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Examining changes in GDP on the demand for road freight transport

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Abstract

The paper deals with the analysis of long-term development of GDP, while it is per 1 capita in Slovakia and neighboring countries. This development will be further compared with the economies of developed countries. This paper also parse the vehicle fleet of road transport and examines the burden on the road network. This is based on statistical data from the Slovak Road Administration and information from the toll system since 2009. The paper also examine the load of roads in the factory Kia Motors Slovakia by road freight transport. The output of paper are recommendations for the development of transport infrastructure, road and rail transport in terms of sustainable development.

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Keywords: GDP; freight transport; transport capacity.

1. Introduction

GDP (Gross domestic product) is a monetary measure of the market value of all final goods and services produced in a period on particular territory. Nominal GDP estimates are commonly used to determine the economic performance of a whole country or region, and to make international comparisons the word „product“ expresses increase of wealth. The time period is usually a year. Economic growth is conventionally measured as the percent rate of increase in real gross domestic product, or real GDP, usually in per capita terms in period. GDP can be determined in three ways, all of which should, in principle, give the same result. They are the production (or output

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or value added) approach, the income approach, or the expenditure approach. The article deals with the development of GDP and its derived indicators - GDP per capita

2. Analysis of long-term development of GDP in the Slovak Republic

Development of GDP was affected by established the independent Slovak Republic. This has necessitated some adaptation in the economy market to developed economies Development of GDP was supported by growth of industrial production because production was exported to developed countries.

In graph (Fig. 1) can be viewed that development GDP was not permanent. GDP development was growth gradually until 2009 and in this year was a significant decrease compared to 2008 (- 6,5 %). After joining to European System of Central Banks, the Slovak Republic gained many advantages.

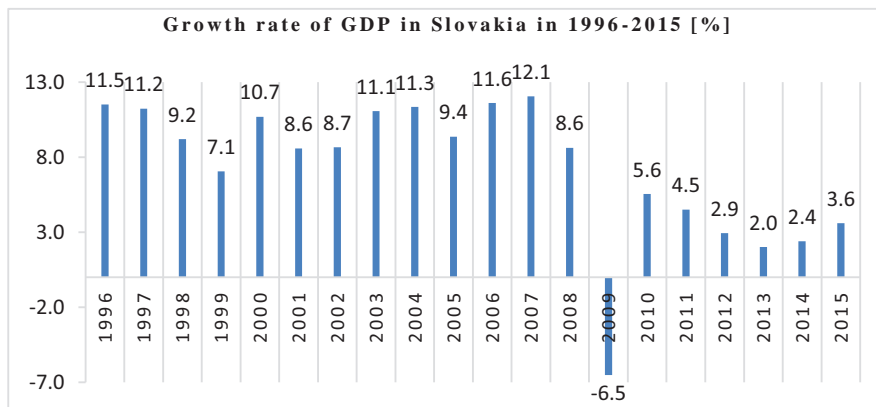


Fig. 1 Graph of growth of GDP in the Slovakia in 1996-2015; Source: collaborated by authors based on [2]

In 2009 Slovak economy was affected by the global recession which resulted in the growth of GDP. In the next year economy recorded growth, but because in some of the member states of EU financial crisis was deepening the GDP experienced a reduction in the pace of growth. This slowdown lasted until 2014, when annual growth in GDP began to rise. The GDP growth is evidenced by the data plotted in the graph in Fig. 2, which recorded its development in current prices (mil. EUR).

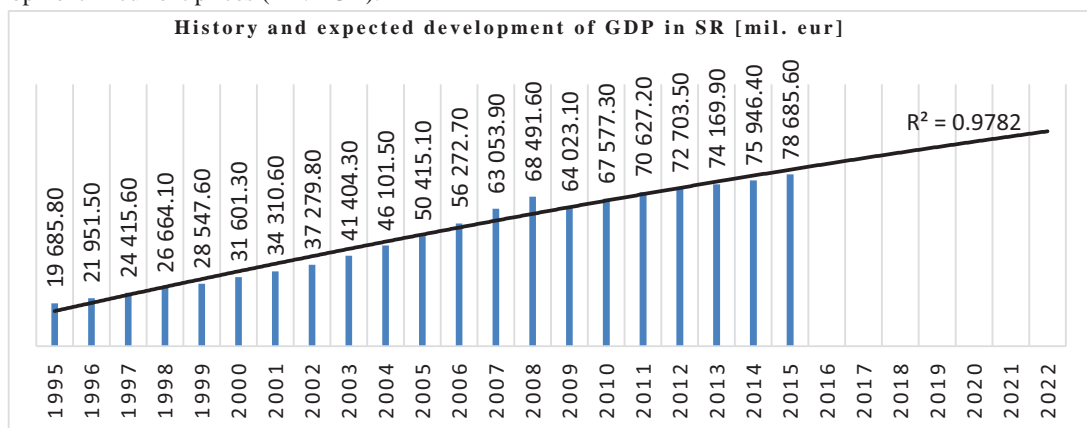


Fig. 2 Graph of history and expected development GDP in SR; Source: collaborated by authors based on [2]

