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INDUSTRIAL INFLUENCE ON THE INTERNATIONAL FREIGHT TRAFFIC OF THE LAND TRANSPORTS IN THE REPUBLIC OF BULGARIA

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JEL Category: **L92, O18, R41**

Abstract
The market demand and supply of transport services are in direct functional correlation with the industrial output and the consumption. The sectors "Mining and quarrying" and "Manufacturing" in the Republic of Bulgaria are generating the basic product flows thus determining the land transport market demand parameters in the country.
The paper is investigating and analyzing the current state and development tendencies of the industrial sector as well as the tendencies of basic indicators of the international exchange of the Republic of Bulgaria. The estimation results are systematically represented, the economic activities are determined and ranged according to their influence strength over the international land transport.

Keywords: *Freight transport, industry, international transport.*

1 OBJECTIVES

Purposes of the analysis:

- determining the modal shares of road and rail transport in international trade;
- determining the trends of the industrial development in the Republic of Bulgaria;
- determining the development trends of international land transport;
- identification of the freight structure represented by different goods in the international road and rail transport;
- identification of main directions and key partners in the international stock exchange based upon land transport;
- determining the influence rate of the industry over the international freight.

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2 METHODOLOGY

The objects of the survey are international railway and road transport, industry and international trade of Bulgaria. Using Eurostat statistical data (EC, 2016), the trade turnover of Bulgaria is

analyzed in physical units (tons) based upon the following sections and combinations (Jelezov & Kirilova, 2015):

- export and import divided by partner countries;
- export and import by groups of cargo per SITC[1];
- differentiated freight structure by commodities;
- export and import divided by modes of transport (only for non-EU member countries) per classification SNT/R[2] in physical units (tons).

The international trade is studied based upon physical units per classification SITC.

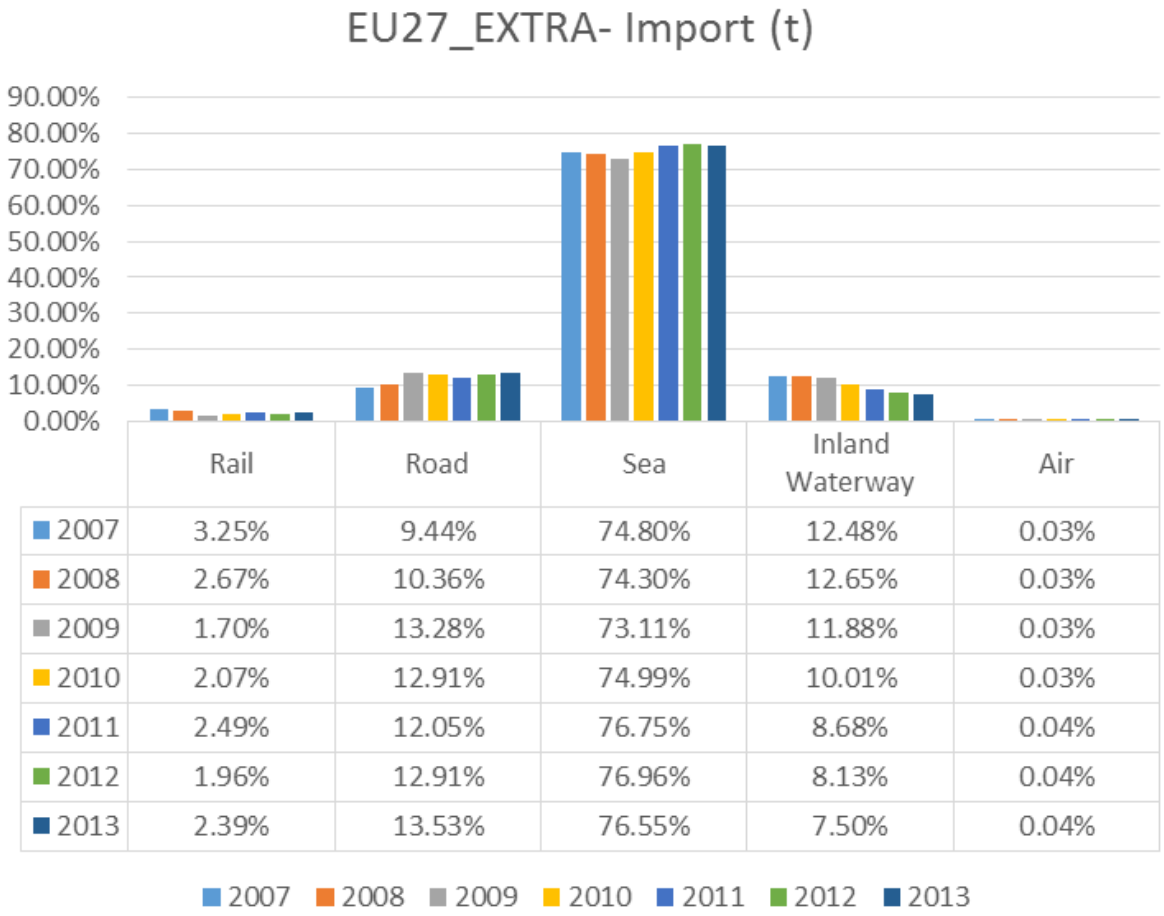
The reference period of the analysis is 2007 – 2013.

