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Article

Types and spatial characteristics of traffic offences committed by road hauliers and carriers in the North Great Plain region, Hungary

Szabolcs Mátyás[1], Zsolt Radics[2], Andrej Balogh[3], Krisztina Keller[4], Dénes Lóránt Dávid[5,*], Enikő Harman[2]

[1] *Department of Criminal Tactics, Ludovika University of Public Service, HU-1083 Budapest, Hungary*
[2] *Department of Social Geography and Regional Development Planning, University of Debrecen, HU-4032 Debrecen, Hungary*
[3] *Doctoral School of Economic and Regional Sciences,Hungarian University of Agriculture and Life Sciences, HU-2100 Gödöllő, Hungary*
[4] *Department of Tourism, Institut of Sustainable Development, Corvinus University of Budapest, HU-1093, Hungary*
[5] *Department of Tourism and Hospitality, John von Neumann University, HU-6000 Kecskemét, Hungary, Institute of Rural Development and Sustainable Economy, Hungarian University of Agriculture and Life Sciences (MATE), HU-2100 Gödöllő, Hungary*
*** Corresponding author:** Dénes Lóránt Dávid, david.lorant.denes@uni-mate.hu

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Abstract: This study examines the spatial distribution and structure of traffic offences in the Northern Great Plain region. The research is unique in that it examines a specific area through the lens of geography. The research shows and demonstrates that the research area of crime and transport geography is much broader than previous researches has shown. At the beginning of the study, the authors clarified the conceptual framework, as the terms "violation" and "offence" are often confused even in technical materials. The research shows which routes are the most frequently used by road hauliers in the regions under study and what type of checks have been carried out on these routes by the Transport Authorities of the Government Offices. The type of administrative penalty detected and the nationality breakdown of the infringements are described. The study typifies the infringements involving administrative fines by nationality category.

Keywords: infringement; crime geography; freight transport; North Great Plain region; transport

1. Introduction

Road safety is a segment of sustainability alongside public safety. The prevention and detection of traffic offences and violations are also the basis of safe transport. They are also a prerequisite for economic and sustainable transport. These general priorities are made even more important by Hungary's geographical location and economic policy position.

Road freight transport is an important segment of the economy and society, so it is important that the area operates smoothly and complies with the legal conditions and requirements. In this respect, Hungary's favourable geographical location also requires a more in-depth analysis of this segment, as it is located at the intersection of the routes connecting East-West and North-South Europe, and thus plays a key role in the international transport of goods (Kovács et al., 2015).

The timeliness of the research topic is shown by the fact that the European Commission forecasts a dynamic growth of freight transport performance in the EU-27 until 2050. This growth will also affect freight transport performance by heavy and light commercial vehicles. This segment is forecast to grow by 40%–50% in 2050 compared to the 2005 base year, despite the EU's 2011 Transport White Paper setting the target that "by 2050, 50% of road freight transport over 300 km should be

undertaken by other modes" (EUROPEAN COMMISSION, 2011).

Due to its interdisciplinary nature, research on infringements sanctioned by fines involves several disciplines, including public administration, transport, law and geography. Within geography, the field is closely related to the geography of crime and transport (Mátyás, 2020). The authors believe that the practical value of the research is demonstrated by the fact that the study of traffic, traffic offences and infringements related to freight transport and transport operations, and their geographical aspects, can contribute to improving transport safety and economic efficiency.

This study explores the relationship between geography, nationality clusters and types of noncompliance. Our aim is to show which countries of origin are more likely to use the roads of the Northern Great Plain region and whether the frequency and types of administrative offences committed in the region show (spatial) specificities with respect to the country of origin of the offenders. Data used in this study addresses the question of how authorities can reduce traffic infringements considering users are often not locals. The study can contribute to the practical and theoretical debate regarding geography and traffic related problems.

2. Literature review

The investigation of crime goes back nearly two hundred years. As early as 1833, Guerry drew a map of crime in France (Guerry, 1833). The representation and study of crime on maps has been very popular ever since, with many studies and books appearing every year. However, few researchers have been involved in the study of traffic crimes and offences. If we look at the major scientific databases, we can see that articles on this subject have been published since the late 1960s.

Gargett (1965) looked at traffic offences from a police perspective. He examined offenders by gender over a five-year period. Robinson (1975) examined Australian traffic accidents and sought the most effective sanction. He wondered which sanction might be the most effective in deterring people from committing traffic offences. Australian author duo, Brown and Copeman (1975), investigated how British people rank traffic offences and crimes. They found that it was women and the elderly who judged offences more seriously.

From the 1980s onwards, the number of articles written on the subject increased, just like the number of areas covered by the authors. The nationality of the authors shows that there are articles from almost every country in the world. This also shows that since the eighties and nineties motorisation has spread worldwide, so that traffic offences and crimes have become a serious problem everywhere.

