

## ROLE OF PUBLIC TRANSPORT IN THE DEVELOPMENT OF CITIES AND REGIONS

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**Purpose:** The aim of this article is to examine if there is a correlation between the level of prosperity of Polish regions and their transport network.

**Design/methodology/approach:** Literature studies were carried out, statistical data were analyzed, as well as selected case studies.

**Findings:** There is a clear correlation between regions GDP and their transport network.

**Research limitations/implications:** The author also sees interesting directions for further research in the future – related to the interconnection of macroeconomic and transport indicators.

**Practical/social implications:** With the rapidly increasing level of motorization, the question of the efficiency of public transport is returning. While the role of public transport in urban centres is undisputed, it is much more difficult for agglomeration, metropolitan and regional transport to organise an efficient (cost and spatial) transport network. Thus, many questions arise: about the way of organising transport at the local government level or the possibility of financing. The author reviews two key public transport sub-systems: regional rail and air transport, and analyses the basic data on regional development, looking for interconnections.

**Originality/value:** An attempt to link economic indicators (GDP level) with transport indicators (infrastructure use, passenger transport statistics).

**Keywords:** public transport, regional development, GDP, rail transport.

**Category of the paper:** Research paper.

### 1. Introduction

Public transport is often seen as the “bloodstream” of cities and agglomerations. Similarly, for regions, an efficient public transport network fosters economic development. On the one hand, public transport can be seen as a factor in the development of regions, on the other hand, the development of public transport (as a public service with an important social role) may be an effect of the economic development of the whole region.

Today, because of the rapid increase of private cars use, the main question of the public transport efficiency is returning. While the role of public transport in urban centres is undisputed, it is much more difficult for agglomeration, metropolitan and regional transport to organise an efficient (costly and spatially) transport network. Thus, many questions arise: about the way of organising transport at the local government level or the possibility of financing. The author reviews two key public transport sub-systems: regional rail and air transport, and analyses the basic data on regional development and competitiveness, looking for connections. The main aim of this article is to examine if there is a correlation between the level of prosperity of Polish regions and their transport network. In this reason literature studies were carried out, statistical data were analyzed, as well as selected case studies. The main questions asked by author are: is it possible to link economic indicators (GDP level) and transport indicators? And is there a correlation between economic indicators and transport indicators like infrastructure use or passenger transport statistics? This link between both groups of indicators is a result of the article.

## **2. Tasks and functions of public transport**

Transport (and mobility) serve other human needs. However, the effect of accelerating the speed of life and increasing human activity is a change in the range of movements – especially the lengthening of transport routes (Mężyk, Zamkowska, 2019, pp. 14-15). As mobility needs increase, the question arises as to whether it can be provided. And public transport (as a public service) should also fulfil a social function by ensuring that transport services are accessible to all concerned, regardless of social status or financial means. From an economic point of view, public transport does not provide an opportunity to fully introduce a free market economy – hence subsidising these services as an element of support balancing the implementation of transport at lower prices than the free market (Wyszomirski, 1997).

In this paper, the author focused on the issue of rail transport. However, you should also remember about regional bus transport. As early as 1989, the companies of the State Motor Transport (Przedsiębiorstwa Komunikacji Samochodowej – PKS) held a practically monopolistic position in non-urban bus transport. In a market economy, they had to undergo the necessary transformation, which many times ended with attempts at privatisation, communalisation and often final liquidation. Of 182 entities providing such transport services, 86 had ceased their activity by the end of August 2022 (Ciechański, 2023). The purpose of this publication is not to analyse in detail the changes in the field of bus services, but it is worth to point out that their role has diminished considerably. In practice, this means that for many areas, following the reduction of bus services, there is a real risk of traffic exclusion. And rail transport, due to natural constraints (high investment costs and long implementation

times for investment projects), is not able to ensure full accessibility (even assuming the optimistic assumption of full availability of funds).