The trends of industrial development are studied based upon National Statistical Institute (NSI, 2016) data about the indices of production and per economic activities.

3 RESULTS AND DISCUSSIONS

3.1 Modal split in the international trade

The modal split data about import and export by modes of transport are represented by figures 1, 2, 3 and 4.

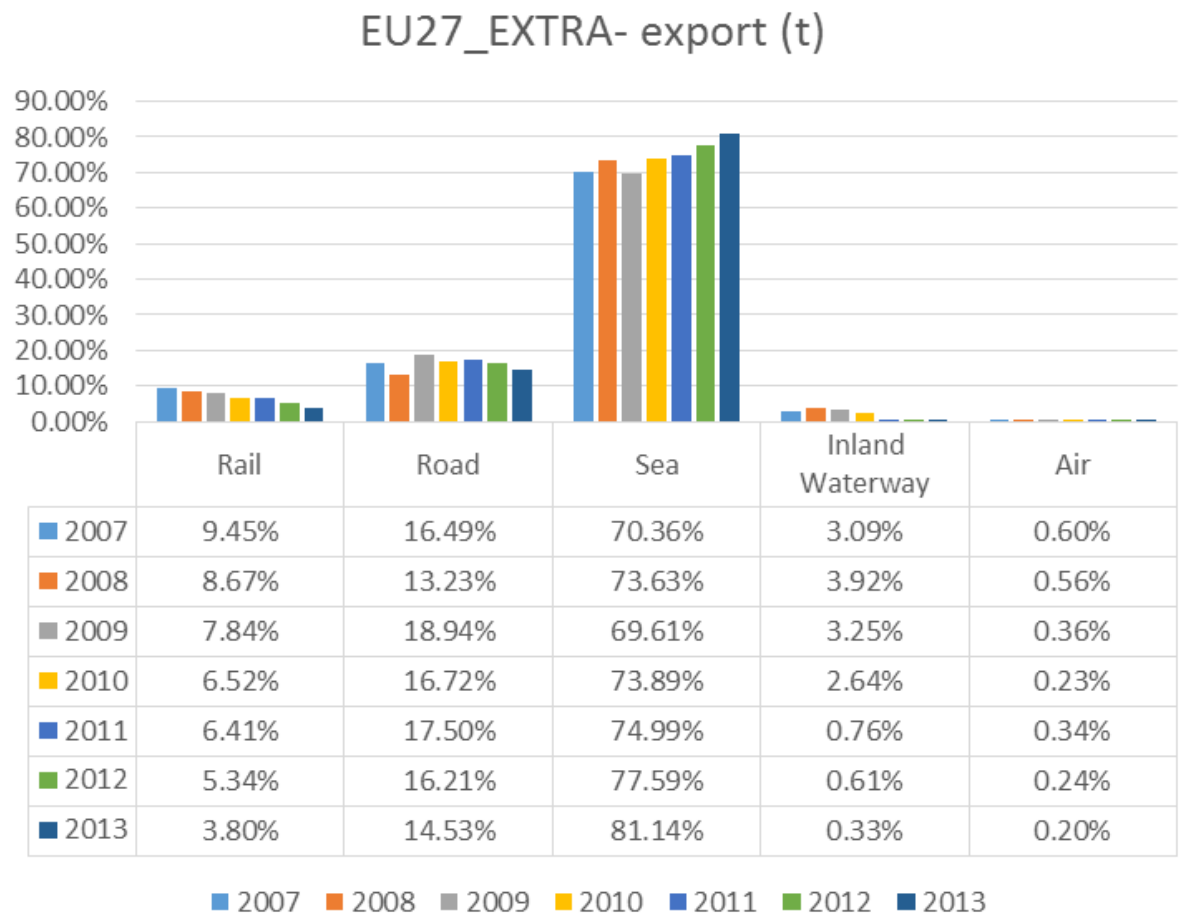


	Rail	Road	Sea	Inland Waterway	Air
2007	3.25%	9.44%	74.80%	12.48%	0.03%
2008	2.67%	10.36%	74.30%	12.65%	0.03%
2009	1.70%	13.28%	73.11%	11.88%	0.03%
2010	2.07%	12.91%	74.99%	10.01%	0.03%
2011	2.49%	12.05%	76.75%	8.68%	0.04%
2012	1.96%	12.91%	76.96%	8.13%	0.04%
2013	2.39%	13.53%	76.55%	7.50%	0.04%

Fig. 1 Modal split in the import

[1] *Standard International Trade Classification*.