In Switzerland, a group of drivers were observed for three months and, on the basis of the offences committed during this period, an attempt was made to predict who was likely to commit traffic offences in the future and what type of offence they would commit (Michiels and Schneider, 1984). The research of Ratshibvumo (1996), who wrote a doctoral thesis on the traffic situation in South Africa, evaluates data from a different perspective than previous research. He examined traffic accidents by severity, spatial location, sex and age of the perpetrators, etc. Perera examined fatal traffic accidents in Sri Lanka. In 2010, there were nearly 3000 fatal road traffic

accidents in the country, which also caused significant financial damage to the economy. The author focused on the type of transport and the role of alcohol in the occurrence of these accidents (Perera, 2016).

Based on the themes of the past articles, it can be concluded that no researcher has investigated traffic offences related to freight transport.

Although road transport is clearly a key driver of economic growth and prosperity, there are often concerns about the sustainability of road freight transport, both in terms of safety, efficiency and health aspects. The issues raised in the road freight transport literature are mainly clustered around economic and ecological factors (Demir et al., 2011; Palsson and Kovacs, 2014; Perego and Perotti, 2011; Richardson, 2005; Winebrake et al., 2012).

However, alongside society's expectations, the need for safety is becoming increasingly important for hauliers, and can therefore be seen as one of the externalities arising from freight transport operations.

Increasing the effectiveness of controls, which must go hand in hand with identifying the characteristics of infringements and violations, among other means, will help to improve safety levels.

The study of infringements has recently come to the fore in the literature. Due to the pandemic caused by COVID-19, several publications and studies have been published on the topic of the investigation of epidemiological non-compliance (Ambrus and Hollán, 2020; Balázs and Hoffman, 2020; Juma et al., 2020; Hollán, 2020).

The other so-called classical area is the group of traffic offences, which examines offences from the law enforcement side, mainly from the perspective of traffic accidents (Ambrus and Hollán, 2020; Balázs and Hoffman, 2020; Juma et al., 2020; Hollán, 2020).

Robert Javoršek uses data from the Slovenian police to give a picture of the comparison of traffic accidents and tachograph-related offences. However, his analysis focuses on accidents caused by drivers of buses and lorries and violations of tachograph-related legislation (Javoršek, 2011). It does not analyse nationality, but only the types of infringement and the penalties applied. Rychter (2012) examines the detected infringements from a traffic control perspective. In it, he reveals that in 2010, the proportion of administrative penalty decisions among vehicles checked in Poland was 15.4%, a decreasing trend since 2003. In terms of nationality, the proportion is 14.4% for Polish nationals and 17.6% for foreign nationals. The author also describes the types of offences, with a high proportion of offences being driving time, break and rest period offences (70%), followed by improper use of tachographs (15%). The author presents his research in a multidisciplinary way, concluding with technical and training recommendations to improve the quality of enforcement activities in order to detect as much as possible digital tachograph manipulation.

In addition to these, ADR (Accord Dangereux Routier), the control of the transport of dangerous goods, has a broader literature related to roadside inspection. The transport of dangerous goods is extremely risky and can present a wide range of disasters in the event of an accident, from mild to very serious hazards, e.g., radioactive or biological contamination (Chovancovaet et al., 2018; Skrucanyet et al., 2018). Some scientific publications on the transport of hazardous materials analyse

the violations from the perspective of the disaster management authority (Almási, 2022; Balogh et al., 2018; Bárdos, 2010; Kátai-Urbán et al., 2015; Körmendy and Földi, 2004; Török and Földi, 2007). Since 2001, the Disaster Management Authority has been involved in roadside inspections of the transport of dangerous goods in Hungary, together with the police and the transport authority. From 1 May 2007, an amendment to the Act on the Protection of Dangerous Goods allowed it to act as an independent authority with powers in the field of ADR roadside inspections. The transport of dangerous goods from the perspective of the Transport Authority was examined by a research group including P. Gorzelanczyk-M. Krawiec T. Kalina-M. Jurkovič, who examined the inspections of the Provincial Road Transport Inspectorate in Poznań. They found that in the Greater Vojvodina region of Poland, between 2015 and 2017, infringements related to the transport of dangerous goods were less frequent, with 3123 vehicles and/or vehicle combinations carrying dangerous goods inspected, of which 63.62% were of Polish nationality, 14.13% of other EU nationality (non-Polish) and 22.25% of non-EU nationality. This composition also reflects Poland's stronger economic ties with its eastern neighbours. Since the Ukrainian-Russian war, these relations have weakened. The inspection resulted in 236 deficiencies, only a few of which were penalised (Gorzelanczyk et al., 2020).

A hot research topic today is the possibility of predicting traffic crime (see: predictive policing). Hundreds of researchers per year have addressed this topic (Gräler et al., 2020; Jwan, 2017; Sieveneck and Sutter, 2021). The authors investigate the possibility of using predictive software for prevention and analyse the accuracy of the software. The authors also argue that predictive algorithms could play a major role in traffic safety in the future.

However, the frequency and types of violations also depend on the geography and characteristics of the area and the socio-cultural characteristics of the actors involved in transport (Imbeah et al., 2020; Khademi-Vidra, 2014).

