The Impact of Migration of Road Freight Transport Services on Economic Indicators in Selected EU Countries

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ABSTRACT

Transport is an industry that generates a significant portion of national income and directly or indirectly employs a large number of workers, while supporting the existence and development of all other sectors of the economy. Despite the long-standing goal of decoupling economic and transport growth in the European Union (EU), freight transport volumes, especially road freight transport, continue to increase. This leads to a deterioration of the quality of life and the environment, but on the other hand also creates business opportunities. The question is which country's haulers will benefit the most. Using a shift-share analysis, the authors provide an overview of the dynamics of the EU road freight market and select countries for closer examination. They then examine the extent to which the road freight sector contributes to national income in these countries. Using a regression analysis, they estimate transport prices and changes in turnover and gross value added (GVA) for selected countries due to market structure change. The results show that the sector's turnover increased by 4% due to market changes, sectoral GVA deviated only slightly, and there was a loss of at least 8 billion EUR in GVA due to the shortage of truck drivers.

KEYWORDS

EU; road freight transport; national income; shift-share analysis; regression analysis; employment.

1. INTRODUCTION

The competitiveness of the European economy is based on the internal market, where the free movement of people, goods, services and capital is guaranteed. Transport is a crucial factor for the development and existence of modern economies and societies, as it supports the optimal geographical distribution of economic activities, the growth of economic output and the quality of life. At the same time, transport is an industry that generates a significant share of national income and directly or indirectly employs a large number of workers. Currently, the transport sector contributes 5% to the European gross domestic product (GDP) and directly employs about 10 million workers [1]. The gross value added (GVA) of the transport and storage sector amounts to about 575 billion EUR at current prices (estimate from [2]).

Transport demand has been growing almost steadily in the EU for decades, although somewhat more slowly than GDP; the average annual growth rate (AAGR) for passenger transport was 1.2% and 1.4% for freight transport, while GDP grew by an average of 1.7% per year from 1995 to 2019 [2]. Despite the long-standing tendency to decouple economic development from transport growth and, in particular, to reduce the negative side effects of transport, which are mainly caused by road transport, the road passenger and road freight transport are projected to grow by roughly 40% and 60%, respectively, by 2050 compared to 2010 [3].

The focus of this paper is on commercial road freight transport in the EU. Today, the market of road freight transport services is fully open to competition, as international and cabotage road freight transport have been liberalised through a series of European legal acts; haulers can operate throughout the EU, regardless of whether the freight flows are in any way linked to the economies of the countries from which they originate.

In 2020, the European road freight market was sized at 324.5 billion EUR and was forecasted to grow to pre-covid numbers in 2021 to reach the value of around 352 billion EUR. Further growth is predicted in the forthcoming years [4]; however, not all haulers and not all countries will benefit the same from the projected increase. There are many articles in daily newspapers describing the worsening position of road haulers in the EU-14 (countries that were members of the EU prior to 2004) countries compared to those in the EU-13 (countries that became members of the EU after 2004) countries. On the other hand, the number of scientific articles on this particular topic is limited.

Studies show that freight flows respond rapidly to economic and political changes, with road transport showing the strongest response. The relationship between the size of freight flows and the level of economic activity has long been a method for predicting future freight flows. A number of studies have demonstrated a strong correlation between GDP growth and the volume of freight flows, measured in ton kilometres (e.g. [5, 6]). Freight flows can be related also to demographic change, economic structure, transport costs, globalisation of the economy, environmental awareness, logistics concepts used and characteristics of potential modes (e.g. [7-9]). In this study, however, the authors attempt to identify the inverse relationship, i.e. the direct contribution of road freight services to GVA in selected countries and to assess the impact of changes in road freight services provision on overall road freight transport costs.

In 2017, the European Commission published a report on the road transport market, but without the ambition to evaluate the situation from an economic point of view [10]. Studies that addressed this issue mainly examined the wider impact of the different transport sectors on national economies. For this purpose, they mostly used indicators such as value added, employment, labour income and investment, and applied input-output analysis, a quantitative economic model that describes the interdependent relationships between industrial sectors within an economy. Coppens et al. [11] studied the impact of the Port of Antwerp on regional economic development. Troch et al. [12] studied the value added of rail freight in Belgium, while Meersman et al. [13] studied the indirect economic impact of rail freight in Belgium. Njoya and Nikitas [14] studied the impact of air transport on employment and poverty reduction in South Africa.

The EU road freight market has been witnessing major changes in terms of service providers in recent years. The objective of the paper is to quantify the changes in the EU road freight transport market in the last decade and to provide the answers to the following research questions: (a) Is the shift in road freight transport services provision beneficial to the European population? (b) How is the shift in road freight transport services provision affecting the GVA of selected EU countries? (c) How much is the truck driver shortage directly affecting the GVA in selected EU countries?

The paper is divided into six sections. The first section contains an introduction to the topic and the research questions. The second section describes the methodology used. The third section gives a brief overview of the road freight sector in the EU. The fourth section sets the basis to answer the research questions. The fifth section is the core section that provides answers to research questions and discussion. The sixth section summarises the findings and provides insight for further work.

2. METHODOLOGY

The research methodology followed is a top-down one. In the first phase, the profile of the road freight transport sector in the EU is provided through the application of some basic descriptive statistics and legislation review.

In the next phase the Herfindahl-Hirschman Index (HHI) is calculated to determine market concentration.

$$HHI = 10000 \cdot \sum_{i=1}^{n} s_i^2 \tag{1}$$

where *s* is the percent market share (of each country *i* in our case).

HHI ranges from close to 0 to 10,000. A market with the HHI lower than 1,500 is considered competitive, with the HHI from 1,500 to 2,500 moderately concentrated, and with HHI 2,500 or greater is considered a highly concentrated one.

