world. The way key regions are served is determined by container terminal capacity, the capacity and quality of rail connections, inland transport costs, tariff policy and customer preference. The latter is influenced by cargo value, transit time, and customs regulations and local practice.

## 2. The First Factor: Delivery Lead Time

As there are 3 main companies in the world, which provide services from China to the Baltic States (39.65% market share), further their services in more detailed manner will be described.

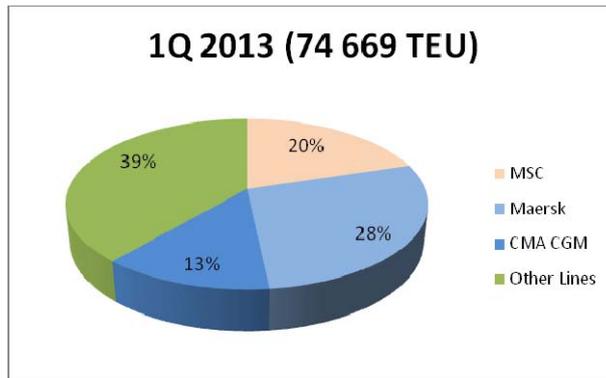


Figure 2. Main shipping Lines working through the Riga container terminals statistics, TEU

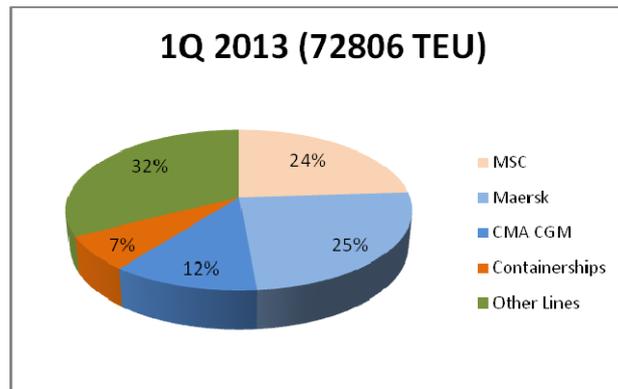


Figure 3. Main shipping Lines working through the Klaipeda container terminals statistics, TEU

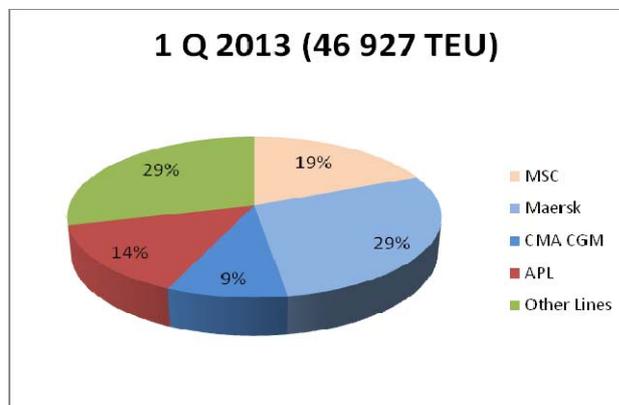


Figure 4. Main shipping Lines working through the Tallinn container terminals statistics, TEU

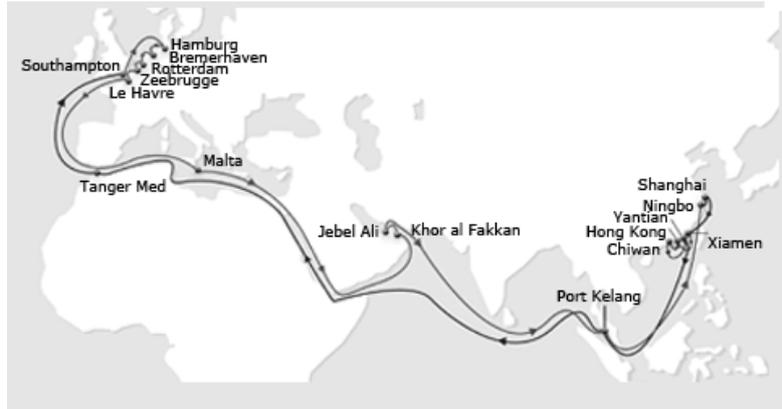


Figure 5. Example of Shipping Line service from Far East to North Europe

The main transportation route for cargo flows from China to Russia were analysed by Author. The basic consumers of Chinese goods located in the European part of Russian Federation. And the Moscow with Moscow region is the centre of attraction [2]. There is a major production area located in the Eastern and South-eastern Parts of China. Due to all above mentioned the route which is chosen by Author for deep research was: “Loading area about 500 km from Shanghai port – Moscow/Moscow region”.