[2] *Standard Goods Classification for Transport Statistics/Revised (NST/R).*



	Rail	Road	Sea	Inland Waterway	Air
2007	9.45%	16.49%	70.36%	3.09%	0.60%
2008	8.67%	13.23%	73.63%	3.92%	0.56%
2009	7.84%	18.94%	69.61%	3.25%	0.36%
2010	6.52%	16.72%	73.89%	2.64%	0.23%
2011	6.41%	17.50%	74.99%	0.76%	0.34%
2012	5.34%	16.21%	77.59%	0.61%	0.24%
2013	3.80%	14.53%	81.14%	0.33%	0.20%

Fig. 2 Modal split in the export

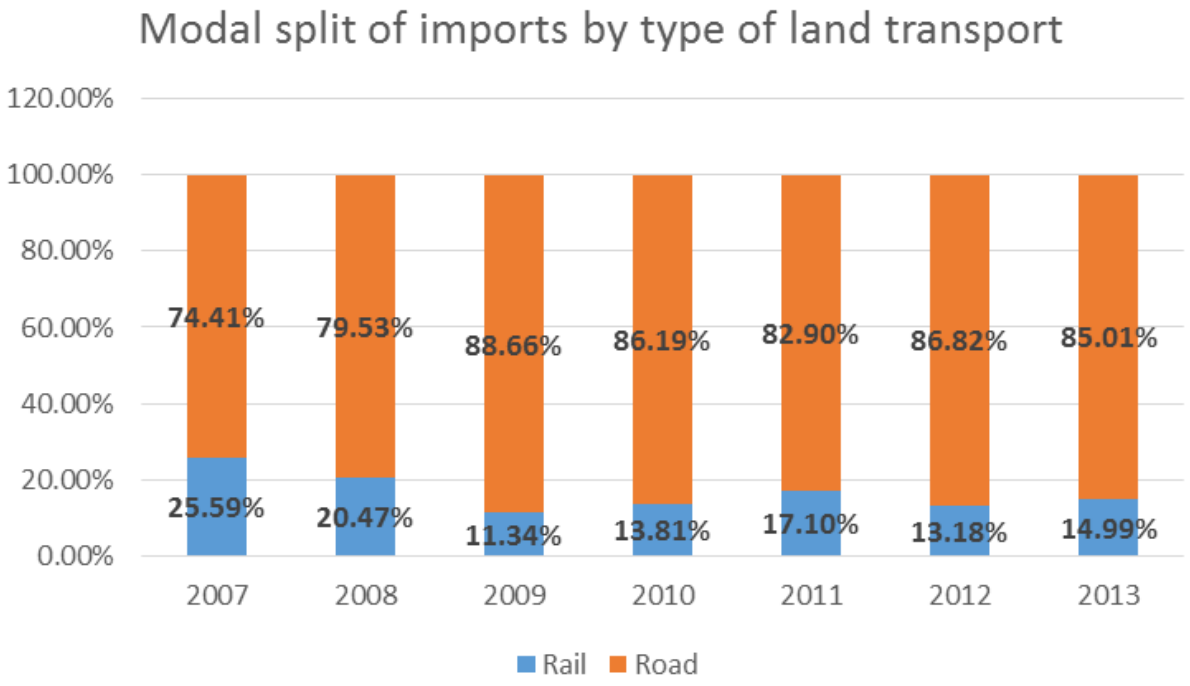


Fig. 3 Modal split of imports by type of land transport

Fig. 4 Modal split of export by type of land transport

Conclusions:

- Basic share in international trade with tendency towards increasing belongs to maritime transport both in import (75%-77%) as well as export (70%-81%);
- The overall share of land transport during the study period has increased from 12.69% to 15.92%;
- The share of railway transport in import during the study period has decreased from 3.25% to 2.39%;
- The share of railway transport in export during the study period has decreased from 9.45% to 3.80%;
- The share of road transport in import has increased from 9.44% to 13.53%;
- The share of road transport in export has decreased from 16.49% to 14.53%;
- The share of road transport in international freight with land transport has increased from 74.41% to 85.01% in import and from 63.58% to 79.28% in export.