The shift share analysis and regression analysis are used as core methods to answer the research questions.

Shift-share analysis was introduced in the early 1940s by Creamer. It is a scientific method developed for regional economic analysis. The original idea behind this method is to indicate the employment growth and competitiveness of an industry in a given region by decomposing the effects into four components, namely the national growth effect, the industry mix effect, the expected change effect and the competition effect. In 1997, Notteboom [15] introduced the simplified shift-share analysis, which can have a much broader application. For example, Twrdy and Batista [16] used it for container transport analysis in the North Adriatic.

Simplified shift-share analysis helps understand market changes by decomposing them into two parts, with share reflecting expected growth to maintain market share and shift reflecting the difference from expected growth.

$$share_{i,t} = GR_t \cdot Q_{i,t-1} = (Q_t - Q_{t-1}) \cdot s_{i,t-1} \tag{2}$$

$$shift_{i,t} = (s_{i,t} - s_{i,t-1}) \cdot Q_t = Q_{i,t} - Q_{i,t-1} - share_{i,t} \tag{3}$$

where *GR* is growth rate (of total) observed variable, *Q* denotes sum of the quantity observed, *i* denotes the single observation (country), while *t* and *t*-1 denote the time of observation.

Shift-share analysis is straightforward; it requires only a small amount of data, which is generally readily available [17]. However, it is a static method where the results depend on the selected years, and the changes between the initial and final years are not described. The authors chose the static approach with the ten-year period to highlight the changes in the road freight market in the EU. A year-to-year approach would not provide better results, especially since some short-term distortions due to macroeconomic fluctuations or unexpected events could also be taken into account [18]. Primarily, the results of the modal shift-share analysis served as one of the factors to identify the countries for further, more detailed consideration and to outline the changes in the road freight market. The results of the modal shift-share analysis are not used for predictive purposes in this paper.

In the second phase of the research, the selected member states are looked at in more detail. Eight countries were selected for further study; four of them as emerging powers in the road freight market, namely Poland, Lithuania, Bulgaria and Romania, and four large and traditionally significant countries which have been losing their importance in the European road freight market in the last decade, namely Germany, France, Spain and Italy. The criteria for selecting the countries included the results of the shift-share analysis, the total number of employees in the road freight sector and the share of employment in the road freight sector in total employment as well as transport volume and personnel costs. Current values and trends were considered. Similar countries have been given focus also in the study by De Smedt and De Wispelaere [19].

The data on the performance of the road freight transport sector and the transport volume of the haulers based in the country concerned were divided into national transport, loading in the reporting country, unloading in the reporting country, cross-trade and cabotage. These data come from Eurostat ([sbs_na_1a_se_r2] and [ROAD _GO_ TA _TOTT]). Missing data were retrieved from the Statistical Pocketbook – Mobility and Transport (2014–2019). For the analysis data from 2011 to 2020 inclusive were considered. During this period, more precisely from 2008 to 2014, the EU-27 experienced a W-shaped crisis. A W-shaped crisis is a double-bottom crisis in which the economy grows rapidly and then falls again [20]. Also, the year 2020 was marked by the pandemic. These situations can limit the forecasting modelling capabilities.

In multiple linear regression, the parameters of a model are adjusted to minimise the difference between the predicted result and the measured result when multiple inputs are considered.

$$Y = \alpha + \beta X + \varepsilon \tag{4}$$

where *Y* denotes a vector of dependent variable, α stays for intercept (constant), β denotes slope coefficients for each explanatory variable, *X* is a matrix of explanatory variables and ε denotes model's error term (residuals).

Data on transport volume expressed in vehicle kilometres represented independent (explanatory) variables, while data on turnover served as dependent variable in the multiple regression model created during this research work. This model allowed authors to estimate the cost per kilometre in domestic and international transport for selected countries and then estimate turnover based on projected vehicle kilometres.

3. OVERVIEW OF COMMERCIAL ROAD FREIGHT TRANSPORT IN EU

The road freight transport sector is one of the key sectors in the EU; in 2020 it comprised more than 545,000 mainly small companies and employed about 3.2 million people [21]. Together, they carry more than 10 billion tons of freight or around 75% of Europe's freight by volume [22], either in domestic or international transport, the latter consisting of the transport of goods loaded and unloaded in the carrier's country, as well as cross-trade and cabotage (*Figure 1*). A further 3 billion tons of freight are transported on European roads for the companies' own account.
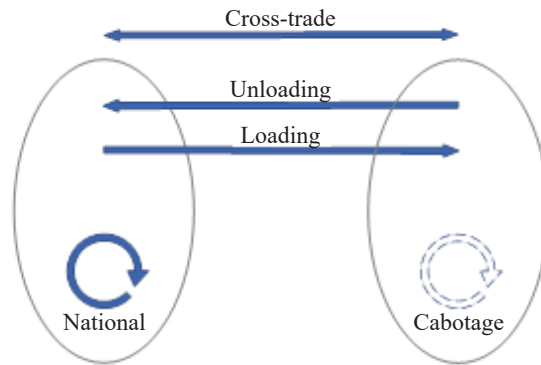