For this reason, we consider it important to present the field of investigation and to describe the conceptual framework and the Hungarian system of non-compliance.

3. Methods

The present research focuses on road freight transport and haulage, including the analysis of the inspections carried out by the Transport Authorities of the Government Offices and the infringements sanctioned by administrative fines.

The main objectives of the research underlying the study were:

- To identify the countries from which hauliers most frequently use the road network in the Northern Great Plain region. To look for a correlation between the geographical location of the region and the distribution of the destinations. The results of roadside checks on foreign residents will be used as a guide to achieve this objective.
- To analyse the frequency of administrative irregularities for Hungarian resident, EU26 (foreign) or non-EU hauliers.
- To show the distribution of infringements subject to administrative fines by nationality category.
- To help improve the effectiveness of roadside checks.

3.1. Conceptual framework

Offences and breaches are not the same because of the confusing terminology. Infringement and misdemeanour are violations of the law. Generally speaking, neither is a criminal offence (although there are rare cases where they are), as a result of which are not subject to criminal prosecution, and, therefore, have non-criminal sanctions (Kovács, 2023). For misdemeanours, a special procedure known as the misdemeanour procedure applies and the sanction of the administrative procedure is administrative in nature. In the case of a breach of the rules, an administrative procedure is initiated, the sanction of which is administrative in nature. Types of administrative sanctions in Hungary according to Act CXXV of 2017 on the Sanctions of Administrative Violations:

- warning
- administrative fine
- prohibition from engaging in an activity
- confiscation
- Other sanctions provided for by law.

In administrative proceedings, the application of administrative sanctions is determined by the legal provisions (Kovács, 2023).

The present research focuses on those sanctioned with administrative fines in Hungary, and the term not sanctioned with administrative fines is used for cases where there were no deficiencies or where the competent authorities imposed a warning as an administrative sanction.

3.2. Types of infringements examined

The range of road traffic offences is wide, but the present research focuses on offences within the scope of the competence and jurisdiction of the competent County Government Offices in the Northern Great Plain region. On this basis, the study covers the following:

(a) for national or international road transport services subject to the possession of a specific authorisation and a specific document (hereinafter referred to as "transport documents"),

(b) own-account transport of goods subject to the possession of a specific document (hereinafter referred to as "own-account transport documents"),

(c) the social rules for road transport, driving time, breaks and breaks and rest periods (hereinafter referred to as driving and rest periods),

d) the use of recording equipment and tachograph discs used in road transport and the use of cards for digital tachographs (hereinafter referred to as "recording equipment and tachograph"),

(e) the transport of dangerous goods, the carrier, the road vehicle and its crew, the consignor, the temporary storage, the packer, the loader, the loader, the consignee and the safety adviser for the transport of dangerous goods (hereinafter referred to as the transport of dangerous goods),

(f) for the transport by road of perishable foodstuffs and live animals,

(g) the carriage of goods by road by means of hired vehicles,

(h) the technical, safety and environmental characteristics of road vehicles intended for use in road transport, the circulation on the road of vehicles exceeding the maximum authorised mass, axle load and dimensions, the securing of loads and the transport of bulk goods (hereinafter referred to as vehicle and load safety),

i) restricting the circulation of heavy goods vehicles, breach of the relevant provisions.

In order to compare the types of foreign and Hungarian infringements, the type of infringement of the own-account goods transport document was merged with the infringement of the goods transport document, since the own-account goods transport document applies to Hungarian nationals in Hungary and the two types of infringement have a similar profile. The merged category is hereinafter referred to as documents and authorisations.

3.3. Competent authorities

The control and sanctioning of infringements in Hungary is the responsibility of several authorities. These may include the Traffic Authorities and the Employment Inspectorates of the County Government Offices, the Police, the Customs, the Disaster Prevention Authority and the Public Roads Inspectorate. In the case of the infringements we are examining, the scope of the aforementioned authorities is narrower because the Hungarian legislator has designated the following authorities in Act I of 1988 on Road Traffic (hereinafter referred to as the Act): the police, the customs authorities and the Traffic Authority of the County Government Offices. The permits and documents required for the carriage of goods and passengers may also be checked by the road operator, the tachograph disc cards for digital tachographs, driving and rest periods by the employment-supervisory authority, and the transporters of dangerous goods (ADR) by the disaster prevention authority. Vehicles exceeding the maximum permissible gross laden weight, axle load and dimensions may also be checked by the road manager.

The research will analyse the data until 2017 and 2021, because from 21 February 2022, a change in legislation will allow the transport of goods by road by lorries with a maximum permissible laden weight of over 2.5 tonnes. Previously, this milestone applied to lorries with a maximum permissible laden weight of over 3.5 tonnes. As a consequence, a comparison of the statistics for 2022 and beyond would not be exact from the perspective of the subject, as the list of those checked is wider.

