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pod redakcją
Moniki Noviello i Małgorzaty Zdon-Korzeniowskiej

TRANSFORMATIONS OF ECONOMIC SPACE: CASE STUDIES FROM LOCAL, REGIONAL AND INTERNATIONAL PERSPECTIVES

edited by
Monika Noviello and Małgorzata Zdon-Korzeniowska

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Wprowadzenie

Współczesna przestrzeń społeczno-gospodarcza podlega dynamicznym przemianom wynikającym zarówno z procesów zachodzących wewnątrz miast i regionów, jak i z oddziaływania uwarunkowań zewnętrznych. Postępująca suburbanizacja, zmiany wzorców mobilności, rozwój nowych form transportu, a także narastająca podatność gospodarek na zewnętrzne szoki ekonomiczne wpływają na sposób funkcjonowania przestrzeni gospodarczej na różnych poziomach jej organizacji. Procesy te prowadzą do przekształceń struktury funkcjonalnej obszarów miejskich, zmiany lokalizacji usług i aktywności gospodarczej, kształtowania nowych wzorców mobilności oraz modyfikacji powiązań gospodarczych w skali międzynarodowej. Szczególnego znaczenia nabiera zatem analiza wzajemnych relacji między przemianami przestrzennymi, rozwojem lokalnym oraz regionalnym i procesami zachodzącymi w gospodarce światowej.

W niniejszym numerze przedstawiono wybrane aspekty przemian przestrzeni gospodarczej w ujęciu lokalnym, regionalnym i międzynarodowym. Prezentowane opracowania odnoszą się do zróżnicowanych, lecz wzajemnie powiązanych procesów: wpływu suburbanizacji na rozmieszczenie usług i wyposażenie w infrastrukturę społeczną, znaczenia e-rowerów dla rozwoju lokalnego i regionalnego oraz oddziaływania zewnętrznych szoków gospodarczych na międzynarodowy handel usługami. Analizowane zagadnienia pokazują wielowymiarowość współczesnych procesów rozwojowych oraz ich konsekwencje dla funkcjonowania miast, regionów i gospodarek.

Na poziomie lokalnym i regionalnym analizie poddano wpływ suburbanizacji na lokalizację i zakres usług oraz infrastruktury społecznej na obszar zaplecza postindustrialnego miasta Pilzna w Czechach (Martin Domín, Petr Hlaváček, Jiří Nedvěd). Szczególną uwagę poświęcono relacjom wzrostu liczby ludności na obszarach podmiejskich, rozwojowi funkcji handlowych i usługowych oraz zdolności gmin do zapewnienia odpowiedniego poziomu usług publicznych. Na podstawie analizy 41 gmin podmiejskich, a także badań ankietowych i wywiadów z przedstawicielami władz lokalnych przedstawiono zróżnicowanie przestrzenne dostępności usług w zależności od odległości od rdzenia aglomeracji. Studium przypadku Chotíkova pozwala dodatkowo przedstawić konflikty związane z lokalizacją wielkopowierzchniowych obiektów handlowych, infrastruktury technicznej oraz funkcji uciążliwych dla środowiska. Wyniki badań wskazują na złożoność procesów suburbanizacyjnych oraz na ich znaczenie dla kształtowania struktury funkcjonalnej obszarów miejskich i podmiejskich.

W kontekście przemian mobilności miejskiej i ich znaczenia dla rozwoju lokalnego i regionalnego przedstawiono problematykę wykorzystania e-rowerów na przykładzie miasta Rijeka w Chorwacji (Michał Adam Kwiatkowski, Zoran Ježić). Analizie poddano znaczenie tego środka transportu w kształtowaniu mobilności mieszkańców, rozwoju lokalnej przedsiębiorczości i turystyki oraz funkcjonowaniu miasta jako ośrodka akademickiego. Dużą rolę odgrywają w tym przypadku uwarunkowania przestrzenne Rijeki, w tym zróżnicowanie wysokościowe terenu oraz utrwalona kultura mobilności oparta

na wykorzystaniu samochodów. Przeprowadzone badania ankietowe wśród studentów Uniwersytetu w Rijece wskazują na ograniczone wykorzystanie rowerów tradycyjnych i elektrycznych przy jednoczesnym dostrzeganiu potencjału e-rowerów, zwłaszcza w obszarze rozwoju turystyki. Przywołane przez respondentów bariery, związane m.in. z bezpieczeństwem ruchu, infrastrukturą rowerową, warunkami pogodowymi i ryzykiem wandalizmu, pokazują, że rozwój nowych form mobilności wymaga uwzględnienia uwarunkowań zarówno przestrzennych, jak i społecznych oraz infrastrukturalnych.

W wymiarze międzynarodowym przedstawiono zagadnienie wpływu zewnętrznych szoków gospodarczych na handel usługami, ze szczególnym uwzględnieniem państw Grupy Wyszehradzkiej (Wojciech Zysk). W opracowaniu zidentyfikowano trzy istotne wydarzenia oddziałujące na gospodarkę światową w latach 2005–2024: globalny kryzys finansowy z lat 2008–2009, pandemię COVID-19 oraz inwazję Rosji na Ukrainę. W badaniu wzięto pod uwagę zarówno globalne kierunki eksportu i importu usług, jak i trzy najważniejsze rodzaje usług – z uwzględnieniem gospodarek V4. Przeprowadzona analiza pozwala wskazać zróżnicowaną skalę potencjalnego oddziaływania poszczególnych szoków na międzynarodowy handel usługami oraz wyodrębnić obszary wymagające dalszych badań nad odpornością i zmianami strukturalnymi gospodarki usługowej. Podejmowana problematyka wpisuje się w szerszą dyskusję dotyczącą postępującej serwicyzacji gospodarki światowej oraz uwarunkowań jej dalszego rozwoju.

Mamy nadzieję, że przedstawione w niniejszym numerze zagadnienia spotkają się z zainteresowaniem Czytelników i staną się inspiracją do dyskusji nad przemianami przestrzeni gospodarczej, ich uwarunkowaniami oraz konsekwencjami dla rozwoju miast, regionów i gospodarki światowej. Zachęcamy do zapoznania się z prezentowanymi opracowaniami oraz do podejmowania dalszych badań nad procesami kształtującymi współczesną przestrzeń gospodarczą i jej zróżnicowanie w wymiarze lokalnym, regionalnym i międzynarodowym.

Monika Noviello, Małgorzata Zdon-Korzeniowska

Introduction

Contemporary socio-economic space is undergoing dynamic transformation driven both by processes unfolding within cities and regions and by the influence of external conditions. Ongoing suburbanisation, changing mobility patterns and the emergence of new forms of transport, together with the increasing exposure of economies to external economic shocks, are reshaping the organisation and functioning of economic space at different spatial scales. These processes are transforming the functional structure of urban areas, altering the location of services and economic activities, shaping new patterns of mobility, and modifying economic linkages at the international level. Against this background, particular importance should be attached to examining the interrelationships between spatial transformations, local and regional development, and processes taking place within the global economy.

This issue presents selected aspects of transformations in economic space from local, regional and international perspectives. The contributions address diverse yet interrelated processes, including the impact of suburbanisation on the spatial distribution of services and the provision of social infrastructure, the role of e-bikes in local and regional development, and the effects of external economic shocks on international trade in services. Taken together, the studies highlight the multidimensional nature of contemporary development processes and their implications for the functioning of cities, regions and economies.

At the local and regional levels, the issue examines the impact of suburbanisation on the location and scope of services and social infrastructure in the hinterland of the post-industrial city of Plzen, Czechia (Martin Domín, Petr Hlaváček, Jiří Nedvěd). Particular attention is paid to the relationship between population growth in suburban areas, the development of commercial and service functions, and the capacity of municipalities to provide an adequate level of public services. Based on an analysis of 41 suburban municipalities, a questionnaire survey and interviews with local government representatives, the study identifies spatial differences in service accessibility in relation to distance from the urban core. The case study of Chotíkov further illustrates conflicts associated with the location of large-scale retail facilities, technical infrastructure and environmentally burdensome functions. The findings highlight the complexity of suburbanisation processes and their importance for shaping the functional structure of urban and suburban areas.

In the context of changing urban mobility patterns and their implications for local and regional development, the issue also addresses the role of e-bikes, using the city of Rijeka, Croatia, as a case study (Michał Adam Kwiatkowski, Zoran Ježić). The study examines the potential role of e-bikes in shaping urban mobility, supporting local entrepreneurship and tourism, and influencing the functioning of a city as a university centre. Particular attention is given to the spatial characteristics of Rijeka, including its varied topography and an established car-oriented mobility culture. A survey conducted among students at the University of Rijeka indicates that the current use of both conventional bicycles

and e-bikes remains limited, while respondents nevertheless recognise the potential of e-bikes, particularly in relation to tourism development. The barriers identified by respondents – including road safety concerns, inadequate cycling infrastructure, weather conditions and the risk of vandalism – demonstrate that the development of new forms of mobility requires consideration of spatial, social and infrastructural conditions.

At the international level, the issue examines the impact of external economic shocks on international trade in services, with particular attention to the Visegrad Group (V4) countries (Wojciech Zysk). The study identifies three major events that affected the global economy between 2005 and 2024: the global financial crisis of 2008–2009, the COVID-19 pandemic and Russia's invasion of Ukraine. The analysis considers global patterns of services exports and imports, as well as the three most important categories of services, with particular emphasis on the V4 economies. The findings reveal differences in the potential magnitude of the impact of individual shocks on international trade in services and identify areas requiring further research into the resilience and structural transformation of service-based economies. The study contributes to the broader discussion on the ongoing servicisation of the global economy and the conditions shaping its future development.

We hope that the issues addressed in this volume will be of interest to readers and encourage further discussion on transformations in economic space, their underlying conditions, and their implications for the development of cities, regions and the international economy. We invite readers to engage with the studies presented in this issue and encourage further research into the processes shaping contemporary economic space and its differentiation at local, regional and international levels.

Monika Noviello, Małgorzata Zdon-Korzeniowska

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The Impact of Suburbanisation on the Location and Range of Services and Amenities in the Hinterland of a Post-Industrial City: Evidence from the Plzeň Agglomeration

Abstract: This paper analyses how suburbanisation affects the location, structure and perceived sufficiency of services and civic amenities in municipalities located in the hinterland of the post-industrial city of Plzeň, Czechia. The paper focuses on the economic-spatial dimension of suburbanisation, especially on the relationship between residential growth, commercial suburbanisation, municipal service provision and the relocation of selected urban functions into suburban space. The suburban region was delimited using an aggregation method based on daily commuting flows and divided into two hinterland zones according to distance from the urban core. The empirical analysis combines data on civic amenities in 41 suburban municipalities with a questionnaire survey and semi-structured interviews conducted with mayors and deputy mayors. A case study of Chotíkov illustrates the interaction between residential development, large-scale retail, technical infrastructure and conflicts related to the relocation of environmentally burdensome urban functions. The findings show that municipalities closer to Plzeň face stronger population pressure and more visible demand for educational, health and everyday services, while some specialised services remain concentrated in the urban core or in larger suburban settlements. The paper contributes to research on post-socialist suburbanisation by demonstrating how service provision and economic functions are spatially differentiated within a post-industrial agglomeration.

Keywords: civic amenities; commercial suburbanisation; local conflicts; services; spatial differentiation; suburbanisation; post-socialist cities

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Introduction

Post-socialist urban regions in Central and Eastern Europe have undergone profound economic, social and spatial restructuring since the early 1990s. These changes are associated

with market liberalisation, deindustrialisation, the transformation of housing markets, the growth of private mobility and the changing role of local governments (Parysek, 2005; Sýkora, Bouzarovski, 2012; Stanilov, Sýkora, 2014). In this context, suburbanisation has become an important but spatially differentiated phase of urban development rather than a universal process occurring with the same intensity everywhere.

The economic dimension of suburbanisation is particularly relevant for post-industrial cities. While population growth in suburban municipalities is often visible through residential construction, it is also closely linked to the relocation, concentration or transformation of services, retail, logistics, manufacturing and technical infrastructure. In Central and Eastern Europe, city centres are not always the most densely populated areas, although they often concentrate high-value functions, specialised services and administrative institutions. At the same time, peripheral land availability, transport accessibility and lower development costs encourage selected economic activities to move beyond city boundaries (Ptáček et al., 2013; Brezdeń, Szmytkie, 2019; Sikorski, Brezdeń, 2021).

The main aim of this paper is to analyse how suburbanisation affects the spatial distribution, structure and perceived sufficiency of civic amenities and selected economic functions in the hinterland of the post-industrial city of Plzeň. Particular attention is paid to whether distance from the urban core differentiates the availability of services and amenities, and how residential and commercial suburbanisation interact in shaping municipal development. The paper addresses four research questions: (1) how are services and civic amenities distributed between the inner and outer suburban hinterland; (2) which types of amenities are perceived as insufficient by municipal representatives; (3) how does proximity to the core city influence the economic and service function of suburban municipalities; and (4) how can a local case study illustrate conflicts resulting from the relocation of urban functions to suburban space?

The article is structured as follows. The following section discusses post-socialist and post-industrial suburbanisation with an emphasis on commercial suburbanisation, service provision and municipal capacity. The following sections introduce the Plzeň agglomeration, explain the methodology, present the empirical findings and discuss the Chotíkov case study. The conclusion summarises the main results and provides recommendations for spatial planning and municipal governance.

Suburbanisation, services and economic functions in post-industrial urban regions

Suburbanisation can be understood as the transfer of urban population, activities and land-use forms into the hinterland of a city (Foley, Scott, 2014; Ouředníček, 2008). In post-socialist countries, this process was shaped by the legacy of centrally planned settlement structures, delayed market-based residential development, fragmented municipal governance and the rapid transformation of land and property relations after 1989 (Sýkora, 2003; Stanilov, 2007; Tsenkova, Nedović-Budić, 2006). Its intensity differs considerably between metropolitan regions, post-industrial conurbations and medium-sized cities (Nuissl, Rink, 2005; Spórna, 2018; Kovács et al., 2019).

Residential suburbanisation is frequently accompanied by changes in the demand for public and private services. New inhabitants often increase pressure on kindergartens, elementary schools, health care, retail, leisure infrastructure and public transport (Ouředníček, Temelová, 2008; Szmytkie, 2020). However, service development does not

necessarily follow residential growth automatically. In many suburban areas, residents continue to use services in the core city because of commuting patterns, a wider range of specialised services and higher-order retail functions. Therefore, the question is not only whether suburban municipalities possess particular amenities, but also which services can efficiently remain centralised in the urban core and which daily services must be provided locally.

Commercial and non-residential suburbanisation represent a second major dimension of the process. Trade, logistics, production, administration and large-scale services may relocate to suburban zones because of lower land prices, larger plots, motorway accessibility and weaker land-use constraints (Ptáček et al., 2013). Evidence from Wrocław shows that post-socialist suburban zones can become important locations for manufacturing, logistics and specialised industrial activities, with spatial concentration and functional specialisation shaped by accessibility and restructuring of the urban economy (Brezdeń, Szmytkie, 2019; Sikorski, Brezdeń, 2021).

The interaction between residential and commercial suburbanisation may generate both synergies and conflicts. New retail or service facilities can improve local accessibility and municipal revenues, but they can also serve primarily the core city and create traffic, landscape pressure or uneven fiscal effects. Similarly, the relocation of technical or environmentally burdensome infrastructure may solve problems of the central city while transferring costs and risks to smaller municipalities. These conflicts are especially important in fragmented municipal systems, where small municipalities often have limited administrative and financial capacity to negotiate with large cities, investors or regional authorities (Hlaváček et al., 2019; Klusáček et al., 2011).

Here, negative fiscal effects do not mean that retail is inherently financially detrimental to municipalities. They refer to an uneven distribution of fiscal gains and costs: a municipality may receive local revenues or fees from a facility while simultaneously bearing expenditure on roads, public transport, utilities, land-use administration, environmental mitigation and maintenance. Some fiscal gains may also accrue at other levels of government or may be delayed and therefore not correspond to the municipality's immediate infrastructure costs.

Theoretical research on suburbanisation therefore needs to connect housing development with the geography of services, employment and municipal capacity. In this article, civic amenities are treated not only as indicators of quality of life, but also as spatial-economic functions that reveal how suburban municipalities are integrated into the broader post-industrial agglomeration.

Study area: the Plzeň agglomeration

Plzeň is the fourth largest city in Czechia and the main economic, administrative, cultural and service centre of the Plzeň Region. The city has a strong industrial tradition, represented historically by engineering, electrical engineering, food industries and Škoda Holdings, a.s. Since the 1990s, Plzeň has also undergone tertiarisation, reflected in the expansion of services, trade, business centres and foreign investment oriented towards modern technologies and skilled labour (Baštová, Toušek, 2005).