3.2 Main commodities per transport modes

Table 5 indicates the shares of different commodity groups by directions and modes of transport.

Conclusions:

- For import by road transport leading are the following commodity groups:
  - machinery, transport equipment, manufactured articles and miscellaneous articles;
  - agricultural products and live animals;
  - chemicals;
  - metal products;
  - foodstuffs and animal fodder.

These groups account for over 80% of the import with road transport.

- For export by road transport leading are the following commodity groups:
  - crude and manufactured minerals, building materials;
  - machinery, transport equipment, manufactured articles and miscellaneous articles;
  - chemicals;
  - ores and metal waste;
  - agricultural products and live animals.

These groups account for over 79% of the export with road transport.

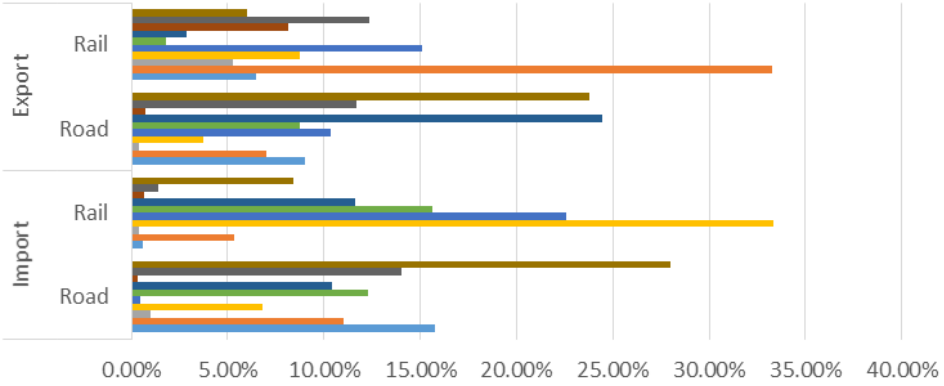
- For import by railway transport leading are the following commodity groups:
  - petroleum products;
  - ores and metal waste;
  - metal products;
  - crude and manufactured minerals, building materials;
  - machinery, transport equipment, manufactured articles and miscellaneous articles.

These groups account for over 91% of the import with railway transport.

– For export by railway transport leading are the following commodity groups:

  - foodstuffs and animal fodder;
  - ores and metal waste;
  - chemicals;
  - petroleum products;
  - fertilizers;
  - agricultural products and live animals.

These groups account for over 77% of the export with railway transport.



	Import		Export	
	Road	Rail	Road	Rail
MACHINERY, TRANSPORT EQUIPMENT, MANUFACTURED ARTICLES AND MISCELLANEOUS ARTICLES	27.98%	8.41%	23.76%	5.99%
CHEMICALS	14.00%	1.39%	11.72%	12.34%
FERTILIZERS	0.30%	0.68%	0.70%	8.15%
CRUDE AND MANUFACTURED MINERALS, BUILDING MATERIALS	10.41%	11.64%	24.42%	2.86%
METAL PRODUCTS	12.32%	15.62%	8.78%	1.79%
ORES AND METAL WASTE	0.45%	22.56%	10.36%	15.07%
PETROLEUM PRODUCTS	6.78%	33.36%	3.77%	8.76%
SOLID MINERAL FUELS	1.03%	0.41%	0.43%	5.29%
FOODSTUFFS AND ANIMAL FODDER	11.01%	5.31%	7.03%	33.26%
AGRICULTURAL PRODUCTS AND LIVE ANIMALS	15.73%	0.61%	9.03%	6.49%

