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The effect of road transport, rail transport, air transport on the formation of gross domestic product

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Abstract

This research examines and proves the effect of Road Transport, Rail Transport, and Air Transport on the formation of Europe's Gross Domestic Product in 2013-2016. The problems to be discussed are regarding the variables that affect the formation of European Gross Domestic Product in 2013-2016. The aim of this research is to prove the influence of the effect of Road Transport, Rail Transport, and Air Transport to the formation of Europe's Gross Domestic Product. To research and prove the hypothesis an empirical test was administered within the sort of Q Square prediction with Smart PLS version 3.3.3 on the magnitude of the influence of the activity sub-sector. The method utilized in data collection may be a combination of secondary data derived from European Statistical Recovery Dashboard data.

The method went to analyze data is that the statistic data method. The results show that not all variables affect Gross Domestic Product. It can be proved from the statistical t value of $1,792 <$ from the t table value of 2,028 which means that Road Transport (X1) has no positive effect and significant to the formation of total Gross Domestic Product. The Rail Transport (X2) is an independent variable that features a positive and significant effect on the formation of total Gross Domestic Product. It can be proved from the statistical t value of $3,374 >$ from the t table value of 2,028. The air transport (X3) is an independent variable that features a positive and significant effect on the formation of total Gross Domestic Product. It can be proved from the statistical t value of $2,608 >$ from the t table value of 2,028.

Keywords: Road Transport, Rail Transport, Air Transport, Gross Domestic Product

1. Introduction

Economic growth is extremely important and its speed must be much greater than the increase rate in order that the rise in people's per capita income are often achieved. One measure of a country's economic process are often seen from their value, while the measure of value that's often used is Gross Domestic Product (GDP), which is that the value of all goods and services produced by a rustic within a particular period of your time. Gross Domestic Product is everything that's produced by society and business, including workers' salaries. Gross Domestic Product data is additionally a way wont to determine which economic sectors are experiencing growth or decline. The GDP calculation method that uses income parameters is obtained by adding up the income of all employees, employees, company profits, copyright income, income and net interest income, this is often called the GDP income method calculation. While other methods are often measured by the expenditure approach calculated by adding up total consumption, investment, state expenditure and net exports. Countries calculate GDP in their own currencies so as to match across countries these estimates need to be converted into a standard currency. Often the conversion is formed using current exchange rates but these can provides a misleading comparison of truth volumes of ultimate goods and services in GDP. A far better approach is to use purchasing power parities (PPPs). PPPs are currency converters that control for differences within the price levels of products between countries then allow a world comparison of the volumes of GDP and of the dimensions of economies.

Road transport means transportation of products and personnel from one place to the opposite on roads. Road may be a route between two destinations, which has been either paved or worked on to enable transportation by way of motorised and non-motorised carriages.

Rail transport is additionally referred to as train transport. It's a way of transport, on vehicles which run on tracks (rails or railroads). It's one among the foremost important, commonly used and really cost effective modes of commuting and goods carriage over long, also as, short distances.

Air transport is one among the fastest modes of conveyance which connects international boundaries.

Air transportation allows people from different countries to cross international boundaries and travel other countries for private, business, medical, and tourism purposes.

2. Literature Review

2.1 Gross Domestic Product

Gross Domestic Product (GDP) is a crucial indicator to live the condition of a country's economy. GDP is essentially the quantity of added value generated by all business units during a country. Or is that the total value of the ultimate goods and services produced by all economic units. In short, GDP is one among the methods for calculating value.