In view of the diminished role of bus transport in recent years, the focus has therefore been on rail and air transport. Rail and air transport require specific infrastructure and therefore high capital outlays. And this capital intensity (both in terms of investment and maintenance) means that it is necessary to maintain an adequate level of financing. And bus transport, as having much lower barriers to entry into practice, can be implemented much faster, according to current needs – which explains the presence on this market also of private entities, reacting dynamically to changes in demand (but also providing transport services where it is financially justified).

An additional component of the public transport network is all personal transport equipment (Urządzenia Transportu Osobistego – UTO). They provide valuable support for the entire transport network in terms of reaching the last mile. In non-urban areas, this means long-established commuting (for example by bicycle) to the points of intersection with the public transport network. They also make it possible to reduce the inconvenience associated with the so-called traffic exclusion. It should be noted that the closure of connections increasingly affects the inhabitants of larger cities as well – there are also centres of several tens of thousands inhabitants – Lubin, Łomża, Mielec or Bełchatów (Kaczorowski, Misiaszek-Przybyszewski, 2018).

Among the basic legal acts that determine the functioning of public transport is the Public Transport Act (Public transport act, 2022), which defines, among other things, who is responsible for organising public transport and in what area. These are often local authorities and a more detailed breakdown by area is given in the table below.

**Table 1.**

*Public transport organisers*

Area of activity	Contractor of transport services
Municipality	Mayor of the city
Intermunicipal Association	Board of the Intermunicipal Association
District	Mayor of the district
Association of districts	Board of association of districts
District-Communal Association	Board of the district-communal association
Metropolitan Union	Board of the Metropolitan Union
Voivodship	Marshal of the Voivodship
Inter-province and international rail transport	Minister with responsibility for Transport

Source: (Public transport act, 2022).

It should be noted that the regulations on entrusting the organization of public transport to local governments are not new – they have been present for many years, including in the Act on municipal, local government. According to the Act on Public Transport, the tasks indicated in the above table of organizers include (in accordance with Article 8 of the Act) primarily: planning the development of transport; organising public transport; managing public transport. The organizer also has the possibility to establish an integrated tariff and ticket system valid within its borders (Public transport act, 2022). Analyzing the transport problems of the regions,

it should be noted that the responsibility for organizing transport within the voivodship lies with the Marshal of that voivodship. And this later forms the basis for the development of railway companies established for specific areas by the local authorities of the certain voivodships.

Public transport today faces many problems, one of which remains the financial condition of local governments. The high inflation rate (with a peak of 17.9% year-on-year in October 2022) (GUS, 2022) puts a high pressure on wages, which are one of the main cost elements of transport services. The loss of revenues of local governments may also be critical, resulting from changes in the scope of personal income tax – according to the Association of Polish Cities (Związek Miast Polskich – ZMP, 2023), these losses will be counted in billions of PLN, and the largest cities will lose the most.

### **3. Development of regional transport – rail transport by regions**

Investments in rail transport can be a source of pro-development consequences in the economic dimension – for example, the elimination of disparities in development resulting from spatial regulations can be a source of increased mobility of residents, better access to jobs, schools or social services, activating residents, as well as a source of investment attractiveness (Bul, 2014). It should be noted that the transport organizer, having an impact on the shape of the transport network at the level of the voivodship, also has a real impact on the development of selected areas. At the same time, it has the financial means not only to maintain the network but also to develop it. Combined with investment measures, it can stimulate the development of selected areas by developing infrastructure and launching new transport links. Of course, in the case of rail transport, this is a time-consuming process, but it is not impossible.

