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Expenditure on transportation in households in voivodeships in Poland from 2004 to 2021

Wydatki na transport w gospodarstwach domowych w województwach w Polsce w latach 2004–2021

Abstract. The paper aims to identify differences and changes in household expenditure on transport by voivodeships in Poland from 2004 to 2021. Using two variables – the value and the share of household expenditures on transport – voivodeships with the lowest and highest levels of indicators were distinguished, and the coefficient of variation between voivodeships was calculated. The results show that the greatest increase in the value of household expenditure on transport was observed in Dolnośląskie, while the lowest increase was in the Lubuskie voivodeship. The value of expenditure on transport decreased significantly in the pandemic year 2020, but the share did not drop below the level observed in previous years, probably due to the overall decrease in household consumption expenditure. Differences between voivodeships in the value of households' expenditure on transport did not shrink during the analyzed period, as evidenced by the coefficient of variation between 2004 and 2021, which did not decrease. Grouping voivodeships based on the value of household expenditure on transport showed that in some voivodeships, the situation remained stable, while expenditures increased in Dolnośląskie and Lubelskie, and decreased in Małopolskie and Podkarpackie.

Key words: households, expenditures, transport, voivodeships

Synopsis. Celem pracy była identyfikacja różnic oraz zmian w wydatkach na transport w gospodarstwach domowych według województw w Polsce w latach 2004–2021. Z wykorzystaniem dwóch zmiennych – wartości i udziału wydatków na transport w gospodarstwach domowych – wyodrębniono województwa o najwyższych i najniższych wartościach wskaźników, ale także policzono współczynnik zmienności pomiędzy województwami. Wyniki pokazują, że największy wzrost wartości wydatków gospodarstw domowych na transport był

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obserwowany w województwie dolnośląskim a najniższy w lubuskim. Wartość wydatków na transport spadła znacząco w pandemicznym 2020 roku, ale udział nie spadł poniżej poziomu obserwowanego w ubiegłych latach, prawdopodobnie z powodu spadku całkowitych wydatków konsumpcyjnych gospodarstw domowych. Różnice pomiędzy województwami w wartości wydatków gospodarstw domowych na transport nie zmniejszyły się w badanym okresie, o czym świadczy nie zmniejszający się współczynnik zmienności pomiędzy 2004 a 2021 rokiem. Grupowanie województw ze względu na wartość wydatków na transport pokazało, że w części województw sytuacja pod tym względem była stabilna, wydatki na transport zwiększyły się w województwach dolnośląskim i lubelskim, a spadły w małopolskim i podkarpackim.

Słowa kluczowe: gospodarstwa domowe, wydatki, transport, województwa

JEL codes: D10, D31, R20

Introduction

Household expenditure on transport includes the purchase of vehicles (new and second-hand motor cars, motorcycles, bicycles, and other vehicles), the operation of private transport equipment (spare parts and accessories, fuels, maintenance and repairs, hire of parking spaces, etc.), and transport services (transport of persons and luggage by train, road, air, sea, and inland waterway, etc.) [GUS 2022, p. 209–210].

The analysis of household expenditure on transport is a very important problem for many reasons.

Society today is much more mobile than it was 50 years ago. In the UK, the average distance traveled has risen from about 10 km per person per day in the 1960s to about 50 km per person per day. This reflects the increasing availability and affordability of transportation, as well as changes in the organization of everyday life [Banister 2019]. In Poland, there is a high proportion of small cities with populations below 20,000. In these types of cities, transportation plays a crucial role in commuting [Zakrzewska 2019]. It determines participation in the labor market and influences the potential for income generation. Public transport plays a particularly significant role, providing employment opportunities for marginalized segments of the population [Martines et al. 2020].

From the perspective of quality of life, expenditures on transportation can be seen as essential, along with expenses on food, clothing, and footwear [Chmielewska and Zegar 2018]. A decrease in transportation expenses indicates an improvement in the quality of life.

Transport is one of the major components of household expenditure, with considerable inequalities between households, mainly due to their incomes. This is because regular use of motorized transport is unaffordable for the poorer segment of the population [Olvera et al. 2008]. The share of expenditures on transport is higher in high-income groups than in low-income groups [Dudek et al. 2012]. Furthermore, different total expenditure levels, which are determined by income, result in different mobility patterns [Domènech et al. 2020].