3.4. Methods used

During the research, the authors obtained statistical data from the Public Transport Authority. These data were used for quantitative analysis. In the course of the research, after obtaining the data, the authors performed data cleaning, then organized the data into data tables, created a database and performed data analysis.

Statistical methods were used to analyse the data (distribution and arithmetic mean calculation). Excel software was used to construct graphs from the data. A limitation of the research was that only data for the Northern Great Plain Region was available, not the national data. If statistical data with a larger time interval can be obtained, it will be possible to predict traffic offences in the future.

3.5. Target groups

In defining the target groups for the research, we also took into account the potential for future use, so the target groups were:

- the operators and drivers of vehicles with foreign and Hungarian registration plates, who have been checked during roadside inspections by the competent Traffic Authorities of the region in the North Great Plain region and have been sanctioned with administrative fines in case of violation of the rules;
- operators and drivers of vehicles with Hungarian registration plates who have been checked during an on-site inspection and have been sanctioned with an administrative fine for non-compliance.

The target group was divided into three main categories:

- of Hungarian nationality;
- EU-26 (EU citizenship without Hungary);
- Non-EU Residents.

The reason for the above breakdown of the target group is to answer our research questions, and the reason for the separation of Hungarian nationals is that Hungarian nationals were checked more than 3.5 times more often than foreign nationals. The reasons for this are understandable, as the transport infrastructure in the region is predominantly used by Hungarians and more frequent checks would distort the proportions.

3.6. Test methods

The control task is defined in several legal acts for the authority under scrutiny. In order to ensure the safe transport and transit of goods by road, the present research study carries out a so-called random check of the vehicle in road traffic. A special form of inspection is the on-site inspection, where vehicles and documentation relating to the performance of the activity, which have been certified as roadworthy by the operator, are inspected by the authority at the premises of the undertaking. Inspections at the premises are not carried out by the inspectors of the Transport Authority for the EU-26 and non-EU clusters, as appropriate, but not for the Hungary cluster, because the first research question does not analyse this cluster in detail, and in the case of the premises inspections, the inspectors check vehicles classified as “in running order”, which are involved in the transport of goods and freight by road, so that the infringements detected here are also carried out on the roads. And for the comparative studies, administrative fine indicators mapped to 100 checks are used between the different clusters so that the final conclusion is not distorted. In terms of road safety, on-site inspections are also a priority in order to enforce lawful behaviour, prevent accidents (prevention), protect the environment and animals and avoid exploitation of drivers.

3.7. Description of the area under study

Hungary is strategically located in Central Europe, with important transit routes connecting Europe from North-South to South-East and South-South (Kovács et al., 2015). One of the country’s special regions is the Northern Great Plain region, which is adjacent to EU-member Slovakia, EU-member but non-Schengen area Romania and

non-EU Ukraine. The region's role in transport is reinforced by the fact that the region is crossed by the Trieste Kiev Pan-European Corridor V, which partly overlaps the Mediterranean Corridor, part of the TEN-T core network. The Mediterranean corridor starts from the Ukrainian border of the study region and connects Hungary to Spain via Croatia, Slovenia, northern Italy and southern France (**Figure 1**).

