# Research on Relationship between Freight Transport Performance and GDP in Slovakia and EU Countries

## Istraživanje odnosa između izvedbe prijevoza tereta i BDP-a u Slovačkoj i EU državama

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**Summary**

**The paper deals with developments in gross domestic product (GDP) and transport performance in freight transport in EU countries, measurement and performance reporting. The authors examine the correlation between freight transport performance and EU GDP. Correlation relationships are examined for absolute and relative values of the indicators. According to the period, relationships are divided into three-year and year-on-year changes. GDP growth is also increasing with transport performance growth. The positive relationship of these investigated variables was confirmed.**

*Sažetak*

*Članak se bavi razvojem domaćega bruto proizvoda i izvedbe transporta tereta u EU zemljama, mjerenju i izvješću o izvedbi. Autori istražuju korelaciju između izvedbe prijevoza i EU bruto domaćega proizvoda. Odnosi korelacije se ispituju zbog apsolutnih i relativnih vrijednosti indikatora. Prema razdoblju, odnosi se dijele u trogodišnje i jednogodišnje promjene. BDP se također povećava s rastom izvedbe transporta. Potvrđen je pozitivan odnos ovih ispitanih varijabli.*
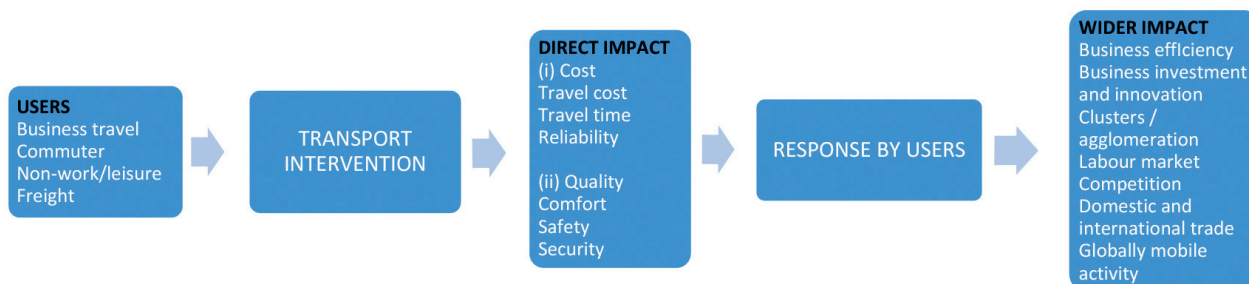
## 1. INTRODUCTION / *Uvod*

Transport is an indispensable basis for the support of almost all sectors. It is necessary to support and safeguard social and economic processes. [1] Transport services are important for economic growth and company development. [2] Individual states apply different financial support to carriers, which affects carrier performance. It produces different performance and competitiveness. [3] Transport has a greater impact on microeconomic factors of productivity than the labor market, domestic and international trade, investment and innovation. [4] The relationship between traffic and economic performance is in Figure 1.



Source: Adapted from Eddington, R. (2006), The Eddington Transport Study, Main Report, Volume 1, Figure 2.3 [5]

Figure 1 Links between transport and economics performance
*Slika 1. Poveznice između izvedbe transporta i ekonomičnosti*

The economic importance of the transportation industry can thus be assessed from a macroeconomic and microeconomic perspective:

- At the macroeconomic level (the importance of transportation for a whole economy), transportation and the mobility it confers are linked to a level of output, employment and income within a national economy. In many developed countries, transportation accounts between 6% and 12% of the GDP. In terms of the Slovak Republic, this share reached 6.8 % in 2015.
- At the microeconomic level (the importance of transportation for specific parts of the economy) transportation is linked to producer, consumer and production costs. The importance of specific transport activities and infrastructure can thus be assessed for each sector of the economy. Usually, higher income levels are associated with a greater share of transportation in consumption expenses. Transportation accounts on average between 10% and 15% of household expenditures, while it accounts around 4% of the costs of each unit of output in manufacturing, but this figure varies greatly according to sub sectors. The share of net household expenditure on transport was 11.1% per month and per person in the Slovak Republic in 2015 (Statistical Office of the Slovak Republic).

The added value and employment effects of transport services usually extend beyond those generated by that activity; indirect effects are salient. For instance, transportation companies purchase a part of their inputs (fuel, supplies, maintenance) from local suppliers. The production of these inputs generates additional value-added and employment in the local economy. The suppliers in turn purchase goods and services from other local firms. There are further rounds of local re-spending which generate additional value-added and employment.