According to previous research, economic and sociodemographic characteristics are important determinants of the probability and level of transportation expenditures [Coruh et al. 2021]. With an increase in household income, the value of expenditures on transport increases [Anowar et al. 2018]. Older individuals spend less on transport and more on heating because younger people are more mobile [Bardazzi and Paziienza 2018]. The research shows that in developing countries, rural people are less mobile than urban people, despite the differences in income [Venter 2011].

In Poland, after joining the European Union in 2004, there was an increase in the technical and road infrastructure, especially in rural areas. As a result, the value of household expenditure on transport in rural areas grew by 38.8% from 2006 to 2011. [Chmielewska 2013]. The research shows that socioeconomic indicators influence the level of spending on transport. Higher values of household expenditure on transport are observed among persons with higher education, self-employed individuals, and those living in larger cities. Moreover, expenditure on transport is determined by consumer needs and infrastructure [Piekut and Piekut 2022]. According to the results of the survey conducted on household heads aged over 50, the value of expenditure on transport increases with the educational level of the person and decreases with their age [Bąk and Szczecińska 2018].

Especially in rural areas, where the public transport network is less developed compared to urban areas, transportation services play a smaller role than in cities [Piekut and Piekut 2022]. In rural areas, the proportion of expenditure on transportation in total household expenditure is higher than in urban areas, primarily due to the lower accessibility of public collective transport [Utzig 2018]. Additionally, the process of suburbanization leads to an increase in transportation expenses [Lityński 2023].

The use of public transport is determined by its infrastructure. For example, the southern and southwestern voivodeships in Poland are characterized by the highest number of railways per 100 km, and the average number of passenger trips per year was the highest in the Pomorskie and Mazowieckie voivodeships (about 20), and the lowest in the Podlaskie, Podkarpackie, Lubelskie, and Świętokrzyskie voivodeships (about 2); [Górecka 2021].

Economic crises cause a reduction in household expenditure on tourism and transportation [Eugenio-Martin and Campos-Soria 2013]. The COVID-19 pandemic has also affected households' transportation behaviors. The use of public transport has decreased, both due to the increase in remote work and due to restrictions and limitations on public transport [Shortall et al. 2022]. Following COVID-19, there has been a decrease in demand for commuting transportation due to a combination of ongoing economic crisis and changing work habits [Koehl 2020]. The restrictions imposed by the COVID-19 pandemic have had a significant impact on passenger transportation behaviors. In 2020, the number of air passengers decreased by 73% in the EU-27 and by 70% in Poland [Zawoj-ska and Siudek 2021].

The paper aims to identify differences between voivodeships in Poland in household expenditure on transport. It is important to find out if convergence in this field occurs or if the differences shrink. There are many scientific articles identifying the determinants of household expenditure on transport and there are also some papers on infrastructure diversity, but there is not much research from the perspective of household budgets. The new value of the paper is also identifying the changes in the value and share of expenditure on transport in households in voivodeships in Poland during the COVID-19 pandemic.

Materials and methods

The paper aims to identify the differences in household expenditure on transport between voivodeships in Poland.

The data from Statistics Poland (*Główny Urząd Statystyczny*) Local Data Bank was used, covering the period from 2004 to 2021. This timeframe is long enough to observe changes since Poland's accession to the European Union, as well as changes occurring during the COVID-19 pandemic in 2020 and 2021. The data was presented for both Poland as a whole and the voivodeships of Poland (Fig. 1).



Figure 1. Administrative division of Poland

Rysunek 1. Podział administracyjny Polski

Source: own elaboration.

Źródło: opracowanie własne.

As a measure of household expenditure on transport, two indicators were used:

- the average value of household expenditure on transport per capita (in PLN);
- the share of the expenditure on transport in total consumption expenditure of households (in %).

The growth rate of analyzed variables was calculated and voivodeships with the highest and the lowest level were distinguished.

To identify if the differences between voivodeships are shrinking, the coefficient of variation was calculated [Abdi 2010]:

$$C_v = \frac{S}{M} \quad (1)$$

where: M – mean, S – standard deviation.

Decreasing the coefficient of variation means that differences between objects are decreasing. When the dispersion of the examined phenomenon decreases over time, convergence sigma is occurring [Sobczyk 2007].

Based on the mean and standard deviation of the value of household expenditure on transport, voivodeships were grouped into four groups [Kisielińska et al. 2021]:

- class 1 (high): $X \geq M + S$;
- class 2 (upper medium): $M \leq X < M + S$;
- class 3 (lower medium): $M - S \leq X < M$;
- class 4 (low): $X < M - S$.

where: X is the value of expenditure on transport for the analyzed year.