The strategy of “reconstruction” of the railway network is clearly visible in the Dolnośląskie Voivodeship. In June 2019, trains returned to Lubin and Bielawa (after 40 years), in December 2019, the revitalization of the line from Lubin to Głogów was completed. In 2022 a connection was launched on railway line No. 285 from Wrocław to Świdnica via Sobótka (trains did not run there for 22 years). In the same year combined bus-rail services were introduced on the route to Stronie Śl. and Lądek-Zdrój (with a changeover, but on one, common ticket). In December 2022 trains returned to Chocianów (also after a 22-years), and in the coming months (2023-2024) trains are scheduled to return to Jedlina Zdrój, Świeradów-Zdrój and Karpacz (KD, 2023).

#### **4. Public transport as a factor of development and effect**

The phenomenon under analysis should be viewed from two perspectives. On the one hand, transport (transport infrastructure) can be considered as a factor of regional development – such an approach is consistent with the results of both Polish (Koźlak, 2012; Burnewicz, 2013; Majewski, 2021; Rosik, 2021) and global authors (Gauthier, 1970; Polyzos, Tsiotas, 2020; Rietveld, Nijkamp, 1992). At the same time, it should be taken in mind that the largest share of the economic power of regions is often the urban centres themselves. However, cities as areas with the highest concentration of population and activity are often areas with the highest concentration of problems: economic, social, technical and other (Domański, 2006). Thus, the connection between the city and the region becomes crucial – which gives the opportunity for full and harmonious development. Progressive suburbanisation makes it necessary today to talk not about the problems of cities, but about the problems of agglomerations, metropolises or whole regions. It is not possible to organise a transport network in isolation from the ongoing social or economic changes.

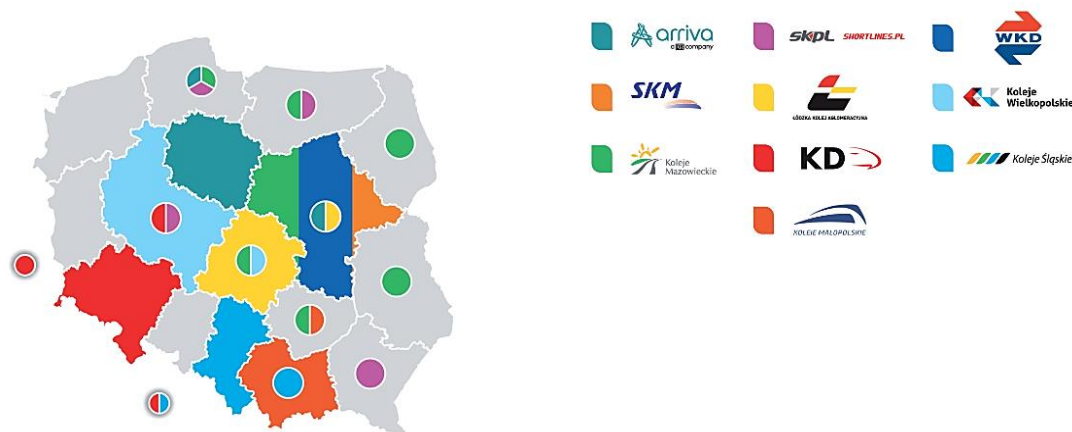
The analysis of the development of regions can be made based on the growth rate of the national economy – determining the changes in the size of this data and the distribution of growth between regions (Domański, 2006). It therefore makes sense to analyse, for example, indicators of the level of GDP. At the same time, it is worth noting that in cities and agglomerations, public transport development policy means creating conditions for efficient movement of people and goods, but taking into account not only transport accessibility but also the environmental factor (Rydzkowski, 2017). Environmental issues are among the most important factors in the organisation of urban transport. Apart from cities, others dominate – first of all, ensuring adequate transport accessibility and attractive transport offer. Strictly environmental issues are analysed in a slightly different way – there is not so much pressure, for example on zero-emission vehicles. What does not change the fact that new power sources are an interesting area of research also in urban transport, as well as in the fleets of Polish carriers you can find hybrid vehicles.