Similarly, households that receive income from employment in transport activities spend some of their income on local goods and services. These purchases result in additional local jobs and added value. Some of the household income from these additional jobs is in turn spent on local goods and services, thereby creating further jobs and income for local households. As a result of these successive rounds of re-spending in the framework of local purchases, the overall impact on the economy exceeds the initial round of output, income and employment generated by passenger and freight transport activities. Thus, from a general standpoint the economic impacts of transportation can be direct, indirect and induced:

- Direct impacts. The outcome of improved capacity and efficiency where transport provides employment, added value, larger markets as well as time and costs improvements. The overall demand of an economy is increasing.
- Indirect impacts. The outcome of improved accessibility and economies of scale. Indirect value-added and jobs are the result of local purchases by companies directly dependent upon transport activity. Transport activities are responsible for a wide range of indirect value-added and employment effects, through the linkages of transport with other economic sectors (e.g. office supply firms, equipment and parts suppliers, maintenance and repair services, insurance companies, consulting and other business services).

- Induced impacts. The outcome of the economic multiplier effects where the price of commodities, goods or services drops and/or their variety increases. For instance, the steel industry requires cost efficient import of iron ore and coal for the blast furnaces and export activities for finished products such as steel booms and coils. Manufacturers and retail outlets and distribution centers handling imported containerized cargo rely on efficient transport and seaport operations. [6]
- Gao, Y. et al. (2016) published study that analyzes the intrinsic relationship between comprehensive transportation freighting index and GDP for early detection of extremely development problems in transportation. Results show that the volume of freight traffic and freight turnover of China are positively correlated with GDP. [7] The freight demand of comprehensive transportation is derivative demand, and the level of the demand depends on the level of social and economic development. The relationship between freight and GDP is:
- Correlation: Empirical evidence shows that, there is a positive correlation between the development of freight transport and GDP in China. In the long run, both of freight and freight turnover respectively present equilibrium steady relationship with GDP.
- Structural: The correlation degree between transportation structure changes in transport and Chinese national economy is different. In 37 years of reform and opening up, the civil aviation, railway freight index and GDP has greater correlation.
- Stage: During the different stages, the correlation between freight index and GDP is different. Seen from the relationship of freight turnover and GDP, the stage of 1978 to 1995 presents less correlation than the stage of 1995 to now. Mainly because of the development in economy and society, as well as improvement transportation infrastructure, the effect of comprehensive freight index is more prominent when reflects the status of economic and social development, Gao, Y. et al. (2016). [7]
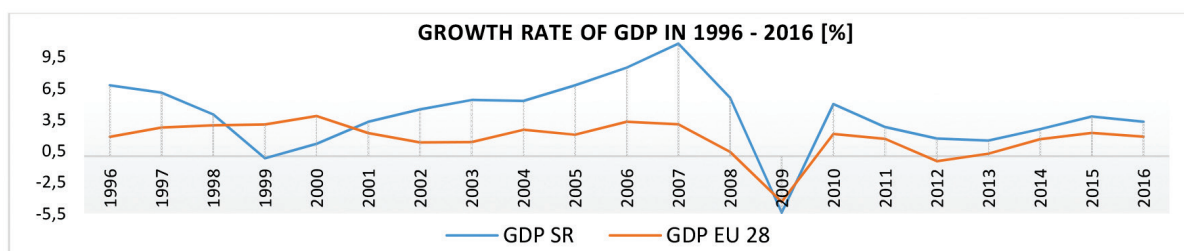
## 2. GDP DEVELOPMENT AND TRANSPORT POWER IN SLOVAKIA AND EU COUNTRIES / *Razvoj BDP-a i transportne moći u Slovačkoj i EU zemljama*
### 2.1. Development of GDP in Slovakia and EU 28/ *Razvoj BDP-a u Slovačkoj i EU 28*

One of the most important concepts of macroeconomics is gross domestic product (GDP), which measures the total value of all goods and services produced in the country in one year. GDP is part of the national pension and national accounts, which are a set of statistics, which tells the government whether the economy is experiencing a downturn or expansion, or there is no serious recession or sharp increase in inflation.

Currently there are three different methods of measuring GDP. Gross domestic product can measure production (production, goods), consumption (consumption) and income (income) method. All these methods should achieve the same value independently of each other in the resulting expression.