In Fig. 2 is evidenced prediction future development of GDP in the Slovak Republic. The expected development is elaborated until 2022. For determine the probability of the development was used polynomial trend line at which probability this development is 97, 82 %.

3. Analysis GDP in Slovakia in current prices per capita

GDP is the most frequently used measure for the overall size of an economy, while derived indicators such as GDP per capita — for example, in euro or adjusted for differences in price levels — are widely used for a comparison of living standards, or to monitor the process of convergence across the European Union (EU).

3.1. Comparison GDP per capita of the Slovakia with countries of Visegrad Four (V4)

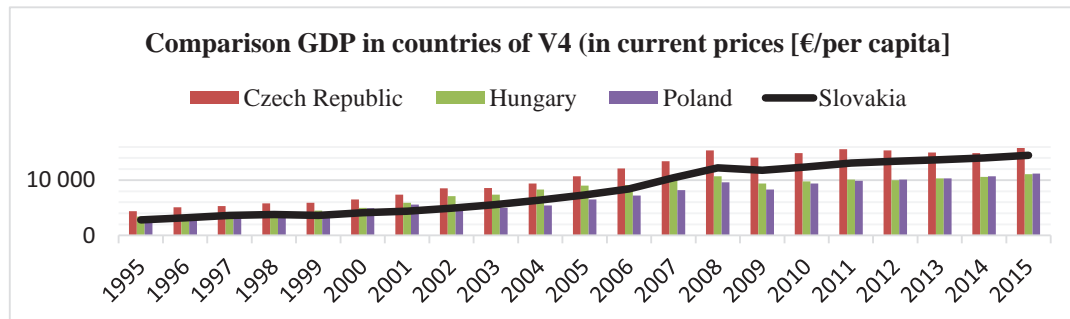


Fig. 3 Comparison GDP per capita of the Slovakia with countries of Visegrad Four per capita; Source: collaborated by authors based on [3]

Based on the data in Fig. 3 can be stated that GDP in the Slovak Republic and in other countries of Visegrad Group historically grows. The GDP of the Slovak Republic was on the third place in comparison with other countries of Visegrad Group. Since 2007 this development has gradually improved and GDP in the Slovakia is on second place nowadays, and gradually approaching the GDP in the Czech Republic.

3.2. Comparison GDP per capita of Slovakia with developed countries

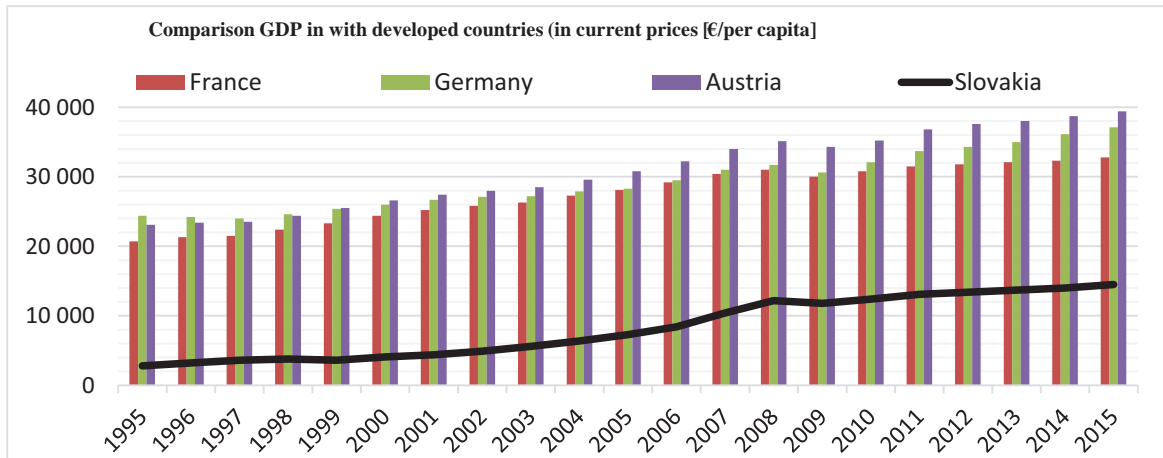


Fig. 4 Comparison GDP in Slovakia with developed countries in current prices per capita; Source: collaborated by authors based on [3]