#### **5. Development of regional trains managed by local government**

Analyzing the rail transport market, it should be noted that the most serious side effect of transferring responsibility for rail transport to the barge of voivodship self-governments was a worsening of the offer on sections crossing the borders of voivodships (Trammer, 2019, pp. 144-145). The companies established by the marshals focused (obviously) on transport within their areas. And the organization of transport has become problematic especially at the

junction of voivodships or when a given railway line crosses an additional voivodship. And such examples can be observed on the railway network – for example, on railway line No. 351, which connects Wielkopolska (Poznań) with zachodniopomorskie voivodship (Szczecin) and runs in a small part through lubuskie voivodship (Dobiegniew and surroundings). The challenge is also to service connections operated in the regional railway standard, but with longer connections, which are de facto the responsibility of the marshals of two or more voivodships (in the case of wielkopolskie and zachodniopomorskie voivodships, this applies to the connections Poznań – Szczecin/Świnoujście and Poznań – Szczecinek/Koszalin/Kołobrzeg).

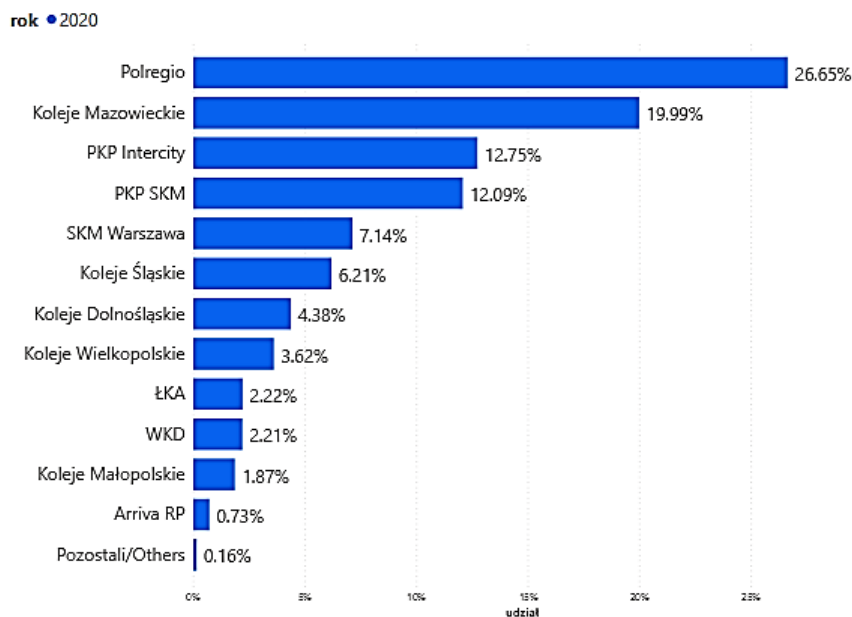
In Poland, there are ten so-called local government carriers, affiliated to the Union of Local Government Railway Carriers. These are (in alphabetical order): Arriva RP, Koleje Dolnośląskie, Koleje Małopolskie, Koleje Mazowieckie, Koleje Śląskie, Koleje Wielkopolskie, Łódzka Kolej Aglomeracyjna, SKPL Cargo, Szybka Kolej Miejska, Warszawska Kolej Dojazdowa (ZSPK, 2023). The field of activity of these entities is shown in Figure 1.



**Figure 1.** Local government carriers in Poland.

Source: (ZSPK, 2023).