On graph 1 it can be seen that even though GDP growth in Slovakia was not stable, GDP grew steadily. A slight fall (-0.2%) is recorded in 1999 and another significant up to ten years

Source: Authorized by [11]

Graph 1 Growth GDP rate of Slovakia compared to EU 28
*Grafikon 1. Rast stope BDP-a Slovačke u usporedbi s EU 28*

later, due to the financial and economic crisis. GDP growth in Slovakia and the EU 28 is different until 2002. It is also possible to see that GDP growth rate from 2002 in Slovakia is similar to developments in the EU 28. In 2009, there was a significant slowdown in growth in both cases due to the economic crisis.

When compiling data on GDP in EU countries, it was necessary to choose an appropriate indicator to exclude the impact of market price changes. A good indicator is the expression of GDP at constant prices.This indicator is converted from GDP data at current prices. Fixed-price adjustments are made by double deflation of gross output and intermediate consumption using the appropriate price indices (converted into previous year's prices and chained to the reference year 2010). GDP data at constant prices are compiled according to the "European System of National and Regional Accounts, 2010 (hereinafter ESA 2010)" methodology. Source: *Statistical Office of the SR - National Accounts – Methodology.*When indicator was selecting, it was also based on the fact that GDP at constant prices was also used in the article mentioned in the source [8].

## 2.2. Freight transport performance, reporting and measurement / *Izvedba transporta tereta, izvješća i mjere*
### Collection of data on transport performance in road freight transport / *Prikupljanje podataka o izvedbi transporta u cestovnom prijevozu tereta*

Regulation (EU) No 70/2012 is a recast of Council Regulation (EC) No 1172/98 of 25 May 1998 and subsequent amendments which aimed to consolidate the legal basis for road transport data collection and bring it into line with the Lisbon Treaty.

Regulation (EU) Nº 70/2012 aims to ensure that the Commission, other EU institutions and national governments are provided with comparable, reliable, harmonized, regular and comprehensive statistical data on the scale and development of the carriage of goods by road. These data are needed for framing, monitoring and evaluating EU policy. Regulation (EU) No 70/2012 was designed to limit the burden on transport enterprises to a minimum. The data collection is based on a sample survey. Information is thus requested only for a sample of transport vehicles, and for a short time (generally a week). Member States can also exclude smaller vehicles from the survey[1].

The Regulation applies directly and in its entirety to all Member States. It does not have to be transposed into national legislation. It requires all Member States to provide data. Under Article 1(3), Malta is the only exception to this

rule, given the low number of goods road transport vehicles registered in Malta licensed to engage in the international carriage of goods by road.

The non-EU countries Norway and Switzerland also fully participate in the collection of road freight transport statistics along the lines of Regulation (EU) Nº 70/2012. The two EEA countries Iceland and Liechtenstein are currently exempted from the obligation to collect road freight transport statistics according to the Regulation due to the limited number of their respective fleet engaged in international road transport. [9]

Member States shall compile statistics relating to the following areas:
- vehicles, ride and goods.

More detailed information on the collection of this information can be found in EC Regulation no. No 70/2012 of 18 January 2012 on statistical returns in respect of the carriage of goods by road.

### Collecting data on transport operations in other modes of freight transport / *Prikupljanje podataka o operacijama prijevoza u drugim načinima prijevoza tereta*
The collection of statistical data on other modes of transport is governed by the following regulations:
- Rail: Regulation (EC) No 91/2003 on rail transport statistics,
- Inland waterways: Regulation (EC) No 1365/2006 on statistics of goods transport by inland waterways
- Air: Regulation (EC) No 437/2003 on statistical returns in respect of the carriage of passengers, freight and mail by air,
- Maritime: Directive 2009/42/EC on statistical returns in respect of carriage of goods and passengers by sea. [10]

## 2.3. Development of transport performance of freight transport in Slovakia and EU countries / *Razvoj izvedbe transporta tereta u Slovačkoj i EU državama*
Table 1 provides statistics on transport performance in the EU 28 and individual in member states. Transmission performance is divided into two groups according to the unit of measure, expressing performance. The first category is expressed in units of thousands of tonnes and the second group represents the transport performance in million tonne-kilometers. In the category expressed in tonne-kilometer units, a smaller amount of data could be found, as air or sea traffic is not statistically detected in these units. Although there is only road, rail and inland waterway transport in this group.The tonne-kilometer ratio is a more reliable indicator because the performance measured only in the tonne of the transported tonnes does not take into account the number of kilometers traveled with the loaded vehicle. The expression in tonne-kilometers (transport

1 Each Member State may exclude road transport vehicles with a load capacity or maximum permissible weight below a certain limit from the scope of the Regulation. For single motor vehicles, the limit may not exceed a load capacity of 3.5 tonnes or maximum permissible weight of 6 tonnes.

