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ЕКОНОМІКА ТА УПРАВЛІННЯ

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THE INTRODUCTION OF THE MOST POWERFUL RAILWAY OF THE EU, AND ITS SUPPORT WITH ECONOMIC ANALYSES

Purpose. The purpose of the research is to support with results and present one of the most powerful (German) railways' relationships with the economy and its network coverage. To prove that the railway has a strategic significance within the connection of economic regions. **Methodology.** We select the country with the highest capacity from the EU countries, then in respect of the given country we present its homogeneity and connections. We look for those points in the given country, where the greatest quantities of goods are placed on rail. Then we compare this with the country's GDP map and look for a relationship between the rail network and the country's GDP. **Findings.** The railway creates the country's ideal economic centre of gravity. It is clear that the country can be divided into two major regions, the northern and the southern part. **Originality.** The railway system has been studied rarely from an economic point of view, with GDP correlations. The method can serve as a useful research base to the economic analysis of any area, where we are interested in the importance of railways. **Practical value.** In case of any economic or geographical area, the importance of the railway can be determined, and it can be shown that how important role the railway can play in an economic region.

Keywords: competition; railway freight transport; GDP

Introduction

In this article we present Europe's most powerful railway system. Further, we examine its components, in particular from the aspect of freight transport. First, we examine Europe's freight transport data and determine where the largest rail freight flow in Europe is. Second, we present the railway density in Europe and deduce conclusions about the fact whether it is in direct proportion to the freight flows. Third, we take a closer look at Germany's dispatch points, which we divide into two main groups. Finally, we draw parallels between the railway dispatch points and the GDP-producing regions.

Research procedure

In our research we move step by step and examine the flow of goods from a quantitative and qualitative point of view, we determine the dispatch points, the network, and the other factors connected to the network, such as GDP. One of the essential questions of the research is the goods' volume, distribution. It is shown in Figure 1 that in freight ton kilometres the best is Germany in European context, and in passenger transport it also plays an outstanding position. In the following, we will present the reasons for this and examine why the German railway could become an outstanding player in Europe, and why it is so important for the German economy.

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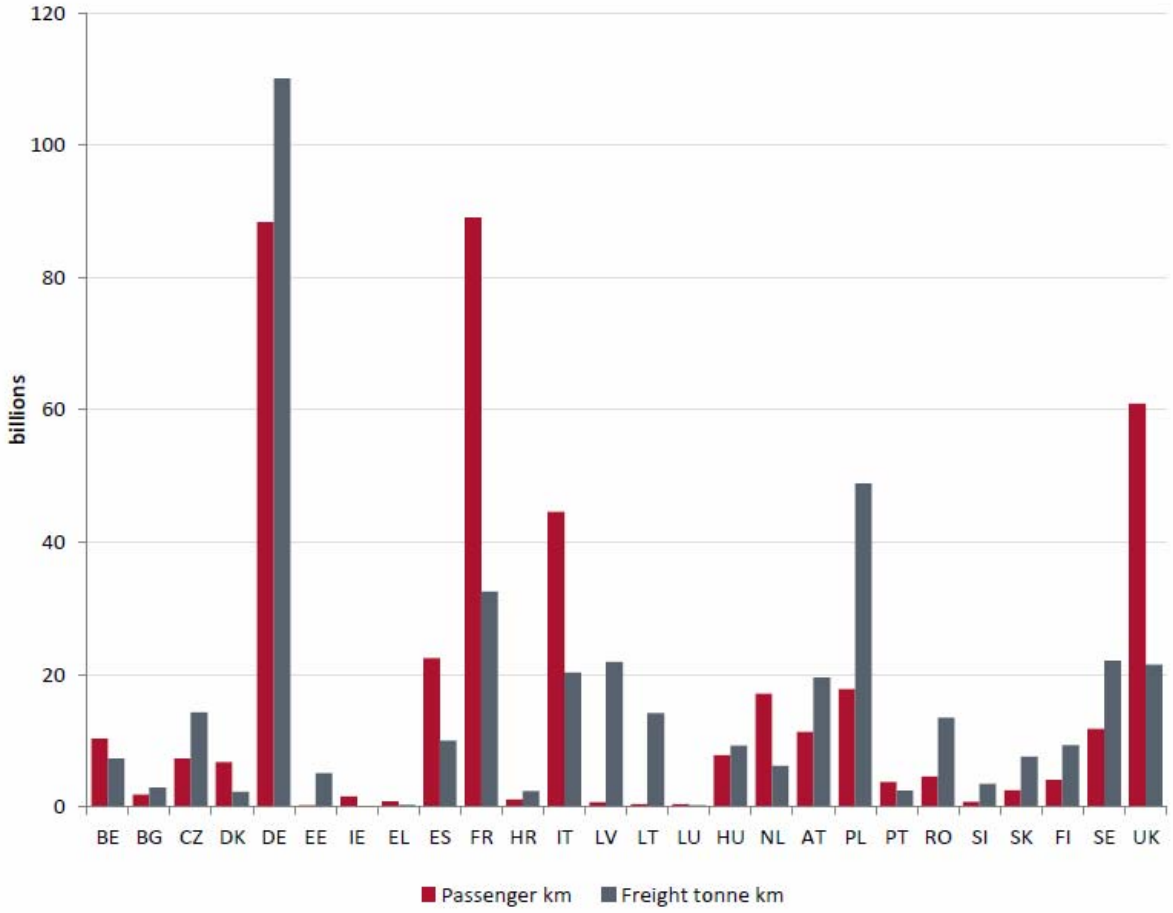