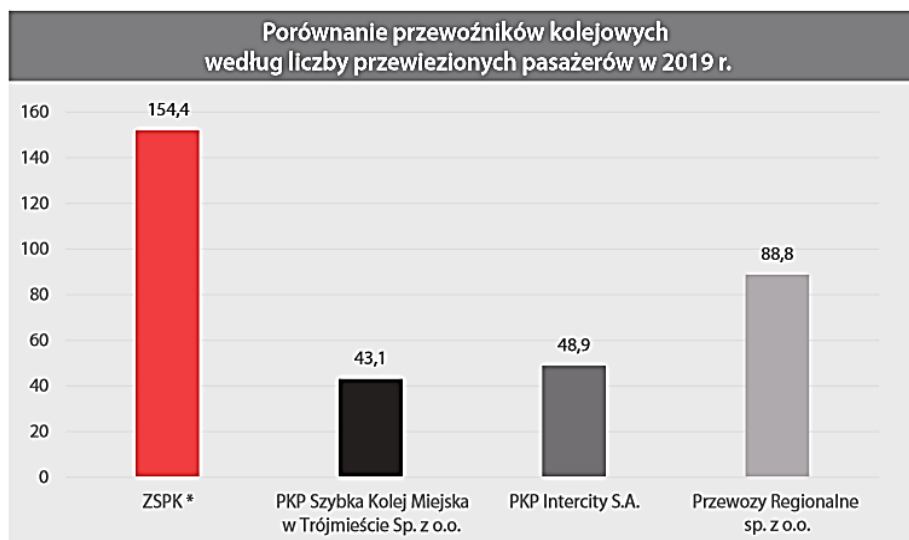
The chart below (Figure 2) shows the share of local government carriers in transport on the Polish market for the period from January to December 2020 (UTK, 2023). These statistics show the scale of activity of individual companies.



**Figure 2.** Share of carriers by number of passengers, January - December 2020.

Source: (UTK, 2023).

It should be noted that transport by local government companies has already become a key area of the railway market. ZSPK data (2022) show that carriers affiliated to ZSPK carried 154.4 million passengers in 2019 – which represents 46% of the total railway market in Poland (see Figure 3).



**Figure 3.** Comparison of railway companies by number of passengers carried in 2019.

Source: (ZSPK, 2022).

It is worth noting the “new quality” introduced to the market of railway services by local companies. Starting their activity practically from scratch, very often with the vocation of life they made purchases of new rolling stock. Thus, local government operators today very often have new or several-year-old rolling stock, less often thoroughly modernized – which has

significantly contributed to raising the standard of agglomeration or regional service. The regional railway was no longer identified with obsolete electric units of the EN57 series, and a number of new series of vehicles appeared in the fleet of carriers, both domestically produced (PESA, Newag) and from foreign suppliers (Bombardier, Stadler). It is also very important, that local government companies rely to a large extent on domestically produced rolling stock (PESA, Newag, Stadler), which has a measurable effect on the development of the domestic rail vehicle production market, building competencies in this field, investments and development of Polish manufacturers and their suppliers.

Of course, this is only the beginning of building a long-term strategy for the development of rail transport in Poland and local government carriers are facing many challenges. Among the challenges associated with the construction of local government railways, issues related to common ticket, implementation of transport at voivodships borders and integration of rail and bus transport are identified (Górny, 2016).

## **6. The role of air transport in building regional development**

European experience shows that air and rail transport can create efficient transport solutions (Huderek-Glapska, 2010). Access to this type of infrastructure is one of the criteria affecting the competitiveness of the economy and investment attractiveness of a given region (Truskolaski, Busłowska, 2011, p. 46). From the perspective of the city, air transport plays many important roles. In addition to the obvious increase in transport accessibility, it allows to build attractiveness on the international arena, thus influencing the acquisition of foreign partners and expanding cooperation, which means both the organization of international events and new investments. It is therefore the basis for long-term development. It is important to be aware that air transport can also be a source of risks and that the positive impact of an airport on the environment may result, among other things, from the limited capacity of the infrastructure – reducing the demand for air services, as well as the effects of the airport – economic and social (Olipra, 2010).

In six Polish cities, rail connections have been launched allowing access to airports also by rail. In selected locations, through the combination of railway investments and road solutions (highways, bus connections) it is possible to talk about the development of multimodal hubs (Pijet-Migoń, 2020). It should be noted that for European airports, intermodality, understood as communication within both road and rail networks, is the standard (Kozłak, 2011).