In Fig. 4 there is shown developed of GDP per capita in the Slovak Republic in compare with GDP in France, Germany and Austria. From Figure 4 can be state that GDP in the Slovakia in years 1995-2000 did not reach not

even 17% of GDP in developed countries. In period between 2000 to 2008 was reported slow growth, when in 2008 reached GDP in the Slovakia almost 40% of GDP in France. In 2009, the global economic crisis due to a fall in GDP growth among all investigated countries. After this year, GDP started to rise again and in 2015 and achieved GDP in the Slovakia from Austria's GDP, compared to most of the countries the highest GDP per capita of around 37.01%. The Slovakia is compared with developed countries is still below 50 % of GDP but in the long term, we can assume that the level of GDP in the Slovakia will gradually approach the rate of GDP of these countries.

4. Analysis of vehicle fleet of road freight transport

In this part of article is analysis of development in the number of registered freight vehicles. This analysis includes development of transport performance in comparison with count of registered vehicles in SR. This comparison is on figure 5.

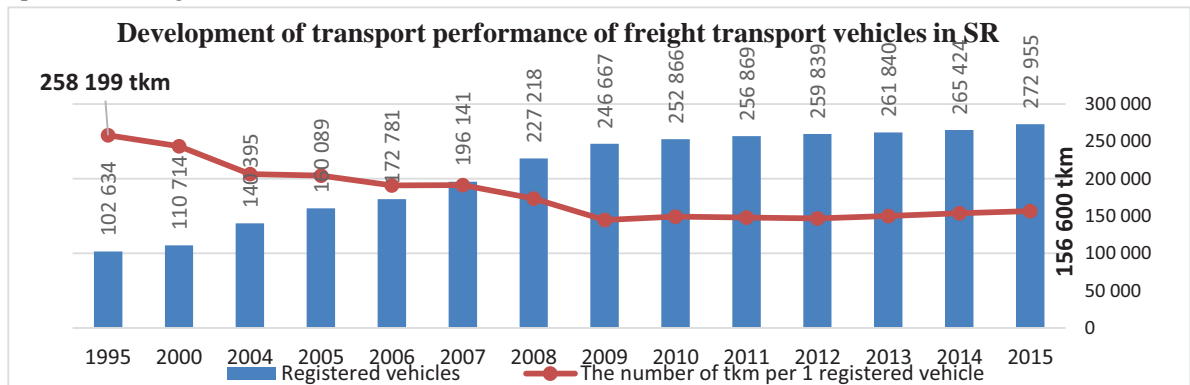


Fig. 5 Graph of transport performance on one registered vehicle in SR; Source: collaborated by authors based on [4], [5]

On Fig. 5 is possible to illustrate that count of registered freight vehicles in years 1995-2009 consistently grew year on year. Since 2009 was reported slow growth, despite this long-term growth. Growth to fall was affected by the global recession. On figure is illustrated, that average transport performance on one registered freight vehicle was 258 199 tkm in 1995. This performance continuously decreased and in 2015 average value was 156 600 tkm. Most transport companies in Slovakia belongs to a group of companies that employ fewer than 20 employees and in obtaining data on the quantities transported takes place only a sample survey of companies. Export of the SR is provided by foreign carriers in the surveyed SOSR occur. It is therefore no need to consider whether the results shown in Fig. 5 correspond to reality.

5. Load of road network by freight transport

Analyse the load of road network in whole Slovakia is wide topic so in this article is analyse this problem in less range (in two parts). In first part is analysed high traffic intensity in correlation with industrial districts. In the second part of the article focuses on the partial output of research communications load in the factory Kia Motors Slovakia freight.

5.1 Analysis of intensity freight transport in correlation with industrial districts

Industry contributes to the state's economy and to the GDP. Each parts of industry such as production, supply chain and so directly contribute with freight transport. Freight transport has source and destination. When company has high share of production, the count of transport cargo is high for policy area and intensity of load freight transport is high on roads in near company. For illustrated was choose area near Goodman Senec Logistic Centre.

Data for analysis intensity of freight transport in this area was gained from national traffic census by Slovak Road Administration in the years 2005-2010. Values are annual average intensity profile (vehicle / 24 hrs.).. National traffic census was performed also in 2015 but in this year was on census used different measurement methodology so this results wasn't compared with previous periods. Logistic center has direct connect to highway D1, so was compared intensity from two profiles of roads. (Fig. 6).