Table 1 Transport performance of EU 28 (year 2015)
*Tablica 1. Izvedba transporta u EU 28 (godina 2015)*

| Country | HDP | FREIGHT TRANSPORT [thousand tons] | | | | | |
|---|---|---|---|---|---|---|---|
| | [mil. eur] | ROAD | RAILWAY | AIR | MARITIME | INLAND WATERWAY | TOTAL |
| EU 28 | 13 510 486,2 | 11 263 430 | | 1158,276 | 3 840 510 | 147 389 | 15 252 487,3 |
| Belgium | 383 641,0 | 31 729 | | 1 158,3 | 188 158 | 241 459 | 462 504,3 |
| Bulgaria | 41 274,0 | 32 297 | 14 635 | 17 201,0 | | 27 166 | 91 299,0 |
| Czech Republic | 169 074,5 | 57 200 | 97 280 | 58,4 | 850 | | 155 388,4 |
| Denmark | 257 527,7 | 15 500 | 8 086 | 238,9 | | 95 098 | 118 922,9 |
| Germany | 2 791 108,9 | 3 539 200 | 367 314 | 4 496,0 | 221 369 | 295 918 | 4 428 297,0 |
| Estonia | 17 472,0 | 6 263 | 28 026 | 16,0 | | 34 965 | 69 270,0 |
| Ireland | 228 766,9 | 9 900 | 540 | 144,8 | | 50 666 | 61 250,8 |
| Greece | 184 468,1 | 19 764 | 1 404 | 62,3 | | 167 036 | 188 266,3 |
| Spain | 1 068 283,0 | 209 390 | 28 960 | 592,4 | | 447 048 | 685 990,4 |
| France | 2 094 982,0 | 153 580 | 95 545 | 2 492,0 | 63 094 | 297 880 | 459 011,0 |
| Croatia | 43 924,8 | 10 439 | 9 939 | 7,1 | 6 642 | 18 930 | 45 957,1 |
| Italy | 1 555 008,6 | 116 820 | 92 273 | 908,6 | 379 | 458 020 | 668 400,6 |
| Cyprus | 17 655,5 | 563 | | 27,5 | | 10 268 | 10 858,5 |
| Latvia | 21 186,4 | 14 690 | 55 645 | 16,8 | | 67 811 | 138 162,8 |
| Lithuania | 33 649,8 | 26 485 | 48 053 | 19,9 | 68 | 43 128 | 117 753,9 |
| Luxembourg | 46 898,7 | 8 850 | 5 207 | 739,2 | 7 106 | | 21 902,2 |
| Hungary | 107 874,1 | 38 353 | 50 333 | 65,7 | 8 163 | | 96 914,7 |
| Netherlands | 655 573,7 | 69 492 | 41 721 | 1 712,0 | 359 898 | 594 272 | 1 067 095,0 |
| Austria | 310 470,4 | 24 436 | 97 642 | 246,4 | 8 599 | | 130 923,4 |
| Poland | 419 819,1 | 260 713 | 224 320 | 98,4 | 5 036 | 69 530 | 559 697,4 |
| Portugal | 171 804,5 | 31 835 | 11 108 | 118,6 | | 86 769 | 129 830,6 |
| Romania | 142 981,5 | 39 023 | 55 306 | 33,4 | 30 020 | 44 533 | 168 915,4 |
| Slovenia | 37 050,4 | 17 909 | 17 832 | 8,9 | | 19 931 | 55 680,9 |
| Slovakia | 76 346,6 | 33 540 | 47 358 | 21,2 | 5 721 | | 86 640,2 |
| Finland | 187 054,0 | 24 488 | 33 392 | 181,8 | | 99 962 | 158 023,8 |
| Sweden | 408 509,4 | 41 502 | 64 999 | 146,2 | | 169 708 | 276 355,2 |
| United Kingdom | 2 023 577,9 | 158 924 | 96 821 | 2 396,8 | 5 594 | 496 708 | 760 443,8 |
| Norway | 351 128,7 | 23 136 | 31 585 | 127,3 | | 193 605 | 248 453,3 |
| Switzerland | 472 926,0 | 12 441 | 66 089 | 403,3 | | | 78 933,3 |