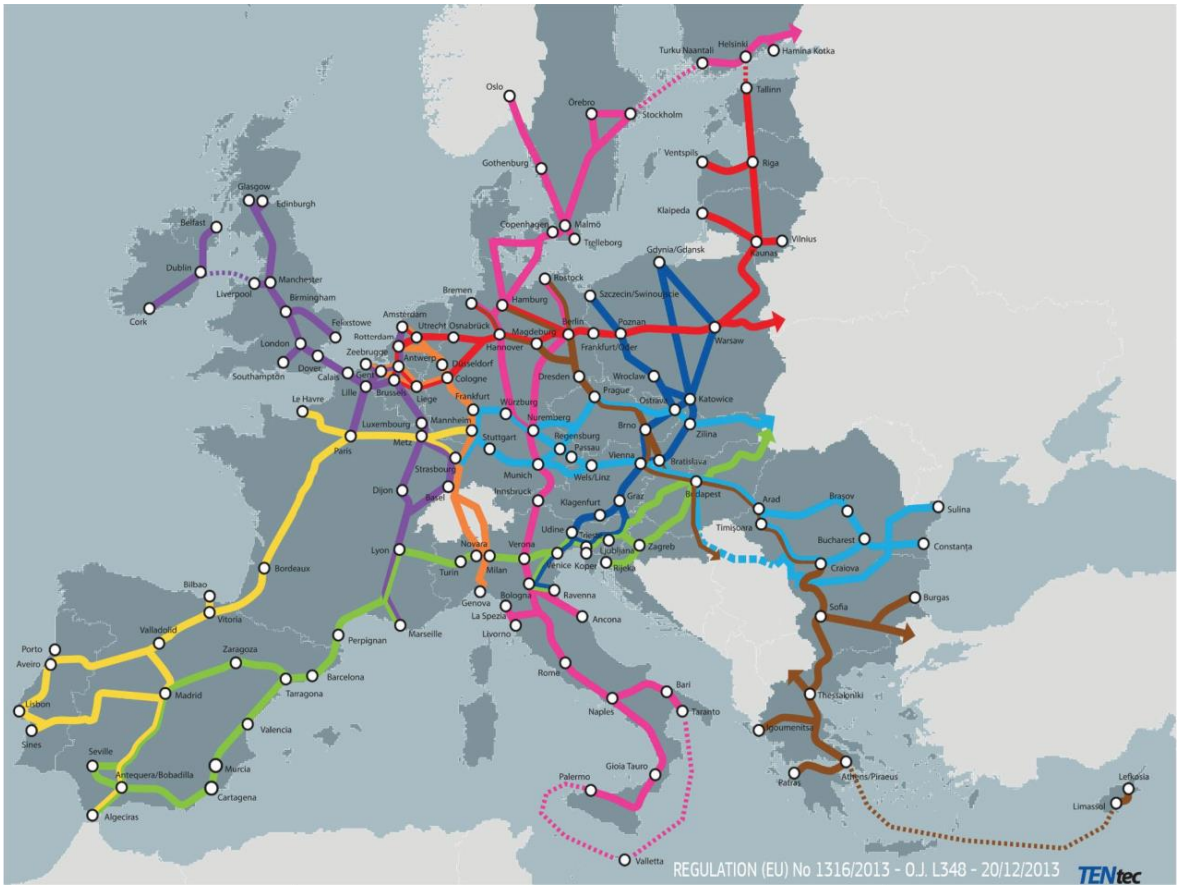

Figure 1. TEN-T core network.
Image source: https://op.europa.eu/webpub/eca/special-reports/core-road-network-9-2020/hu/.

The dual situation of the region is also reflected in the fact that the eastern part of the catchment area of the highly centralised metropolitan agglomeration partly spills over into the western parts of the Northern Great Plain region. At the same time, the eastern one of the two transport axes, which counterbalance the over-centralised network, is the international innovation axis Kassa (Slovakia)-Miskolc-Tiszaújváros-Nyíregyháza-Debrecen-Nagyvárad (Romania), which runs through the region, further extending into the Romanian counties of Timis and Arad, counterbalancing the socio-economic and transport role of the capital (National Transport Infrastructure Development Strategy, 2014) (**Figure 2**).