The suburbanisation of Plzeň intensified after 2000 and is comparable to processes observed around other medium-sized Czech regional cities (Kopp, Novotná, Matušková, 2013). Residential construction has been most intensive in municipalities close to the

cadastral boundary of Plzeň, while commercial suburbanisation is concentrated especially along the D5 motorway corridor connecting Prague and Plzeň. The city functions as a centre of employment, education, specialised services, culture and administration for surrounding municipalities in the districts of Plzeň-město, Plzeň-sever and Plzeň-jih.

In economic terms, the suburbanisation of the Plzeň agglomeration is therefore connected not only with residential expansion, but also with the changing location of activities linked to retail, services, production, storage and transport accessibility. The D5 motorway corridor and the availability of larger plots in the hinterland strengthen the attractiveness of suburban municipalities for selected economic functions. Although this article does not provide a detailed firm-level analysis of foreign direct investment, manufacturing or logistics, these activities form an important context for interpreting the relationship between residential growth, service demand and commercial suburbanisation.

Czechia also has a highly fragmented municipal structure compared with many other Central and Eastern European countries. Many municipalities are small and have limited financial and administrative capacity. This institutional context is essential for interpreting the results: even when suburban municipalities experience rapid population growth, they may not have sufficient resources to expand schools, health services, public transport or other amenities at the same pace.

This is particularly important in comparison with the more consolidated municipal systems in some other Central and Eastern European countries. In Czechia, many suburban municipalities are administratively independent but functionally dependent on the core city. As a result, the costs of new residential development, school capacity, public transport and technical infrastructure are often borne locally, while the functional causes and consequences of suburbanisation operate at the agglomeration scale.

Methodology

The research was organised in four steps: (a) delimitation of the Plzeň agglomeration and its suburban hinterland; (b) analysis of the structure and concentration of civic amenities in suburban municipalities; (c) assessment of municipal representatives' views on service sufficiency, development pressure and selected conflicts; and (d) a case study of Chotíkov as an example of the interaction between residential, commercial and environmentally burdensome urban functions in suburban space.

The suburban region was delimited using the aggregation method proposed by Novák (2017). The method is based on a matrix of daily commuting flows between municipalities and combines two proportional indicators: the share of daily commuters from a municipality to the agglomeration in the total number of commuters from that municipality, and the share of commuters from the agglomeration in the total number of commuters to the analysed municipality. Municipalities with fewer than ten commuters were included only where their cadastral territory was surrounded by municipalities already assigned to the agglomeration and where they were directly adjacent to the defined area.

The resulting suburban hinterland consisted of 41 municipalities. For analytical purposes, the municipalities were divided into two zones according to distance from Plzeň: Hinterland A, consisting of municipalities up to 12 km from the centre, and Hinterland B, consisting of more distant municipalities within the functional suburban region. This

division makes it possible to analyse whether proximity to the core city is associated with different levels of service provision, commercial functions and perceived municipal pressure.

Civic amenities were mapped according to categories used in Czech spatial planning and quality-of-life research (Rozmanová, 2012; Maštálka, Robová, 2016). The analysed amenities included retail, cultural facilities, health care, social welfare, education, sport, leisure, transport services and selected administrative services. The empirical survey was carried out among mayors and deputy mayors of all municipalities in the defined region. The questionnaire was accompanied by telephone interviews that clarified respondents' answers and provided contextual information on municipal development, service gaps and conflicts.

The questionnaire and the telephone interviews were treated as two separate methods. The questionnaire was completed by one mayor or deputy mayor in each of the 41 municipalities (41 valid questionnaires). It contained four blocks of questions: (i) whether the amenity categories listed in Table 2 were present in the municipality; (ii) which services and civic amenities were perceived as insufficient; (iii) whether suburbanisation was perceived as a municipal benefit, burden or neutral development; and (iv) the intensity of selected critical factors on a ten-point scale, where 1 represented the lowest and 10 the highest intensity (Table 5).

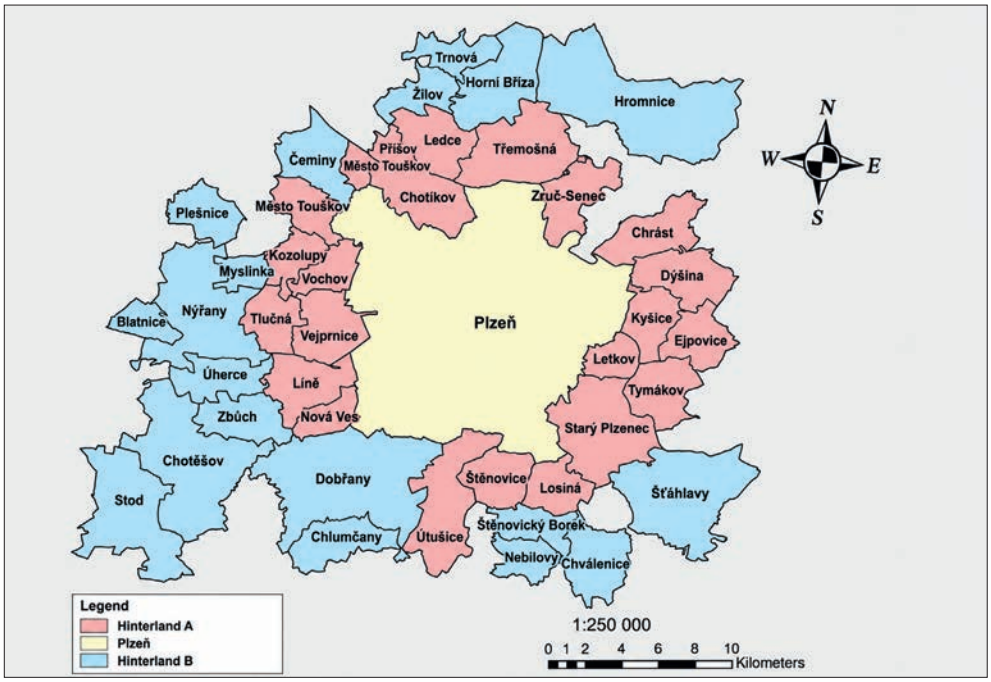
The questionnaire was completed by the municipal representatives. Subsequently, one separate semi-structured in-depth telephone interview, referred to in this article as a 'Telephone Deep Interview', was conducted with a representative of each municipality, resulting in 41 interviews. The interview guide contained open questions on the reasons for missing or insufficient amenities, changes in demand, the location of commercial and technical functions, effects on municipal budgets and conflicts over land-use decisions. The interviews were used to explain and contextualise the questionnaire responses; they were not interpreted as a representative survey of residents.

A methodological limitation must be explicitly acknowledged. The survey captures an institutional perspective of municipal representatives rather than a representative assessment of all residents' perceptions. This approach is appropriate for analysing municipal capacity, service provision and local governance challenges, because mayors and deputy mayors are directly responsible for local development and public infrastructure. However, conclusions about social perceptions are interpreted only as the views of municipal representatives. Future research should complement this approach with surveys among residents based on a representative sample.

Findings: spatial differentiation of amenities and services

The aggregation method identified 41 municipalities belonging to the suburbanised hinterland of Plzeň. Of these, 22 municipalities are located in Hinterland A and 19 in Hinterland B. Hinterland A has a smaller area but a larger population than Hinterland B, which indicates stronger population concentration closer to the urban core. Together with Plzeň, the defined area accommodates a substantial share of the regional population and represents the main functional urban region of the Plzeň Region.

Figure 1. Municipalities in the defined suburban region by type of hinterland (A and B)



Source: authors. Note: Hinterland A includes municipalities at a distance of up to 12 km from the centre of Plzen; Hinterland B includes the more distant municipalities in the defined functional suburban region

Table 1. Basic characteristics of the territory as of 31st December 2024

Territorial unit	Number of municipalities	Area (km^2)	Population	Population density (inhabitants/km^2)	Registered economic entities per 1,000 inhabitants
Hinterland A	22	200.1	45 457	227	242.7
Hinterland B	19	263.6	39 527	150	195.1
City	1	137.7	187 928	1 365	254.7
Plzeň Region	41 + 1 city	601.4	272 912	454	244.1

Source: CZSO (2025), Population and area data refer to 31 December 2024; registered economic entities are reported for 31 December 2024

The analysis of civic amenities shows that the suburban hinterland is not homogeneous. Not every municipality provides the full range of everyday and specialised services. Smaller municipalities often rely on amenities located in larger neighbouring settlements or in Plzeň itself. This confirms that suburban municipalities should not be interpreted as isolated service units, but as parts of a functional urban region shaped by commuting, public transport, road accessibility and the hierarchy of services.

In absolute terms, amenities such as community centres, kindergartens, restaurants and petrol stations are more frequent in Hinterland A, while Hinterland B shows relatively stronger representation of grocery stores, medical services, pharmacies, children's playgrounds and care homes when measured by the number of municipalities in which

these amenities exist. Elementary schools, sports facilities, post offices and libraries are represented similarly in both zones. These differences reflect the combined effects of population size, historical development, transport accessibility and the proximity of Plzeň as a higher-order service centre.

Table 2. Representation of civic amenities according to individual types

	Number of municipalities where the type of amenity exists		Number of municipalities where the type of amenity exists (in %)	
Type of amenities	Hinterland A	Hinterland B	Hinterland A	Hinterland B
Retail				
Grocery store	18	16	81.8	84.2
Culture				
Cultural centre	19	13	86.4	68.4
Library	18	15	81.8	78.9
Healthcare				
Medical practitioner	13	11	59.1	57.9
Specialist doctor	8	9	36.4	47.4
Pharmacy	6	7	27.3	36.8
Social welfare				
House with social service	5	8	22.7	42.1
Education				
Nursery school	18	12	81.8	63.2
Elementary school	14	12	63.6	63.2
Sport				
Sports ground	14	7	63.6	36.8
Leisure				
Playground	20	16	90.9	84.2
Restaurant facilities	22	16	100.0	84.2
Transport services				
Bus station	22	19	100.0	100.0
Train station	10	10	45.5	52.6
Administrative				
Post office	14	12	63.6	63.2
Information centre	3	3	13.6	15.8

Source: authors

Table 3. Relative representation of civic amenities in the hinterland

Type of amenity	Hinterland A municipalities with amenity per km^2	Hinterland B municipalities with amenity per km^2	Hinterland A municipalities with amenity per 1,000 inhabitants	Hinterland B municipalities with amenity per 1,000 inhabitants
Grocery store	0.090	0.061	0.40	0.40
Cultural centre	0.095	0.049	0.42	0.33
Library	0.090	0.057	0.40	0.38
Medical practitioner	0.065	0.042	0.29	0.28

Specialist doctor	0.040	0.034	0.18	0.23
Pharmacy	0.030	0.027	0.13	0.18
House with social service	0.025	0.030	0.11	0.20
Nursery school	0.090	0.046	0.40	0.30
Elementary school	0.070	0.046	0.31	0.30
Sports ground	0.070	0.027	0.31	0.18
Playground	0.100	0.061	0.44	0.40
Restaurant facilities	0.110	0.061	0.48	0.40
Bus station	0.110	0.072	0.48	0.48
Train station	0.050	0.038	0.22	0.25
Post office	0.070	0.046	0.31	0.30
Information centre	0.015	0.011	0.07	0.08

Source: authors' calculations based on the observed number of municipalities with each amenity in Table 2 and the updated population and area data in Table 1. The indicators are a municipality-level accessibility proxy, not a count of individual facilities

The relative indicators in Table 3 do not show a uniform advantage for the closer hinterland. Hinterland A has higher area-based values for most amenities, reflecting the concentration of services in a smaller territory, whereas Hinterland B records higher population-based values for specialist doctors, pharmacies, social-service facilities, train stations and information centres. The results therefore demonstrate that area-based density and population-based accessibility may lead to different interpretations: a more distant hinterland may retain a broader service role for its population even when its absolute number of amenities is lower.

The greatest service-related tensions are linked to amenities that cannot be fully replaced by occasional trips to the core city. Educational facilities are particularly sensitive, because suburbanisation brings young families into municipalities whose kindergartens and elementary schools were historically planned for much smaller populations. Expanding school capacity is financially demanding for small municipalities, and the benefits of population growth through tax revenues are often insufficient or delayed in relation to investment needs.

By contrast, some specialised services may remain efficiently concentrated in Plzeň if accessibility by public or private transport is adequate. This is especially relevant for specialised health care, higher-order retail, cultural services and administrative functions. The empirical results therefore do not support a simple conclusion that every suburban municipality should provide every type of amenity. Rather, they show the need to distinguish between daily local services, which are essential for everyday quality of life, and higher-order services, which can be concentrated in the core city or in selected larger suburban centres.

The survey also points to the economic dependence of suburban municipalities on the core city. Many residents commute to Plzeň for work and satisfy part of their consumption demand there. This can weaken the viability of small local shops and services, particularly in municipalities close to the city. At the same time, population growth creates new demand for retail, leisure and educational infrastructure. The result is an uneven and sometimes contradictory suburban service geography: proximity to the city improves access to specialised services but may reduce the economic competitiveness of local everyday services.

The evidence suggests that the relationship between residential and commercial suburbanisation is not linear. New housing areas increase local demand for everyday services, while commercial facilities and technical infrastructure are usually located according to land availability, accessibility and the needs of the wider urban region. This means that suburban municipalities may experience population growth without a proportional increase in local services or may host large-scale economic functions whose catchment area extends far beyond the municipality itself.

Secondary consequences: municipal perceptions, development form and conflicts although this article focuses primarily on services and economic functions, the survey also recorded how municipal representatives perceive the social and spatial consequences of suburbanisation (Table 4). These findings are interpreted cautiously as an institutional perspective.

Table 4. Perception of new residents in municipalities (%)

	Hinterland A	Hinterland B	Difference	Men	Women	Difference
Benefit to the municipality	29.27	21.95	7.32	48.28	58.33	10.06
Burden for the municipality	19.51	17.07	2.44	13.79	8.33	5.46
Neutral position	4.88	7.32	2.44	37.93	33.33	4.60

Source: authors. Note: results express the assessment of municipal representatives, not a representative survey of residents

The most critical factors identified by respondents were landscape change caused by new development and changes in relations between original and new residents. These effects were stronger in Hinterland A, where suburbanisation pressure is more intensive (Table 5). From the perspective of this paper, these conflicts are important mainly because they are related to the spatial organisation of services, public space and infrastructure. New residential zones, retail areas or technical facilities may create municipal revenues and improve accessibility, but they can also fragment settlement structure, increase traffic and create new fiscal obligations.

Table 5. Critical factors of suburbanisation in municipalities (rating 1–10)

Critical factor	Hinterland A	Hinterland B	Difference A and B	Men (total)	Women (total)	Difference
Alteration of the landscape by construction	7.82	5.37	2.45	7.10	5.67	1.44
Relationships with residents	6.95	6.89	0.06	6.66	7.58	–0.93
Total average	7.39	6.13	1.26	6.88	6.62	0.25

Source: authors, note: 1 = lowest intensity; 10 = highest intensity

Case study: Chotíkov as an example of commercial suburbanisation and relocation of urban functions

Chotíkov is located in Hinterland A and illustrates how residential growth, commercial suburbanisation and the relocation of urban technical infrastructure may interact within a small municipality. The population of the municipality has grown substantially over the last three decades, and new residential areas have expanded mainly in the southern and northern parts of the village. The municipality has also become a location for large-scale retail serving not only local inhabitants but also the wider Plzeň agglomeration.

The official demographic series records 698 inhabitants at the end of 1991 and 1,290 at the end of 2024, an increase of 592 inhabitants (84.8%). These data confirm the substantial long-term population growth referred to above (CZSO, 2024).

The Globus shopping centre in Chotíkov represents commercial suburbanisation linked to the consumer market of Plzeň, car accessibility and the availability of large plots on the urban edge. Such retail development changes the economic role of the municipality: it strengthens its position within the suburban service network but its catchment area clearly exceeds the municipality itself. This type of amenity can generate employment, tax income and consumer accessibility, while also increasing traffic and reinforcing dependence on individual car transport.