Table 1 Comparison of volume of road freight transport in the logistics center of Goodman Senec Logistics Centre; Source: collaborated by authors based on [6], [7], [8]

Section	Year	Value of freight transport vehicles	The increase compared to 2005
87030	2005	8 069	14,85 %
	2010	9 267	
87020	2005	9 249	24,14 %
	2010	11 482	

From the table we can see that on the section no. 87030 was between 2005 and 2010 increase in vehicle freight intensity by 14.85 % and in the section no. 87020 an increase of 24,14 %. It follows that the formation of such logistic centers or industrial areas directly affects the intensity of transport and the load of road network.



Fig. 6 Graphic illustration of the increased intensity of road freight distribution center at Goodman Senec Logistics Centre; Source: collaborated by authors based on [6], [7], [8], [9]

5.2 Partial analysis of the census load road network to the factory Kia Motors Slovakia from freight road transport

The survey was performed during 24 hours in 20.-21.11.2016. In this survey was monitored 4 enters to the factory, which are for enters of freight road vehicles. The results from this measurements are recorded on table 2.

Table 2 Number of recorded freight transport vehicles on the each enters; collaborated by authors

	Enter 1	Enter 2	Enter 4
Number of vehicles	546	1105	418



Fig. 7 Graphic illustration of intensity of freight traffic on each enter and surrounding roads; Source: collaborated by authors based on [10], [11], [12],

During the survey it was monitored 4 enters, but in enter 3 wasn't recorded any freight vehicle. Number of freight vehicles in 4 enters is record in table 2. In columns are record count of vehicles in relevant categories. On the figure 7 is in white column record count of freight vehicles from national traffic census in 2015. In upper part on white column is recorded count of freight vehicles and in the lower part is marking the census section. This data was possible comparison with the measured data from survey. In comparison weren't section no. 95890 and 93506,

because is less possible that from this areas enter freight vehicles category N3 to the factory. In this areas the count of vehicles consist from vehicles category N1. If the section no. **95750** where is record **2 381** freight vehicles subtract only vehicles category N3, in the next section no. **95870** record intensity of **1 957** vehicles.

If is in the next step subtract count of vehicles in enter 2 (**1 105** vehicles) and 4 (**418** vehicles), value of intensity on the end section no. **95870** is **434** vehicles. To this value is add intensity vehicles from section no. **93506** (**365** vehicles). The final intensity on section no. **93510** is **799** vehicles. In compare with national traffic census is difference **214** vehicles. The second example is comparison to the intensities from direction of the section road no. **93510** (**1 013** vehicles). In this section is no entry for vehicles with maximum weight up 7, 5 tons was assumption that the most vehicles were category N1 and N2. In first step is necessary from section no. **93510** (**1013** vehicles) subtract intensity from section no. **93506** (**365**) vehicles, so the intensity entering to section no. **95870** is **648** vehicles. To this value is add intensity vehicles from areas 4 (**418** vehicles) and 2 (**1 105** vehicles), intensity on this section no. **95870** increase to value **2 171** vehicles. This final value is different as value from national traffic census (**1 495** vehicles). In the last step is add intensity of vehicles category N3 in enter 1 (**424** vehicles), intensity on section no. **95750** is **2 595** vehicles, this is difference of **214** vehicles. These comparisons show that the said intensity from freight transport in national traffic census on section **95870** (**1 495** vehicles) is wrong. The difference between value from national traffic census and measurement is **1 100** vehicles.

6. Conclusion

Analysis of the developed of GDP in Slovakia, it was found that Slovakia's GDP, despite the global crisis in 2008, historically growing. Compared with GDP V4 countries Slovakia since 2007, the second most economically growing state. Slovakia is compared with developed countries is still below 50% of GDP but in the long term. In the long term it is possible to expect a slow approximation to their level. From analysis of fleet of road freight transport in Slovakia shows the long-term growth in the number of registries vehicles. Development of performances per one vehicle since 1995 has decreased by almost 40%, but for the last six years is rising again. From analysis in 5 chapter follows that the formation of such logistic centers or industrial areas directly affects the intensity of transport and the load of road network. After analysis measurement load of road network to factory Kia Motors Slovakia by freight transport and comparison with intensity from national traffic census was identified that on area no. 95870 was significant differences in the intensity of freight vehicles. Further, we recommend that the construction of large production sites need to pay attention to traffic investigation before and after production, respectively. In increasing production. By manufacturing directly affects the intensity of freight transport, we can be argued that the growth of GDP is increasing the burden on the road network. Farther we can assume that the increase in GDP growth in the demand for transport. More detailed examination of changes in demand for freight transport on the gross domestic product will also be looked into further research.

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