Continue the Table 1 Transport performance of EU 28 (year 2015)
*Nastavak Tablice 1. Izvedba transporta EU 28 (godina 2015.)*

| Country | HDP | FREIGHT TRANSPORT [mil.tkm] | | | |
|---|---|---|---|---|---|
| | [mil. eur] | ROAD | RAILWAY | INLAND WATERWAY | TOTAL |
| EU 28 | 13 510 486,2 | 1 453 683 | | 544 712 | 1 998 395 |
| Belgium | 383 641,0 | 31 729 | | 10 426 | 42 155 |
| Bulgaria | 41 274,0 | 32 297 | 3 650 | 5 595 | 41 542 |
| Czech Republic | 169 074,5 | 57 200 | 15 261 | 33 | 72 494 |
| Denmark | 257 527,7 | 15 500 | 2 273 | | 17 773 |
| Germany | 2 791 108,9 | 314 816 | 116 632 | 55 315 | 486 763 |
| Estonia | 17 472,0 | 6 263 | 3 117 | | 9 380 |
| Ireland | 228 766,9 | 9 900 | 96 | | 9 996 |
| Greece | 184 468,1 | 19 764 | 294 | | 20 058 |
| Spain | 1 068 283,0 | 209 390 | 11 131 | | 220 521 |
| France | 2 094 982,0 | 153 580 | 34 252 | 8 516 | 42 768 |
| Croatia | 43 924,8 | 10 439 | 2 184 | 879 | 13 502 |
| Italy | 1 555 008,6 | 116 820 | 20 781 | 62 | 137 663 |
| Cyprus | 17 655,5 | 14 690 | 18 906 | | 33 596 |
| Latvia | 21 186,4 | 14 690 | 18 906 | | 33 596 |
| Lithuania | 33 649,8 | 26 485 | 14 036 | | 40 521 |
| Luxembourg | 46 898,7 | 8 850 | 207 | 235 | 9 292 |
| Hungary | 107 874,1 | 38 353 | 10 010 | 1 824 | 50 187 |
| Netherlands | 655 573,7 | 69 492 | 6 545 | 48 535 | 124 572 |

| | | | | | |
|---|---|---|---|---|---|
| **Austria** | 310 470,4 | 24 436 | 20 266 | 1 806 | **46 508** |
| **Poland** | 419 819,1 | 260 713 | 50 603 | 88 | **311 404** |
| **Portugal** | 171 804,5 | 31 835 | 2 688 | 13 168 | **47 691** |
| **Romania** | 142 981,5 | 39 023 | 13 673 | | **52 696** |
| **Slovenia** | 37 050,4 | 17 909 | 4 175 | | **22 084** |
| **Slovakia** | 76 346,6 | 33 540 | 8 439 | 741 | **42 720** |
| **Finland** | 187 054,0 | 24 488 | 8 468 | | **32 956** |
| **Sweden** | 408 509,4 | 41 502 | 20 583 | | **62 085** |
| **United Kingdom** | 2 023 577,9 | 158 924 | 21 990 | 166 | **181 080** |
| **Norway** | 351 128,7 | 23 136 | 3 498 | | **26 634** |
| **Switzerland** | 472 926,0 | 12 441 | 12 431 | | **24 872** |

Source: Authorized by [10 - 18]

performance) expresses the multiple of the weights of things and the distance traveled with these things. For this reason, we will continue to look at the transport performance expressed in tonne-kilometers.

## 3. RESEARCH OF RELATIONSHIP BETWEEN TRANSPORT PERFORMANCE AND GDP IN EU COUNTRIES / *Istraživanje odnosa između izvedbe transporta i BDP-a u EU državama*

For the study of freight transport and GDP relations in EU countries are used available statistics on the development of transport performance and GDP developments at constant prices in EU countries are used between 2009 and 2015.

For analysis of relationship were used Pearson's correlation coefficient and single-criterion regression function. The independent variable X is the transport power and the dependent variable is GDP.

Research is done in two ways:
- examining the relationship and causality of the values of the indicators in absolute terms (freight transport and GDP),
- examining the relationship and causality of the relativized form of data (change in freight transport performance and GDP change).

### 3.1. Correlation between the absolute values of the indicators / *Korelacija između apsolutnih vrijednosti indikatora*

The relationship between freight transport and GDP at constant prices between 2009 and 2015 in the EU countries is examined together for all EU countries as well as for the "old" EU countries

and "new" EU countries (since 2004: Cyprus, Czech Republic, Estonia, Lithuania, Latvia, Hungary, Malta, Poland, Slovakia, Slovenia, Romania, Bulgaria and Croatia).

The correlation coefficient for all EU countries reached 0.732 in the period under review, the value for the old EU countries is 0.783, for the new EU countries 0.954.