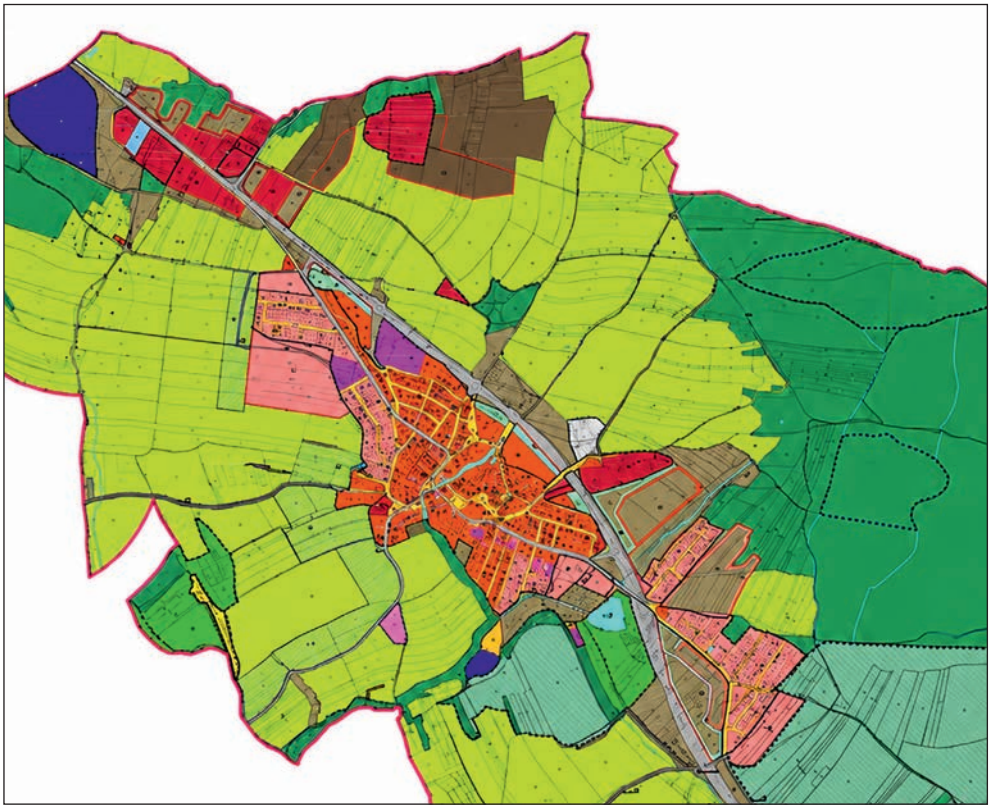
Figure 2. Chotíkov – commercial suburbanisation represented by a large-scale retail facility

Source: authors' archive (2019)

A second and more controversial function transferred to the municipality is the waste-to-energy plant. The municipality of Plzeň decided to solve part of its waste disposal needs by locating a large-capacity waste incineration plant outside the city, in the cadastral territory of Chotíkov. The project illustrates an asymmetric relationship between the core city and a suburban municipality: the environmental and spatial burden is located in the hinterland, while the function primarily serves the needs of the larger urban region.

The Chotíkov zoning plan shows the coexistence of the original settlement, new residential development, open landscape, transport infrastructure, commercial activities and areas reserved for production or technical infrastructure. The plan therefore demonstrates that the suburban municipality is not only a residential space, but also a multifunctional area in which economic and technical functions of the post-industrial agglomeration are concentrated.

Figure 3. Zoning plan of the municipality of Chotíkov



Key for Figure 3:

Colour	Function represented in Figure 3
	Orange – existing residential or mixed-use development
	Pink – proposed residential or mixed-use development
	Red – commercial, production or technical-infrastructure functions
	Brown – commercial, production or technical-infrastructure functions
	Grey – transport infrastructure
	Green – open landscape, agricultural land or forest
	Blue – water elements

Source: Obec Chotíkov (2020). Note: The zoning plan is used to illustrate the coexistence of residential, commercial, transport, landscape and technical-infrastructure functions within the municipal territory

In this article, "coexistence of functions" means that several land-use functions are present within the same municipal territory and are spatially adjacent or functionally connected; it does not mean that they occupy one parcel or one building. The coexistence is identified by comparing the areas mapped in the zoning plan for the original settlement, residential development, commercial and production activities, transport infrastructure, open landscape and technical infrastructure. The plan therefore provides the spatial basis for interpreting how local residential functions and agglomeration-serving economic and technical functions are combined. The approval of the incineration plant was linked to a local referendum. The project was approved by a narrow majority, with 51% of voters in favour, which shows the depth of local disagreement (Vejvodová, 2009). Opponents emphasised potential environmental and health risks, traffic connected with waste transport and the visual impact of the facility on the landscape. The building permit was cancelled several times before trial operation began in 2016, contributing to delays and cost increases. Although the municipality obtained financial compensation and additional revenues, these economic benefits did not remove the conflict.

Figure 4. Waste incineration plant in Chotíkov

Source: Visit Plzeň (2020)

The case study demonstrates that suburbanisation in post-industrial regions cannot be reduced to housing development. Suburban municipalities may become locations for retail, logistics, production or environmentally burdensome infrastructure serving the entire agglomeration. These functions can strengthen the economic role of the municipality, but they also raise questions about fiscal compensation, landscape quality, public acceptance and the distribution of environmental costs between the core city and its hinterland.

Discussion

The findings show that the hinterland of Plzeň is shaped not only by residential suburbanisation, but also by the relocation of selected economic, commercial and technical functions into suburban space. Suburban municipalities should therefore not be understood merely as residential extensions of the core city, but as parts of a wider functional region in which services, civic amenities, commercial activities and infrastructural burdens are spatially differentiated. This conclusion corresponds with findings from other post-socialist cities, for example Wrocław (Poland), where industrial, logistics and service activities have gradually concentrated in suburban zones due to land availability, transport accessibility, and links to the urban labour and consumer market (Brezdeń, Szmytkie, 2019; Sikorski, Brezdeń, 2021).

The analysis confirms that distance from the agglomeration core influences the range and structure of civic amenities, although it is not the only determining factor. Municipalities in the closer hinterland of Plzeň, i.e. Hinterland A, are exposed to stronger population pressure, more intensive new construction and higher demand for everyday services, especially in pre-school and elementary education, basic retail, health services and leisure infrastructure. At the same time, this zone is more strongly affected by commercial suburbanisation and by the location of functions that benefit from proximity to the city, good transport accessibility and more available land. More distant municipalities, i.e. Hinterland B, show a relatively stable or even higher presence of certain types of amenities, related to their historical development, size, transport links and service role for the wider rural surroundings.

The findings therefore indicate that the availability of services in suburban space cannot be explained solely by a simple distance gradient from the urban centre. Previous municipal development, inherited infrastructure from the pre-1989 period, municipal size, administrative and financial capacity, transport position and the ability of local governments to respond to population growth also play an important role. Suburbanisation thus does not affect all municipalities in the same way, but produces a spatially differentiated structure of needs, capacities and development pressures.

The research also shows that some higher-order and specialised services may remain concentrated in the core city, provided that their transport accessibility is sufficient. This applies especially to specialised health care, higher-level administration, cultural institutions and a more extensive retail offer. By contrast, everyday services that directly influence residents' quality of life cannot be replaced in the long term solely by commuting to the city. Kindergartens, elementary schools, basic retail, playgrounds, public spaces, sports facilities and basic leisure infrastructure need to be available either directly within municipalities or through well-coordinated inter-municipal cooperation. It is in this area that the tension between rapid population growth and the limited budgetary capacities of small municipalities becomes most evident.

The case of Chotíkov illustrates another dimension of suburbanisation processes. Suburban space is becoming not only a place of residence and everyday services, but also a location for commercial and environmentally burdensome functions serving the wider agglomeration. Commercial zones, technical infrastructure and waste-management facilities may bring fiscal benefits to municipalities, but they also generate conflicts related to traffic burden, landscape quality, environmental risks and local acceptance. Chotíkov therefore demonstrates that suburbanisation in a post-industrial hinterland is not only

a residential process, but also a process of spatial redistribution of economic functions, costs and burdens between the core city and its surroundings.

The highly fragmented municipal structure in Czechia is also of particular importance. Small municipalities often face suburbanisation pressures that exceed their fiscal, administrative and planning capacities. This creates a mismatch between the functional scale of suburbanisation, which is agglomeration-based and regional, and the institutional scale of decision-making, which remains predominantly local. This mismatch increases the need for coordinated spatial planning, inter-municipal cooperation, shared capacities of public services and clearer mechanisms for financing infrastructure induced by new development.

Conclusions and recommendations

The distribution of services and civic amenities across the suburban hinterland is spatially differentiated rather than following a simple centre–periphery gradient. Hinterland A has stronger representation of cultural, educational, sport, leisure and restaurant amenities, whereas Hinterland B is not uniformly underserved and shows relatively stronger representation of specialist doctors, pharmacies, social-service facilities and train stations. The relative indicators in Table 3 further demonstrate that absolute counts should be interpreted together with area and population when assessing accessibility.

The greatest perceived insufficiencies concern everyday services that cannot easily be replaced by occasional trips to Plzeň, particularly kindergarten and elementary-school capacity, basic health care, local retail, public space, playgrounds and leisure infrastructure. These pressures are associated with rapid population growth, the age structure of incoming households and the limited financial and administrative capacity of small municipalities.

Proximity to the core city improves access to specialised services and strengthens commuting and consumption links with Plzeň, but it may also weaken the viability of local everyday services because residents use the core-city labour market and retail offer. More distant municipalities may retain a broader local service role for their surroundings, while commercial and technical functions are located according to accessibility, land availability and the needs of the wider agglomeration.

The Chotíkov case demonstrates how suburban municipalities can combine population growth and local residential development with large-scale retail and infrastructure serving the whole agglomeration. The resulting benefits in accessibility, employment or local revenues may coexist with traffic, landscape, environmental and fiscal burdens. The case thus shows why the functional scale of suburbanisation can exceed the scale of individual municipal decision-making.

From a planning perspective, spatial development should be coordinated at the level of the functional agglomeration and should link new housing to school capacity, public transport, everyday services, technical infrastructure and public space. Municipalities should also negotiate a fairer distribution of costs and benefits when they host facilities serving the wider region. The study is limited by its institutional perspective: it includes 41 municipal representatives and does not provide a representative survey of residents. Future research should combine the municipal questionnaire and 'Telephone Deep Interviews' with representative surveys of original inhabitants and newcomers, as well as systematic data on firms, employment, logistics, retail and investment.

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E-bikes in urban mobility: the local and regional development perspective – a case study of Rijeka, Croatia

Abstract: Electric and e-bikes are becoming an increasingly popular means of transport, especially in cities with varied topography or over long distances. They make it easier to overcome steep hills and allow for covering greater distances than with a traditional bicycle. Increasing the share of e-bikes in city residents' daily mobility can positively impact a city's development in various way by fulfilling the principles of sustainable transport and driving the local economy. This study aims to assess the role of e-bikes in local and regional development, using the city of Rijeka as an example. The city is characterised by a mobility culture oriented towards car travel, as well as terrain unfavourable to traditional cycling while the study will consider aspects related to the development of local businesses and tourism in the city in the context of student life. To achieve this, a survey was conducted among economics students at the University of Rijeka. The results indicate that these respondents do not use either traditional bicycles or e-bikes for urban mobility. The answers however allow us to believe that the surveyed students generally have a positive or at least an indifferent attitude towards the development of e-bike mobility, but they see the highest potential for e-bikes in tourism. Respondents are also aware of the barriers to the development of this form of mobility, mentioning problems related to road safety, problems with vandalism, weather and the lack of bicycle infrastructure.

Keywords: bicycle; cycling policy; e-bike; economic development; Rijeka; students; tourism

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Introduction

The mobility of modern city residents is one of the most important challenges in planning while it also affects urban development and the economy (Bertolini, 2012). An important problem of modern urban mobility is the excessive level of motorisation, understood primarily as the significant share of passenger cars in the modal split of transport (Moeinaddini et al., 2015). The concept of sustainable mobility, which supports means

of transport that cause minimal harm to the urban environment, reduces congestion, supports the economy and addresses unequal access to transport (Banister, 2008), seems to address these problems. This is particularly important in cities with multiple functions, including university (Cattaneo et al., 2018) and tourist cities (Zientara et al., 2024). Among the means of transport considered sustainable, the bicycle is often mentioned, but not in every urban environment can this be an easy task. In densely built-up cities, there is usually no room left for a separate cycling infrastructure. On the other hand, in cities with varied terrain, like Rijeka, with large altitude differences, cycling may be too demanding for residents. In this dimension, the implementation of electrically assisted bicycles, which have been successfully developed as a means of transport in recent years, seems to be an effective solution. Their role can also be very important, as mobility shapes the presence of students and tourists.

This study aims to assess the development of e-bike-based mobility in the city of Rijeka, Croatia, as seen through the eyes of economics students, and in the context of the city's economic development. In order to achieve the objective, the following research questions were used on the impact of the development of e-bike mobility as an increase or expansion of the e-bike sharing system:

- How do students currently move around the city and what role does bicycle mobility play in this context?
- What impact can the development of e-bike mobility have on the overall economic situation, students' everyday life and in the context of tourism in the opinion of students?

The paper uses the opinion of students from economics faculties, as firstly, they are professionally interested in future economic development, and secondly, they are everyday users of the space in which the study was conducted. The city of Rijeka in Croatia in Central-Eastern Europe is used as an example. This region is characterised by a relatively low level of cycling culture (Németh, Horňák, 2026) and a high level of car ownership and use (Radzimski, Gadziński, 2019). In addition, the city is highly attractive to tourists and an important academic centre. The topographical conditions of Rijeka, located on hills, are also important for the development potential of e-bike mobility. This study assesses the potential for developing a new, underused mode of mobility, such as the e-bike, and the results will provide valuable recommendations that can be effective for other cities facing similar problems.

E-bikes in literature

Electric bicycles have developed in recent years as an alternative mode of transport that can offer more travel options than a traditional bicycle (Rérat, 2021). This is emerging across both private e-bikes and e-bike sharing (Guidon et al., 2019; Li et al., 2024) and is a particularly important issue in the context of the search for sustainable forms of mobility and the reduction of CO2 emissions in transport (McQueen et al., 2020; Raydan, Nehme, 2026). However, e-bikes, unlike traditional bikes, give users more options. They are useful for covering longer distances than a traditional bike and for overcoming hills while also increasing accessibility among people with lower physical fitness and the elderly. In addition, e-bikes can introduce cycling culture in places where it has not been possible with traditional bicycles due to topographical conditions. Increasing the

availability of e-bikes can lead to increased mobility for residents, students and tourists, as well as a greater attractiveness of the city in its harder-to-reach areas.

E-bikes in urban mobility. E-bikes (electric bikes and pedelecs) have become increasingly popular as a form of transport in urban areas around the world in recent years (Rose, 2011; Fishman, Cherry, 2016; Kwiatkowski, Karbowiński, 2023; Emanuel-Cristian et al., 2025). In fact, studies to date have confirmed that they increase travel range (Huang et al., 2024; Yang et al., 2024) while reducing the effort required when using a bicycle. This may increase the accessibility of cycling for a larger group of users (Haustein, Møller, 2016) and the likelihood of using the bicycle for everyday mobility. Popovich et al. (2014) also emphasise in this context that e-bikes may encourage a reduction in the need to use cars. However, stereotypes about electric bikes can significantly affect perceptions and, in turn, the decision to use them. It has been shown that people who have not used e-bikes before are more likely to perceive more barriers to their use (Simsekoglu, Klöckner, 2019) and among the most important, Lee & Sener (2022) mention the availability and cost of using such a bike, the lack of infrastructure and stereotypes about those who use them. Among social barriers, the stereotype of the so-called 'cheated effort' towards the traditional cyclist is undoubtedly of great importance (Le Bris, 2016; Jones et al., 2016) while a sense of security (Yao, Wu, 2012) can be another. However, according to Fyhri et al. (2017), those who have tried an e-bike are more likely to consider buying one and using it again. E-bikes are also considered a sustainable means of mobility, especially in the context of a possible decarbonisation of transport (Hiselius, Svensson, 2017; Calan et al., 2026), but are not themselves fully inclusive (Guo et al., 2025).

Electrically assisted bicycles have also developed within e-bike sharing systems (Hosseini et al., 2024; Adorean et al., 2026). The implementation of such systems may, as Handy & Fitch (2022) indicate, affect the willingness to use e-bikes, which is especially important in cities with a less developed bicycle infrastructure (Julio, Monzon, 2022). Another well-known form of development is subsidies for the purchase of one's own e-bike (Sundfør, Fyhri, 2022; Veisten et al., 2024).

Students undoubtedly play a big role in urban mobility, and the ability to move around the city is crucial for them (Etminani-Ghsrodashti et al., 2024), both when choosing a means of mobility and the city in which they will study. As shown in previous work (Nash, Mitra, 2019; Ribeiro et al., 2020), for the most part, students use public transport or walk. Although a large role has been attributed to electric bicycles in the context of supporting the mobility of older people (Leger et al., 2019), studies by Plazier et al. (2017) and Nematchoua et al. (2020) have shown that it is among students – young adults – that there is a great potential to increase the share of e-bike users.

Electrically assisted bicycles can therefore bring several benefits – both individually and on a wider scale – to cities and regions. However, as shown, there are numerous actions and numerous barriers to overcome that will help implement this solution on a wider scale than before across the daily mobility of residents, student mobility, and tourism and recreation.