In the next step, shifts between classes were presented to identify changes in voivodeships.

Results and discussion

The value of average monthly per capita expenditure on transport in households in Poland (Fig. 2) increased during the analyzed period, with a decrease in 2020, which could be attributed to the COVID-19 pandemic. The share of expenditure on transport in the total consumption expenditure also dropped in 2020.

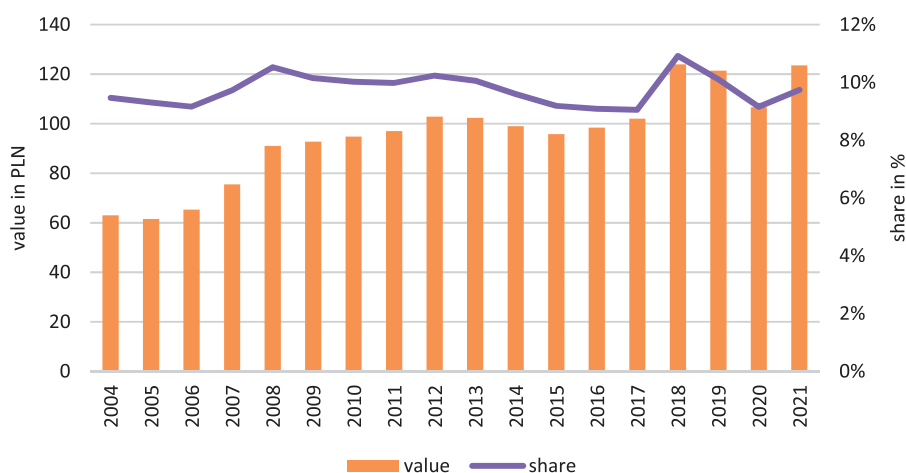


Figure 2. The value of average monthly per capita expenditure on transport in households in Poland (in PLN) and its share in total consumption expenditure (in %)

Rysunek 2. Wartość przeciętnych miesięcznych wydatków na transport na osobę w gospodarstwach domowych w Polsce (w PLN) oraz ich udział w całkowitych wydatkach konsumpcyjnych (w %)

Source: own elaboration based on GUS – Local Data Bank.

Źródło: opracowanie własne na podstawie GUS – Bank Danych Lokalnych.

The average value of per capita monthly expenditure on transport in households in Poland increased – in current prices – from PLN 63 in 2004 to PLN 123 in 2021. The value of expenditure decreased by up to 5% in 2005, 2013, 2014, 2015, and 2019, but the value dropped significantly under COVID-19 pandemic restrictions in 2020 (by over

12% in current prices and by over 15% in real terms). In nominal terms, the average expenditure on transport increased by 96%, but in real terms, it increased by 35%.

The share of expenditures on transport in total consumption expenditures of households remained within the range of 9 and 11% throughout the analyzed periods. A decrease was observed in 2020, but the share stayed at 9%, which is not lower than in previous periods. This could be attributed to the overall decrease in total consumption expenditures of households as a result of COVID-19 restrictions, as well as households' inclination to reduce consumption levels during times of economic uncertainty [Utzig 2022].

The value of average monthly per capita household expenditure on transport differed between regions (Fig. 3).