From the point of view of specific countries, the strong positive relationship of the investigated quantities was confirmed for Slovakia (0.987), Spain (0.970), Poland (0.962), Hungary (0.961), Latvia (0.958), Bulgaria (0.953), Romania), The Czech Republic (0.840), Romania (0.902), Lithuania (0.734) and Italy (0.724).
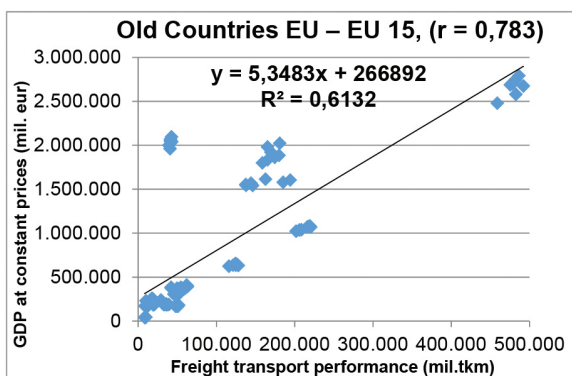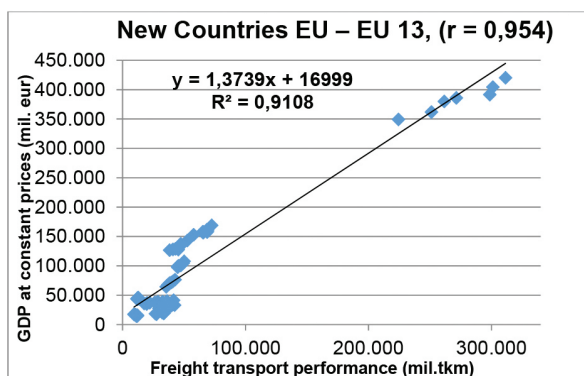
The average strength of the relationship is for Germany (0.698), Slovenia (0.635), Sweden (0.614), France (0.607), Great Britain (0.531), Netherlands (0.503), Luxembourg (0.500), and Portugal (0.483).In other countries, it is a weak relationship.

### 3.2. Correlation of relativized values of indicators / *Korelacija relativiziranih vrijednosti indikatora*

It is a study of the relationship and causality of a relativized form of data, using changes in the value of freight transport performance and changes in GDP. The changes are assessed on the one hand in the short term (annually from 2009 to 2015) and in the medium-term (differences in values with a 3-year time span between 2009 and 2015).
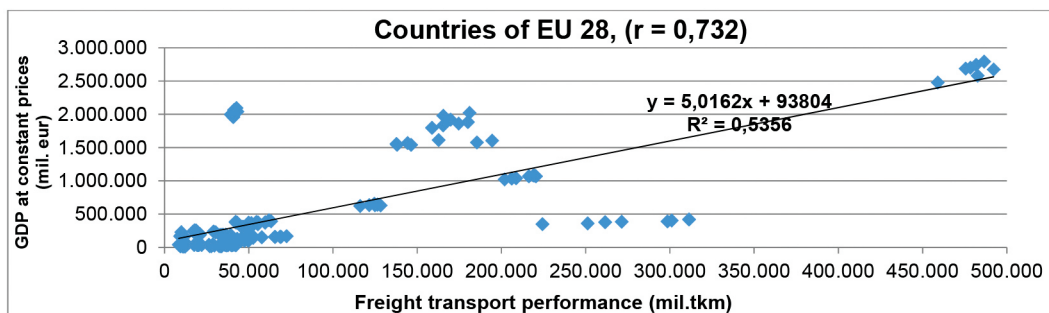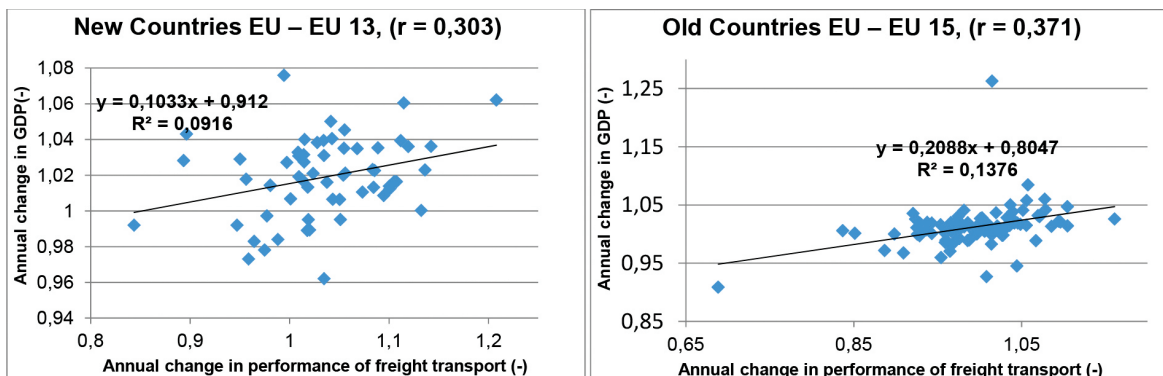
**a) Correlation of annual changes in freight transport performance and GDP / *Korelacija godišnjih promjena u izvedbi transporta tereta i BDP***