E-bikes in local and regional development. The use of electrically assisted bicycles can not only stimulate individual activity among different social groups but also have a wider impact on local and regional development. An increasing share of e-bikes in local development, understood as a process of strengthening the economic opportunities of cities, improving social relations and the quality of life of residents (OECD), brings local economic benefits (Gilderbloom et al., 2016). On a macro level, Mason et al. (2015)

estimated that increasing bicycle traffic could save society $24 billion by 2050. The bicycle tourism sector is also important in this context (Clifton et al., 2012; Chakraborty, 2019) because as Pirolo & Pileri (2026) point out, e-bike-based cycling has a positive impact on the local economy, while proper infrastructure preparation for e-bike tourism can affect local and regional development (Pirolo, Moscarelli, 2025). However, activities related to the development of e-bike mobility do not have to be limited to city activities but also include local entrepreneurs offering services for the rental or repair of e-bikes (Genikomsakis et al., 2021). It has also been shown that the proximity of tourist cycling routes can increase the income of businesses located along them (Luekveerawattana, 2022). Dahir & Le (2025) emphasise that in some cases, the presence of bicycle infrastructure can increase the value of the properties located next to it. Cycling mobility also increases the number of jobs in the local market (Blondiau et al., 2016), in cycling tourism (Meletiou et al., 2005) and in industries not directly related to cycling.

However, in e-bike development planning, it should be remembered that, as with other users, tourists may also experience barriers to e-bike use (Ahmad, Harun, 2024). In addition, in some cases, the development of bicycle infrastructure, especially when it is at the expense of car infrastructure, may raise concerns about its negative impact on local business development (Field et al., 2018). However, many studies have proven that the development of infrastructure for active mobility can be harmless and of no issue to business (McCoy et al., 2019) or gastronomy (Yu et al., 2026), or even bring positive economic effects to the local economy (Poirier, 2018; Volker, Handy, 2021).

In this context, e-bikes, which have been developing in recent years as technological (Zuev, 2020) and social (Seebauer, 2015; Wild, Woodward, 2019) innovations, can also successfully become an innovation in the economic dimension. However, previous research has insufficiently linked the issues of e-bike mobility with economic development. This study additionally introduces the perspective of students of economics, showing their view of the role of e-bike mobility in local and regional development.

Methods

To achieve the study's aim and determine answers to the research questions, the survey used a questionnaire conducted among students of economics at the Faculty of Economics and Business of the University of Rijeka. It was decided to select this research group, identifying it as those who will deal with local and regional development issues among their future professional interests as well. The faculty location where the selected group studies, was also important as it is located in the very centre of the city.

Rijeka case study. Rijeka is Croatia's main port and one of the most important urban centres on the northern Adriatic. According to census data, Rijeka had 144,043 inhabitants in 2001, 128,624 in 2011, and 107,964 in 2021, meaning the population fell by about 25% between 2001 and 2021. Recent estimates indicate that the decline has continued, with around 105,700 inhabitants in 2024 (Citypopulation.de).

In terms of mobility, Rijeka is a traffic-oriented city with a high number of cars (Marsanic, Krpan, 2015). The roads, especially in the city centre, are very steep, and dense buildings make it impossible to introduce separate infrastructure for cyclists without interfering with sidewalks or car lanes (Figure 1). In addition, the city has a system of electric public bikes *Ricikleta*, which includes four bicycle rental and return stations (Figure 2).

Figure 1. Streets in the centre of Rijeka

Source: Michał Adam Kwiatkowski

Figure 2. Ricikleta e-bike sharing stations in Rijeka

Source: Michał Adam Kwiatkowski

Currently, Rijeka is working to strengthen innovation, IT, creative industries, green technologies and cooperation between the economy and the University of Rijeka. Tourism, including cruise and cultural tourism, has become more prominent, but Rijeka is still less dependent on tourism than many Croatian coastal cities and remains primarily a port, transport, service and university city.

The University of Rijeka is one of the key institutions shaping the city's contemporary identity. Founded in 1973, it has helped Rijeka shift from being viewed mainly as an industrial and port city to becoming a centre for students, research and innovation. The university comprises 17 faculties and offers more than 180 accredited study programmes with approximately 16,500 students and more than 1,700 employees making it the central higher education and research institution in western Croatia. Its campus at Trsat and its cooperation with local institutions and businesses is especially important for the city's social and economic development (Uniri.hr). As mentioned earlier, tourism is one of the city's growing economic sectors (see Table 1).

Table 1. Number of tourists in Rijeka: 2019–2024

Year	Rijeka: tourist arrivals*	Primorje-Gorski Kotar County / Kvarner: tourist arrivals	Rijeka as % of the county total
2019	166,534	3,130,326	5.3
2020	61,675	1,464,210	4.2
2021	109,843	2,371,806	4.6
2022	182,908	3,065,846	6.0
2023	221,107	3,219,927	6.9
2024	226,940	3,229,443	7.0

* Rijeka values are approximate because they are derived from reported year-on-year growth statements, while other values are directly reported annual totals. County/Kvarner data are from Croatian tourism statistics, mainly HTZ/eVisitor annual December reports, with older years cross-checked against DZS/compiled county tourism data.

Source: authors' calculation based on: https://web.dzs.hr/Hrv_Eng/publication/2015/04-03-02_01_2015.html (access: 10.05.2026)

Compared with the county as a whole Rijeka still accounts for a relatively small share of tourism, but its share increased from around 4–5% before the pandemic to about 7% in 2024, indicating that Rijeka has become a more visible urban tourism destination within Primorje-Gorski Kotar County.

Topographically, Rijeka has a distinctive coastal and hilly form. The city developed at the mouth of the Rječina River, where the Adriatic Sea extends deeply into the European mainland, stretches along the Gulf of Rijeka, part of the wider Kvarner Gulf, while hills and mountains rise immediately behind the urban area. Because of this, Rijeka is built on a narrow coastal strip and on steep slopes above the sea, giving it a compact, terraced and visually dramatic urban landscape (enter.rijeka.hr). This makes Rijeka an attractive destination for tourists, but it is difficult to get around by bike without electric assistance.

Survey. To achieve the study's aim, an anonymous survey was conducted among students of the Faculty of Economics and Business at the University of Rijeka between May 15 and 25, 2026, with 154 responses. It was carried out in accordance with the principles of the CAWI (Computer Assisted Web Interview) technique, which meant sending a link in electronic form via the University of Rijeka's internal mail, as well as making

the QR code available to students during auditorium classes. In the survey, respondents answered questions about their general and socio-demographic characteristics, and about their perceptions of electric bicycles (and e-bike sharing) in the context of the city's economic, tourism and student development. The questionnaire consisted of 16 closed questions, including single-choice, multiple-choice and Likert-scale. The survey results were compiled as frequency analysis using IBM SPSS and Microsoft Office software and presented in this article using tables and graphs.

Results

The survey was conducted among 154 students studying at the Faculty of Economics and Business at the University of Rijeka. First, the socio-demographic characteristics of the study participants were analysed: gender, age in years, year of study and place of residence in Rijeka.

Table 2. Socio-demographic characteristics of respondents

Variable		Number of answers	%
Gender	Female	111	72.1
	Male	42	27.3
	Prefer not to disclose	1	0.6
Age	mean		22.91
Year of the study	First	31	20.1
	Second	86	55.8
	Third	22	14.3
	Fourth	5	3.2
	Fifth	10	6.5
Place of residence	In the city centre of Rijeka	39	25.3
	In another part of Rijeka	65	42.2
	On the University campus	2	1.3
	Outside Rijeka	48	31.2

Source: authors' study based on a survey *[N=154]*

According to the results (Table 2), 72.1% of female and 27.3% of male students participated in the survey. The gender structure of respondents corresponds to the gender structure of Faculty of Economics and Business students where according to data for the 2023/24 academic year, 71.7% were female and 28.3% were male (Jurić et al., 2025). The average age of the respondents was 22.91. Among them, the largest percentage were second-year students (55.8%), followed by first-year (20.1%) and third-year (14.3%). 25.3% of respondents live in the city centre where the Faculty of Economics and Business is located but the largest percentage live in other parts of Rijeka (42.2%).

The mobility patterns of the students participating in the study were analysed and the means of transport they most often use when moving around the city and the purposes for which they travel most often were checked.

Table 3. Distribution of answers to the questions: "How do you move around Rijeka most often?" and "Where do you move around Rijeka most often?"

Question	Answer	%
How do you move around Rijeka most often?	By car	38.31
	On foot	31.17
	By public transport	28.57
	By motorcycle	0.65
	By taxi	0.65
	Other	0.65
	By bicycle	0.00
	By an electric bicycle	0.00
	By scooter	0.00
Where do you move around Rijeka most often?	To the university	44.16
	To restaurants/cafés	14.29
	To services	10.39
	To shops	9.09
	To friends/family	8.44
	Other	7.79
	To sports facilities	5.84

Source: authors' study based on a survey *[N=154]*

Among the means of transport used, three forms of mobility dominate (Table 3): driving a car (38.31%), walking (31.17%) and using public transport (28.57%). None of the survey participants indicated a traditional bicycle or an e-bike as a means of transport in Rijeka. Among the destinations for moving around the city, the university dominates (44.16%) while other important places for students include restaurants and cafés (14.29%) and services (10.39%).

The survey also asked whether respondents had ever had the opportunity to use an e-bike. The survey asked two questions: one was generally related to the use of an electric bike, and the other to e-bikes with the *Ricikleta* bike-sharing system (Table 4).

Table 4. Answers to the questions: "Have you ever used an e-bike or electric-assisted bicycle?" and "Have you ever used an e-bike from the Ricikleta e-bike sharing system?"

Question		%
Have you ever used an e-bike or electric-assisted bicycle?	Yes	22.08
	No	77.92
Have you ever used an e-bike from the Ricikleta e-bike sharing system?	Yes	5.84
	No	94.16

Source: authors' study based on surveys *[N=154]*

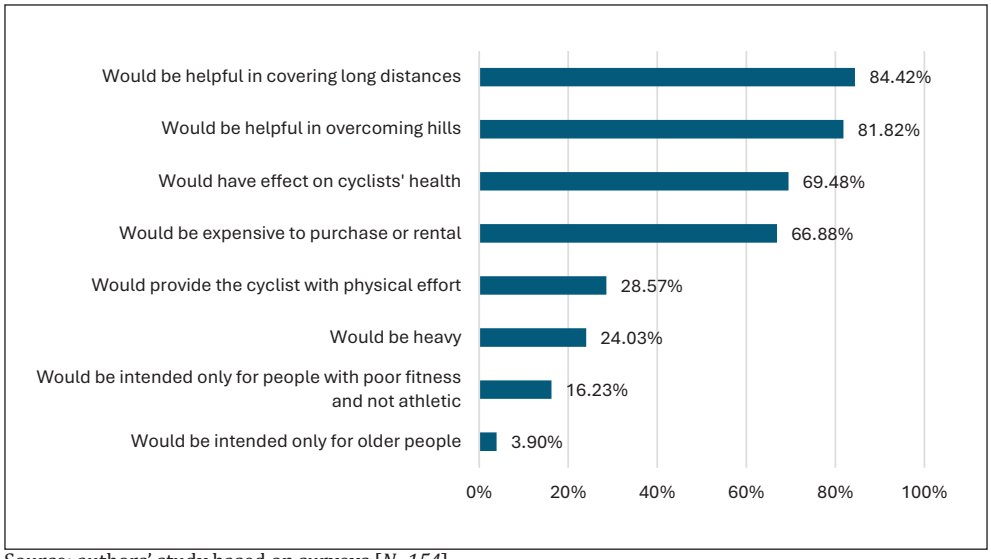
The majority of respondents have never used e-bikes, whether as private bikes or through a bicycle-sharing system. 77.92% of respondents indicated they had never used e-bikes, while in the case of the *Ricikleta* e-bike sharing system, 94.16% of respondents had not used it.

The diagnosis of the basic characteristics of the surveyed group indicates that women and those living outside the city centre dominate among respondents who most often move around the city to the university and to catering and service outlets, and that they

use public transport, a car or walk. It has also been shown that the experience of using e-bikes in the studied group is very small.

In the next part, the respondents' opinions regarding perceptions of e-bikes and the possibility of developing this form of mobility in the Rijeka area were analysed. Opinions on the possible impact of e-bikes on economic development, local businesses, tourism and student life in the city were also collected. First, the study group was asked about their general perception of e-bikes and the students indicated the opinions they agreed with (Figure 3).

Figure 3. Distribution of answers to the question: "Please mark the statements with which you agree: Electric bikes / electric-assisted bicycles in Rijeka…"



Source: authors' study based on surveys [*N=154*]

Among the most frequent were those indicating that e-bikes would help cover long distances (84.42%) and overcoming hills (81.82%). A high number of indications were also received for assessing that e-bikes would have an effect on health (69.48%) but also that e-bikes would be expensive to purchase or rent (66.88%). The fewest agreed with the statement that e-bikes would be intended only for older people (3.90%). Later in the survey, students answered questions directly about the impact of e-bikes on city development. First, they assessed their impact on local businesses, tourism and students' lives (Table 5), and on the city's image (Table 6).

Table 5. Answers to the questions: "Do you think that implementing measures to simplify the ownership and use of electric bikes, or extending an electric bike-sharing system, will have an impact on local business / tourism / students"

Category	Answer	%
Local business	Will increase the turnover of current businesses	22.73
	Will introduce new businesses	34.42
	Will have no influence	39.61
	Will reduce the turnover of existing businesses	3.25

Tourism	Will increase current tourists' interest in the city	32.47
	Will increase new tourists' interest in the city	37.01
	Will have no influence	29.22
	Will reduce tourists' interest in the city	1.30
Students	Will increase current students' interest in the city	31.82
	Will increase future students' interest in the city	31.17
	Will have no influence	35.71
	Will reduce students' interest in the city	1.30

Source: authors' study based on surveys *[N=154]*

Regarding the impact on local businesses, 39.61% of students considered that the introduction or development of e-bike mobility will have no influence, 34.42% said they would introduce new business, and 22.73% said they would increase the turnover of current businesses. In the assessment of the impact on tourism, it was most often indicated (37.01%) that it will increase new tourists' interest in the city while 32.47% said they would increase current tourists' interest in the city, and 29.22% said they would have no influence. Regarding students' everyday life, 35.71% said it would have no influence, 31.82% said it would increase current students' interest and 31.17% said it would increase future students' interest.

Table 6. Distribution of answers to the question: "How can implementing measures to simplify the ownership and use of electric bikes, or extending an electric bike-sharing system, influence the image of the city?"

Answer	%
Positively	74.03
May not have an influence	22.08
Negatively	3.90

Source: authors' study based on surveys *[N=154]*

As for the overall impact of e-bikes on the city's image, 74.03% of respondents assessed that it may have a positive impact, 22.08% it may not have an influence and 3.90% that the impact may be negative (Table 6).

The next section assessed opinions on e-bikes (both private and e-bike sharing) and their impact on specific aspects of the city's economic development (Tables 7 and 8). Respondents assessed whether they agreed with the given statements using a scale from 1 to 5, where 1 means "strongly disagree" and 5 means "strongly agree." For each of the evaluated statements, the arithmetic mean of the grades given by the respondents was calculated.

Table 7. Average answer to the question: "Please rate the following statements about e-bikes as a sharing system on a scale of 1 to 5, where 1 means 'strongly disagree' and 5 means 'strongly agree'"

Answer	Mean
E-bike-sharing could create new business opportunities in Rijeka, such as rental, repair, charging and parking services	3.928
The economic benefits of e-bike-sharing would depend on safe cycling infrastructure, affordable prices and good integration with public transport	3.902
E-bike-sharing could support the development of sustainable tourism in Rijeka	3.772
E-bike-sharing could encourage tourists to visit local businesses outside the city centre	3.655

E-bike-sharing could make Rijeka more attractive to tourists	3.616
E-bike-sharing could make Rijeka more attractive as a university city	3.584
E-bike-sharing could encourage students to spend more time and money in different parts of Rijeka	3.571
The expansion of e-bike-sharing in Rijeka could have a positive impact on the city's overall economic situation	3.422
Source: authors' study based on surveys *[N=154]*	

In the evaluation of e-bikes within the bicycle sharing system, the highest average score was obtained for the following statements: "E-bike-sharing could create new business opportunities in Rijeka, such as rental, repair, charging and parking services" (3.928) and "The economic benefits of e-bike-sharing would depend on safe cycling infrastructure, affordable prices and good integration with public transport" (3.902). On the other hand, the respondents rated the statement "The expansion of e-bike-sharing in Rijeka could have a positive impact on the city's overall economic situation" (3.422) lowest. It should be noted, however, that all the statements evaluated in this question achieved average grades in the range of 3.422–3.928.