Fig. 5 Main commodities by transport modes

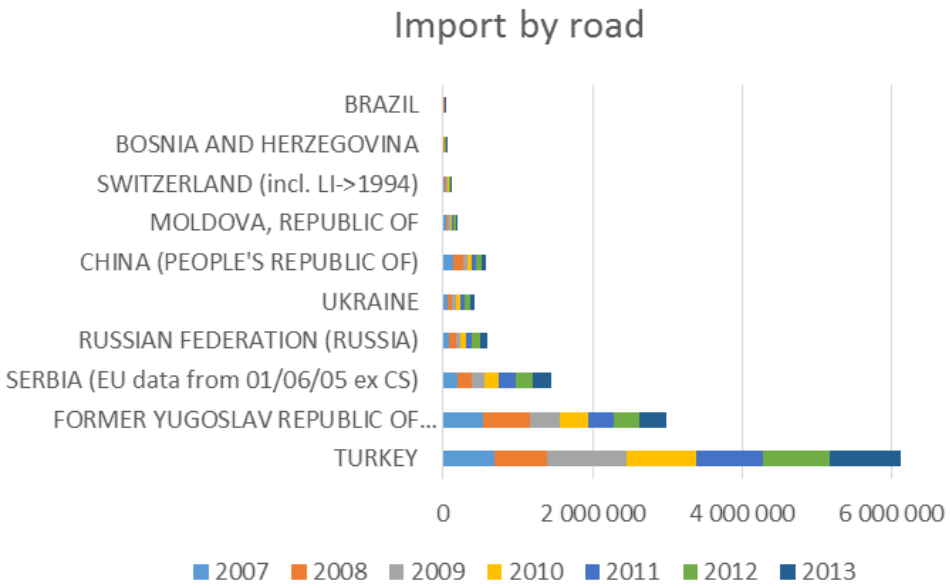


Fig. 6 Key country-partners (road, import)

3.3 Key country-partners per transport mode

Figures 6, 7, 8 and 9 represent data about the road and rail transport freight haulage by commodities and directions (import and export).

Conclusions:

- The basic partner countries for road transport haulage are Turkey, Former Yugoslav Republic of Macedonia, Serbia, Russian federation. These countries account for over 84% of the import and over 79% of the export by road transport;
- The basic partner countries for rail transport freight in import are Serbia, Kazakhstan, Russian federation и Ukraine. These countries together account for accumulation of over 77% of the import by rail transport;
- The basic partner countries for rail transport freight in export are Turkey, Former Yugoslav Republic of Macedonia, Serbia, Russian federation. These countries account for over 87% of the export by railway transport

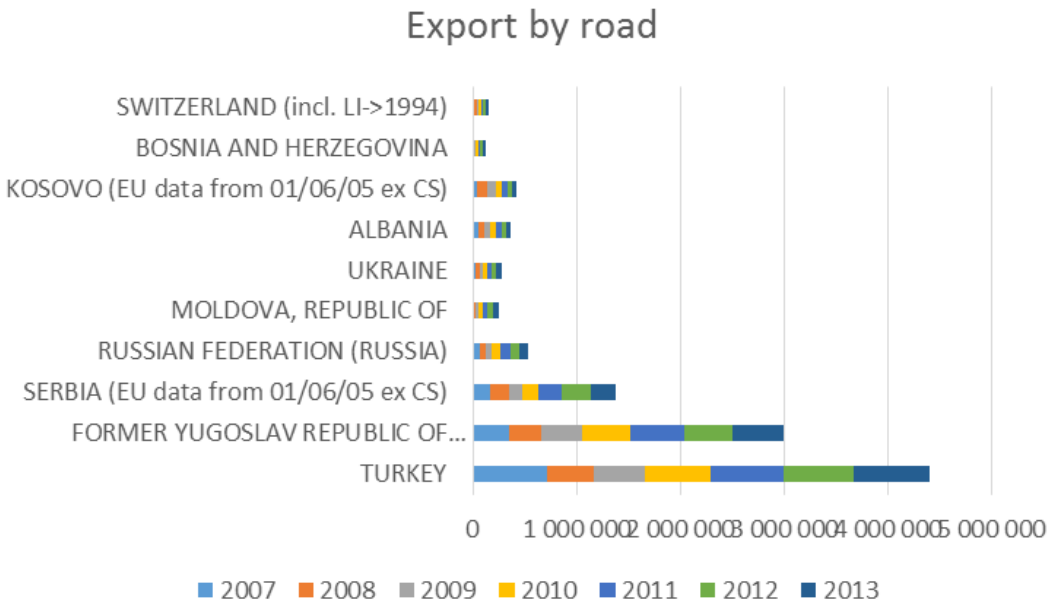


Fig. 7 Key country-partners (road,export)