Fig. 1. Passenger and freight activity (2012) [18]

As a first step, we examine the distribution of shipped quantities in Germany in respect of international, domestic and transit traffic. Figure 2 shows that the nationally dispatched goods make up the largest proportion. This is followed by the international, and then the transit traffic. By examining the structure of the German rail market, it can be determined that it tries to keep roughly in balance all three types of traffic. This is advantageous, because if any of the three segment should fail, the German railway would be able to optimal operation [1, 18].

In contrast with the above, it is clearly visible in Figure 2 in case of Turkey, that the rail freight is made up exclusively from domestic traffic, so it is very vulnerable, however, their rail share can be increased on international level.

By examining Hungary, it is visible that most of the volume of goods transported is made up by the international traffic. From this we can conclude that it would be necessary to target an increase in its own flow of goods to make the ratio roughly the same.

In case of Austria, it can be determined that it has the same structure as Germany, only the quantities differ from each other. Thus, from the European cyclorama it can be concluded that only Germany and Austria has such a composition in terms of traffic, which can be said to be in equilibrium broadly. With regard to other European countries, Hungary is also close to the equilibrium distribution.

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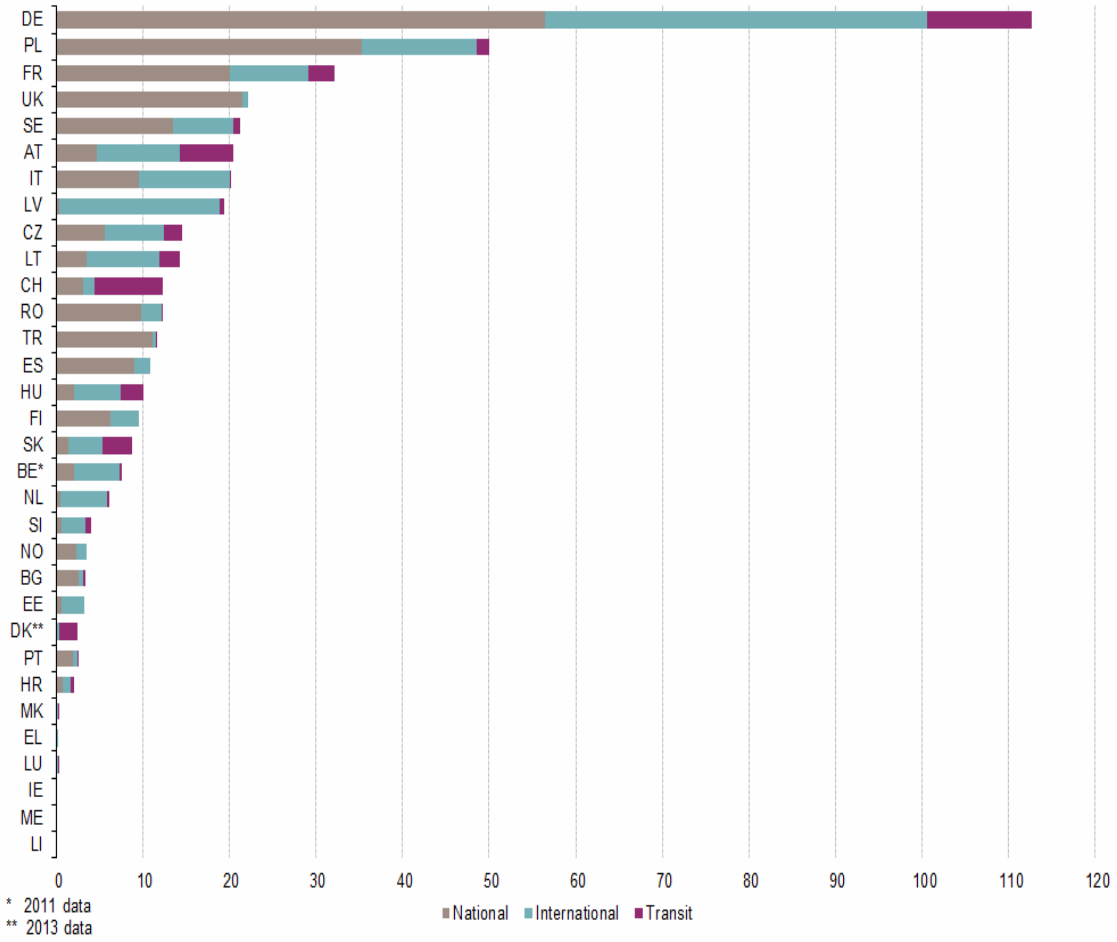