Annual changes in freight transport performance and annual changes in GDP were calculated, followed by the



Source: Authors

Graph 2 Freight transport and GDP relation in "New EU Countries (EU 13) and Old EU Countries (EU15)"
*Grafikon 2. Transport tereta i BDP odnos u "Novim EU Državama (EU13) i Starim EU Državama (EU 15)"*

Source: Authors

Graph 3 Relationship between freight transport and GDP in EU 28 countries
*Grafikon 3. Odnos između transporta tereta i BDP-a u EU 28 zemljama*

correlation between these EU-yearly correlations by EU-wide correlation coefficient, for all EU countries as well as for "old" EU countries and "new" EU countries.

The correlation coefficient for all EU countries reached 0.355 in the monitored period, the value for the old EU countries was 0.371, for the new EU countries 0.303.

According to specific EU countries, a strong relationship (high value of the correlation coefficient) was confirmed in Spain (0.975), Croatia (0.869), Germany (0.831), Luxembourg (0.750), Slovenia (0.742), Romania (0.738) and Hungary (0.724).

The average strength of the relationship is for Greece (0.600), Ireland (0.572), France (0.544), Belgium (0.522), Slovakia

(0.497), Sweden (0.497), Austria (0.495), Lithuania (0.460), Latvia (0,403). In other countries, it is a weak relationship.
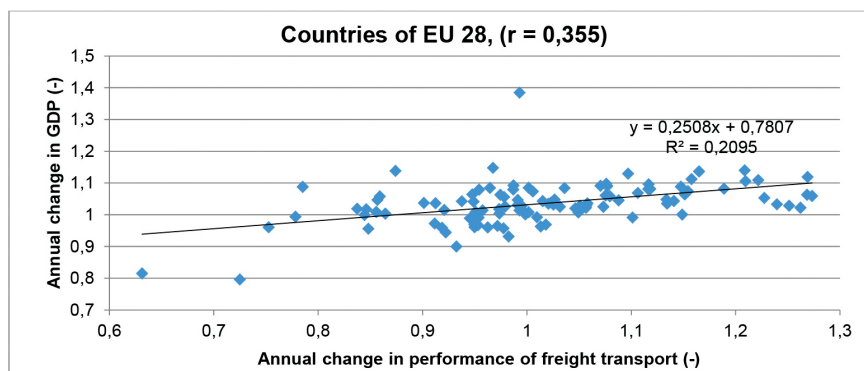
**b) Correlation of freight transport performance and changes in GDP over three years /** *Korelacija izvedbe transporta tereta i promjena u BDP-u tijekom trogodišnjeg razdoblja*

Changes in freight transport performance and GDP changes over three-year time periods have been calculated, followed by a correlation coefficient by EU country, together for all EU countries and separately as "old" EU countries and "new" EU countries.
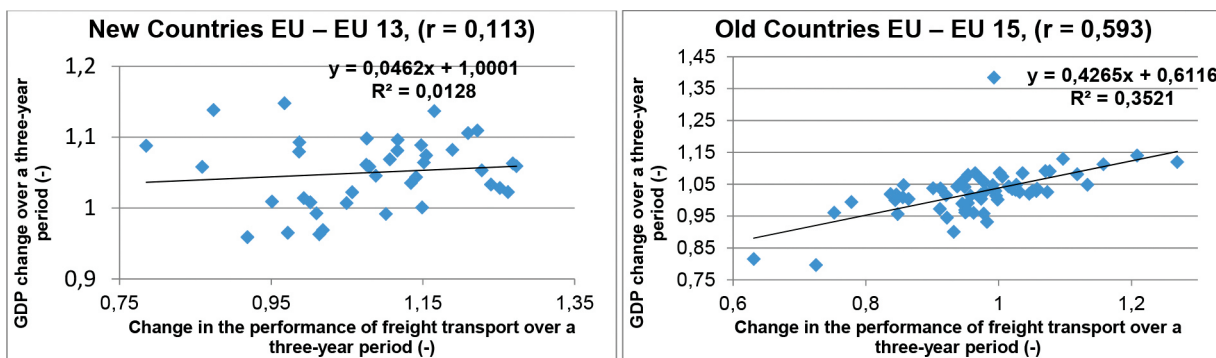