Figure 1 – Elements of commercial road freight transport

As can be seen from *Figure 2*, the share of international commercial road freight transport is increasing, in particular cross-trade and cabotage; however, the share of international transport in total transport is still relatively low at around 11% in terms of tons (a), but in terms of ton-kilometres this share is about 41.5% (b).
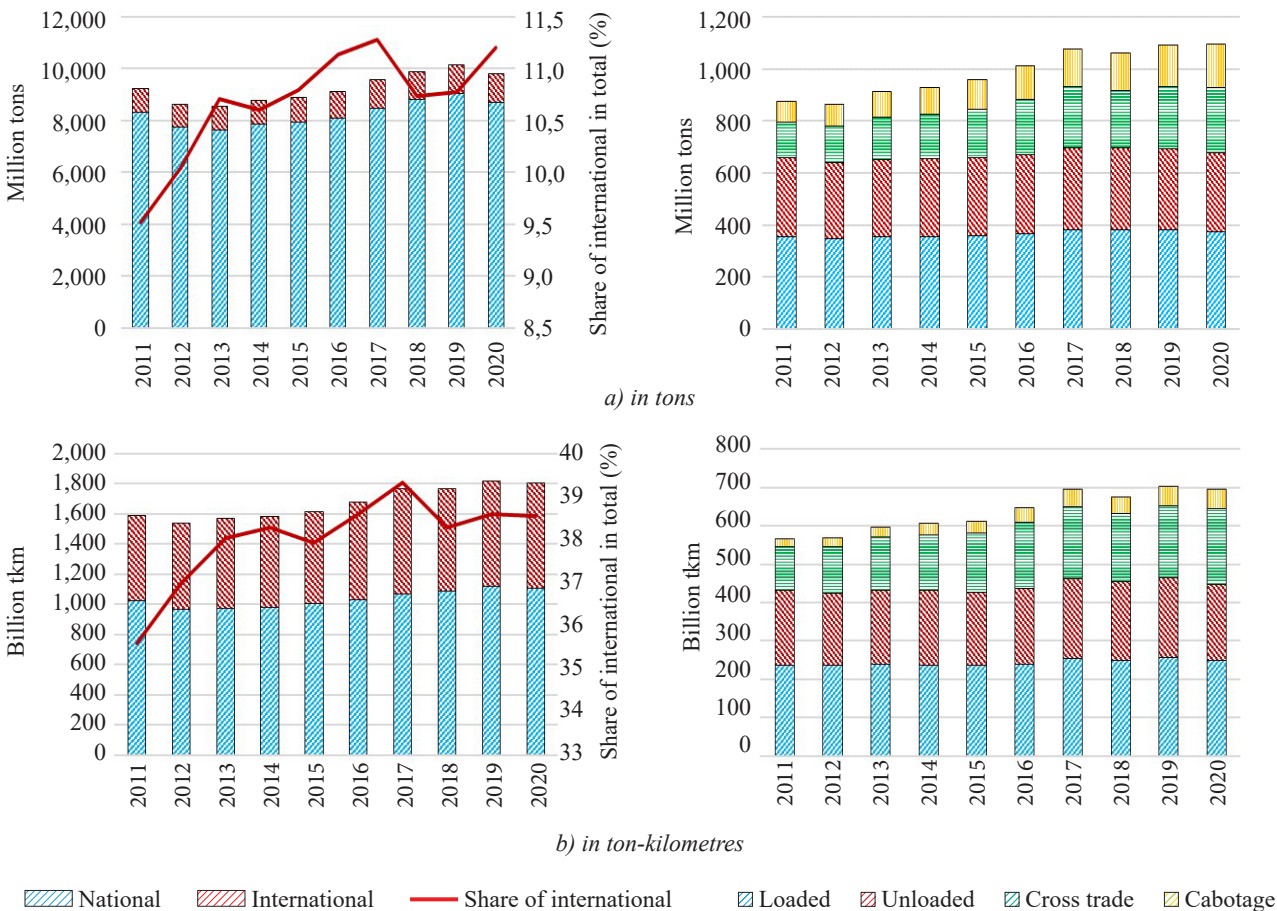

a) in tons

b) in ton-kilometres

Figure 2 – The structure of for hire (commercial) road freight transport in EU-27 [23]

By far the largest freight volume in the EU is carried by German haulers, explicitly around 2.4 billion tons per year. French, Spanish and Polish haulers transported around 1.3 billion tons each. About 65% of cross-trade shipments, measured in tons transported, are carried between the top 20 trading partners in the EU-27, and most of these transhipments are traditionally carried out by Polish haulers [24, 25].

In 2020, still around 18% of total road freight transport for hire expressed in vehicle-kilometres in the EU was carried out by empty vehicles; this share was around 22% in domestic transport, and around 12% in international transport (own calculation, based on [13]). These numbers have slightly improved in recent period following the removal of transport restrictions for carriers, regardless of their origin within the EU. To improve transport efficiency, road cabotage, transport within a certain territory by non-resident road haulers was legislated by Regulation (EC) No 1072/2009 and has been possible since May 2010. Regulation (EC) No 1072/2009 was amended in July 2020 by Regulation (EU) 2020/1055. The basic rule states that after the truck is fully unloaded in the receiving/unloading country, a total of three cabotage transports can be performed in the next seven days, or one transport within three days [26].

4. RESULTS

4.1 Shift-share analysis on number of people employed in road freight sector in EU

As already mentioned, road freight sector employs around 3.2 million workers, which is around 1.7% of total employment of people aged from 15 to 64 in EU-27 (own calculation based on [27] and [28]). The five largest European countries, namely Germany, France, Spain, Poland and Italy, employ almost 62% of all road freight transport workers in the EU-27; however, the Herfindahl-Hirschman Index (HHI), the index of market concentration was at about 880 for the year 2020, indicating that the market is quite competitive.

In the decade between 2011 and 2020, the number of employees in the road freight transport sector in the EU-27 increased by more than 550,000, but not evenly in all member states. The number of employees in transport companies is also rising sharply in Serbia.

The following table (*Table 1*) shows the results of the shift-share analysis. The "Share" column shows the expected change in the number of employees if the share from the previous period (in our case 2011) is maintained. The "Shift" column shows how many employees were lost or added because the share from the previous period changed. For example, in Poland, the total number of employees in the road freight sector increased by almost 200,000 people; normal growth would have been about 60,000 people, but some other factors caused the sector to grow by another 140,000 employees.