Fig.2. Rail transport of goods by country in 2014 – in billion tkm [15]

As a second step: So far it has been found that the role of the railway is the largest in Germany within Europe with respect to both passenger and freight transport. You may wonder that in this case whether Germany has the densest railway network or not. If this condition is not available, then it is difficult to meet the conditions for optimal operation.

In Figure 3, we see Europe's rail density, not surprisingly, one of the densest rail network is located in Germany (marked as hue, the darkest are the densest area approx. 200 km/1000 km^2). It also confirms that why the rail freight volume is the best here.

As a third step we examine that if a dens infrastructure is available, then where good dispatches are formed [2].

In Figure 4 the places, where dispatches occurred in Europe, can be seen marked with blue dots. These may be land or sea points. From the network it is clearly visible that these point are concentrated in the area of North Germany, where the network is also the most powerful. In addition, nearly 20 of such dispatch point is located in the area of Germany [6]. Later on we will discuss that points located in the south [21].

As a fourth step: we examine the distributions by good types. From this we can conclude how homogeneous the rail freight market of Germany is in respect of the goods. We examine the volume of the goods traditionally carried by rail [12, 13].

The pie chart (Figure 5) show the quantity transported in million ton-kilometres in Germany.

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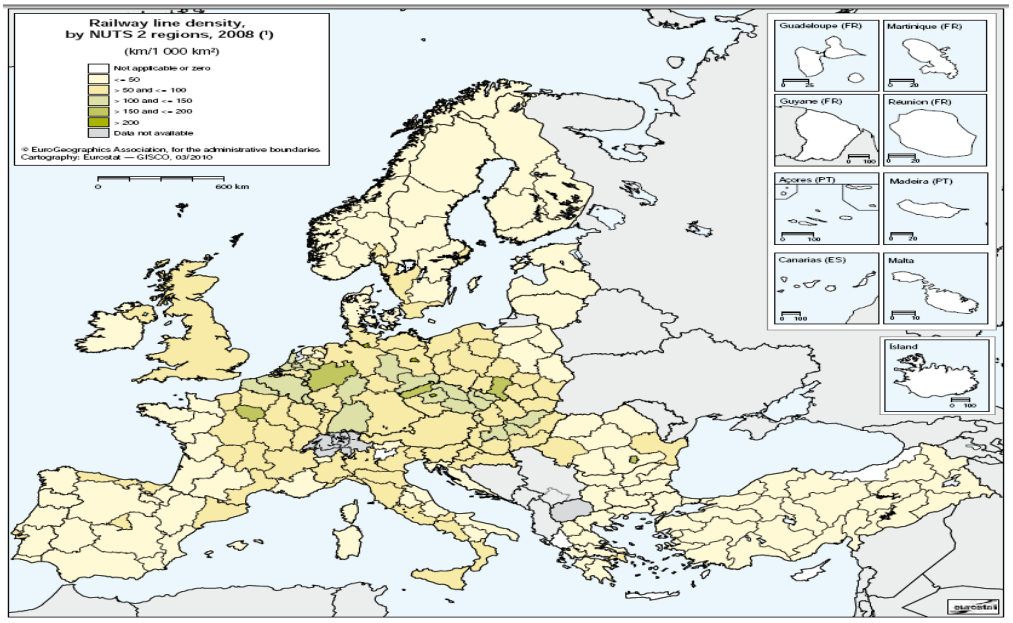