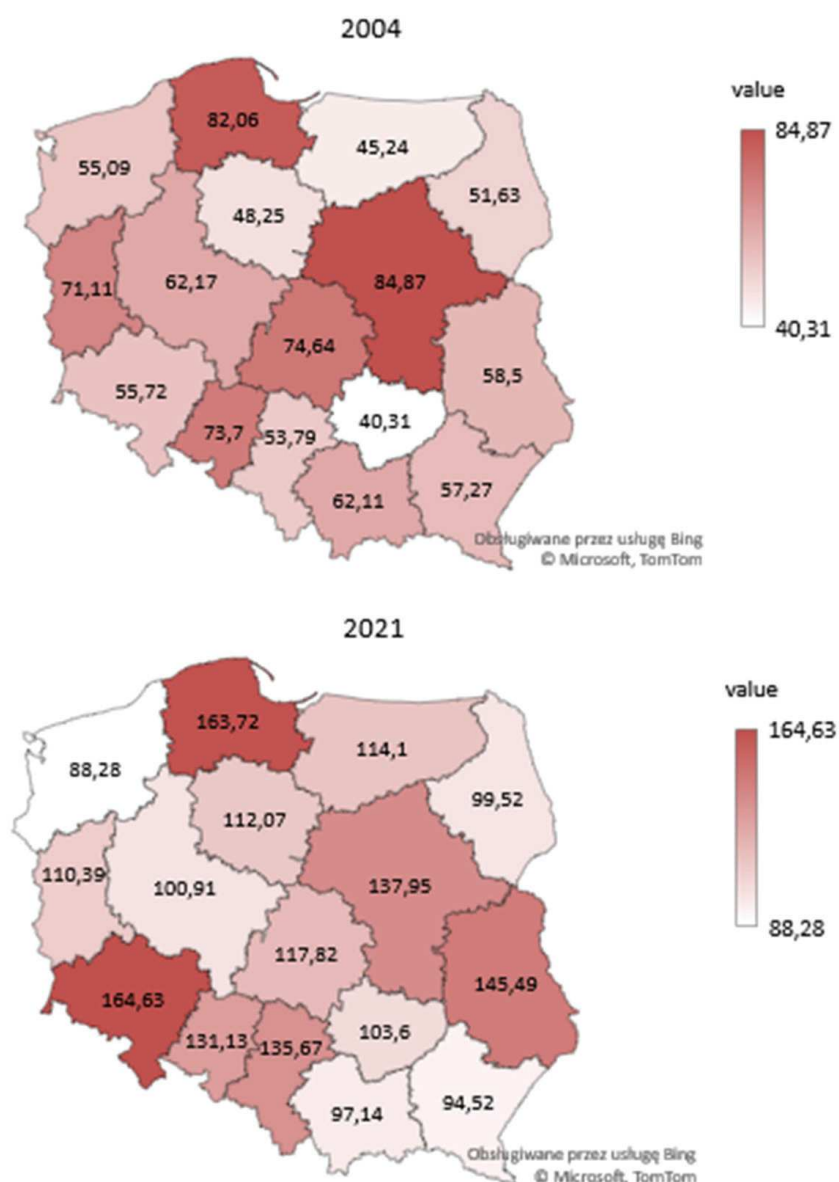


Figure 3. The value of average monthly per capita expenditure on transport in households in voivodeships of Poland (in PLN)

Rysunek 3. Wartość przeciętnych miesięcznych wydatków na transport na osobę w gospodarstwach domowych w województwach w Polsce (w PLN)

Source: own elaboration based on GUS – Local Data Bank.

Źródło: opracowanie własne na podstawie GUS – Bank Danych Lokalnych.

In 2004, the highest expenditure on transport was in the Mazowieckie and Pomorskie voivodeships, while the lowest was in the Świętokrzyskie, Warmińsko-Mazurskie, and Kujawsko-Pomorskie voivodeships. In 2021, the Dolnośląskie and Pomorskie voivodeships had the highest expenditure on transport, while the Zachodniopomorskie, Podkarpackie, and Małopolskie voivodeships had the lowest. The expenditure on transport was presented in current prices, resulting in growth in all the voivodeships. Between 2004 and 2021, the value of expenditure on transport increased from below 60% (55% in Lubuskie, 56% in Małopolskie, and 58% in Łódzkie) to over 150% (195% in Dolnośląskie, 157% in Świętokrzyskie, 152% in Śląskie, and 152% in Warmińsko-Mazurskie).

It is also worth examining whether the differences between voivodeships in Poland are increasing or not. There is no evidence that the convergence sigma (the decrease of the coefficient of variation in the examined period) between household expenditures on transport in voivodeships occurs (Fig. 4).



Figure 4. The coefficient of variation of the value of average monthly per capita expenditure on transport in households in Poland (in PLN)

Rysunek 4. Współczynnik zmienności wartości przeciętnych miesięcznych wydatków na transport na osobę w gospodarstwach domowych w Polsce (w PLN)

Source: own elaboration based on GUS – Local Data Bank.

Źródło: opracowanie własne na podstawie GUS – Bank Danych Lokalnych.

The coefficient of variation decreased from 2009 to 2011 and from 2012 to 2014. However, it grew from 2014 to 2016, from 2017 to 2019, and from 2020 to 2021.

Voivodeships were grouped according to the level of household expenditure on transport (Fig. 5). In the voivodeships classified as Class 1, the level of expenditure on transport was the highest, while in voivodeships classified as Class 4, the level was the lowest.