In two peripheral countries, Greece and Portugal, as well as in all countries with personnel costs above the EU average, the number of employees in road freight transport increased less than expected; in five countries, it even decreased. On the other hand, the number of employees in Lithuania grew the fastest, almost six times faster than expected, and accounted for 7.6% of all employees in Lithuania in 2020. It is followed by Poland, Romania and Bulgaria.

4.2 The rationale for the selection of countries for further analysis

Haulers from EU-14 countries generally have a more established and developed logistics and transportation industry with larger and more experienced companies. They also tend to have more advanced technology, which can give them an advantage in terms of efficiency and cost-effectiveness. On the other hand, haulers from EU-13 countries may have greater problems accessing finance and funding. However, many EU-13 haulers have lower labour costs, which can make them more competitive.

Table 2 provides some basic information on road freight sector in selected countries in 2020 and the rank within the EU, while *Figure 3* shows the trends for these elements. In 2020, more than 70% of all companies working in road freight transport were located in these eight countries. Overall, these companies employed 72% of all workers from the sector in the EU-27. At the same time, haulers from these countries carried 71.5% of all commercial road freight and performed almost 75% of all ton-kilometres (own calculation, based on [23] and [21]).

Table 1 – Shift-share analysis on number of people employed in road freight sector in EU for 2011 and 2020 [23, 29]

Country	Share	Shift	Difference
Belgium	12,610	(13,820)	(1,210)
Bulgaria	9,947	14,046	23,993
Czechia*	24,214	(12,736)	11,478
Denmark	6,560	(7,750)	(1,190)
Germany	77,033	(37,335)	39,698
Estonia*	2,833	467	3,300
Ireland*	3,887	1,050	4,937
Greece	7,792	(7,424)	368
Spain*	69,685	(61,811)	7,874
France	71,802	(22,633)	49,169
Croatia*	4,136	2,373	6,509
Italy	65,885	(30,916)	34,969
Cyprus	519	(931)	(412)
Latvia	3,939	2,562	6,501
Lithuania	9,124	45,073	54,197
Luxembourg	1,652	(2,064)	(412)
Hungary	13,164	3,681	16,845
Malta*	227	(106)	121
Netherlands	23,820	(16,299)	7,521
Austria	11,920	(8,292)	3,628
Poland	59,684	138,044	197,728
Portugal	13,372	(3,529)	9,843
Romania	20,077	40,680	60,757
Slovenia	4,407	3,087	7,494
Slovakia	8,140	401	8,541
Finland	9,142	(10,400)	(1,258)
Sweden	15,974	(15,416)	558

* Data from Statistical Pocketbook 2014

Table 2 – Basic information on road freight sector in selected countries in 2020 [21, 30]

Country	Employed persons	Share in total employment within a country	Average personnel cost	Number of goods vehicles stock
Germany	412,235 (2)	1.1% (23)	32.0 (10)	552,885 (2)
France	396,407 (3)	1.5% (17)	37.8 (8)	413,121 (3)
Spain	344,874 (5)	1.8% (11)	31.0 (11)	355,708 (4)
Italy	353,593 (4)	1.6% (16)	36.8 (9)	193,751 (5)
Poland	486,364 (1)	3.0% (2)	10.9 (20)	708,819 (1)
Lithuania	98,320 (9)	7.6% (1)	12.7 (18)	58,214 (19)
Romania	157,848 (6)	1.9% (9)	6.4 (22)	135,520 (9)
Bulgaria	72,097 (13)	2.4% (7)	6.1 (23)	96,044 (10)

Note: Island nations and Estonia were excluded from analysis, due to geographic reasons and missing data

The increased interest in employment in the sector has influenced the increase in personnel costs in emerging countries, but they are still much lower than in the economically strongest European (EU-14) countries, maintaining their competitiveness and increasing their market share at the European level.
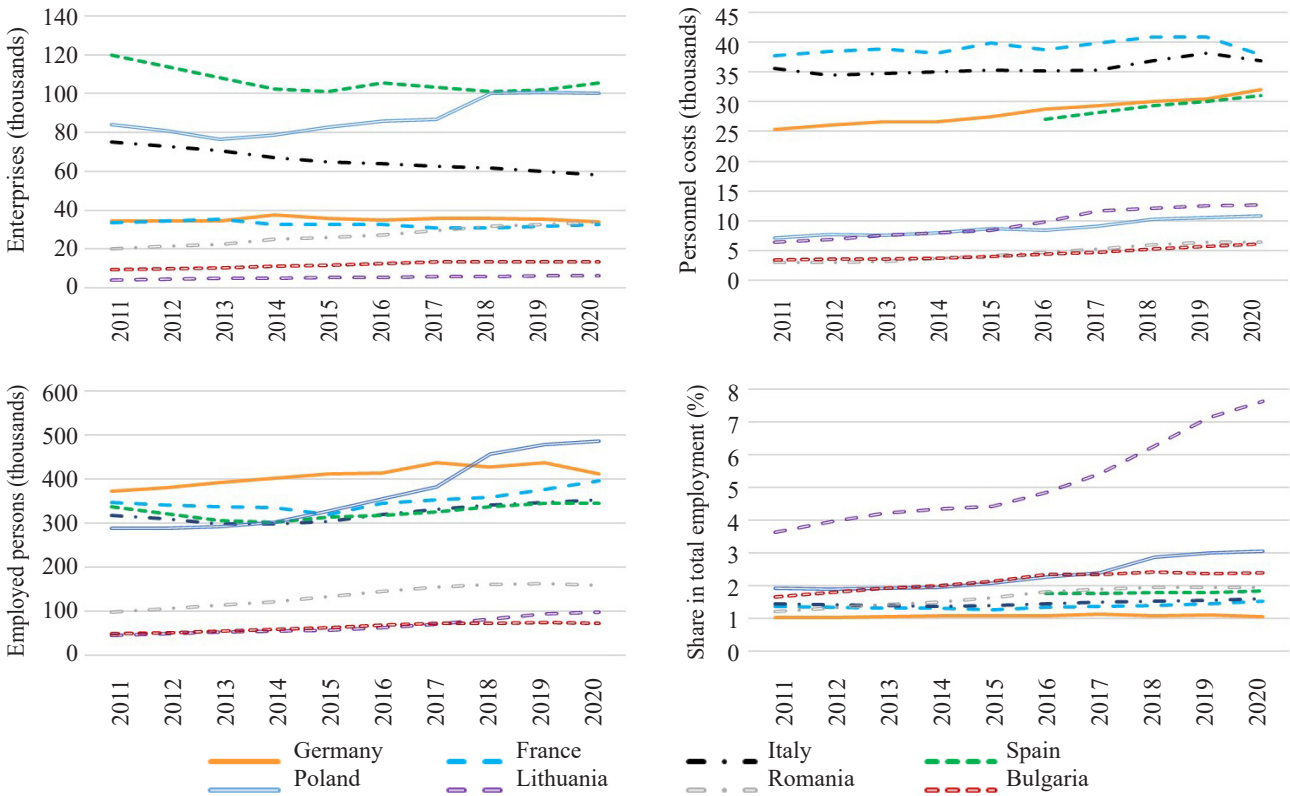
Figure 3 – Basic road freight transport related statistics for selected countries [27]