(¹) Belgium, Denmark, Ireland, Austria, Slovenia and United Kingdom, national level; Germany, NUTS 1 regions; Austria, 2007 data.
Source: Eurostat (tran_r_net).

Fig. 3. Railway line density [19]

Fig.4. ETRMS Planned Deployment Through 2020 [21]

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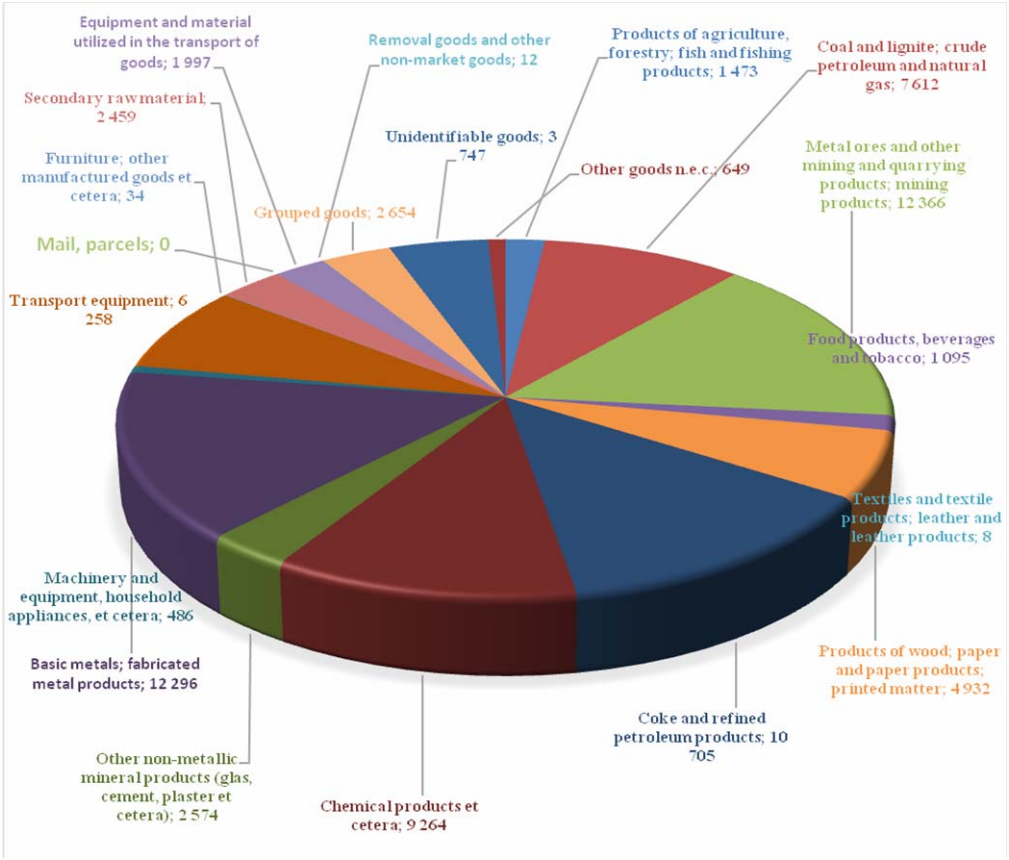

Fig. 5. Transport performance in 2015, by mode of transport and product division (in million tonne-kilometres) [20]