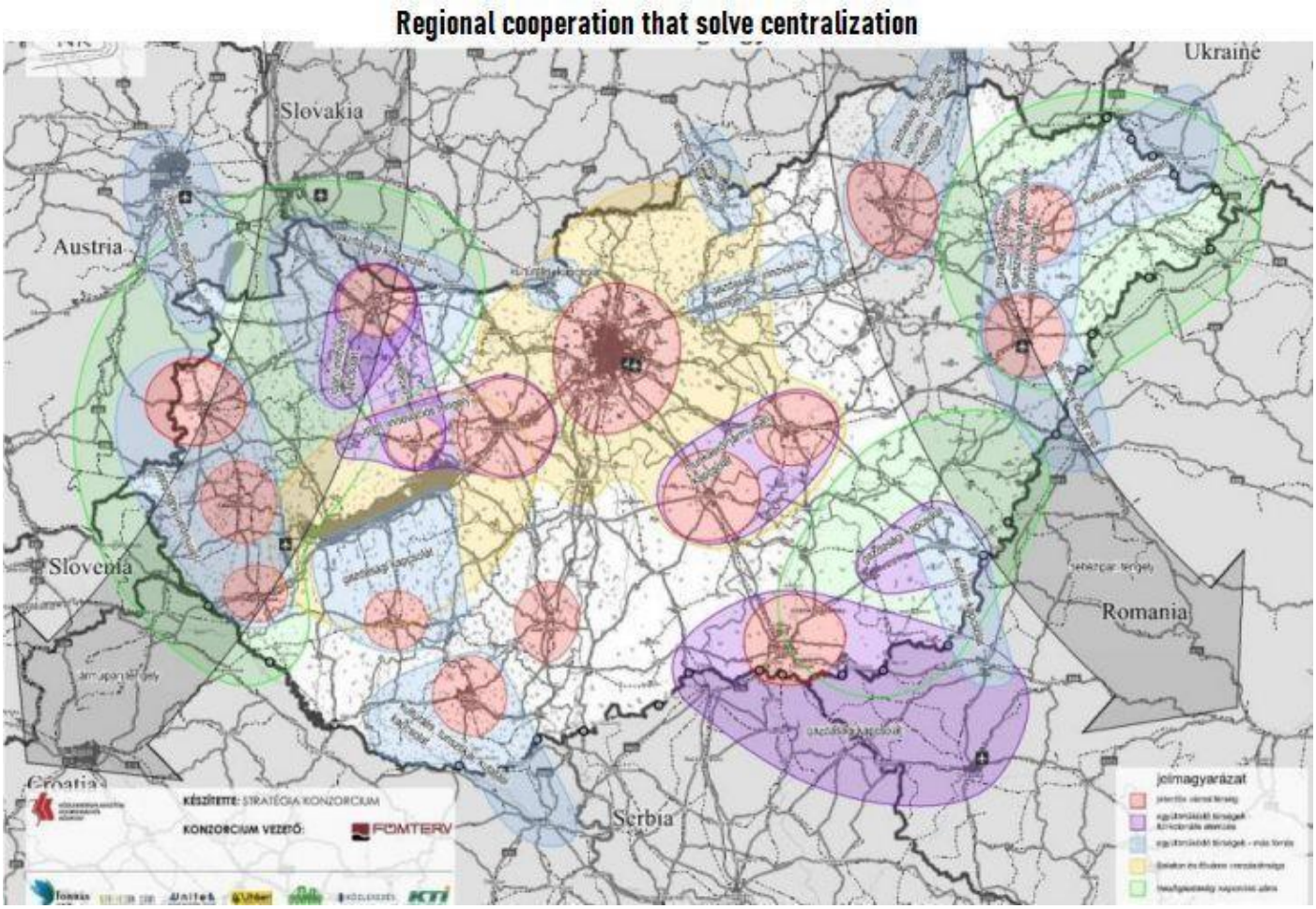

Figure 2. Regional cooperation that solves centralization.
Symbol description: 1: significant urban area, 2: cooperating areas—functional analysis, 3: cooperating regions—other source, 4: Balaton and the capital's catchment area, 5: agricultural contact zone. Source: National Transport Infrastructure Development Strategy, August 2014.

4. Results

4.1. Inspection and examination of administrative fines imposed by nationality

The analysis of foreign nationals checked in the region is useful as an indicator of the geography and economic links of the area, and also to assist road inspectors.

4.1.1. Checks carried out by the region's transport authorities by nationality

The Transport Authorities of the region carried out 38,915 inspections between 2017 and 2021, of which 79% were carried out in Hungary, 18% in non-Hungarian EU countries and only 3% in non-EU countries.

In terms of EU-26 nationals, there is a dominance of Romanian nationals, followed by Polish and Slovakian nationals in orders of magnitude smaller numbers and proportions (**Figures 3** and **4**).

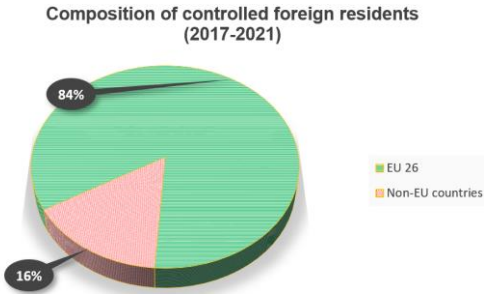

Figure 3. Composition of controlled foreign residents (2017–2021).
Source: official data.

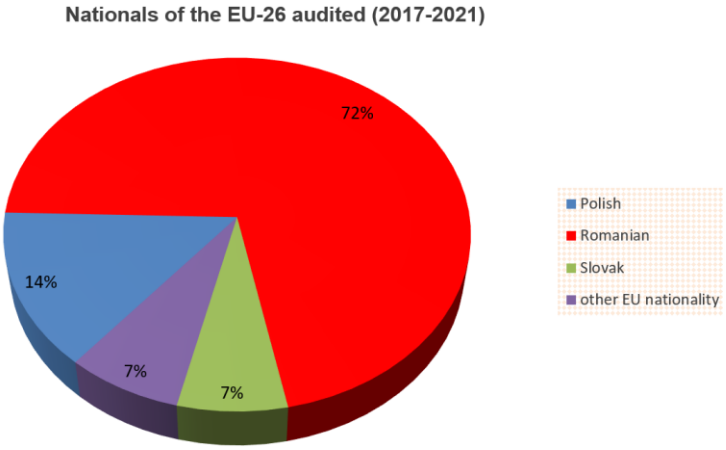

Figure 4. Nationals of EU-26 audited (2017–2021).
Source: official data.

The following statement can be made about the figure. Romania is Hungary's Eastern neighbour, so the link to Western Europe is Hungary for Romania. The figure of almost two-thirds is, therefore, not surprising. Poland has the second highest value. Poland has one of the largest economies in the region and one of the largest truck fleets in Europe. Polish trucks play a major role in North-South freight transport. Slovakia is Hungary's Northern neighbour, with an economy almost half the size of Hungary's. There are close economic ties between the two countries, so a figure of 14% is realistic. Surprisingly, the remainder is only 7%. If we look at the size of the Ukrainian economy, we would have expected a much higher turnover. This 7% represents not only Ukrainian trucks but also trucks from other countries (although the largest number is Ukrainian trucks).

The chart above shows that the highest percentage of non-EU nationals checked (66%) were those of Ukrainian nationality (66%), who border the region under review. Freight carriers and transporters from Serbia, which borders Hungary but is not a direct neighbour of the region under investigation, were the second most frequently checked, followed by those of Russian nationality. The analysis of foreign nationals also shows that 76.5% of the foreign nationals 260 checked in the Northern Great Plain region come from countries neighbouring the region 261 (Romania, Slovakia, Ukraine) (**Figure 5**).