The result of grouping voivodeships shows that expenditures on transport were the highest in Mazowieckie and the lowest in Świętokrzyskie between 2004 and 2021. The value of those expenditures increased in Dolnośląskie, Lubelskie, and Kujawsko-Pomorskie, while a decrease was observed in Opolskie, Podkarpackie, Małopolskie, and Lubuskie.

Because of income inequalities between households in voivodeships in Poland, the list of voivodeships with the highest values of household expenditure on transport differs from the list of voivodeships with the highest share of expenditure on transport in total consumption expenditure (Fig. 6).

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
DOLNOŚLĄSKIE	3	2	3	2	2	2	2	2	2	3	2	2	2	3	2	1	1	1
KUJAWSKO-POMORSKIE	4	3	3	3	3	3	2	3	3	2	3	2	3	2	2	1	2	3
LUBELSKIE	3	2	2	3	2	3	3	3	3	3	2	2	2	1	2	2	2	1
LUBUSKIE	2	1	3	3	3	3	3	3	3	3	2	3	2	3	2	3	4	3
ŁÓDZKIE	1	2	1	2	2	2	2	2	1	1	2	2	1	1	3	2	2	3
MAŁOPOLSKIE	2	2	3	3	2	3	2	2	3	2	3	3	3	4	4	3	4	3
MAZOWIECKIE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
OPOLSKIE	1	1	1	1	1	1	1	2	2	2	2	2	1	1	3	1	2	2
PODKARPACKIE	3	3	3	3	3	3	3	2	4	3	3	3	4	4	3	4	4	4
PODLASKIE	3	3	3	3	3	3	3	3	3	4	2	2	3	3	2	3	3	3
POMORSKIE	1	3	2	1	2	2	2	2	2	2	3	3	2	2	2	2	2	1
ŚLĄSKIE	3	2	3	3	3	3	3	3	2	2	3	2	3	2	1	2	2	2
ŚWIĘTOKRZYSKIE	4	4	4	4	3	4	4	4	4	3	2	4	4	4	3	4	3	3
WARMIŃSKO-MAZURSKIE	4	4	4	4	4	3	4	4	3	3	4	4	3	3	4	4	2	3
WIELKOPOLSKIE	2	2	2	3	3	3	3	2	3	3	3	3	3	3	3	3	4	3
ZACHODNIOPOMORSKIE	3	4	3	3	4	3	4	3	3	4	4	2	3	3	3	3	4	4

Figure 5. The result of grouping voivodeships in Poland by the value of average monthly per capita expenditure on transport in households (in PLN)

Rysunek 5. Rezultat grupowania województw w Polsce ze względu na wartość przeciętnych miesięcznych wydatków na transport na osobę w gospodarstwach domowych (w PLN)

Source: own elaboration based on GUS – Local Data Bank.

Źródło: opracowanie własne na podstawie GUS – Bank Danych Lokalnych.

In 2004, the voivodeships with the highest share of expenditure on transport in total consumption expenditure of households were Pomorskie, Łódzkie, Lubuskie, and Opolskie. The regions with the lowest share of expenditure on transport in total consumption expenditure of households in that year were Świętokrzyskie and Warmińsko-Mazurskie. In 2021, the greatest share of expenditure on transport was observed in Lubelskie, Pomorskie, and Dolnośląskie, and the smallest share in Zachodniopomorskie, Wielkopolskie, and Lubuskie.

From 2004 to 2021, the share of average households' expenditure on transport decreased by more than 1 p.p. in Lubuskie, Łódzkie, Wielkopolskie, and Zachodniopomorskie. Conversely, it increased by more than 1 p.p. in Świętokrzyskie, Dolnośląskie, Lubelskie, Warmińsko-Mazurskie, Śląskie, and Kujawsko-Pomorskie.

Conclusions

Between 2004 and 2021, the value of household expenditure on transport in current prices increased in all the voivodeships in Poland, but the greatest growth was observed in the Dolnośląskie voivodeship. In that region, the expenditure on transport skyrocketed from one of the lowest levels to the highest among all the voivodeships. The growth of expenditure on transport was the lowest in Zachodniopomorskie, and that region was characterized by the lowest level of expenditure on transport in 2021. Differences between voivodeships, measured by the coefficient of variation, did not decrease. This means that expenditures on transport are determined by factors that are relatively stable over time.