The number of enterprises is relatively stable in the four more developed countries, while there is strong growth in the new member states. The compound annual growth rate (CAGR) for the number of enterprises in road freight transport for the period 2011 to 2020 is 2% for Poland, 3.9% for Bulgaria, 4.8% for Lithuania and 6% for Romania. This is also the result of the so-called "flagging out", when companies establish subsidiaries abroad if it is cheaper to operate there. Primarily, but not exclusively, because of lower personnel costs.

Therefore, companies from the EU-14 influence the supply of transport services in EU-13, so they contribute to the reduction of GDP in their own countries and increase of GDP in the countries where they establish subsidiaries.
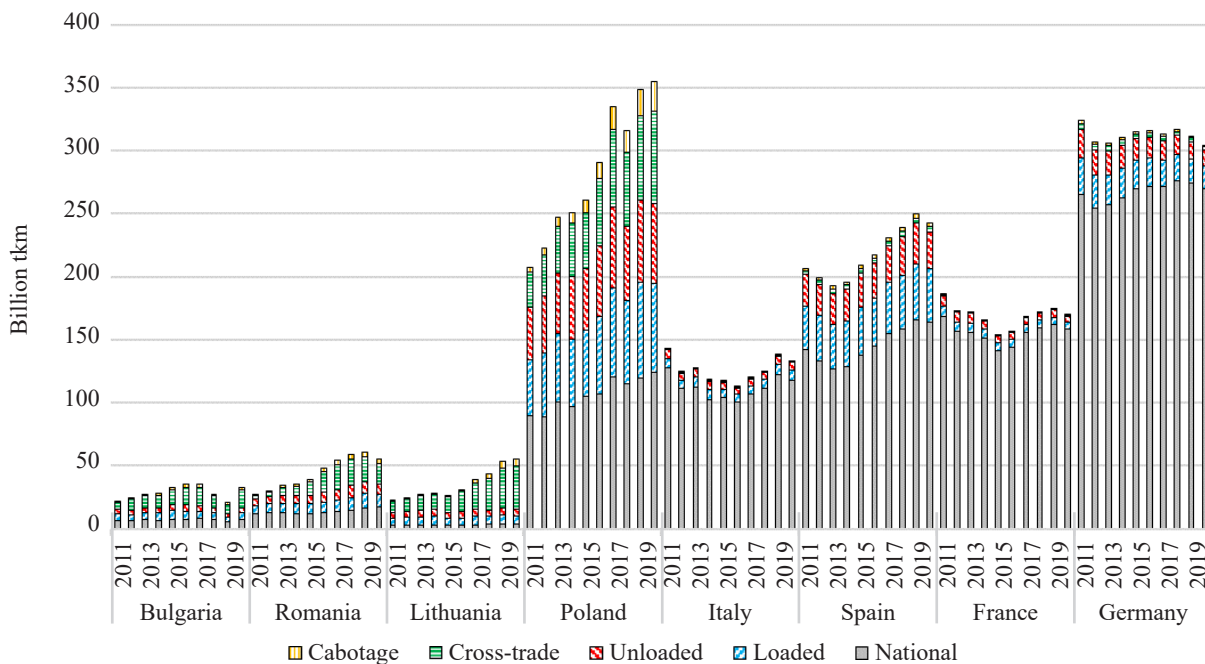

Figure 4 – Transport volume and structure in selected EU member states from 2011 to 2020 (in terms of ton-kilometres) [23]

The countries studied are very different as can be seen from *Figure 4*. Romanian, Bulgarian and Lithuanian haulers are mainly active in the international market in the segments of cross trade and cabotage, as they are coming from relatively weak economies. In fact, Lithuanian haulers transport more than 10 times more cargo in international traffic than in domestic traffic. In contrast, haulers from large and developed economies mostly provide domestic transport because they are not competitive in the foreign environment. For example, the volume of international traffic represents only 6% of domestic traffic for French haulers. Moreover, even national traffic is decreasing in these countries. Polish haulers serve a strong domestic economy due to the size of the country and the diversity of its production. At the same time they are an important factor in the country's trade and the main provider of transport services in cross-trade and cabotage in EU.

5. DISCUSSION

In absolute terms, the volume of transport carried out by haulers from the eight countries studied in depth, expressed in tons, increased by 5.4% in the period from 2011 to 2020, while the volume of transport expressed in ton-kilometres increased by almost 20% in the same period. This is the result of the internationalisation of road freight transport services in the EU; the distances in the domestic transport are on average up to 8 time shorter than in international transport.