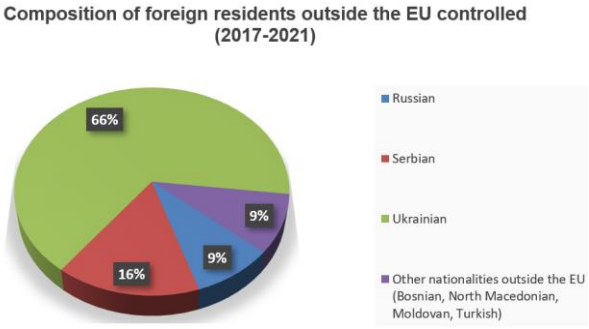

Figure 5. Composition of foreign residents outside the EU controlled (2017–2021).
Source: official data.

As mentioned in **Figure 4**, Ukrainian lorries are the most numerous non-EU lorries entering Hungary. Serbia also shares a border with Hungary, but the Western link is also Croatia, not just Hungary. Therefore, Serbian traffic to Hungary either enters Hungary directly or heads North. Russian traffic to Hungary is small. The reason for this is that trucks from Russia are mainly heading Westwards towards Belarus and Poland.

Among the other non-EU nationalities, it is worth highlighting the Turkish and Moldovan nationalities, who mostly transit Hungary, i.e., the country plays a transit role for them.

4.1.2. Administrative fines imposed by the region's traffic authorities by nationality

During the five years under review, 2470 administrative fines were imposed in the region, 65% of which were imposed on Hungarian nationals, 30% on EU-26 nationals and 5% on non-EU nationals (**Figure 6**). It should be mentioned, however, that the fact that Hungarian citizens are more familiar with domestic legislation and traffic conditions (and foreigners less so) certainly plays a role in this. This certainly reduces the number of offences committed by Hungarian citizens.

In this respect, it is worth comparing the number of persons checked and the number of persons fined, because this also allows us to show the proportion of persons not sanctioned with administrative fines (**Figure 7**).

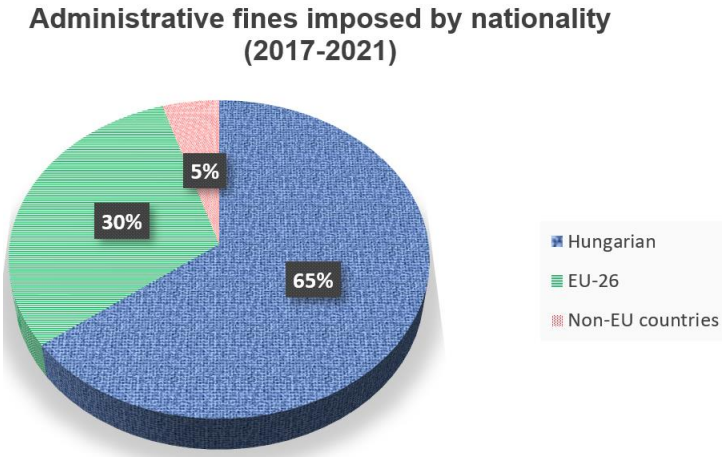

Figure 6. Administrative fines imposed by nationality (2017–2021).
Source: administrative data.

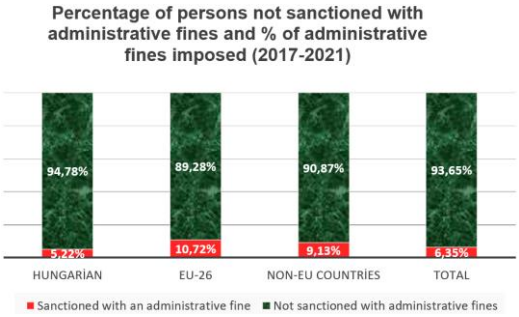

Figure 7. Percentage of persons not sanctioned with administrative fines and % of administrative fines imposed (2017–2021).
Source: data provided by the Office.

Compliance is very high in the region without regard to nationality (93.65%), which also means that there are 6.35 administrative fines imposed per 100 checks (**Figure 7**). When analysing nationalities, it can be seen that Hungarian nationals are the most likely to comply with the law, which is remarkable because more than 3.5 times more Hungarian nationals were checked than foreign nationals. However, this correlation no longer holds in the EU-26 category, as the proportion of foreign nationals checked is higher by an order of magnitude, as is the proportion of non-compliant nationals. It follows that in this respect there is no direct proportionality between the number of checks and the number of infringements sanctioned by administrative fines. For non-EU countries, compliance is higher than in the EU-26, which can be explained by the fact that border controls are carried out when crossing the EU's Schengen borders, where more deficiencies are detected by the tax and customs officials.

In the EU-26 category, the composition by nationality of those sanctioned with administrative fines is parallel with the nationalities most checked within this category: Romanian, Polish and Slovak (**Table 1**).