Table 1. Main route for “China-Russia” cargo flows and their leading time

The route	Transit time
Route through Vladivostok / Nakhodka / Vostochny	32 days
Route through Manchzhuria/Zabaykalsk	40 days
Route through Dostyk/Alashankoy	40-50 days
Route through Novorossiysk / Odessa	47 days
Route through the Baltic Sea ports	45 days

For this route there are five main competitive logistics solutions. As we can see according to this factor the transportation through the Baltic Sea is not most competitive.

### 3. The Second Factor: Price for Transportation

The second factor that influences the containerised cargo flow on “China-Baltic States” shipping route for cargoes going to Russia is price level.

Table 2. Price indexes for “China-Russia” cargo flows using different routes (March 2013 year)

The route	Price index for cargo till 20 t. gross weight "standard cargo"	Price index for cargo over 20 t. gross weight "overweight cargo"
Route through Vladivostok / Nakhodka / Vostochny	1,23	1,13
Route through Manchzhuria/ Zabaykalsk	1,53	1,39
Route through Dostyk/ Alashankoy	1,54	1,40
Route through Novorossiysk / Odessa	1,01	1,01
Route through the Baltic Sea ports	1,00	1,00

Consequently we can see that variant “Route through the Baltic Sea ports” is cheaper than others. But there is a huge instability on the market because each month the prices for sea transportation from

China can be increased or decreased significantly. One month it could double the price. And decreases could be significant as well.



Figure 6. Sea freights Shanghai port – Riga port for 40' dry container, 2009-2012 years, the US dollars

Therefore the Author developed a regression model that describes the dependence of a sea freight level on “Shanghai-Riga” shipping route from several explanatory variables. The principles on which the selection of explanatory variables has been done are illustrated below.

Table 3. Regression model

N	Variable	Description
1	Y (dependent variable)	Price for 40' dry container on the route Shanghai port – Riga port (2009-2012 year, monthly)
2	X1 (independent variable)	European Union Economic Sentiment Indicator (ESI)
3	X2 (independent variable)	Idle capacity, % of total with 3 month lag

The European Economic Sentiment Indicator report consists of business and consumer surveys collected by the European Commission. The surveys provide essential information for economic surveillance, short-term forecasting and economic research. The data has been derived from surveys conducted by national institutes in the European Union Member States and candidate countries.

Table 4. Regression model analysis

Parameters		Results		
<b>Regression Summary:</b>		$\hat{Y} = -2665.6678 + 0.6250 \times X_1 + 0.5330 \times X_2$		
<b>R:</b>		0,8584		
<b>R2:</b>		0,7369		
<b>Adjusted R2:</b>		0,7252		
<b>Standard Error of Estimate:</b>		528,3530		
<b>Results of the ANOVA</b>				
<b>Regression Sum of Squares</b>	<b>Degrees of freedom</b>	<b>Residual Sum of Squares</b>	<b>Degrees of freedom</b>	
ESS=35192839	df1=3	RSS=12562061	df2=44	
F:	63,0342	P-level:	0.0000	
<b>Analysis of the coefficients of the model</b>				
<b>Independent variable</b>	<b>Coefficient</b>	<b>Standard Error of Coefficient</b>	<b>t</b>	<b>p-level</b>
$X_1$	0,624701	0,076801	-4,46391	0,000053
$X_2$	0,532710	0,076801	8,13407	0,000000

On the base of received data it is possible to conclude that we can't accept the hypothesis about model's insignificance according to significance point 0.05. R2 is given directly in terms of the explained variance: it compares the explained variance (variance of the model's predictions) with the total variance

(of the data). In a multiple linear regression model, adjusted R square measures the proportion of the variation in the dependent variable accounted for by the explanatory variables. Unlike R square, adjusted R square allows for the degrees of freedom associated with the sums of the squares. Both are quite high, close to 1. An F-test is any statistical test in which the test statistic has an F-distribution under the null hypothesis [3]. It is most often used when comparing statistical models that have been fit to a data set, in order to identify the model that best fits the population from which the data were sampled. Exact F-tests mainly arise when the models have been fit to the data using least squares. Here it is equal to 63,0342. But if we will look at Analysis of the coefficients of the model, we could conclude that they p-level lower than our significance point (0.05). That means that we couldn't accept the hypothesis about coefficients' insignificance according to significance point 0.05.

We can conclude that price for sea transportation on the route "Shanghai-Riga" depends on idle capacity of containerhips that are not used for several month, that mean that if we have increasing quantity of idle TEU, we have less places on containerhips and higher price for container. And also the price depends on EU economic situation that influence the filling of containerhips fleets on Far-East – North Europe trade line, and "China-Baltic States" depends on this line accordingly. That means if economic situation is better the price is higher.