The growth of the individual components of transport was not uniform; national transport increased by only 4% if expressed in ton-kilometres, while cross-trade and cabotage increased by 210% and 225%, respectively.

Table 3 shows that the growth of national transport increased by around 110 million tons, but if the shares from 2011 continued, it would have increased by additional 225 million tons. In addition, trade is nowadays carried out in a greater extent by haulers from countries not being connected to any of the economies; haulers serving national trade lost around 7.5 billion ton-kilometres, while cross-trade increased nine-fold in terms of ton-kilometres in comparison to expected growth.

Table 3 – Shift-share analysis of transport volume (in ton-kilometres and tons) by type of transport in 2011 and 2020 [23]

Type of trip	In thousand tons			In million ton-kilometres		
	Share	Shift	Difference	Share	Shift	Difference
National	337,431	(224,046)	113,385	151,610	(102,887)	48,723
Loaded	10,046	21,547	31,593	26,371	(1,481)	24,890
Unloaded	8,589	6,260	14,849	21,952	(5,927)	16,025
Cross-trade	3,168	119,467	122,635	9,957	82,411	92,368
Cabotage	1,902	76,771	78,673	1,758	27,884	29,642

Table 4 – Shift-share analysis of transport volume (in ton-kilometres and tons) in selected countries in 2011 and 2020 [23]

Country	In thousand tons			In million ton-kilometres		
	Share	Shift	Difference	Share	Shift	Difference
Bulgaria	3,325	16,185	19,510	3,952	7,401	11,353
Romania	3,376	49,725	53,101	4,909	23,769	28,678
Lithuania	1,710	60,001	61,711	4,008	29,772	33,780
Poland	45,514	209,279	254,793	38,690	108,586	147,276
Spain	67,092	(37,550)	29,542	38,539	(3,114)	35,425
Italy	53,166	(233,488)	(180,322)	26,615	(36,235)	(9,620)
France	69,003	(198,501)	(129,498)	34,597	(50,621)	(16,024)
Germany	117.950	134.348	252.298	60.337	(79.557)	(19.220)

Haulers from large and economically strong European countries are losing employment possibilities; French and Italian haulers transported around 300 million tons less cargo in 2020 than in 2011, while in terms

of ton-kilometres even German haulers are losing their share. There were almost 120 million tons of cargo in cross-trade and cabotage more than expected by shares from 2011 (*Table 4*).

Although shift-share analysis does not provide answer why the shift occurs, it is quite clear that in case of road freight sector, the wages play important role. Average generalised transport cost structure can be seen in *Table 5*.

Table 5 – EU average generalized transport cost components [31]

Component	Share [%]
Personnel costs	42.1
Fuel costs	21.1
Ownership taxes	0.6
Tolls	5.9
Other (time)	17.1
Other (distance)	13.3

Based on ten-year data on kilometres travelled in the eight selected countries (there were no data on empty rides by Romanian and Italian haulers, therefore these values were estimated), the linear regression model was built to approximate total turnover as an output variable with the input variables kilometres in domestic traffic and kilometres in international traffic.

$$Turnover = 1.90 \cdot National\_vkm \cdot 3.33 \cdot International\_vkm \tag{5}$$

with adjusted R-squared being 0.87 in both cases and both independent variables being statistically significant with p-value lower than 0.05.

Using the above model and available data, the authors calculated average prices for national and international transport for road haulers from the eight selected countries. Polish and Lithuanian haulers have the lowest prices per vehicle-kilometre, while Italian and French haulers have much higher prices, especially in international transport. The results are generalised based on available data; however, road freight prices may be higher for longer distances and for specialised freight (e.g. hazardous materials) that requires additional handling or equipment. Prices may also vary depending on the origin and destination of the shipment and the availability of transportation services in different regions. The price of road freight may also be affected by external factors such as global economic conditions, trade agreements and political stability. In general, the average cost of road freight transport in the EU ranges from around 1.00 to 3.50 euros per kilometre (according to [32] and tested with online tool CargoApps by Impargo), which is line with the calculations done.

The volume of road freight transport expressed in tons is the only appropriate measure to apply shares from 2011 on 2020 total volume as different types of service (i.e. domestic transport vs any form of international transport) exhibit very different distances. In total, almost 7 billion tons of cargo where transported by haulers from the selected countries in 2020. *Table 6* presents the volumes that would have been transported by haulers from these countries in 2020 if the structure of road freight transport remained the same as in 2011.

The average distances travelled by haulers in the eight selected countries are greater than the EU-27 average, with an average distance of 171 kilometres in 2020, ranging from an average of 130 kilometres for national transport to about 805 kilometres for cross-trade. For the calculation purposes these distances were transferred in kilometres per ton transported. Empty rides were taken into account. This resulted in an estimation of total vehicle-kilometres done by haulers if the shares from 2011 remained and the approximation of their turnover (*Table 7*).

If the structure of the provision of road freight transport services had remained unchanged (extreme addition of cross-trade or cabotage services), the total transport volume expressed in vehicle kilometres would have been about 10.7 billion kilometres (11%) lower due to the shorter distances in national transport and in the own economy (goods loaded and unloaded in the reporting country). According to the available data, end users in this case would have spent about 9.4 billion EUR or about 4% less than they actually did (i.e. transport operators' revenue would have been 9.4 billion EUR lower).