To calculate the GDP figures, three approaches are often used

1. **Production approach:** GDP is that the added value of products and services produced by various production units during a region or country within a particular period of your time (usually in one year).
2. **Income approach:** GDP is the amount of remuneration received by production factors that participate in the production process in a country within a certain period of time. Production factor remuneration in question is wages and salaries, land rent, capital interest and profit. Everything before deducting income tax and direct tax.
3. **Expenditure approach:** GDP is all components of final demand which consist of:
 - a. **Household consumption expenditure:** Household consumption expenditure is expenditure on goods and services by households for consumption purposes. Households become the end users of various types of goods and services provided in a country's economy.
 - b. **Government consumption expenditure:** Government consumption expenditure is the value of all types of government output minus the value of output for the formation of own capital minus the value of the sale of goods or services plus the value of goods or services purchased from market producers to be given to households for free or at prices that are not economically significant.
 - c. **Gross fixed capital formation:** Gross fixed capital formation is defined as the expenditure of a production unit to increase fixed assets less the reduction of used fixed assets. It is referred to as gross fixed capital formation because it describes the addition and reduction of capital goods at a certain period.
 - d. **Inventory:** Inventories held by the producing unit for use in further processing, sale, or delivery to another party. It can also be interpreted as inventory originating from other parties, which will be used as input or resold without further processing.
 - e. **Export-Import:** In general, the concept of export-import abroad refers to the 1933 System of National Accounts (SNA). Goods export transactions are defined as transactions of transfer of economic ownership of goods from residents of a province to foreign economic actors

2.2 Road Transport

Road transportation is all forms of transportation that use land roads to transport and move passengers or goods. In ancient times, road transportation used animals such as horses, donkeys. Some even use human labor to carry and move. Along with the development of the flow of trading business, road construction was also improved to accommodate the

activities of people carrying out their activities. The invention of the wheel became the forerunner to the ease of transportation development. Until now, land transportation consists of rickshaws, bicycles, motorbikes, cars and trains. There are many advantages of road transport as compared to other means of transport. The investment required in road transport is extremely less compared to other modes of transport like Rails and air transport. The worth of construction, operating cost and maintaining roads is cheaper than that of the Rails. Road transport are often classified as transporting either goods and materials or transporting people. The most advantage of road transport is that it can enable door-to-door delivery of products and materials.

2.3 Rail Transport

Rail transport is a means of transportation in the form of a steam powered vehicle or electricity consisting of a series of carriages drawn by a locomotive and walk on rails or steel rails. Train is a general means of mass transportation which generally consists of locomotives (vehicles with propulsion that run independently) and a series of trains or carriages (coupled with other vehicles). The train or carriage series is relatively large so that it can accommodate passengers and goods on a large scale. Due to its nature as an effective mass transportation, several countries have tried to make maximum use of it as the main means of land transportation both within cities, between cities and between countries. In terms of propulsion or from its propulsion, trains are divided into three, namely steam trains, diesel trains and electric rail trains.

2.4 Air Transport

Air transportation is any form of tool or means that functions to move, carry, or operate passengers and goods, by utilizing air space as a medium for traffic. Some examples of air transportation include planes, helicopters and hot air balloons. Some of the advantages of air transportation

1. Able to reach distant destinations in a very short time.
2. It is very compatible for carrying or sending important objects or items, such as documents, or fruits that are perishable.
3. Able to reach areas that are difficult to be covered by land and water transportation.

Some of the disadvantages of air transportation

1. To use air transportation, generally we need to spend money which tends to be more expensive than using water or land transportation (although this is relative to some people).
2. Travel using air transportation is very dependent on weather or natural conditions. As the airlines usually sail their flights due to bad weather, such as heavy rain, wind storms, and so on.
3. The costs incurred for maintenance of air transportation tools generally tend to be more expensive than those for land and water transportation.

3. Method

This study uses a data analysis method using SmartPLS software version 3.0. which is run on computer media. Secondary data on the effect of road transport, Rail transport and air transport of gross domestic product in 2013-2016 sourced from the European Statistical Recovery Dashboard data. The measurement model is used to test the validity and reliability, while the structural model is used to test causality (hypothesis testing with predictive models).