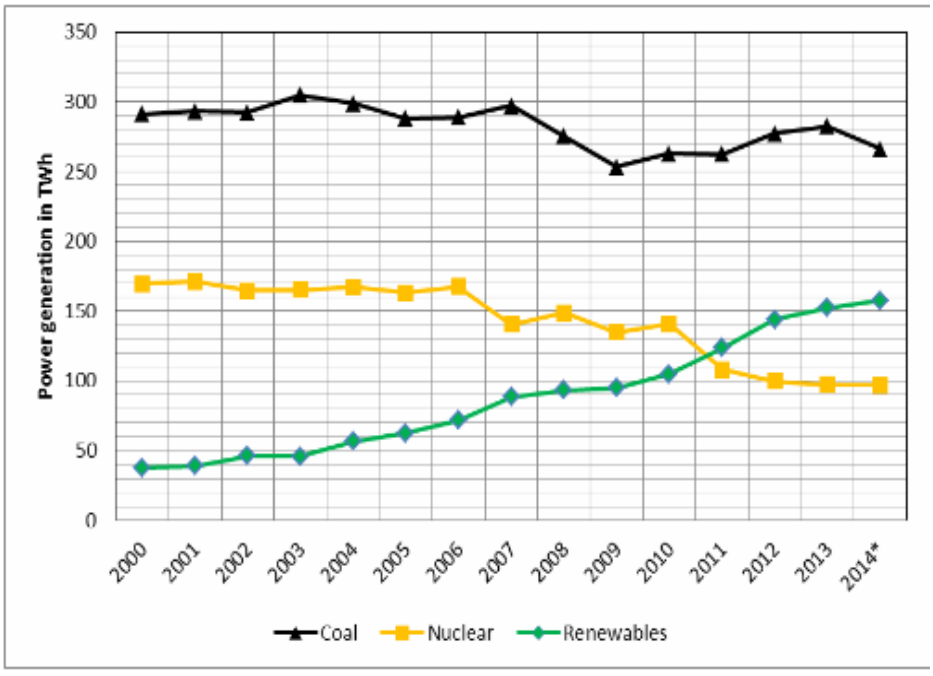

Fig. 6: Development of power generation from coal (lignite and hard coal), nuclear and renewable energy sources (in terawatt-hours, 2014 data patly estimated) [2]

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It is visible in Figure 5 that a significant proportion of rail goods is linked to heavy industry, such as mining, coke, petroleum and chemical products. It is also clearly visible that the structure is not homogeneous, so if the transport of any product is terminated by chance, then the rail is able to continue to operate safely. However, if we examine the composition in a complex way, then it ca be seen that each is related to heavy industry. Hereinafter we have to reckon with that in Germany the capacity of conventional power plants is permanently reduced, or they even want to abolish the operation of conventional coal-fired power plants. Currently the coal power plants are still dominant in the German energy production, the energy they produce was 44% of the electricity in 2014 (26% from lignite, and 18% from hard coal). The combustion of lignite causes the greatest greenhouse gas emission. In order to reduce emissions, the German government launched a process that will reduce carbon consumption in the country [17].

In Figure 6 the 3 main components of energy production of Germany are visible. It can be seen that the coal consumption is more and more reduced, while the renewable energies are increased. On the long term the rail must reckon with this.

As a fifth step: we examine where Germany generates the largest part of GDP [8]. We assume that the rail also has an important role there. We can also confirm with the fact that Germany is built on heavy industry economy. Figure 7: "Germany's GDP map" [4, 5, 7]. Based on the map we can have two important statements:

Firstly: where dispatch is done in North Germany, an outstanding value is not generated in terms of the country's GDP. Its explanation is that we talk about port traffics. So there the goods only change modality [3].

Secondly: the dispatch point in South Germany are the most important for the German economy. The finished products are produced there, and the industrial centre of the country is also there.

A more detailed examination should also be carried out in connection with the dispatch locations to determine the high points in terms of dispatch.

As a sixth step: we examine in which regions, cities of Germany the dispatch of goods happens by rail (Figure 8).