## 7. The use of rail transport and the prosperity of the regions

The aim of this publication was to examine if there is a correlation between the wealth of regions and their transport indicators. The data provided by the Central Statistical Office (CSO) in the Local Data Bank (GUS, 2023a) were first taken into account. In particular, data related to the operated infrastructure – railway lines of different categories were analysed. It was decided to take into account the basic indicator – standard-gauge railway lines (without entering into whether they are single- or multi-gauge lines, as well as electrified lines). These data were compared with UTK data concerning the implementation of railway transport in individual voivodships. The bulletins “Railway in voivodships 2022” (UTK, 2023) were analyzed for all sixteen voivodships. These reports included, among others, the number of passengers (in each voivodship) and the rate of rail use (calculated as the ratio of the number of passengers checked in at stations (boarding and disembarking persons) during the year and the number of inhabitants in a given voivodship) (UTK, 2023b). Comparing these two sets of values, an indicator named by the author “Efficiency of infrastructure use” was introduced – as a quotient of the number of passengers carried (millions) and the length of the operated railway network (km).

The analysis of the level of wealth was based on the GDP index. Data on GDP by region are available from the Central Statistical Office (GUS, 2023b). The data presents both absolute and per capita GDP. For the purposes of analysis (and consistency with other data), the values for mazowieckie voivodship were summed up (the Warsaw region and the rest of the voivodship are presented separately in the GUS statistics). The most recent data was for 2021.

The “Efficiency of infrastructure use” indicator was compared with the level of GDP in the regions. The table below shows the previously indicated values. The highest values are indicated in yellow. It should be noted that there is a clear correlation – the level of use of rail transport infrastructure was much higher in the wealthiest voivodships. In this statistics seven voivodships have much higher scores: dolnośląskie, łódzkie, małopolskie, mazowieckie, pomorskie, śląskie and wielkopolskie. It should also be noted that these are voivodships where local and/or metropolitan railways are the most developed, and practically all such carriers operate on the territory of these voivodships (the previously mentioned voivodships and Szybka Kolej Miejska in Tricity), apart from these seven voivodships there are also two other regional carriers – SKPL and Arriva.

**Table 2.**

*Summary of the extent of rail transport performance from the GDP of regions*

Voivodship	Railway lines in operation [km]	Number of rail passengers in region [pas]	Efficiency of infrastructure use [million lanes/km lines]	GDP by region [2021, PLN million]
Polska	19 394	245 060 701	12 635,90	2 631 302
dolnośląskie	1 804	22 690 619	<b>12 577,95</b>	<b>222 670</b>
kujawsko-pomorskie	1 199	6 242 637	5 206,54	114 909
lubelskie	1 097	3 450 539	3 145,43	97 523
lubuskie	914	2 996 747	3 278,72	56 102
łódzkie	1 080	11 400 670	<b>10 556,18</b>	<b>159 665</b>
małopolskie	1 080	12 792 481	<b>11 844,89</b>	<b>215 847</b>
mazowieckie	1 726	74 015 456	<b>42 882,65</b>	<b>593 814</b>
opolskie	784	3 633 106	4 634,06	53 994
podkarpackie	985	3 826 401	3 884,67	101 498
podlaskie	762	1 721 537	2 259,23	58 369
pomorskie	1 214	46 692 418	<b>38 461,63</b>	<b>157 785</b>
śląskie	1 868	19 303 571	<b>10 333,82</b>	<b>314 500</b>
świętokrzyskie	727	2 686 438	3 695,24	60 381
warmińsko-mazurskie	1 091	3 916 953	3 590,24	67 755
wielkopolskie	1 892	21 965 231	<b>11 609,53</b>	<b>259 958</b>
zachodniopomorskie	1 171	7 725 897	6 597,69	96 531

Source: own work based at (GUS, 2023a, 2023b), (UTK, 2023).