Table 8. Average answers to the question: "Please rate the following statements about e-bikes on a scale of 1 to 5, where 1 means 'strongly disagree' and 5 means 'strongly agree'"

Answer	Mean
E-bikes could help tourists access more locations in Rijeka, including beaches, viewpoints, cultural sites, restaurants and surrounding areas	4.019
E-bikes could strengthen the connection between student areas, university facilities and the city centre	3.850
E-bikes could improve access to local shops, cafés, restaurants, services and cultural venues in Rijeka	3.727
Increasing the number of e-bikes in Rijeka could improve residents' mobility and support local economic activity	3.701
Improved student mobility through e-bikes could support the development of student-oriented businesses and services	3.597
Investment in e-bike infrastructure could benefit local businesses	3.409

Source: authors' study based on surveys *[N=154]*

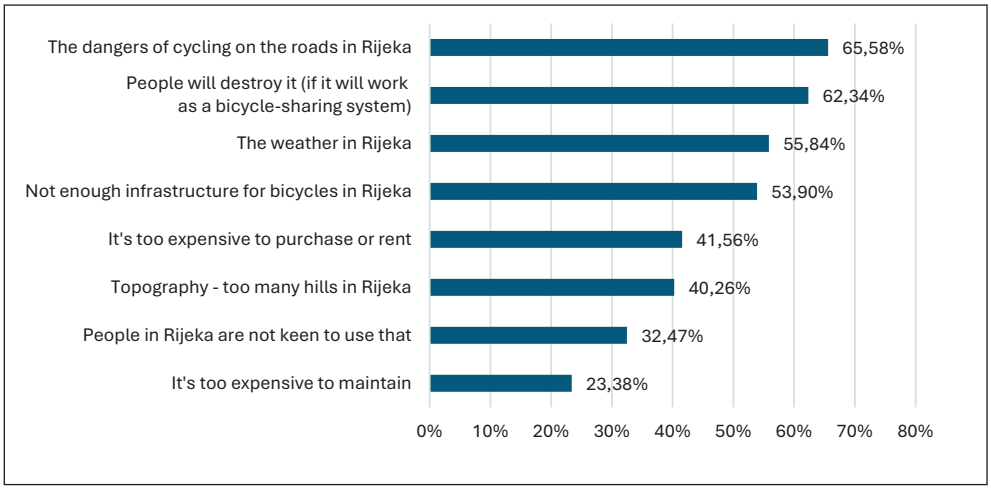
In the evaluation of e-bikes as private bikes, the highest average rating was obtained for the statement "E-bikes could help tourists access more locations in Rijeka, including beaches, viewpoints, cultural sites, restaurants and surrounding areas" (4.019), the lowest was for "Investment in e-bike infrastructure could benefit local businesses" (3.409).

The last question in the survey asked students about the barriers to the development of e-bike mobility in Rijeka. The question was multiple-choice (Figure 4).

The most frequently indicated were the dangers of cycling on the roads in Rijeka (65.58%), the risk of bicycle damage (62.34%), the weather (55.84%) and the underdeveloped cycling infrastructure in the city (53.90%). The least frequently reported barrier was the cost of maintaining an electric bicycle (23.38%).

This section of the survey shows how the students perceive the possibility of developing e-bikes and how they assess the impact of this form of mobility on various aspects of the city of Rijeka's economic development. However, respondents see significant barriers that may limit the development of e-bikes in Rijeka.

Figure 4. Distribution of answers to the question: "What might be the barriers to the development of mobility based on e-bikes / electric-assisted bicycles in Rijeka? You may select more than one answer"



Source: authors' study based on surveys *[N=154]*

Summary

The study identified opportunities to increase the share of e-bikes in Rijeka, Croatia. As previously assumed, this solution could be the answer to the mobility problems in this city in many respects, especially given the topography and many steep roads, not only in the centre but also throughout the city. It was also assumed that the development of e-bike mobility could be a good solution not only for the city's permanent residents, but also for tourists and students, and could contribute to the city's economic development or even promote it on a regional scale.

Students, as one of the most important participants in the city, were asked for their opinions on the potential for e-bike mobility in Rijeka. The study was conducted on a sample of 154, which allowed for careful inferences and answers to the research questions posed in the article.

As diagnosed in the study, the most popular means of transport are public, walking and driving with the last of these modes being treated as the least desirable in the context of sustainable transport. The survey also showed that among the respondents, no one was riding a bicycle around the city. In the context of the potential impact of e-bike mobility on economic development, students recognise this potential; moreover, their most frequent travel destinations – the university, food outlets and service points – suggest that improving access to them could bring economic benefits to these businesses. Respondents rate the growth potential as high or of little consequence due to the increase in the share of e-bikes across local business, tourism and student life. However, it should be mentioned that the potential of this form of mobility in tourism was rated the highest. The students participating in the study also see opportunities to develop local businesses and increase the reach and goals of their trips, with the potential development of e-bikes.

On the other hand, the respondents' answers clearly indicate the need to increase cyclist safety on the road and to create bicycle infrastructure. These observations are

particularly important in the context of spatial planning in a densely built-up city centre. Among the mentioned barriers, infrastructure destruction, such as public bicycle systems, as well as unfavourable weather conditions for cycling, are also of great importance. Nevertheless, among the surveyed students, a mostly positive or indifferent attitude towards e-bikes was demonstrated, emphasising that the majority believe that the development of this form of mobility can have a positive impact on the city's image.

Based on the survey results, it can be concluded that, in the opinion of students in Rijeka, there is potential for an increase in e-bike mobility, and that this development can have a noticeable impact on local and regional development. However, for further development, it is necessary to take into account the potential problems and barriers identified. In this regard, the need to provide conditions for safe bicycle traffic in the city comes to the fore. At the same time, given the means of transport students use, it is necessary to promote and encourage the use of e-bikes. However, it should be emphasized that according to the results obtained the vast majority did not use an e-bike or e-bike sharing system, which may have an impact on the assessment of this form of mobility on economic development.

The limitations of the study include the specific group of respondents selected, as well as its local nature and the specific culture of mobility. Further studies can solve the limitations by taking into account the opinions of other potential bicycle users and including other case studies, also in other countries.

The results obtained can serve as a guideline for planning the development of e-bike mobility in cities struggling with high levels of car traffic, limited space for infrastructure development for other road users, and topography unfavourable to active mobility (cycling and walking). Further research on e-bike mobility and bicycle traffic planning in Rijeka and cities with similar spatial problems should focus primarily on planning bicycle infrastructure and on the possibilities of switching to mobility modes other than passenger cars.

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External shocks and international trade in services, with particular emphasis on the V-4

Abstract: This article attempts to answer the following main research question: how three selected external economic shocks (the 2008–2009 global financial crisis, the COVID-19 pandemic and Russia's invasion of Ukraine) might have influenced international trade in services between 2005 and 2024. Sixteen specific research questions have been formulated regarding such trade (global exports and imports, as well as the three most important types of service) on a global scale, with a particular focus on the Visegrad Group (V4) countries. The following research methods were applied: a literature review on economic shocks (including the author's own classification of such shocks), source text analysis, logical inference, deductive reasoning, documentary and critical analysis methods, descriptive analysis and comparative analysis. Following the planned analyses, it was indicated which external shocks might have had the greatest impact on the trade in services (2 cases), and which might have had a high (6 cases), medium (15) or low (9) impact. Cases of no potential impact were also identified (16). The issues presented in this article represent an attempt to highlight key and significant areas for further analysis. In the author's view, it contributes to the discussion on the development and determinants of international service trade, assuming further, progressive "servicization" on a global scale.

Keywords: external shocks; international trade; international trade in services; trade sectors in services; V4 countries

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Introduction

Over nearly the past half-century of global economic development, a dynamic increase in the significance of international trade in services can be observed. The value of global service exchange is rising, and the service export ratio is expanding in many countries worldwide – indicating that the service sector plays an increasingly vital role in economic development. When comparing data from 1980 and 2024, the growth dynamics of global

service exports and imports outpace those of goods: merchandise exports – 1.193%, service exports – 2.237%; merchandise imports – 1.185%, service imports – 1.804%, as presented in Table 1 below.

Table 1. Dynamics of world export and import of services, 1980–2024, billion USD

International trade in services	Billion USD	Percentage change
Exports of services in 2024	8,852.172	
Imports of services in 2024	8,078.610	
Exports of services in 1980	395.66	2.237%
Imports of services in 1980	447.77	1.804%
International trade in goods		
Exports of goods in 2024	24,456.413	
Imports of goods in 2024	24,782.764	
Exports of goods in 1980	2,050.129	1.193%
Imports of goods in 1980	2,091.006	1.185%

Source: https://unctadstat.unctad.org/datacentre/dataviewer/US.TradeServCatTota (access: 4.11.2025)

It therefore seems justified to use the term "servicization" in reference to the processes occurring in the internationalizing world economy. In the era of globalization, the 21st century may be not only the century of services, but also the century of internationally traded services.

These processes may be influenced by various phenomena that disintegrate the global economy. The contemporary world is becoming increasingly incomprehensible to those engaged in foreign economic exchange. The realities of international business (international management processes, international marketing, international finance, international transport, freight forwarding and logistics, and finally international trade) involve continuous and unpredictable disruptions that often lead to chaos, misinformation and so-called discontinuities. There is an observed uncertainty, volatility and complexity in business models, as well as a tension between accumulated, processed and implemented business knowledge and the potential methods for solving the diverse problems faced by market participants on both the demand and supply sides. The 21st century has brought severe global turmoil that has significantly impacted international business. Between periods of predictable stability – often lasting several decades – there emerge sudden, unprecedented phenomena referred to as "discontinuities" in developmental processes. They have had (and continue to have) a massive impact on humanity, global business and the natural environment. However, there is one fundamental difference: today, these discontinuities occur much more frequently, triggering a state of chaos and international disruption. One can only agree with the prophetic thesis of Płoszajski (2005) who, even before the greatest external shocks of the 21st century, wrote that "the fate of the world (including the business world) has always been shaped by events which, in light of current beliefs, 'had no right to happen' – at least not so quickly." Thus, one can cite here the global financial crisis of 2008–2009, the COVID-19 pandemic, the invasion of independent Ukraine by the Russian Federation in February 2022, and the aftermath of these events.

The purpose of this study is to attempt to answer the following main research question (MRQ): how have these three external shocks affected international trade in services between 2005 and 2024? Sixteen detailed research questions (DRQs) have been

formulated regarding turnover in trade in services (both in total and across the three main types of services) on a global scale, with a particular focus on the Visegrad Group (V4) countries (Poland, Czechia, Hungary and Slovakia).

The Visegrad Group countries share common historical and cultural roots, the post-1989 transformation and the treaty obligation to adopt the euro which is linked to EU membership. However, they are currently divided by different geopolitical aspirations and economic strategies, which is reflected in the structural divergence of their international trade in services and best seen in the example of monetary integration: Slovakia has already adopted the common currency, while Poland, Czechia and Hungary are deliberately postponing this process in order to maintain monetary independence.

How, then, did these three external shocks affect:

1. commercial services trade turnover between 2005 and 2024:
   a) global exports (DRQ1) and global imports (DRQ2),
   b) V4 exports (DRQ3) and V4 imports (DRQ4);
2. transport services trade turnover between 2005 and 2024:
   a) global exports (DRQ5) and global imports (DRQ6),
   b) V4 exports (DRQ7) and V4 imports (DRQ8);
3. travel services trade turnover between 2005 and 2024:
   a) global exports (DRQ9) and global imports (DRQ10),
   b) V4 exports (DRQ11) and V4 imports (DRQ12);
4. other business services trade turnover between 2005 and 2024:
   a) global exports (DRQ13) and global imports (DRQ14),
   b) V4 exports (DRQ15) and V4 imports (DRQ16)?

The following research methods were applied in this study: a review of the relevant literature, source text analysis, logical inference, deductive reasoning, documentary and critical analysis, descriptive analysis and comparative analysis.

Literature review

Economic shocks have long been a feature of the global economy, yet they have become particularly salient in recent years. A shock is a specific event that disrupts an economy or economies from a state of equilibrium. Economic shocks are classified into external (also referred to as exogenous) and internal (endogenous). The European Commission economic paper (*Economic Policy*..., 1997) distinguishes between country- and region--specific shocks, real and financial shocks, and exogenous versus policy-induced shocks. Another classification was proposed by Czaja (2007). Based on a scale criterion, he distinguished between macro-scale and micro-scale shocks; based on the symmetry criterion, between symmetric and asymmetric shocks; based on the source criterion, external (exogenous) and internal (endogenous) shocks; based on the absolute value criterion, positive and negative shocks; based on the market criterion, supply and demand shocks; and based on a type criterion, technical and oil shocks. The author of this study proposes the following classification, which may be somewhat narrower, yet more illustrative of the current state of the global economy – Table 2.

Table 2. Author's classification of economic shocks

Economic shocks	
External (exogenous)	Internal (endogenous)
– global financial and economic crises – pandemics – energy and commodity crises – climate crisis – migration crisis – armed conflicts, wars – shifts in the economic policies of major powers (e.g. Trump's tariff war 2.0 or Brexit) – AI / technological changes	– hyperinflation – price adjustments / price regulations – sharp fluctuations in the domestic exchange rate – changes in the money supply – tax policy changes – changes in trade policy instruments – regulation of the income redistribution model – unemployment – decline in household incomes

Source: author

It is also worth noting that – despite the intuitive negative connotations associated with the word 'shock' – a sudden, unforeseen event can be positive in nature. Examples include successful innovations, breakthrough inventions, beneficial investments, revolutionary scientific discoveries, positive supply shocks and favorable environmental conditions for agricultural cultivation. Furthermore, creative destruction is observed across specific sectors of the global economy, where resources (capital, labor) are first abruptly released and subsequently utilized in a more innovative, efficient and profitable manner (Zysk, Gryczka, 2025). Table 3 presents selected examples of attempts to define and describe issues related to economic shocks in the relevant literature.

Table 3. Summary of some research results focused on economic shocks

Source	Subject matter	Key findings
Kucharski (2014)	Shocks to the economy	Every market economy is subject to cyclical fluctuations. Aggregate output is influenced by various types of demand and supply shock.
Troise et al. (2022)	VUCA, VUCA2	To characterize the environment in which economies, organizations or individuals operate, the term VUCA2 is frequently utilized, highlighting its volatility, uncertainty, complexity and ambiguity.
Espitia et al. (2022)	The COVID-19 pandemic and economic disruptions	The COVID-19 pandemic induced both a demand and a supply shock, thereby materializing the risks associated with the system of international economic interdependencies built over decades.
Mbah, Wasum (2022)	The economic ramifications of Russia's invasion of Ukraine	The sequence of adverse economic shocks and the global economic crisis triggered by Russia's armed aggression against Ukraine.
Vandenbussche et al. (2022)	The economic ramifications of Brexit	Service sectors are particularly vulnerable to the indirect effects of trade shocks due to their central position in the network.
Bukowski et al. (2023)	The economic impact of the COVID-19 pandemic	The COVID-19 pandemic has altered the pace and direction of several constituent processes of globalization.

Gorynia, Trąpczyński (2023)	Economic crises	The third decade of the 21st century has brought two severe economic crises with profound and multidimensional repercussions for the global economy.
Ciravegna et al. (2023)	Exogenous and endogenous economic shocks	The "new normal" is characterized by frequent disruptive events in the international business environment, such as the COVID-19 pandemic and the Russia-Ukraine conflict.
Aiyar et al. (2023)	International trade in commercial services (among others)	A fragmentation into three worlds could occur: the Global West (led by the United States and Europe), the Global East (under the aegis of China and Russia), and the Global South (developing nations) with protectionist consequences.
Sawadogo et al. (2024)	International trade in services in SSA (Sub--Saharan Africa)	Total services exports, transport services exports, travel services, insurance services, financial services, charges for the use of intellectual property, and other business services foster the diversification of export products.
Trzonkowski (2026)	Shocks to the economy	Economic shocks are an inherent feature of economic performance at both global and regional scales

Source: author

As illustrated in the table above, referencing even a few select studies clearly reveals that the global economy is heading toward an inevitable transformation (potentially manifesting as a slow deglobalization), rendering the introduction of the concept of "polycrisis" into the discourse on the future of international business highly justified (Malewska, 2025).

International trade in services in the years 2005–2024 and selected economic shocks

In line with the research assumptions, an attempt will be made to address the main research question (MRQ): how did these three selected external shocks (the global financial crisis of 2008–2009, the COVID-19 pandemic and the invasion of independent Ukraine by the Russian Federation in February 2022) affect international trade in services between 2005 and 2024? To achieve this, detailed research was conducted guided by sixteen detailed research questions (DRQs). Consequently, the study will present findings regarding international trade in services turnover (exports and imports) focusing on the three most significant types of services from a global perspective, with particular emphasis on the Visegrad Group (V4) countries (Poland, Czechia, Hungary and Slovakia).