Table 6 – Estimated volume of road freight transport services in 2020 based on 2011 shares and 2020 total volume (in thousand tons) [23]

	National	Loaded	Unloaded	Cross-trade	Cabotage	Total
Bulgaria	49,923	5,020	3,534	4,315	1,624	64,416
Romania	54,564	3,940	3,258	2,742	908	65,412
Lithuania	16,978	4,929	3,322	7,586	309	33,125
Poland	740,724	48,379	45,458	34,638	12,592	881,792
Spain	1,232,156	32,904	26,427	3,793	4,572	1,299,852
Italy	1,004,778	12,284	11,466	345	1,174	1,030,046
France	1,288,611	22,070	23,611	613	1,969	1,336,873
Germany	2,149,724	65,103	49,328	7,339	13,704	2,285,198
Total expected	6,537,458	194,631	166,405	61,369	36,851	6,996,713
Total 2020	6,313,412	216,178	172,665	180,836	113,622	
Difference	(224,046)	21,547	6,260	119,467	76,771	

Table 7 – The estimation of turnover in road freight sector in 2020 based on 2011 shares and the registered volume and turnover in 2020 [23, 27]

Country	Expected based on shares from 2011			Actual market situation		
	National [mio vkm]	International [mio vkm]	Turnover [mio EUR]	National [mio vkm]	International [mio vkm]	Turnover [mio EUR]
Bulgaria	451	818	2,355	463	1,657	4,209
Romania	805	656	3,527	1,049	2,661	10,309
Lithuania	181	945	1,881	347	3,549	6,720
Poland	8,833	7,049	21,793	9,278	15,639	37,743
Spain	13,342	4,070	33,381	12,796	4,846	34,708
Italy	10,881	1,078	59,373	8,366	1,026	47,253
France	15,066	988	56,803	12,894	728	47,916
Germany	20,032	3,534	46,165	21,651	2,507	45,844
Total	69,592	19,137	225,277	66,844	32,613	234,704

Note: the values are rounded

To answer the second research question, separate models were created for each country. The volume of national and international transport expressed in vehicle-kilometres were again the explanatory variables, while gross value added (GVA) served as dependent variable. GVA is the difference between total output and intermediate consumption, and is one of the ways to measure economic output by measuring the contribution made to the economy by individual sectors. GVA at the company-level is often measured using the production approach, as the difference between turnover and the cost of raw materials and other inputs that are used in production.

In 2020, services were the largest economic activity in the EU in terms of GVA generated, accounting for about 73% of the total EU GVA [33]. In the countries studied, the ratio of GVA to turnover in road freight transport ranged from about 24% to 43% and accounted for between 0.6 and 4.7% of the total GVA in individual countries (own calculation based on [21] and [34]).

The eight countries studied generated a total value added of 8,433 billion EUR in 2020; 91% was created by companies in the four major EU countries under investigation. The value added from transport accounted for only 0.9% in the total GVA in these countries. Therefore, the change in the provision of road freight transport services did not have too much impact on the sectoral GVA or on the total GVA in the decade from 2011 to

2020 if the countries are considered together. In fact, the GVA in transport would have been lower by 1% and the total GVA by 0.01% if the shares from 2011 remained. However, the effect on single economies is significant, as can be seen from *Table 8*.

Table 8 – The estimation of GVA in road freight sector in 2020 based on 2011 shares [23, 27]

Country	Expected (on 2011 share)		Actual market situation		Changes and impacts		
	GVA [mio EUR]	GVA in GVA'$_{total}$	GVA [mio EUR]	GVA in GVA$_{total}$	Abs. change	Sectoral change	Impact on GVA$_{total}$
Bulgaria	565	1.1%	1,010	1.9%	445	44.1%	0.83%
Romania	843	0.4%	2,465	1.2%	1,622	65.8%	0.81%
Lithuania	585	1.4%	2,090	4.7%	1,505	72.0%	3.37%
Poland	5,144	1.1%	8,910	1.9%	3,765	42.3%	0.81%
Spain	12,511	1.2%	13,009	1.3%	497	3.8%	0.05%
Italy	18,497	1.2%	14,722	1.0%	(3,776)	(25.6%)	(0.25%)
France	20,073	1.0%	16,932	0.8%	(3,140)	(18.5%)	(0.15%)
Germany	19,741	0.6%	19,604	0.6%	(137)	(0.7%)	0.00%
Total	77,960		78,741				

Note: GVA'total in Table 8 or the adjusted total GVA was calculated by deducting actual GVA from road freight sector from actual total GVA and adding expected GVA from road freight sector if shares from 2011 were maintained

The largest positive deviation due to the change in the provision of road freight services is recorded in Lithuania (+3.4% from road freight transport in total GVA), while the largest absolute increase was recorded in Poland with EUR 3.77 billion more due to changes in the market. The contribution of transport to the country's GVA decreased in Italy (-0.25% or EUR 3.78 billion) and France (-0.15% or EUR 3.14 billion).

In general, competitiveness in the commercial road freight sector is the result of a complex interaction of multiple factors, and companies that are able to effectively manage these factors have a better chance of success in the market.

Personnel cost is one of the factors that can affect competitiveness in the commercial road freight sector, but it is not the only one; Polish and Lithuanian haulers have higher personnel costs than Romanian haulers, yet they provide cheaper per kilometre price. German haulers achieve best GVA and turnover ratio and a relatively competitive price per kilometre, but are losing cargo even in domestic market. This could be attributed to the shortage of professional truck drivers.

The shortage of truck drivers is present throughout the EU. In the EU-14 countries, the reasons for the shortage are not only uncompetitive wages, but also poor image of the profession, difficult working conditions, poor treatment of drivers at delivery sites and inadequate and dangerous stops, while in the EU-13 countries the shortage is primarily the result of a rapid and strong expansion of the road freight transport sector.

The shortage of professional drivers is an ongoing problem; there were 400,000 driver vacancies in the EU in 2020 [35], and this number continues to rise. In 2021, the average age of truck drivers was 47, and although youth unemployment remains a major problem in the EU, the proportion of young drivers under 25 in the road freight sector remains very low, at around 7% [22].