Several conclusions can be drawn from the analysis of the table. It is clearly visible in which voivodships both the efficiency of infrastructure use and GDP are highest. These provinces are marked in color. The Pearson correlation coefficient for the two datasets is:  $r = 0.748$ . It is high, confirming the correlation between the indicated data. At the same time, it should be noted that the level of statistical significance (p-value) is low, with  $p < 0.001$ , less than the accepted typical value of the significance level  $\alpha = 0.05$ . Correlation analysis is therefore statistically important. In search of answers to the questions, author also analyzed subsets of data from the above table. However, the partial analyses (separately for the regions with the highest and lowest values) gave less satisfactory results ( $r$  between 0.48 and 0.52, p-index between 0.19 and 0.23). It suggests that this direction of study is not appropriate. Therefore, the analysis of regional data turned out to be meaningful only if it was carried out in a complete way (for all voivodships).

Such a high result of selected voivodships shows that it is possible today to attract passengers to regional railways. On the other hand, two voivodships with companies to operate a typical agglomeration railway dominate – although it is not so evident in the statistics of the mazowieckie voivodship (the share of SKM in the number of passengers carried is about 11%), in the case of the pomorskie voivodship this share is significant (PKM SKM carries about 70% of passengers throughout the voivodship). Regardless, even if agglomeration carriers are excluded from the statistics, there is a clear dominance in the statistics of those voivodships, which have strongly developed their own structures for railway transport.

## 8. Air transport and regional prosperity

In a similar way, the level of GDP of voivodships was compared with the scale of air transport (passenger). Regional airports in most cases correspond to the arrangement of voivodships, with the exception of opolskie, podlaskie, świętokrzyskie voivodships (which do not have their own airports) and mazowieckie voivodship (which has as many as three – in addition to Warsaw Okęcie airport also Warsaw Modlin and Radom Sadków airports – the last one, however, did not check in a single passenger in 2022). Again, a clear correlation was observed – a much higher number of checked-in passengers was found in the voivodships with the highest GDP: dolnośląskie, małopolskie, mazowieckie, pomorskie, śląskie and wielkopolskie. The exception is łódzkie voivodship – despite the relatively high level of GDP – sixth in the country, in terms of the number of checked-in passengers, Łódź Airport occupies only twelfth place. However, low interest in transport from this airport has persisted for years and is related to the proximity of a wide range of transport services offered by Warsaw airports. The table below shows the regions and airports with the number of passengers carried and the level of GDP.

**Table 3.**

*Summary of the scale of air transport performance from the GDP of regions*

Voivodship	Airport name	Number of passengers transported (2022)	GDP by regions [2021, in PLN million]
dolnośląskie	Wrocław - Strachowice	2 868 012	222 670
kujawsko-pomorskie	Bydgoszcz	247 008	114 909
lubelskie	Lublin	328 516	97 523
lubuskie	Zielona Góra - Babimost	41 543	56 102
łódzkie	Łódź	179 926	159 665
małopolskie	Kraków Balice	7 386 496	215 847
mazowieckie	Warszawa (Lotnisko Chopina + Modlin + Radom)	17 514 087	593 814
opolskie	brak		53 994
podkarpackie	Rzeszów - Jasionka	683 299	101 498
podlaskie	brak		58 369
pomorskie	Gdańsk im. Lecha Wałęsy	4 559 480	157 785
śląskie	Katowice - Pyrzowice	4 406 241	314 500
świętokrzyskie	brak		60 381
warmińsko-mazurskie	Wrocław - Strachowice	2 868 012	222 670
wielkopolskie	Bydgoszcz	247 008	114 909
zachodniopomorskie	Lublin	328 516	97 523

Source: own work based at (GUS, 2023b), (ULC, 2023).