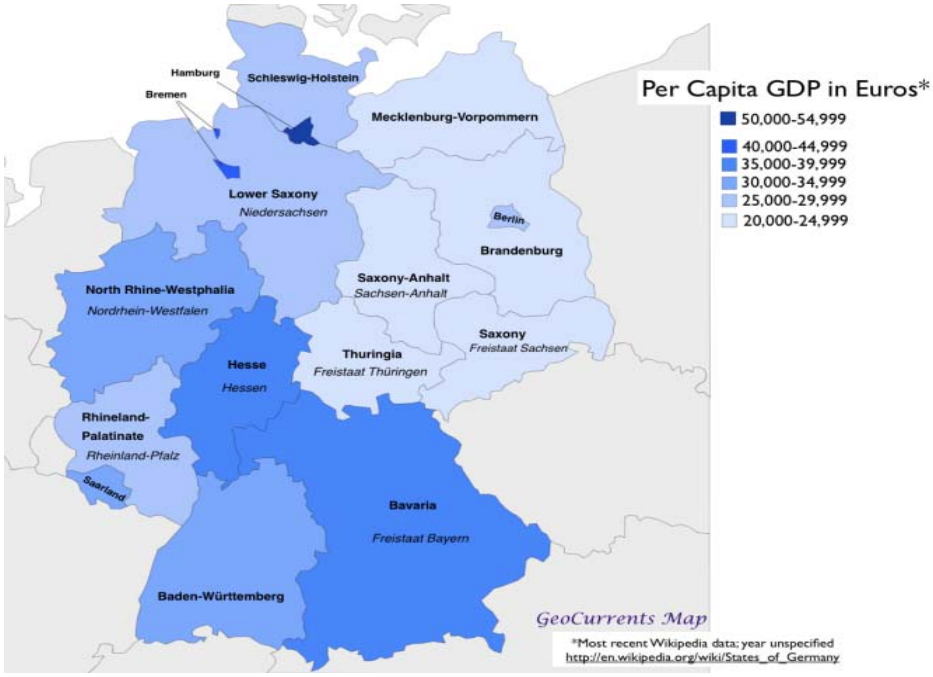

Fig. 7. GDP per capita of the German states [9, 16]

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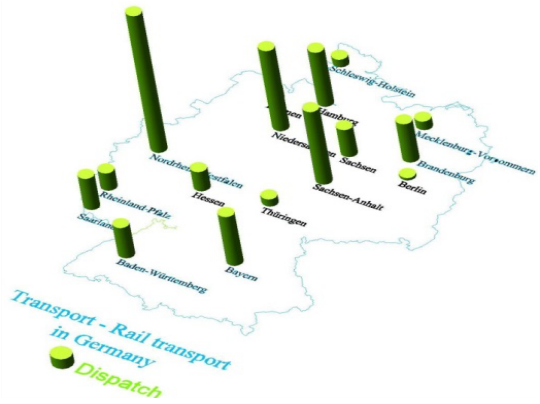

Fig. 8. Transport – Rail transport in Germany [14]

Table 1

Regional breakdown [14]

City	million tons
Baden-Württemberg	15.186
Bayern	24.621
Berlin	1.191
Brandenburg	19.286
Bremen	5.663
Hamburg	27.275
Hessen	9.385
Mecklenburg-Vorpommern	4.349
Niedersachsen	40.373
Nordrhein-Westfalen	69.002
Rheinland-Pfalz	8.726
Saarland	6.665
Sachsen	13.563
Sachsen-Anhalt	36.56
Schleswig-Holstein	3.77
Thüringen	3.556
Germany	289.171

Conclusions

As a first step: We examined the structure of rail market in Europe, and found that Germany plays a very important role both in terms of freight and passenger transport. There we chose Germany for further examination.

As a second step: we approached Europe's rail network along the network aspects and found that the density of the railway network is the largest in Germany.

As a third step: we examined where the dispatch points in Germany are. We divided the points roughly into two main points. The first group is located in North Germany (sea traffic), the second group in South Germany.

As a fourth step: we examined the distributions by good types and came to the conclusion that we talk about goods traditionally with heavy industry. Fortunately, the type of goods is less concentrated, so if the distribution of any goods is terminated, then it will less affect the rail freight market.

As a fifth step: we examined Germany's GDP according to regional distributions, and found that the aforementioned South Germany area is the most powerful in the country. So the rail infrastructure is essential for the region [7, 22].

As a sixth step: by regions, we examined where and in what quantities dispatches happened. We found that we can divide the area of Germany into two main parts, the first is the northern part, which contains rather sea traffic, while the southern part is the capital strong part of Germany.