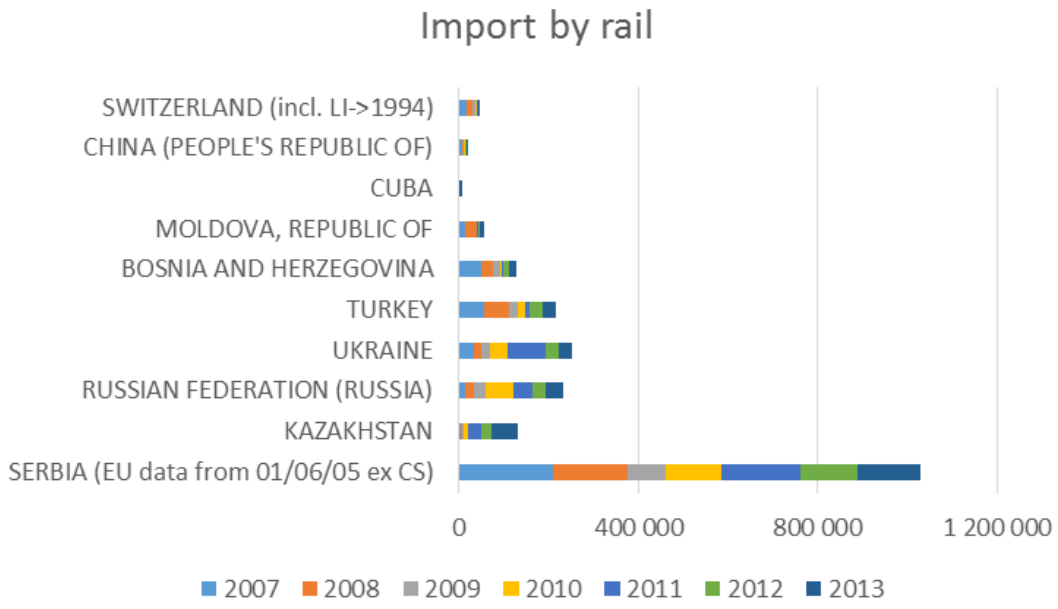


Fig. 8 Key country-partners (rail, import)

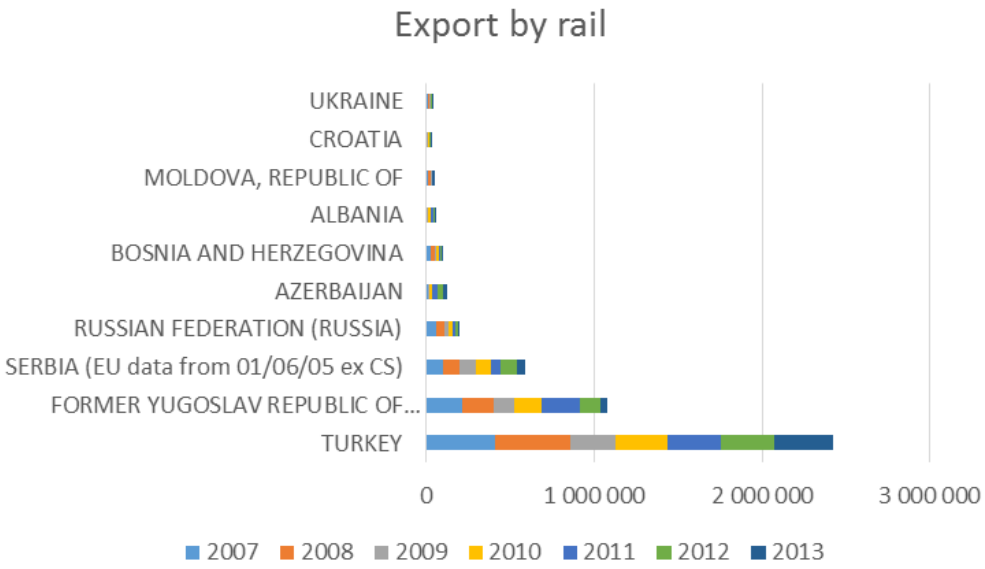
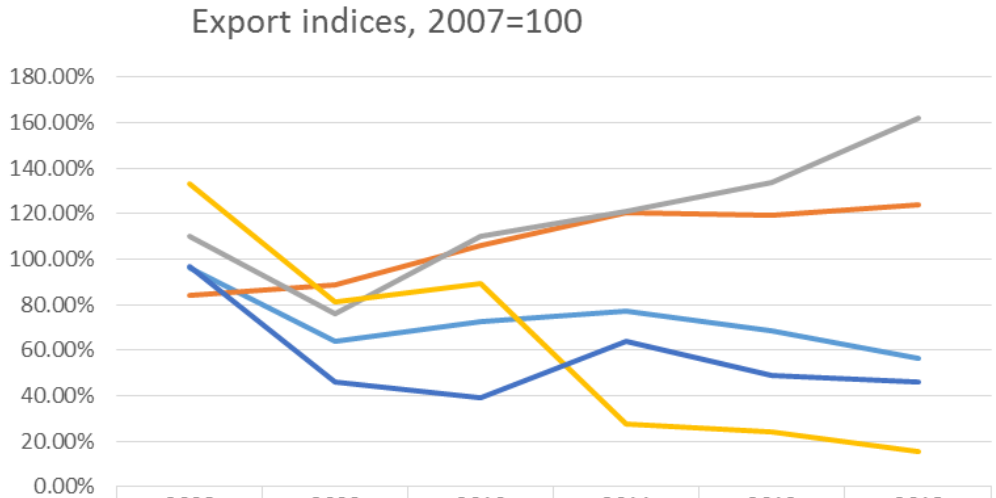