International trade turnover in commercial services between 2005 and 2024

This section presents the international trade turnover in commercial services (which encompass financial and insurance services, consulting and professional services, marketing and PR services, trade and repair services, transport and logistics services, travel and food services, IT and telecommunications services, real estate and construction services, recreational, sports and cultural services, as well as personal [B2C] services) from both a global perspective (exports and imports) and within the Visegrad Group (V4) countries (likewise covering exports and imports).

Global exports (DRQ1)

As illustrated in the Figure 1, during the global financial crisis, global commercial services exports experienced a contraction, falling from USD 4,023.9 billion in 2008 to USD 3,603.2 billion in 2009 while reaching only USD 3,926.3 billion in 2010 (representing a two-year adverse impact, highlighted in orange on the chart). Similarly, during the COVID-19 pandemic, exports declined from USD 6,320.2 billion in 2019 to USD 5,247.4 billion in 2020 while reaching only USD 6,328.6 billion in 2021 (likewise indicating a two-year adverse impact, highlighted in orange on the chart). Conversely, following the invasion of independent Ukraine by the Russian Federation in February 2022, no decline in global commercial services exports was recorded in either 2023 or 2024.

Global imports (DRQ2)

As illustrated in the Figure 2, during the global financial crisis, global commercial services imports experienced a contraction, falling from USD 3,869.8 billion in 2008 to USD 3,465.6 billion in 2009 while reaching only USD 3,789.8 billion in 2010 (representing a two-year adverse impact, highlighted in orange on the chart). Similarly, during the COVID-19 pandemic, imports declined from USD 6,031.9 billion in 2019 to USD 4,967.5 billion in 2020 while reaching only USD 5,776.9 billion in 2021 (likewise indicating a two-year adverse impact, highlighted in orange on the chart). Conversely, following the invasion of independent Ukraine by the Russian Federation in February 2022, no decline in global commercial services imports was recorded in either 2023 or 2024 – analogously to the trend observed in exports.

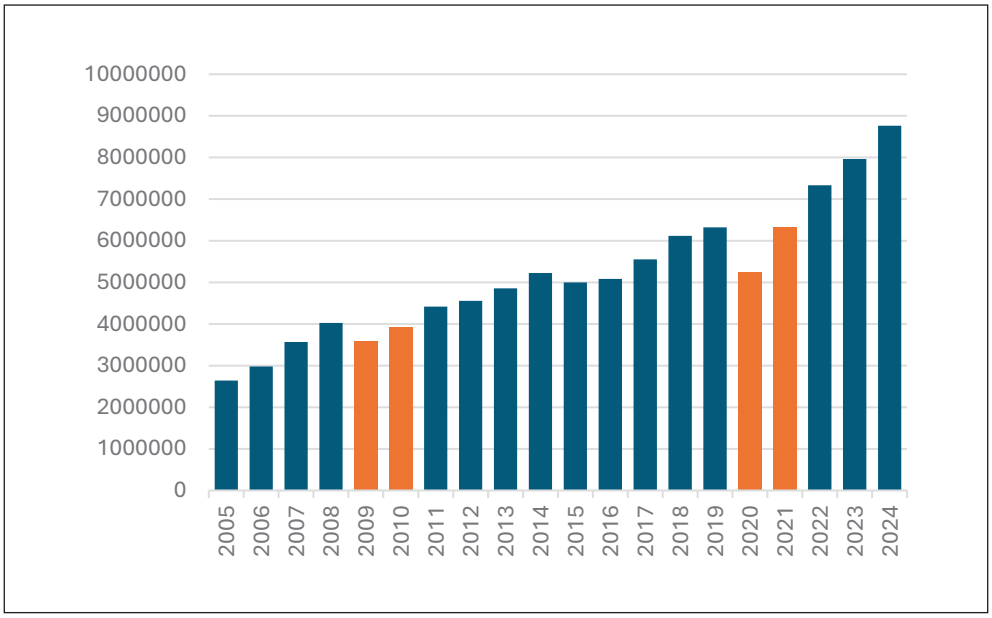
V4 countries' exports (DRQ3)

As illustrated in the Figure 3, during the global financial crisis, commercial services exports from the V4 countries experienced a decline from USD 91.3 billion in 2008 to USD 76.7 billion in 2009 while reaching only USD 82.5 billion in 2010 (representing a two-year negative impact, indicated in orange on the chart). Similarly, during the COVID-19 pandemic, exports fell from USD 143.8 billion in 2019 to USD 126.2 billion in 2020 (reflecting a negative impact of only one year, indicated in orange on the chart). In contrast, following the Russian Federation's invasion of sovereign Ukraine in February 2022, no decline in commercial services exports from the four analyzed countries was recorded in either 2023 or 2024 – a trend that aligns with global export and import developments.

V4 countries' imports (DRQ4)

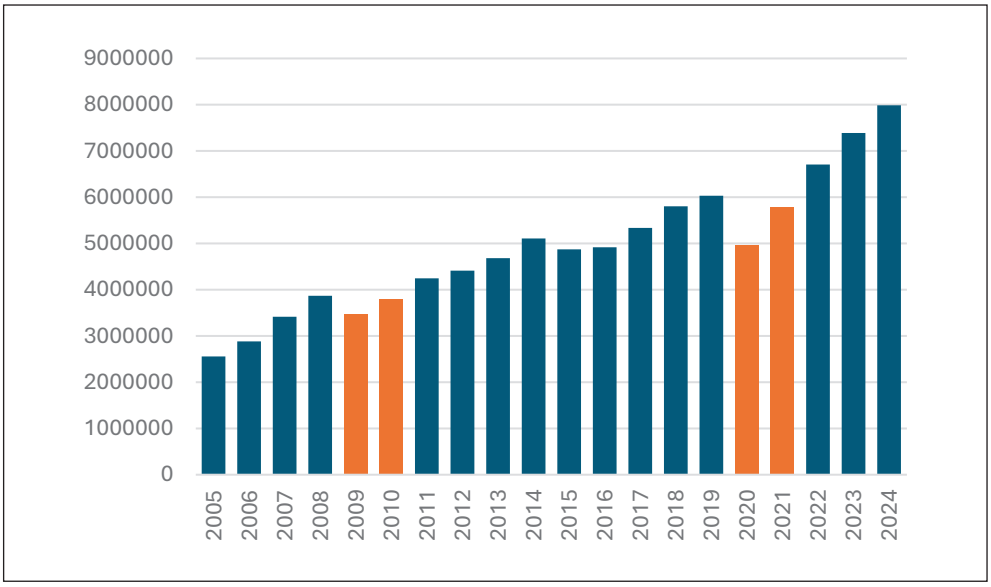
As illustrated in the Figure 4, during the global financial crisis, commercial services imports into the V4 countries experienced a decline from USD 80.3 billion in 2008 to USD 68.3 billion in 2009 while reaching only USD 74.6 billion in 2010 (representing a two-year negative impact, indicated in orange on the chart). Similarly, during the COVID-19 pandemic, imports fell from USD 107.5 billion in 2019 to USD 94.3 billion in 2020 (reflecting a negative impact of only one year, indicated in orange on the chart). In contrast, following the Russian Federation's invasion of sovereign Ukraine in February 2022, no decline in commercial services

Figure 1. Global commercial services exports, 2005–2024, in USD million



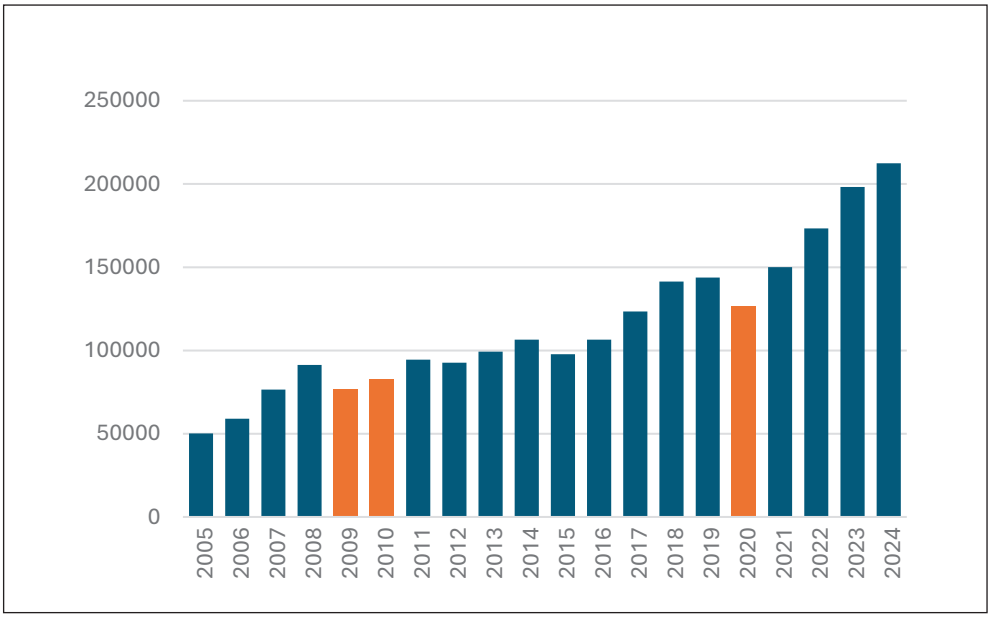
Source: own calculations based on: https://stats.wto.org/ (access: 24.10.2025)

Figure 2. Global commercial services imports, 2005–2024, in USD million



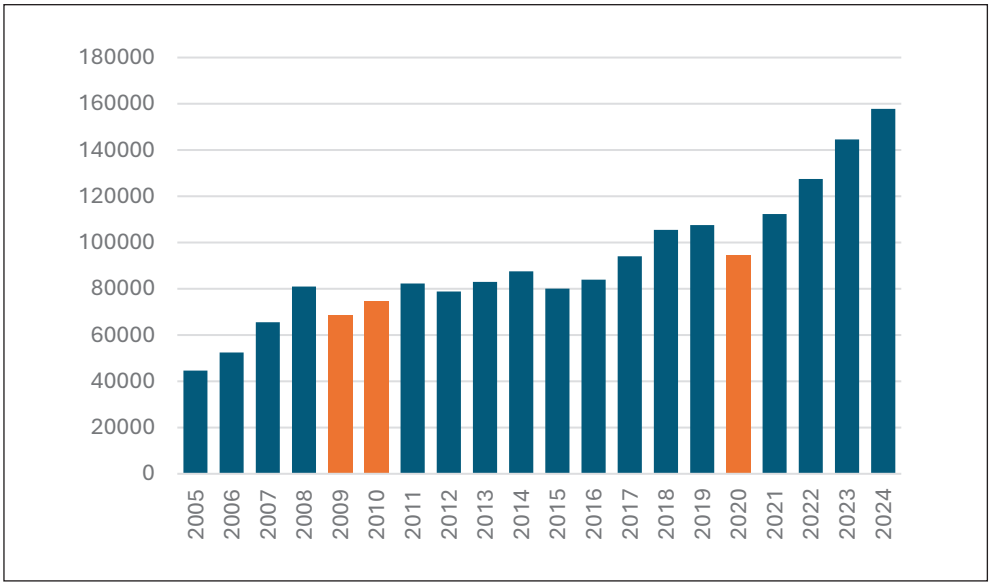
Source: as for Figure 1

Figure 3. Commercial services exports of the V4 countries, 2005–2024, USD million



Source: as for Figure 1

Figure 4. Commercial services imports of the V4 countries, 2005–2024, USD million



Source: as for Figure 1

Source: as for Figure 1

imports into the four analyzed countries was recorded in either 2023 or 2024 – a trend that aligns with global export and import developments as well as V4 countries' exports.

Trade in transport services, 2005–2024

This section presents international trade in transport services (comprising maritime transport, inland/land transport, air transport, space transport, and auxiliary and supporting services for all modes of transport, such as cargo handling, storage and warehousing, freight forwarding, and cargo inspection) from both a global perspective (exports and imports) and within the Visegrad Group (V4) countries (likewise covering exports and imports).

Global exports (DRQ5)

As illustrated in the Figure 5, during the global financial crisis, global exports of transport services experienced a decline from USD 910.7 billion in 2008 to USD 709.8 billion in 2009 while reaching only USD 828.9 billion in 2010 and USD 905.9 billion in 2011 (representing a three-year negative impact, indicated in orange on the chart). Similarly, during the COVID-19 pandemic, exports fell from USD 1,051.2 billion in 2019 to USD 881.9 billion in 2020 (reflecting a negative impact of also only one year, indicated in orange on the chart). Following the Russian Federation's invasion of sovereign Ukraine in February 2022, a decline in global transport services exports was also recorded, dropping from USD 1,539.3 billion in 2022 to USD 1,369.8 billion in 2023, while reaching only USD 1,482.9 billion in 2024 (representing a two-year negative impact, indicated in orange on the chart).

Global imports (DRQ6)

As illustrated in the Figure 6, during the global financial crisis, global imports of transport services experienced a decline from USD 1,054.8 billion in 2008 to USD 827.6 billion in 2009 while reaching only USD 976.4 billion in 2010 (representing a two-year negative impact, indicated in orange on the chart). Similarly, during the COVID-19 pandemic, imports fell from USD 1,244 billion in 2019 to USD 1,043.9 billion in 2020 (reflecting a negative impact of also only one year, indicated in orange on the chart). Following the Russian Federation's invasion of sovereign Ukraine in February 2022, a decline in global transport services imports was also recorded, dropping from USD 1,749 billion in 2022 to USD 1,669.1 billion in 2023, while reaching only USD 1,746.4 billion in 2024 (representing a two-year negative impact – consistent with export trends, indicated in orange on the chart).

V4 countries' exports (DRQ7)

As illustrated in the Figure 7, during the global financial crisis, transport services exports from the V4 countries experienced a decline from USD 23.4 billion in 2008 to USD 18.8 billion in 2009, to USD 19.4 billion in 2010, while reaching only USD 23.2 billion in 2011 and USD 22.9 billion in 2012 (representing a negative impact lasting as long as four years, indicated in orange on the chart). Similarly, during the COVID-19 pandemic, exports fell

from USD 37.1 billion in 2019 to USD 33.8 billion in 2020 (reflecting a negative impact of only one year, indicated in orange on the chart). In contrast, following the Russian Federation's invasion of sovereign Ukraine in February 2022, no decline in commercial services exports from the four analyzed countries was recorded in either 2023 or 2024 – diverging from the trends observed in global transport services exports and imports.

V4 countries' imports (DRQ8)

As illustrated in the Figure 8, during the global financial crisis, transport services imports into the V4 countries experienced a decline from USD 16 billion in 2008 to USD 12.3 billion in 2009, while reaching only USD 14.5 billion in 2010 (representing a two-year negative impact, indicated in orange on the chart). Similarly, during the COVID-19 pandemic, imports fell from USD 23.6 billion in 2019 to USD 21.4 billion in 2020 (reflecting a negative impact of only one year, indicated in orange on the chart). Following the Russian Federation's invasion of sovereign Ukraine in February 2022, a decline in transport services imports into the four analyzed countries was also recorded, dropping from USD 35.8 billion in 2022 to USD 33.5 billion in 2023, while reaching only USD 35.4 billion in 2024 (representing a two-year negative impact, indicated in orange on the chart) – diverging from the trend observed in V4 countries' exports.

Trade in travel services, 2005–2024

This section presents international trade in travel services (comprising accommodation and food services, including restaurant and catering services, travel agency and tour operator services, tour guide services and other operations directly linked to tourism) from both a global perspective (exports and imports) and within the Visegrad Group (V4) countries (likewise covering exports and imports).