As a final conclusion it can be determined that the rail has a strong and outstanding role economically until today in Germany [10]. The rail passes along where the country's economy is the most powerful, it connects the northern and southern regions, which is very important for the economy. The economic goods produced can be easily and quickly forwarded to those points, where a greater demand is generated for that. In Figure 8, which illustrates the dispatch points, it is clearly visible that for example in Hamburg the dispatch of goods is great, but the country's GDP map shows that the GDP is small compared with those of the country, so in respect of this city the modality change of goods arriving by the sea is in the background of high dispatch rate.

During our research, we examined the railway's environment from an economic (GDP) and a network point of view, searched for the network's graph points, that is the dispatch places.

Conclusions can be drawn that the railway still plays a very important network connecting role in Germany. The railway creates the country's ideal economic centre of gravity. It is clear that the country can be divided into two major regions, the northern and the southern part.

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The northern part's operations rather refer to trade, while the southern part clearly refers to domestic production. Presumably, this structure can be said to be optimal, since currently the rail market operating in Germany is highly ranked in Europe [4].

According to the study of H. Mitwallyova, V. Jankovic, the German rail freight market is highly ranked mainly because it operates very efficiently in the EU rail freight market [11]. The EU15 members are much more effectively operating than the later connecting EU Member States, except for Estonia [18]. The explanation for this is they employ less employees for the same work, and use advanced technologies and IT systems

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ПРЕДСТАВЛЕННЯ НАЙБІЛЬШ ПОТУЖНОЇ ЗАЛІЗНИЦІ ЄС ТА ПІДТРИМКА ЇЇ РОБОТИ ЗА ДОПОМОГОЮ ЕКОНОМІЧНОГО АНАЛІЗУ

Мета. Наукове дослідження має за мету представлення економічних відносин та огляд мережі однієї з найпотужніших залізниць (на прикладі Німеччини), а також підтвердження того, що дана залізниця має стратегічно важливе значення для зв'язків між економічними регіонами. **Методика.** У статті обрана країна з найвищою продуктивністю серед країн ЄС. Таким чином, автор представляє однорідність та узгодженість у даній країні. У статті аналізується, де в цій країні найбільша кількість вантажів перевозиться за допомогою залізниці. Потім ці дані порівнюються з картою валового внутрішнього продукту (ВВП) та знаходиться зв'язок між залізничною мережею і ВВП країни. **Результати.** Залізниця створює ідеальний економічний центр країни. Вочевидь, що країну можна розділити на два основних регіони – північний та південний. **Наукова новизна**. Зв'язок системи залізниць та ВВП із економічної точки зору вивчається рідко. Дана методика може використовуватися в якості корисної бази для проведення економічного аналізу будь-якого регіону, де цікавляться питанням важливості залізниць. **Практична значимість**. У будь-якому економічному або географічному регіоні можна визначити важливість залізниці та показати її роль для розвитку даного економічного регіону.

Ключові слова: конкуренція; залізничний транспорт; вантажний транспорт; ВВП

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ПРЕДСТАВЛЕНИЕ САМОЙ МОЩНОЙ ЖЕЛЕЗНОЙ ДОРОГИ ЕС И ПОДДЕРЖКА ЕЕ РАБОТЫ С ПОМОЩЬЮ ЭКОНОМИЧЕСКОГО АНАЛИЗА

Цель. Научное исследование имеет своей целью представление экономических отношений и обзор сети одной из самых мощных железных дорог (на примере Германии), а также подтверждение того, что данная железная дорога имеет стратегически важное значение для связей между экономическими регионами. **Методика.** В статье выбрана страна с самой высокой производительностью из стран ЕС. Таким образом, автор представляет однородность и согласованность в данной стране. В статье анализируется, где в этой стране наибольшее количество грузов перевозится с помощью железной дороги. Затем эти данные сравниваются с картой валового внутреннего продукта (ВВП) и находится связь между железнодорожной сетью и ВВП страны. **Результаты.** Железная дорога создает идеальный экономический центр страны. Очевидно, что страну можно разделить на два основных региона – северный и южный**. Научная новизна. С**вязь системы железных дорог и ВВП с экономической точки зрения изучается редко. Данная методика может использоваться в качестве полезной базы для проведения экономического анализа любого региона, в котором интересуются важностью железных дорог. **Практическая значимость.** В любом экономическом или географическом регионе можно определить важность железной дороги и показать ее роль для развития данного экономического региона.

*Ключевые слова***:** конкуренция; железнодорожный транспорт; грузовой транспорт; ВВП

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