The above table shows, similarly to the comparison of rail transport, that in voivodships with higher level of prosperity the scale of air transport is significantly higher. As with previous data, a correlation analysis was conducted. The correlation coefficient for these two datasets was even higher, and reached:  $r = 0.921$ . It is very high, confirming the correlation between the indicated data. At the same time, it should be noted that the level of statistical significance

(p-value) was again low ( $p < 0.001$ ), less than the accepted typical value of the significance level  $\alpha = 0.05$ . The correlation analysis thus proved to be statistically significant.

The author also reanalyzed selected subsets of data from the table above. Partial analyses were conducted, among others, omitting regions without their own airports (obtaining results:  $r = 0.918$  and  $p < 0.001$ ) or omitting mazowieckie and łódzkie regions (as potentially unreliable,  $r = 0.763$  and  $p = 0.00149$ ). After eliminating from the set of data regions without airports, mazowieckie and łódzkie the results were:  $r = 0.713$  and  $p = 0.137$ . The analysis of partial data has therefore again proved to be of limited usefulness. Although it allowed to notice additional dependencies – voivodships without airports (opolskie, podlaskie, świętokrzyskie) did not have a major impact on the correlation assessment, but łódzkie and mazowieckie voivodships did. Especially the mazowieckie voivodship, which definitely dominates the other regions in terms of GDP and the number of passengers checked in. Which does not change the fact that even after it was excluded from the analysis, the correlation coefficients were characterized by high positive levels. Therefore, it should be considered that correlation is therefore very clear.

## 9. Summary and conclusions

The article presented the basic tasks and functions of public transport, as well as the directions of change and development of public transport with regard primarily to rail and air transport. This was the starting point for answering the question: does the development of these two modes of transport correlate with the development of the regions? A review of the literature shows that the links between air transport development and regional development are relatively more often the subject of research by researchers. Air transport is seen as an investment in point infrastructure (airport and accompanying ground infrastructure) and the benefits of its presence are high and measurable. On the other hand, rail transport, as widely available in many locations, is less often an area of interest for research analysing regional development.

A comparison of GDP data for individual voivodships with data on the number of passengers carried by regional rail and the number of passengers departing from airports shows that the highest number of passengers for both modes of transport was recorded in the wealthiest voivodships. Thus, this confirms the thesis on the pro-development role of railway infrastructure and air transport infrastructure pointed out in the literature. At the same time, it allows to justify investments in railway transport carried out at the level of voivodship self-government – both related to the implementation of transport at the operational level and investment activities: purchase of rolling stock or financing (from funds under the responsibility of voivodship marshals).

Author managed to find a connection between transport and economic indicators – fulfilling the main objective of the article and answering the question posed. There is a clear correlation between regions GDP and their transport network. However, it should be clearly noted that the correlation analysis does not answer the question, which one is the cause and which one is the effect. It only shows the correlation between two sets of data.

Author also sees interesting directions for further research in the future – related to the interconnection of macroeconomic and transport indicators. Can this data be analysed at the lower, municipal level or by counties? What other indicators can be included here? Does the correlation analysis allow to assess the transport policy of voivodships (its legitimacy, correctness, directions?) How would the analysis be influenced by taking into account other fields of public transport (for example bus regional transport)? Or by adding a historical context (historical division and barriers)? The analysis allowed the author to ask many new questions, setting potential directions for further research.

Another area for expanding the area of research indicated here concerns funding models. It should be borne in mind, however, that both of these modes of transport require a high level of expenditure, which is easier for the more prosperous regions to bear. In addition, not all regions have sufficiently large passenger flows, which, especially in the case of air transport, has led to a lively debate on the advisability of maintaining some regional airports. Going further, it is also possible to discuss the relationship between the indicators of the use of individual modes of transport and the average population of individual voivodships. In voivodships with a lower population density, the rail transport operations naturally becomes less efficient. On the other hand, smaller voivodships (by area) do not have to be excluded from transport without having their own transport structures. All this makes the interconnection of regional prosperity with the transport infrastructure maintained and the transport service offered an interesting area of research.

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