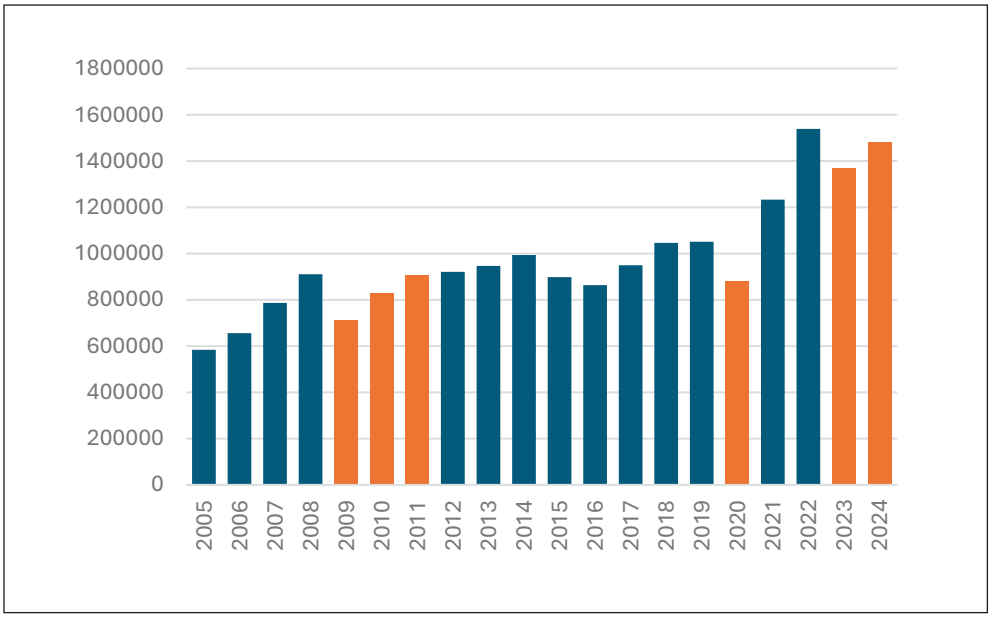
Global exports (DRQ9)

As illustrated in the Figure 9, during the global financial crisis, global exports of travel services experienced a decline from USD 971.8 billion in 2008 to USD 894 billion in 2009, while reaching only USD 966.7 billion in 2010 (representing a two-year negative impact, indicated in orange on the chart). During the COVID-19 pandemic, exports suffered a sharp decline from USD 1,495.3 billion in 2019 to USD 570.4 billion in 2020, while reaching only USD 655.8 billion in 2021, and USD 1,151.7 billion in 2022 (reflecting a three-year negative impact, indicated in orange on the chart). In contrast, following the Russian Federation's invasion of sovereign Ukraine in February 2022, no decline in global travel services exports was recorded.

Global imports (DRQ10)

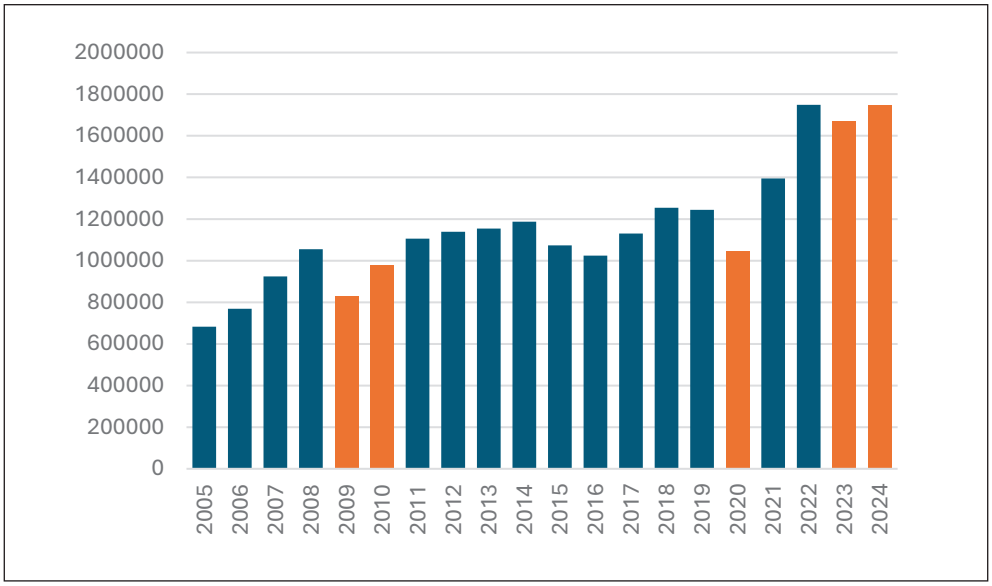
As illustrated in the Figure 10, during the global financial crisis, global imports of travel services experienced a decline from USD 880.3 billion in 2008 to USD 809.3 billion in 2009 (representing a one-year negative impact, indicated in orange on the chart). During the COVID-19 pandemic, imports suffered a sharp decline from USD 1,419.8 billion in 2019 to USD 567 billion in 2020 and to USD 641 billion in 2021, while reaching only USD

Figure 5. Global exports of transport services, 2005–2024, USD million



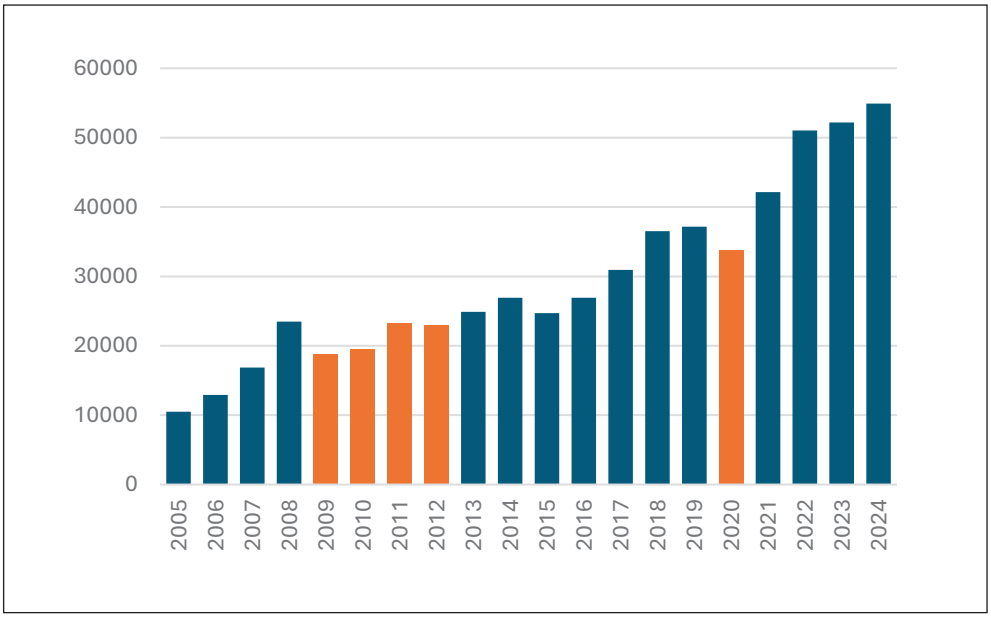
Source: as for Figure 1

Figure 6. Global imports of transport services, 2005–2024, USD million



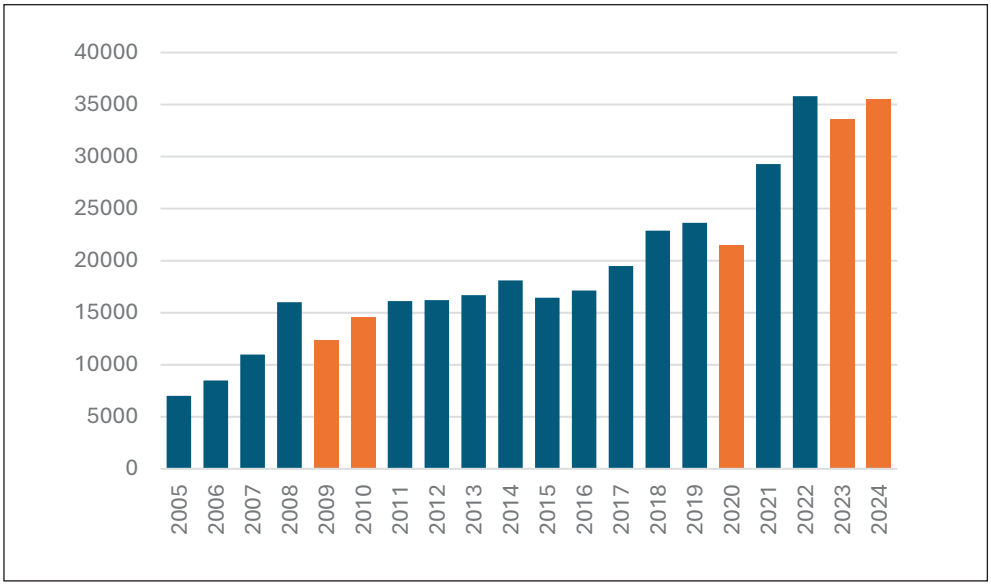
Source: as for Figure 1

Figure 7. Transport services exports of the V4 countries, 2005–2024, USD million



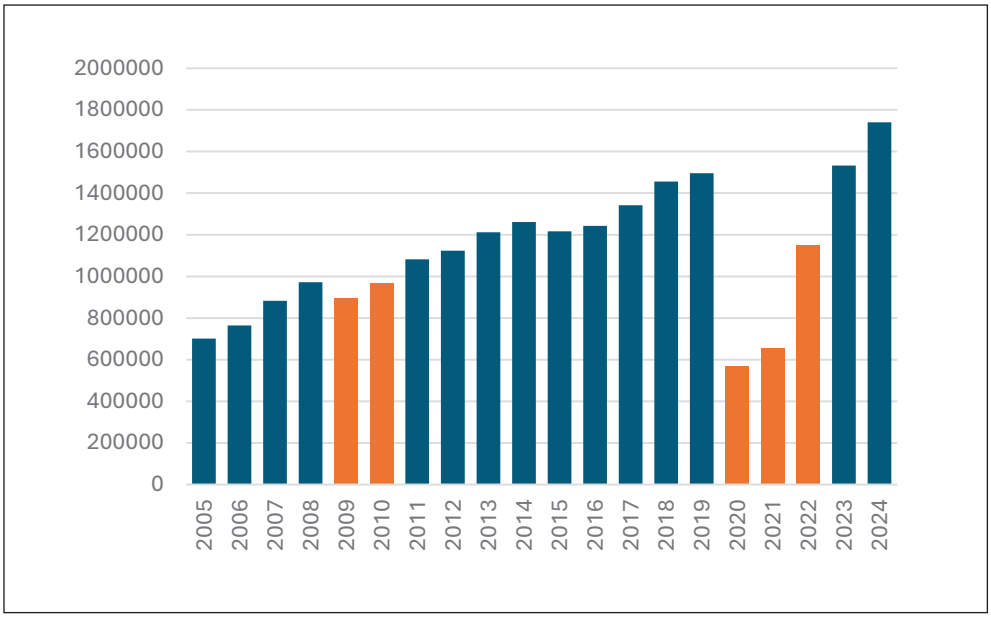
Source: as for Figure 1

Figure 8. Transport services imports of the V4 countries, 2005–2024, USD million



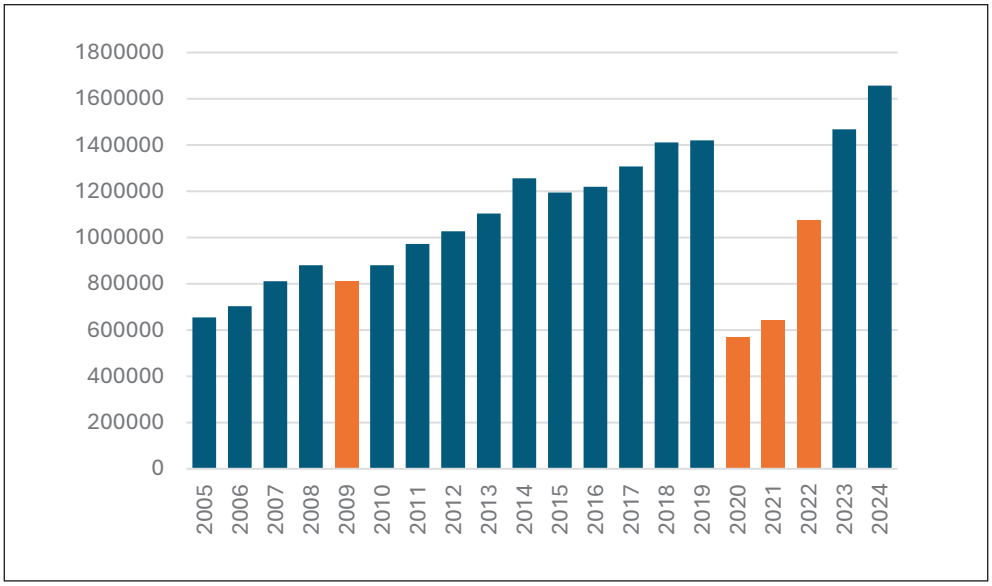
Source: as for Figure 1

Figure 9. Global exports of travel services, 2005–2024, USD million



Source: as for Figure 1

Figure 10. Global imports of travel services, 2005–2024, USD million



Source: as for Figure 1

1,074.7 billion in 2022 (reflecting a three-year negative impact, indicated in orange on the chart). In contrast, following the Russian Federation's invasion of sovereign Ukraine in February 2022, no decline in global travel services imports was recorded – a trend that aligns with export developments.

V4 countries' exports (DRQ11)

As illustrated in the Figure 11, during the global financial crisis, travel services exports from the V4 countries experienced a multi-year decline from USD 29.2 billion in 2008 to USD 24.7 billion in 2009, USD 24.5 billion in 2010, USD 27.1 billion in 2011, USD 25.6 billion in 2012, USD 26.2 billion in 2013, USD 26.9 billion in 2014, USD 24.1 billion in 2015, and USD 25.6 billion in 2016 (representing a negative impact lasting as long as eight years, indicated in orange on the chart). Similarly, during the COVID-19 pandemic, exports suffered a sharp decline from USD 32.1 billion in 2019 to USD 16.5 billion in 2020, and USD 18 billion in 2021 while reaching only USD 26.9 billion in 2022 (reflecting a three-year negative impact, indicated in orange on the chart). In contrast, following the Russian Federation's invasion of sovereign Ukraine in February 2022, no decline in travel services exports from the four analyzed countries was recorded in either 2023 or 2024 – a trend that aligns with global export and import developments for these services.

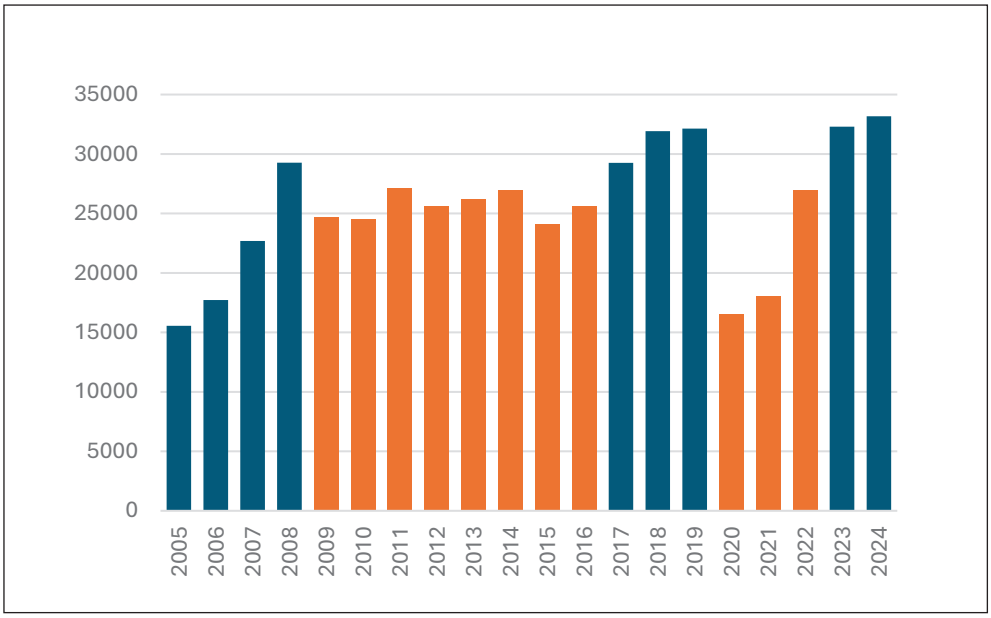
V4 countries' imports (DRQ12)

As illustrated in the Figure 12, during the global financial crisis, travel services imports into the V4 countries experienced a multi-year decline from USD 20.2 billion in 2008 to USD 16.4 billion in 2009, USD 16.9 billion in 2010, USD 17.7 billion in 2011, USD 17 billion in 2012, USD 17.5 billion in 2013, USD 18.1 billion in 2014, USD 16.4 billion in 2015, USD 17.2 billion in 2016 and USD 19.2 billion in 2017 (representing a negative impact lasting as long as nine years, indicated in orange on the chart). Similarly, during the COVID-19 pandemic, imports suffered a sharp decline from USD 20.6 billion in 2019 to USD 11.6 billion in 2020, while reaching only USD 12.3 billion in 2021 and USD 17.6 billion in 2022 (reflecting a three-year negative impact, indicated in orange on the chart). In contrast, following the Russian Federation's invasion of sovereign Ukraine in February 2022, no decline in travel services imports into the four analyzed countries was recorded in either 2023 or 2024 – a trend that aligns with global export and import developments for these services, as well as V4 countries' exports.