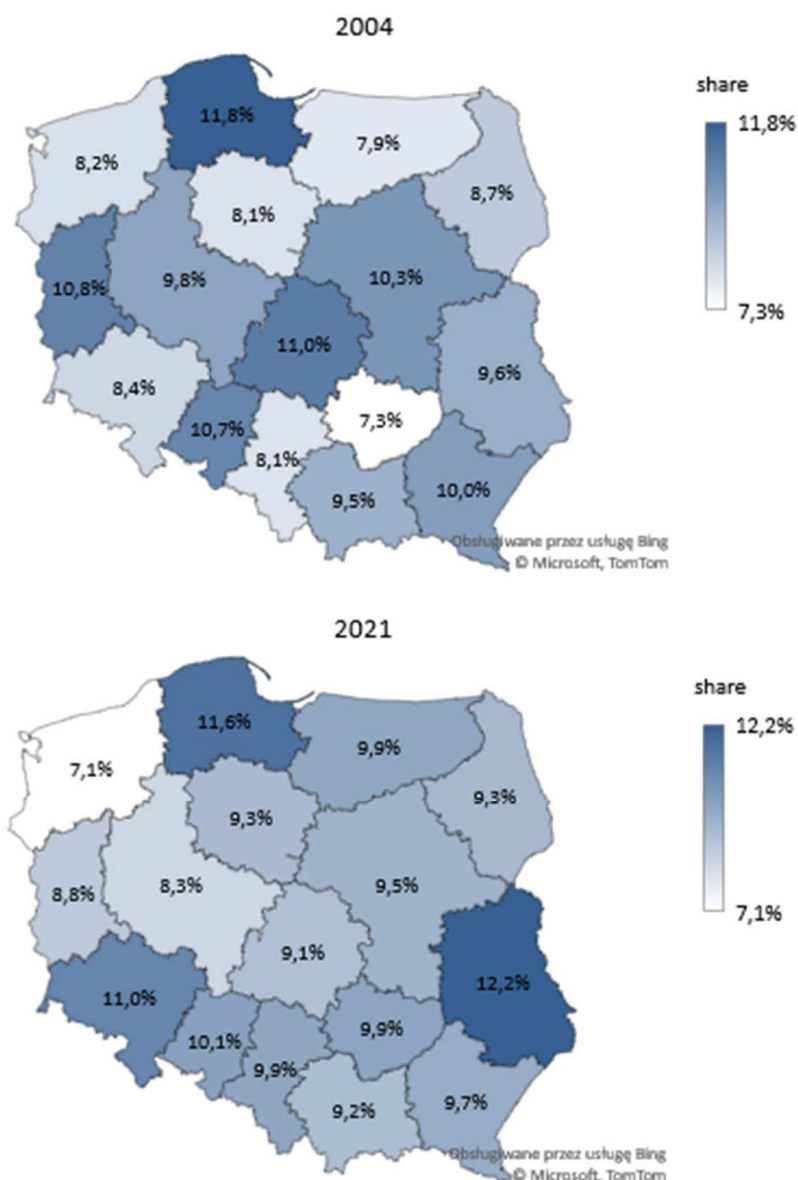


Figure 6. The share of average monthly per capita expenditure on transport in total consumption expenditure in households in voivodeships of Poland (in PLN)

Rysunek 6. Udział przeciętnych miesięcznych wydatków na transport na osobę w całkowitych wydatkach konsumpcyjnych w gospodarstwach domowych w województwach w Polsce (w PLN)

Source: own elaboration based on GUS – Local Data Bank.

Źródło: opracowanie własne na podstawie GUS – Bank Danych Lokalnych.

Looking at the share of expenditure on transport, it can be stated that the share increased in some voivodeships and decreased in others. However, the share did not change significantly in the analyzed period.

Grouping of the voivodeships made it possible to identify shifts in the value of expenditure on transport in households. The value of expenditure on transport relatively increased in Dolnośląskie, Lubelskie, and Śląskie, and relatively decreased in Łódzkie, Małopolskie, and Podkarpackie. It is important to identify the causes of these changes.

As a subject of further research, it will be interesting to identify the determinants of value and the share of expenditures on transportation. This research should take into consideration household characteristics and transport infrastructure in each voivodeship. It is particularly important to explore whether the differences between voivodeships are due to lower travel needs (such as aging populations, remote working, or household preferences) or to limitations (such as lack of infrastructure, convenient and affordable public transport, or insufficient household income). Differences between voivodeships caused by limitations should be reduced by improving infrastructure, public transport, and by implementing poverty alleviation measures. On the other hand, differences caused by lower needs are a reflection of changing times and do not require any special actions.

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