4. Result and Discussion

4.1 Result

4.1.1 Descriptive Data

Table 1: Descriptive Statistics

	No.	Mean	Median	Min	Max	Standard Deviation	Excess Kurtosis	Skewness
X1	1	4359.025	897.000	0.000	15444.000	5890.363	-1.010	0.959
X2	2	14723.150	5486.000	0.000	69247.000	20232.080	2.497	1.813
X3	3	318.450	161.000	23.000	1136.000	324.651	1.162	1.383
Y	4	752687.975	265757.000	19033.000	3134740.000	970294.413	0.585	1.427

Source: Results of processing with SmartPLS 3.3.3
 X1 = Road Transport
 X2 = Rail Transport
 X3 = Air Transport
 Y = GDP

Based on the table 1, can be seen the average value of the level of road transport sector is 4359.025 with the minimum value is 0 and the highest value is 15444. Rail Transport with an average transaction value is 14723.150 with the minimum value is 0 and the highest value is 69247. Air Transport with an average transaction value is 318.450 with the minimum

value is 23 and the highest value is 1136. The GDP (Y) with an average production value is 752687.975 with the minimum value is 19033 and the highest value is 3134740.

The result of t-statistics value in the path coefficients table are presented in the following figure 1 as a follows:

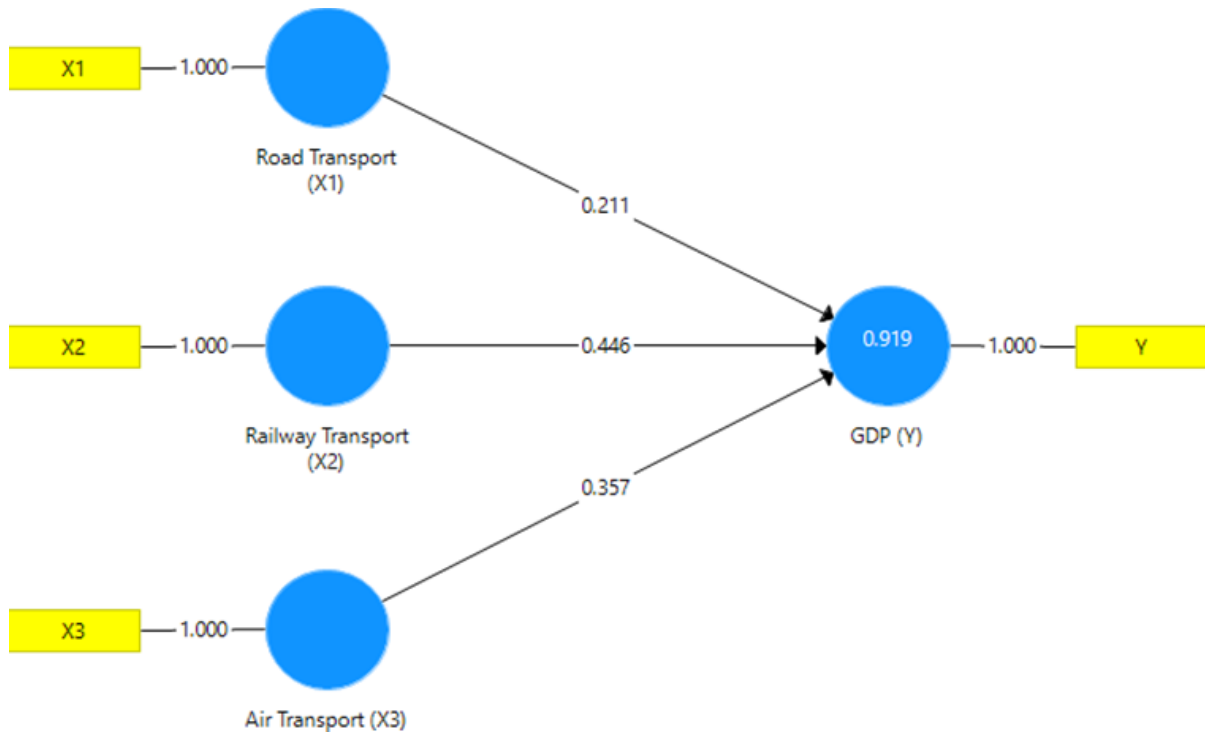


Fig 1

Based on the model in figure 1, it can be seen that the Road Transport, Rail Transport and Air Transport play a major role

in the total Gross Domestic Product. The hypothesis test results are in the following table:

Table 2

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ((O/STDEV))	P Values
Air Transport (X3) -> Gross Domestic Product (Y)	0,357	0,370	0,137	2,608	0,009
Rail Transport (X2) -> Gross Domestic Product (Y)	0,446	0,415	0,132	3,374	0,001
Road Transport (X1) -> Gross Domestic Product (Y)	0,211	0,225	0,118	1,792	0,074

Source: PLS output

Based on the results of the hypothesis test, it can be seen that the Road Transport (X1) is an independent variable that does not have a positive and significant effect on the formation of a total Gross Domestic Product. It can be seen from the statistical t value of 1,792 < from the t table value of 2,028 and this can be proven by the original sample value of 0,074 and the significance of 0,074 > 0,05 which means that Road Transport (X1) has no positive effect and significant to the formation of total Gross Domestic Product. The Rail Transport (X2) is an independent variable that has a positive and significant effect on the formation of a total Gross Domestic Product. It can be seen from the statistical t value of 3,374 > from the t table value of 2,028 and this can be

proven by the original sample value of 0,001 and the significance of 0,001 < 0,05 which means that Rail Transport (X1) has a positive effect and significant to the formation of total Gross Domestic Product. The Air Transport (X3) is an independent variable that has a positive and significant effect on the formation of a total Gross Domestic Product. It can be seen from the statistical t value of 2,608 > from the t table value of 2,028 and this can be proven by the original sample value of 0,009 and the significance of 0,009 < 0,05 which means that Air Transport (X1) has a positive effect and significant to the formation of total Gross Domestic Product. The inner model evaluation is presented in the following Figure 2:

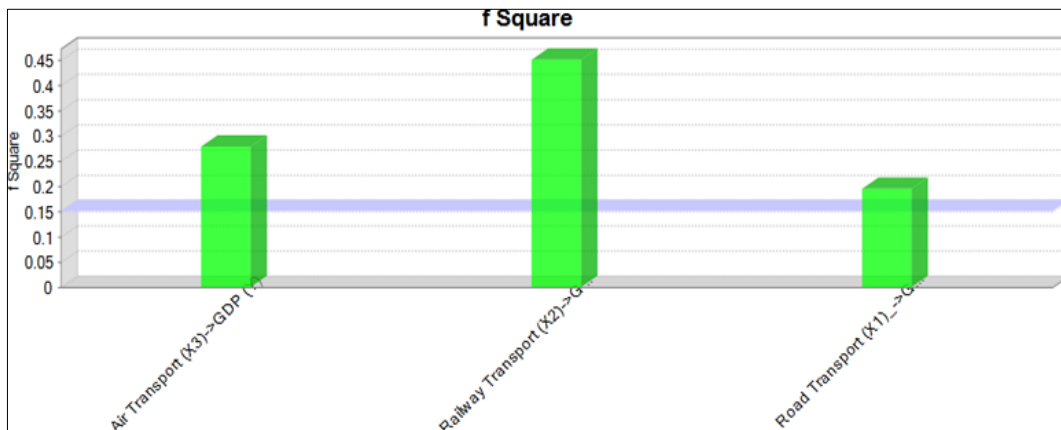


Fig 2

Based on Figure 2 shows that the dominant F Square value comes from the variable Rail Transport (X2)

4.1.2 Predictive Relevance

The result of Predictive Value show in Table 3 as a follows:

Table 3: The predictive relevance

	Air Transport (X3)	GDP (Y)	Railway Transport (X2)	Road Transport (X1)
Air Transport (X3)		0.357		
GDP (Y)				
Railway Transport (X2)		0.446		
Road Transport (X1)		0.211		

Source: PLS Output

Based on the Table 3 it can be show that there is a direct relationship between each independent variable on the

dependent variable.