Source: Authors

Graph 4 Relationship between freight transport and GDP in "New EU (EU 13) and EU Old Countries (EU15)"
*Grafikon 4. Odnos između transporta tereta i BDP u "Novim EU (EU 13) i EU Starim Državama (EU 15)"*
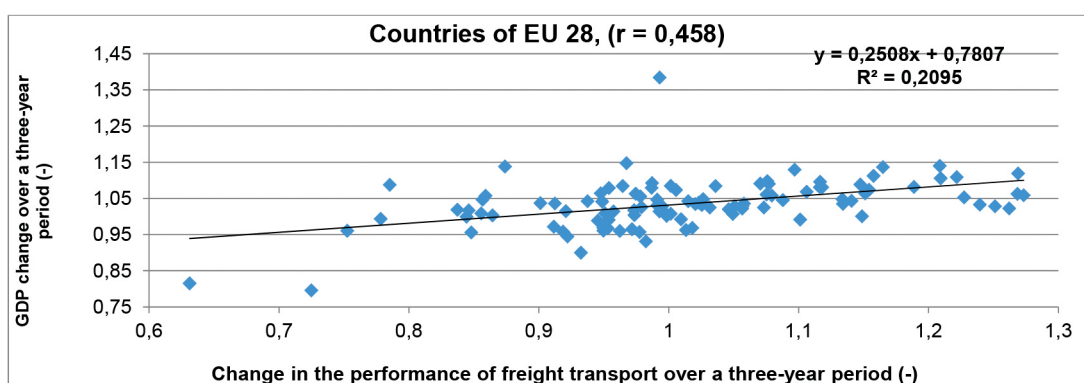


Source: Authors

Graph 5 Relationship between freight transport and GDP in EU 28 countries
*Grafikon 5. Odnos između transporta tereta i BDP-a u EU 28 državama*

Source: Authors

Graph 6 Relationship between changes in freight transport performance and GDP changes over the three-year period in the "New EU (EU 13) and EU-old (EU15)"

*Grafikon 6. Odnos između promjena u izvedbi prijevoza tereta i BDP promjena tijekom trogodišnjega razdoblja u "Novim EU (EU13) i Starim EU (EU15)" zemljama*



Source: Authors

Graph 7 Relationship between freight transport performance and GDP changes over three - year periods in EU 28 countries

*Grafikon 7. Odnos između izvedbe transporta prijevoza i BDP promjena tijekom trogodišnjega razdoblja u EU 28 zemljama*

The correlation coefficient for all EU countries reached 0.458 in the monitored period, the value for the old EU countries is 0.593, for the new EU countries 0.111.

In the 2010 to 2015 reference period, a strong correlation coefficient was established in Spain (0.999), Croatia (0.948), Hungary (0.910), Greece (0.894), Luxembourg (0.842), Ireland (0.815), Romania (0.815), Slovenia (0.805), Germany (0.762), Netherlands (0.738) and Lithuania (0.742).

The average strength of the relationship is for Poland (0.692), Estonia (0.656), Portugal (0.560), France (0.541), Sweden (0.455), Czech Republic (0.660), Bulgaria (0.571). In other countries, it is a weak relationship.

## 4. CONCLUSION / *Zaključak*

Research on the relationship between freight transport performance and GDP in EU countries, based on the absolute and relativized form of statistical data for the groups of countries (EU15, EU13, EU28), confirmed the positive relationship between the surveyed quantities. Growth of freight transport performance is influenced by GDP growth. Globally, no strong dependence of the investigated variables has been confirmed for all EU countries. The strength of the relation between the surveyed indicators is different for each country and the impact of the performance of the freight sector on GDP, according to EU countries, is individual.Research on the relationship

between absolute values of transport performance and GDP, irrespective of the relevance of the values to specific countries, led to the identification of clusters of values. The most predicted aggregates of values found in the EU 15 countries (assumption 6 values aggregates, Graph 2). EU 28 countries 7 clusters of values, Graph 3). The projected aggregates of values will be subject to aggregate analysis in the next study on the impact of transport performance on GDP based on a similarity level in order to determine the number of significant clusters.The clustering interpretation and the relevance of aggregate values to specific EU countries and specific periods. For the identified clusters, an individual study of the impact of freight transport performance on GDP will be realized individually.

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