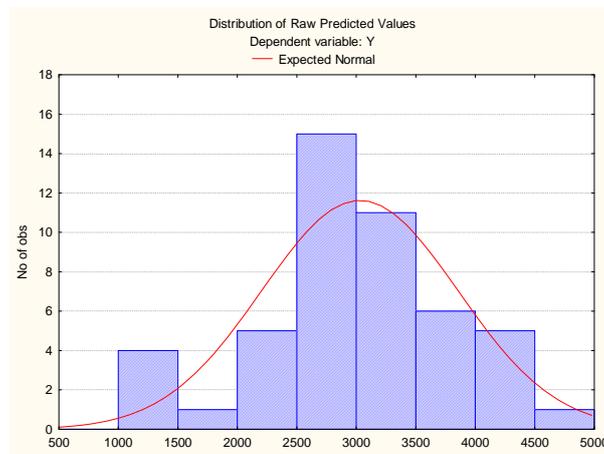


Figure 7. Normal and expected distribution of predicted values

From this graph you can see that the predicted values are close to the observed variable. This model can be used to forecast prices on the "Shanghai-Riga" route.

#### 4. Other Factors

Table 5. Other factors

The route	Advantages	Disadvantages
<b>Route through Vladivostok / Nakhodka / Vostochny</b>	Good time of delivery.	Long waiting time in the port.
<b>Route through Manchzhuria/ Zabaykalsk</b>	Good time of delivery.	Not developed infrastructure in China; Theft.
<b>Route through Dostyk/ Alashankoy</b>	Good time of delivery.	Not developed infrastructure in China; Theft; Obstructions at the border point.
<b>Route through Novorossiysk / Odessa</b>	Cheaper than previous variants.	Bigger transit time; Unpredictable sea freights; This route is geographically logical for destination points in the Southeast regions.
<b>Route through the Baltic Sea ports</b>	Cheaper than all previous variants.	Bigger transit time; Unpredictable sea freights; A lot of competitive ports.

Consequently we can see that one of main factors that influence also the volumes of containerised cargo flows on "China-Baltic States" shipping route is the situation with competitive ports in this region (11 ports compete for cargo to/from Russia, 8 of them specialize in container handling).

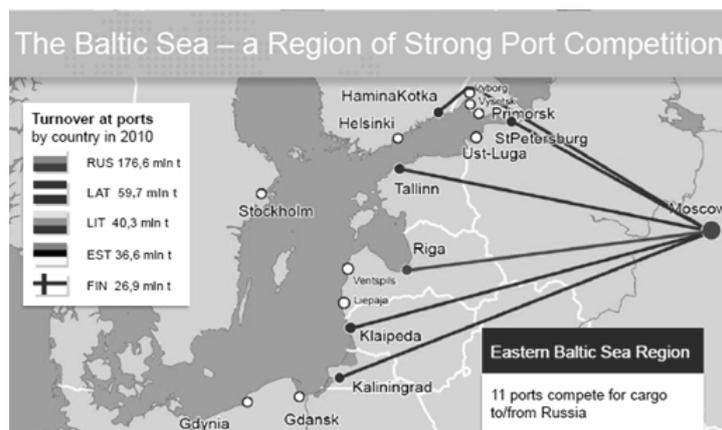


Figure 8. The Baltic Sea – a region of strong competition between ports

The Baltic Sea is the largest brackish body of water in the world, has always been an important sea route connecting Far East and Russia [4]. Surrounded by nine countries, it also has some of the densest maritime traffic in the world.

## 5. Resume

The overarching importance of the “China-Baltic States” mainly based on “China-Russia” trade line and it is best illustrated by the fact that about 80% of containerised cargoes handled in ports of the Baltic States are transit flows and majority of cargoes are produced in China and with destination point in Russia. But transit experts predict that in terms of future prospects the Baltic States could lose some transit cargo flows because of strong competition between ports and clear-cut ascendancy of alternative routes.

That’s why the identification and conversion of key factors that influences the described flows has been done [5]. The most important between them are: lead time of transportation, price and competition between ports in the Baltic Sea region. The Author developed a regression model that describes on which factors the sea freight for containerised cargoes on the route “Shanghai-Riga” depends on. The competitive advantages and disadvantages of the route “China-Baltic States” as opposed to other routes were described. The results allow seeing the formation laws of containerised cargo flows on “China-Baltic States” shipping route and to understand the variability dynamics of cargo flows inside the mentioned network.

That’s why an integral, comprehensive view on the specifics of containerised cargo movements on “China-Baltic States” shipping route has been created for further development of competitive transit container freight traffic management schemes. In future other factors that influence the specifics of containerised cargo ship movements between sea ports into the system with emphasis on Far East-North Europe trade line will be determined and analysed.

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