Fig. 9 Key country-partners (rail, export)

3.4 Impact of the industry on the international land transport

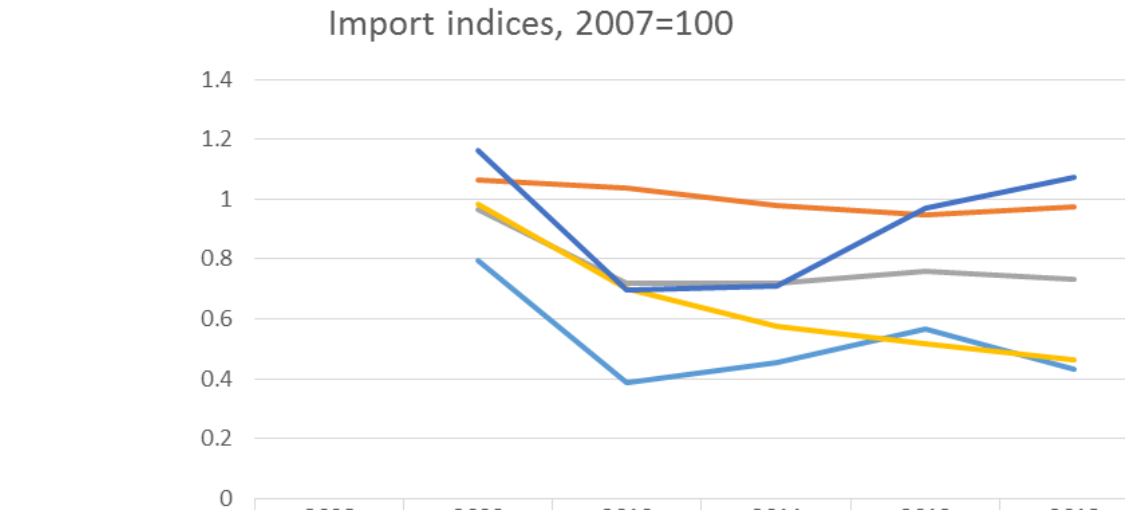
The industrial influence over the international freight carriages is estimated through determining correlation rates between the freight carriage alteration indices and the industrial output alterations indices.

The freight carriage alteration indices are indicated on figure 10 (for export) and figure 11 (import).



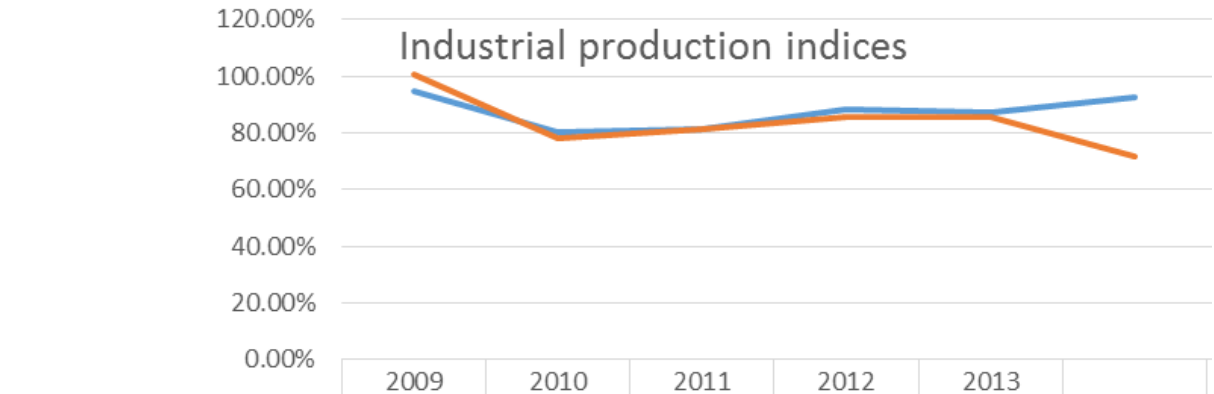
	2008	2009	2010	2011	2012	2013
Rail	96.27%	63.97%	72.36%	76.95%	68.51%	56.51%
Road	84.15%	88.50%	106.25%	120.29%	119.05%	123.85%
Sea	109.81%	76.25%	110.07%	120.80%	133.56%	162.13%
Inland Waterway	133.03%	81.08%	89.29%	27.77%	23.89%	15.21%
Air	96.65%	46.26%	39.41%	63.85%	48.71%	46.33%