4.1.3 Determination coefficient test results the result of adjusted R2 as a follows

Table 4: The determination coefficient

	R Square	R Square Adjusted
Gross Domestic Product (Y)	0,919	0,912

Source: PLS Output

Based on the test results of the coefficient of determination at Table 4 the value of R Square is 0.919 and the Adjusted R Square value is 0.912. Thus, the value of R Square illustrates that all of the independents consisting of the Road Transport (X1), Rail Transport (X2), and Air Transport (X3) in this study are able to represent Gross Domestic Product in Europe (Y) as the dependent variable of 91,9 % while the remaining 8,1% is influenced by other variables outside this equation or the variables studied.

5. Discussion

Infrastructure plays an important role in improving economic processes, especially infrastructure in the transportation sector. Transportation has various impacts on economic development objectives, such as employment, productivity, property value, commercial activity, investment and tax revenue. From the predictive relevance, it can be seen that the level of rail transportation use is the variable that has the greatest influence on economic growth. This can be shown by looking at the predictive value of

0.446. The level of use of rail transportation has a positive effect on economic growth, which means that the higher the level of use of rail transportation, the higher the rate of economic growth will be. There are several factors that make people prefer to use rail transportation over other transportation, such as:

1. The train will not encounter congestion like other land vehicles such as buses or private cars.
2. The timing of departing and stopping trains is better than other vehicles due to the absence of schedule changes, diversion of traffic flow and land traffic complex problems such as public buses or private vehicles.
3. A more secure level of security. It can be seen from the statistics in Europe that the number of train accidents is lower than that of other road transportation
4. The most basic reason why people prefer to use trains compared to using other modes of transportation is the cheaper ticket prices

Based on the results of hypothesis testing using the T test, it can be seen that not all the variables have an effect on economic growth. It can be proved from the statistical t value of $1,792 <$ from the t table value of $2,028$ and this can be proven by the original sample value of 0.074 and the significance of $0.074 > 0.05$ which means that Road Transport (X1) has no positive effect and significant to the formation of total Gross Domestic Product. The Rail Transport (X2) is an independent variable that has a positive and significant effect on the formation of a total Gross Domestic Product. It can be seen from the statistical t value of $3,374 >$ from the t table value of $2,028$ and this can be proven by the original sample value of 0.001 and the significance of $0.001 < 0.05$ which means that Rail Transport (X2) has a positive effect and significant to the formation of total Gross Domestic Product. The Air Transport (X3) is an independent variable that has a positive and significant effect on the formation of a total Gross Domestic Product. It can be seen from the statistical t value of $2,608 >$ from the t table value of $2,028$ and this can be proven by the original sample

value of 0.009 and the significance of $0.009 < 0.05$ which means that Air Transport (X3) has a positive effect and significant to the formation of total Gross Domestic Product. The use of rail and air transportation attracted the attention of the population. This means that the higher the use of rail and air transportation, the higher the economic growth. The use of road transportation is less desirable than rail and air transportation due to several reasons such as road transportation experience more frequent congestion and then road transportation is subject to frequent schedule changes, diversion of traffic flow and complex ground traffic problems.

5. Conclusions

This study has shown that there are theoretical and practical reasons for rail and air transport in general to have modest beneficial effects on the broader economy. Even under certain extreme circumstances effects can be anticipated. And in this reseach has shown that Road Transport doesn't have a positive and significant effect on the formation of a total Gross Domestic Product. Considering the importance of the road transport sector, it is necessary to identify the main issues affecting the efficiency of the road transport sector and take corrective actions to enhance economic growth and development from road transport. This research has implications for the government to provide facilities and facilities to investors who want to enter in the road transport, Rail transport and air transport.

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