Trade in other business services, 2005–2024

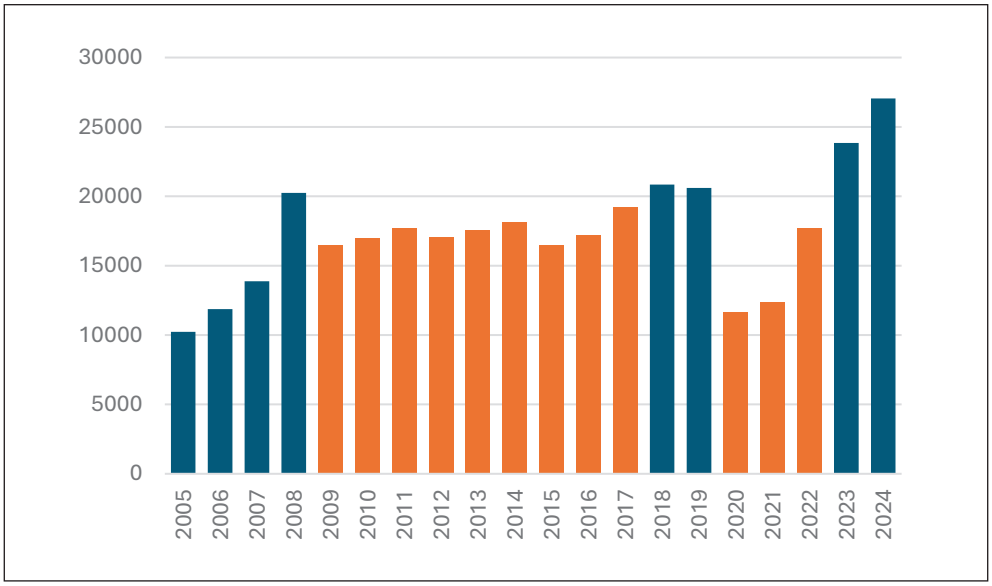
This final analysis presents international trade in other business services (comprising research and development (R&D) services, professional and management consulting services – including legal, tax, accounting, HR or PR services – marketing and market research, technical and architectural services, as well as operational leasing and rentals) from both a global perspective (exports and imports) and within the Visegrad Group (V4) countries (likewise covering exports and imports).

Figure 11. Travel services exports of the V4 countries, 2005–2024, USD million



Source: as for Figure 1

Figure 12. Travel services imports of the V4 countries, 2005–2024, USD million



Source: as for Figure 1

Global exports (DRQ13)

As illustrated in the Figure 13, a decline in global exports of other business services was recorded only during the global financial crisis, dropping from USD 2,012.4 billion in 2008 to USD 1,880.5 billion in 2009, while reaching only USD 2,001.8 billion in 2010 (representing a two-year negative impact, indicated in orange on the chart). Interestingly, no decline in global exports of these services was recorded either during the COVID-19 pandemic or following the Russian Federation's invasion of sovereign Ukraine in February 2022.

Global imports (DRQ14)

As illustrated in the Figure 14, a decline in global imports of other business services was recorded only during the global financial crisis, dropping from USD 1,845.4 billion in 2008 to USD 1,755.3 billion in 2009, while reaching only USD 1,848.8 billion in 2010 (representing a two-year negative impact – consistent with export trends, indicated in orange on the chart). Once again, no decline in global imports of these services was recorded either during the COVID-19 pandemic or following the Russian Federation's invasion of sovereign Ukraine in February 2022.

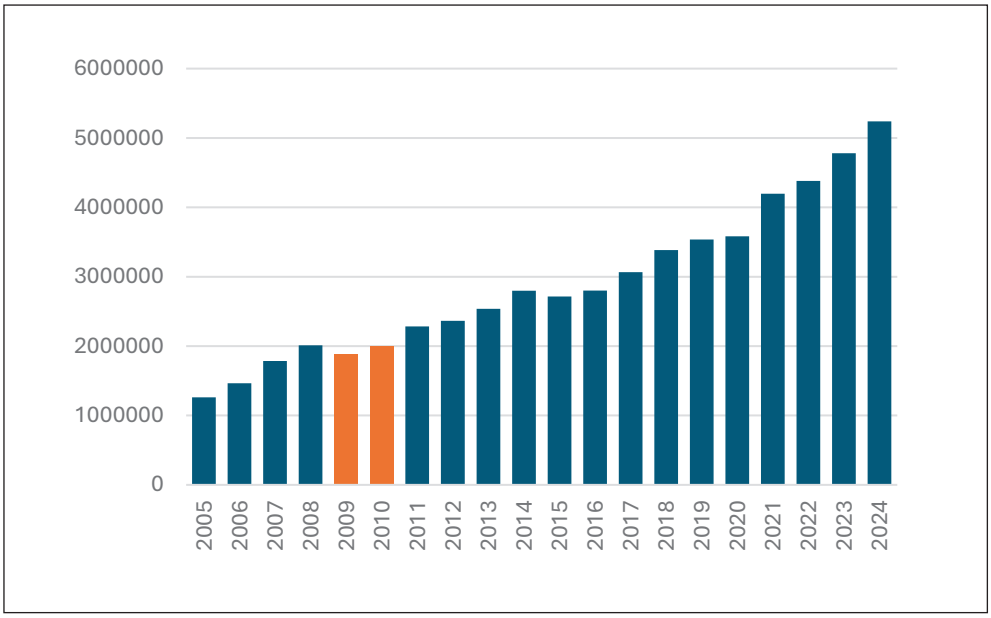
V4 countries' exports (DRQ15)

As illustrated in the Figure 15, a decline in other business services exports from the V4 countries was recorded only during the global financial crisis, dropping from USD 31.9 billion in 2008 to USD 27.9 billion in 2009 (representing a negative impact of only one year, indicated in orange on the chart). Once again, no decline in exports of these services from the V4 countries was recorded either during the COVID-19 pandemic or following the Russian Federation's invasion of sovereign Ukraine in February 2022.

V4 countries' imports (DRQ16)

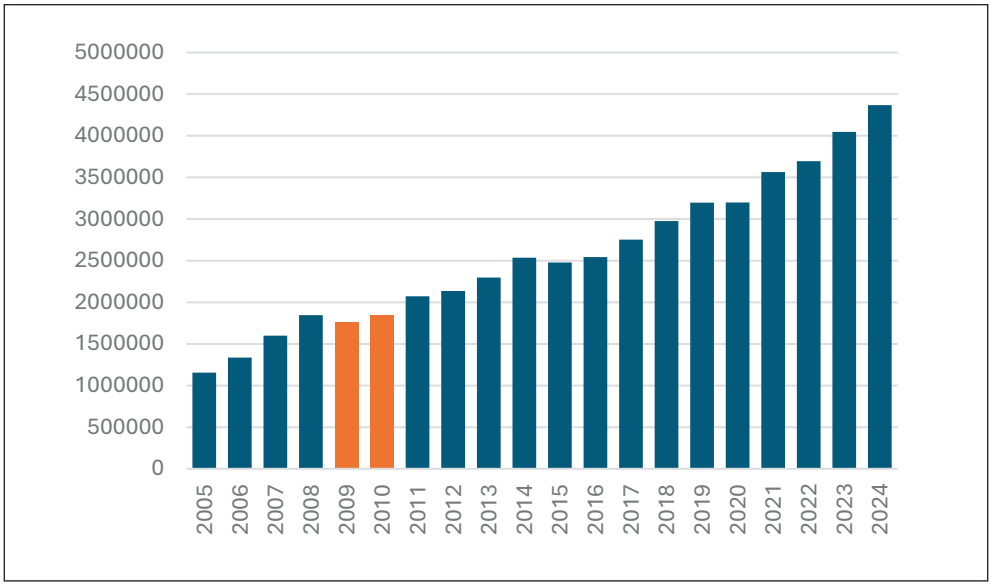
As illustrated in the Figure 16, during the global financial crisis, other business services imports into the V4 countries experienced a decline from USD 37.7 billion in 2008 to USD 33.9 billion in 2009, while reaching only USD 37.5 billion in 2010 (representing a two-year negative impact, indicated in orange on the chart). Similarly, during the COVID-19 pandemic, imports fell from USD 54.2 billion in 2019 to USD 53.1 billion in 2020 (reflecting a negative impact of only one year, indicated in orange on the chart). In contrast, following the Russian Federation's invasion of sovereign Ukraine in February 2022, no decline in other business services imports into the four analyzed countries was recorded in either 2023 or 2024 – a trend that aligns with global export and import developments for these services, as well as V4 countries' exports.

Figure 13. Global exports of other business services, 2005–2024, USD million



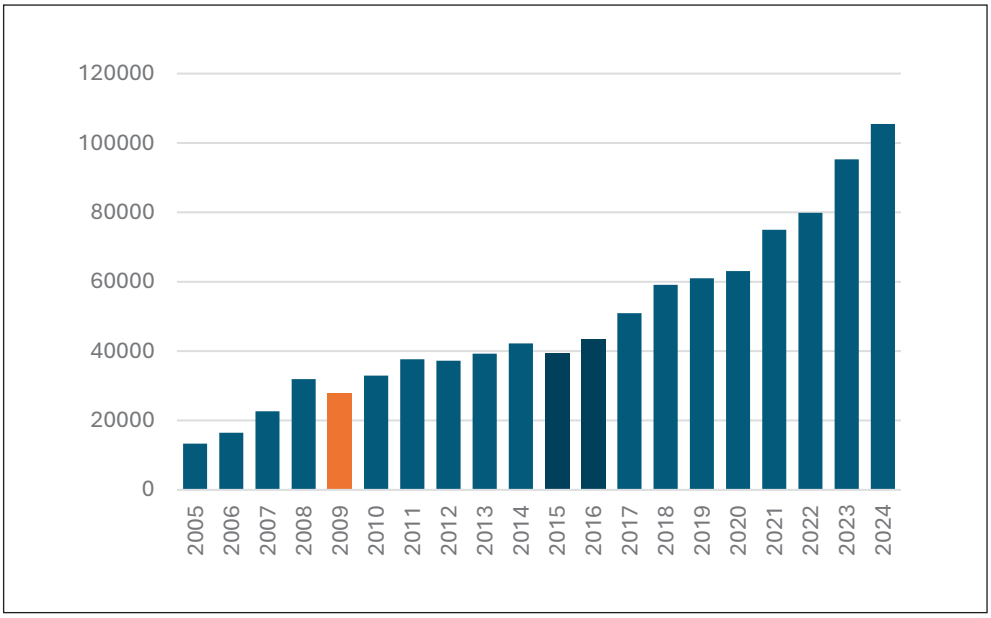
Source: as for Figure 1

Figure 14. Global imports of other business services, 2005–2024, USD million



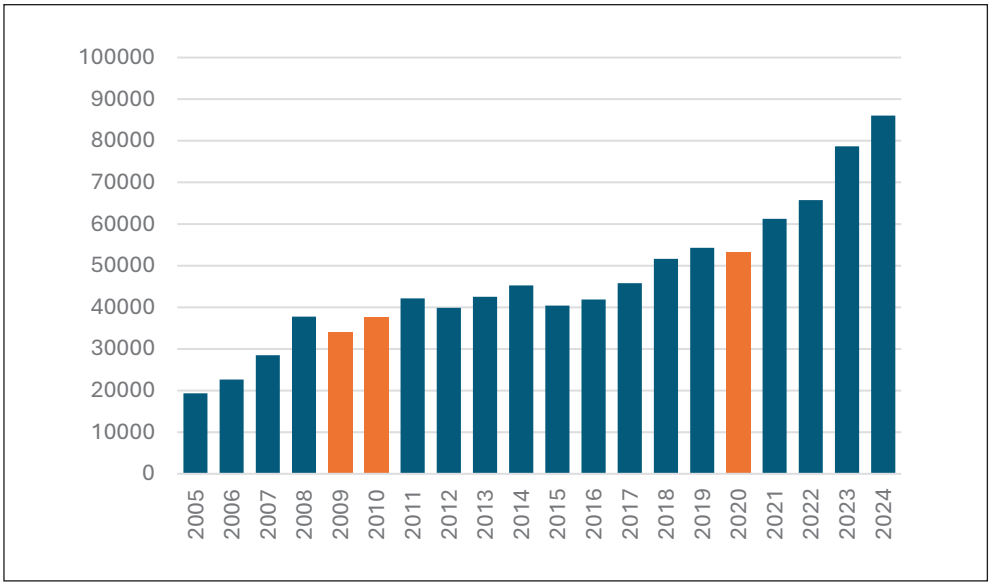
Source: as for Figure 1

Figure 15. Other business services exports of the V4 countries, 2005–2024, USD million



Source: as for Figure 1

Figure 16. Other business services imports of the V4 countries, 2005–2024, USD million



Source: as for Figure 1

Summary and discussion

To summarize the research findings, Table 4 has been prepared to present the results of the analyses. Using descriptive text and shaded cell coloring, the table illustrates how the three analyzed external shocks affected international trade in services over the 2005–2024 period, in line with the adopted assumptions and the sixteen detailed research questions.

Table 4. Synthesis of the research findings

Scope of the research / Economic shock	2008–2009 global financial crisis		COVID-19 pandemic		Russian invasion of Ukraine	
1. International trade in commercial services						
a. Global exports / Global imports	2 years	2 years	2 years	2 years	No impact	No impact
b. V4 countries' exports / V4 countries' imports	2 years	2 years	1 year	1 year	No impact	No impact
2. International trade in transport services						
a. Global exports / Global imports	3 years	2 years	1 year	1 year	2 years	2 years
b. V4 countries' exports / V4 countries' imports	4 years	2 years	1 year	1 year	No impact	2 years
3. International trade in travel services						
a. Global exports / Global imports	2 years	1 year	3 years	3 years	No impact	No impact
b. V4 countries' exports / V4 countries' imports	8 years	9 years	3 years	3 years	No impact	No impact
4. International trade in other business services						
a. Global exports / Global imports	2 years	2 years	No impact	No impact	No impact	No impact
b. V4 countries' exports / V4 countries' imports	1 year	2 years	No impact	1 year	No impact	No impact

Source: author

Purple indicates the highest impact of a given shock on the trade turnover of the analyzed services, red denotes a high impact, orange represents a medium impact, and yellow signifies a low impact. Conversely, green indicates no impact. Specifically:

The 2008–2009 financial crisis had the highest impact on travel services exports and imports in the Visegrad Group (V4) countries (accounting for 2 cases),

A high impact was exerted by the 2008–2009 financial crisis on transport services exports from both a global perspective and from the Visegrad Group (V4) countries; similarly, the COVID-19 pandemic had a high impact on travel services exports and imports both globally and within the Visegrad Group (V4) countries (accounting for 6 cases),

A medium impact was exerted by the 2008–2009 financial crisis on commercial services exports and imports both globally and within the Visegrad Group (V4) countries, on transport services imports both globally and within the Visegrad Group (V4) countries, on global travel services exports, as well as on global exports and imports of other

business services and imports of these services into the Visegrad Group (V4) countries; similarly, the COVID-19 pandemic had a medium impact on global commercial services exports and imports; conversely, the Russian invasion of Ukraine had a medium impact on global transport services exports and imports and on imports of these services into the Visegrad Group (V4) countries (accounting for 15 cases),

A low impact was exerted by the 2008–2009 financial crisis on global travel services imports and on other business services exports from the Visegrad Group (V4) countries; similarly, the COVID-19 pandemic had a low impact on commercial services exports and imports within the Visegrad Group (V4) countries, on global and Visegrad Group (V4) transport services exports and imports, as well as on other business services imports into these countries (accounting for 9 cases),

The COVID-19 pandemic had no impact on global trade in other business services across both directions of trade and had no impact on exports of these services by the Visegrad Group (V4) countries; as mentioned in point "c" above, the Russian invasion of Ukraine exerted a medium impact on global transport services exports and imports and on imports of these services into the Visegrad Group (V4) countries, while having no impact on the remaining types of services (accounting for 16 cases).

Regarding transport services, it is worth noting that the freight rate normalization process in 2021–2022, consisting of the gradual restoration of the operational efficiency of global supply chains, initiated a price correction, which in 2023 – due to the macroeconomic contraction in consumer demand and the simultaneous structural oversupply of the newly tonnaged container fleet – transformed into a sharp market downturn and deflation of freight rates below the operational break-even point for shipowners. Future research should bear in mind the long-term effects of the Red Sea disruptions from late 2023.

The issues discussed in this article represent merely an attempt to identify the primary and vital areas for further analysis. This study serves as a contribution to the debate on the development and determinants of international trade in services. Given the dynamic pace of global "servicization," these matters require further advanced research, particularly in context of evaluating the long-term consequences of the Russian invasion of Ukraine, the trade policy of US president Donald Trump's second administration, and the new trade agreements being signed by the European Union.

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