Fig. 10 Export indices, 2007=100%



	2008	2009	2010	2011	2012	2013
Rail		79.68%	38.57%	45.59%	56.76%	43.05%
Road		106.50%	103.71%	97.87%	94.68%	97.59%
Sea		96.39%	72.02%	71.76%	76.08%	73.40%
Inland Waterway		98.32%	70.14%	57.41%	51.53%	46.48%
Air		116.09%	69.55%	70.79%	96.91%	107.43%

Fig. 11 Import indices, 2007=100



	2009	2010	2011	2012	2013	
Mining and quarrying	94.58%	80.43%	81.49%	88.14%	87.02%	92.70%
Manufacturing	100.73%	78.18%	81.23%	85.45%	85.53%	71.59%

Fig. 12 Industrial production indices

The estimation of the strength of industrial influence over freight carriages the following scale is applied:

Correlation strength
0.3 < R < 0.5 – moderate
0.5 < R < 0.7 – considerable
0.7 < R < 0.9 – high
0.9 < R < 1,0 –very high

The estimation results are systematically represented; the economic activities are determined and ranked according to their influence strength over the international land transport. The results are represented in tables 1 to 5.

Table 1. Impact assessment for rail-very high

Correlation coefficients 0.9 < R < 1,0 –very high		
Rail-import	Manufacture of other non-metallic mineral products	0.90
Rail-export	Manufacture of fabricated metal products, except machinery and equipment	0.98
	Manufacture of furniture	0.96
	Repair and installation of machinery and equipment	0.92
	Intermediate goods	0.98
	Investment goods	0.93

Table 2. Impact assessment for rail-high

Correlation coefficients 0.7 < R < 0.9 – high		
Rail-import	Manufacture of beverages	0.77
	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0.74
	Manufacture of chemicals and chemical products	0.83
	Manufacture of fabricated metal products, except machinery and equipment	0.72
	Manufacture of other transport equipment	0.77
	Manufacture of furniture	0.74
	Intermediate goods	0.84
	Investment goods	0.73
	Consumer non-durables	0.82
	Other mining and quarrying	0.76
Rail-export	Manufacture of food products	0.70
	Manufacture of chemicals and chemical products	0.86
	Manufacture of rubber and plastic products	0.84
	Manufacture of basic metals	0.83
	Electricity, gas, steam and air conditioning supply	0.70
	Electricity, gas, steam and air conditioning supply	0.70
	Energy goods	0.73
	Consumer durables	0.80
	Other mining and quarrying	0.72

Table 3. Impact assessment for rail- considerable

Correlation coefficients 0.5 < R < 0.7 – considerable		
Rail-import	Repair and installation of machinery and equipment	0.55
Rail-export	Manufacture of paper and paper products	0.54
	Printing and reproduction of recorded media	0.66
	Manufacture of other non-metallic mineral products	0.67
	Manufacture of electrical equipment	0.62
	Manufacture of motor vehicles, trailers, and semi-trailers	0.54
	Manufacture of other transport equipment	0.55

Table 4. Impact assessment for road - high

Correlation coefficients 0.7 < R < 0.9 – high		
Road-import	Manufacture of beverages	0.89
	Manufacture of other non-metallic mineral products	0.76
	Manufacture of other transport equipment	0.90
	Consumer non-durables	0.78
	Other mining and quarrying	0.80
Road-export	Manufacture of computer, electronic and optical products	0.83

Table 5. Impact assessment for road - very high

Correlation coefficients 0.5 < R < 0.7 – considerable		
Road-import	Manufacture of leather and related products	0.566
Road-export	Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.613
	Mining of coal and lignite	0.631

4 CONCLUSIONS

- The results indicate six economic activities with very high influence over the railway transport, while no economic activity has such influence over road transport;
- 19 economic activities belong to the high influential group over railway transport, and 6 for the road transport;
- The export by railway transport is influenced by a greater number of economic activities (20

altogether), compared with the import (11 altogether).
- The economic activities influencing the import by road transport (6 altogether) are more than those influencing export (3 altogether);
- The import by railway transport is most influenced by manufacturing of other non-metallic mineral products, while the export by railway transport is most strongly influenced by manufacturing of fabricated metal products, except machinery and equipment;
- The import by road transport is most influenced by manufacturing of beverages, while the export by road transport is most strongly influenced by manufacturing of computer, electronic and optical products.

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