Data on the shortage of drivers varies in different sources, but it is clear that the problem exists, and the problem will not only relate to the direct contribution of the road freight sector to national income, but it may also cause problems in all other economic activities and supply.

German truck drivers averaged about 58,600 kilometres per year, followed by Polish and Spanish drivers with about 51,000 kilometres. French and Italian drivers demonstrate the lowest productivity, with 34,360 and 26,560 kilometres, respectively.

Table 9 – The estimation of lost turnover and GVA in road freight sector in 2020 based on driver shortage and productivity [23, 27, 35]

Country	No. of vacancies	Additional kilometres [mio]		Turnover [mio EUR]	GVA [mio EUR]	GVA in GVA'$_{total}$
		National	International			
Poland	120,000	2,289	3,859	11,315	2,671	0.57%
Spain	15,300	568	215	1,540	577	0.06%
Italy	15,000	355	44	2,005	625	0.04%
France	43,000	1,399	79	5,198	1,837	0.09%
Germany	45,000 60,000	2,363 3,151	274 365	5,004 6,673	2,140 2,853	0.07% 0.09%
Total				25,061 26,730	7,849 8,563	

Assuming that sufficient amounts of freight were available (the number of vacancies is based upon this assumption) and that the ratio between national and international traffic volumes was maintained at 2020 level, revenues in the five countries for which we have data on driver shortages for the year 2020 would increase by at least EUR 25 billion, or the sector's GVA would increase by at least EUR 7.9 billion. The last column in *Table 9* shows how much the work of additional drivers would contribute to total GVA. GVA'total takes into account only the direct value added of road freight transport, so it is calculated as actual total GVA plus extra GVA from road freight sector if there was no driver shortage.

6. CONCLUSIONS

The EU is one of the strongest and most advanced economies in the world. Although it is intended as an area without internal borders or other regulatory barriers to promote competition and trade, it is made up of 27 countries that are far from evenly developed. This is reflected in different working conditions and cost structures, which ultimately affects the competitiveness of companies, including competition among companies providing road freight services.

In the structure of transport costs, labour is the largest item on average, but longer distances and rising fuel prices also affect the price of transport services. Good estimates of transport costs at a detailed spatial level for the EU are not available [31], and data on each individual trip are not available either, so the authors calculated the generic costs of road freight transport in national and international transport for eight selected countries. Italy stands out as a negative example according to the results, being the least competitive and showing the largest relative decrease in transport volume. According to the calculations, German haulers are the most competitive in terms of prices among haulers from large and important EU countries, but have experienced a sharp decline in the number of drivers in Germany, so that they cannot even cover their own transport needs any longer.

Overall, road freight transport generates higher total turnover at the EU level than it would have if conditions had remained as they were in 2011. Due to the changed structure of road freight transport providers, an estimated 11 billion kilometres more were performed in 2020. The lower prices charged by EU-13 providers do not outweigh the difference in distances travelled. With the regulation of international road freight transport, the share of empty journeys decreased slightly in the decade from 2011 to 2020 (from 19.2% to 18.3%), but their volume increased (by about 2.34 billion kilometres in total or by about 1.24 billion in international transport).

Transport plays an immense role in Europe's competitiveness as it supports all other activities, and its performance has been in the spotlight for several decades. Previous studies mainly examined the wider impact of transport on national or regional economies, while this study analyses the direct economic impact of road freight transport at the EU level. It allocates and quantifies the changes that have happened in the road freight market. The results of this study are not in line with the EU's objectives to make transport more efficient and environmentally friendly, but these results should be taken with some caution as haulers' productivity, transport distances and prices have been estimated and averaged, while in practice they depend on a number of factors that vary from case to case.

Further work by the authors will take two directions. The authors will assess the external costs of transport due to the increased number of freight vehicle kilometres travelled on EU roads, focusing on road safety. On the other hand, the shortage of professional drivers leads to financial losses for haulers and consequently for the national GDP. Therefore, the authors will investigate whether the shift of labour to other sectors, which is particularly common in the EU-14, has a positive direct impact on GDP in these countries.

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Marina Zanne, Elen Twrdy, Robert Muha, Milan Batista

Vpliv migracij storitev cestnega tovornega prometa na gospodarske kazalnike v izbranih državah EU

POVZETEK

Promet je panoga, ki ustvari pomemben del nacionalnega dohodka in neposredno ali posredno zaposluje veliko število delavcev, hkrati pa podpira obstoj in razvoj vseh drugih gospodarskih panog. Kljub dolgoletnemu cilju, da se v Evropski uniji (EU) ločita gospodarska in prometna rast, se obseg tovornega prometa, zlasti cestnega tovornega prometa, še naprej povečuje. To povzroča poslabšanje kakovosti življenja in okolja, po drugi strani pa ustvarja tudi poslovne priložnosti. Vprašanje je, prevozniki iz katerih držav bodo imeli največ koristi. Avtorji z analizo deleža premikov podajo pregled dinamike trga cestnega tovornega prometa v EU in izberejo države, ki jih je treba podrobneje preučiti. Nato preučijo, v kolikšni meri sektor cestnega tovornega prometa prispeva k nacionalnemu dohodku v teh državah. Z regresijsko analizo ocenijo cene prevozov ter spremembe v prihodkih in bruto dodani vrednosti za izbrane države zaradi spremembe strukture trga. Rezultati kažejo, da se se prihodki sektorja zaradi sprememb na trgu povečali za 4 %, bruto dodana vrednost sektorja pa je le malo odstopala, zaradi pomanjkanja voznikov tovornjakov pa je prišlo do izgube bruto dodane vrednosti v višini najmanj 8 milijard EUR.

KLJUČNE BESEDE

EU; cestni tovorni promet; nacionalni dohodek; analiza deleža menjav; regresijska analiza; zaposlovanje.