Table 1. Administrative fines imposed in EU26 cluster (2017–2021).

Honesty	**Sanctioned with an administrative fine (%)**
Bulgarian	1.86
Czech	3.32
Netherlands	1.19
Croatian	0.13
Polish	14.59
Latvian	0.66
Lithuanian	1.06
German	0.93
Italian	0.13
Romanian	63.53
Spanish	1.59
Slovak	9.68
Slovenian	1.33
Total	100.00

Data source: administrative data.

For those sanctioned with an administrative fine outside the EU, the former is no longer the case. Most of the administrative fines were imposed on Ukrainian nationals (55.93%), followed by a smaller number and proportion of Moldovans (12.71%) and Serbs (9.32%) (**Table 2**). In terms of the number of persons checked in this category, Ukrainian nationality is also the most numerous, but the second most checked nationality is Serbian, followed by Russian.

Table 2. Distribution of non-EU nationals sanctioned with administrative fines (2017–2021).

Honesty	**Sanctioned with administrative fine (%)**
Bosniak	5.93
North Macedonia	7.63
Moldavia	12.71
Russian	5.08
Serbian	9.32
Turkish	3.39
Ukrainian	55.93
Total	100

Source: official data.

It can also be noted that, when analysing foreign nationals, there are large differences between the nationalities with the highest administrative fines and those that follow.

4.2. Infringements sanctioned by administrative fines by type of infringement

4.2.1. Assessment on the basis of authenticity

Figure 8 shows that the most frequent infringements of the provisions on driving and rest periods (35.55%) and on recording equipment and tachograph (33.6%) were committed irrespective of nationality and sanctioned by administrative fines. These two infringements account for almost 70% of the cases sanctioned with administrative fines. The number of infringements of the provisions on documents and licences (13.32%) and vehicle and load safety (10.32%) and the provisions on the carriage of goods by road by means of hired vehicles (5.71%) is much lower. The other types of infringement examined are negligible.

For Hungarian nationals subject to administrative fines, the types of offences concerning driving and rest times, recording equipment and tachograph are equally represented (31.35%), followed by offences concerning documents and licences (18.96%) and vehicle and cargo safety. It can be seen that the order and the proportions of infringements sanctioned by administrative fines imposed on Hungarian nationals are the same as for the data regardless of nationality, as 65% of the administrative fines imposed were imposed on Hungarian nationals.

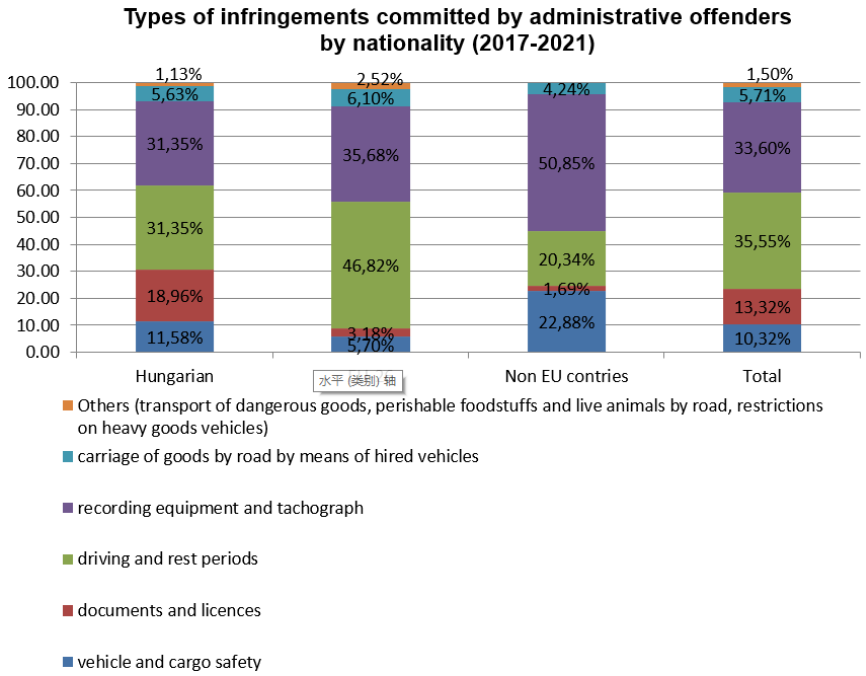

Figure 8. Types of infringements committed by administrative fines by nationality (2017–2021).

Source: administrative data.

Looking at the EU-26 category, almost half of the administrative fines are for infringements of the regulations on driving and rest times (46.82%), recording equipment and tachograph (35.68%), which account for more than two thirds of the administrative fine.

For non-EU countries, recording equipment and tachograph are the most common type of infringement (50.85%), followed by vehicle and cargo safety (22.28%) and driving and resting time (20.34%).

4.2.2. Infringements by type

By type of offence (**Figure 9**), the most common types of offences are infringing the driving and rest time and tachograph rules. These are most frequently committed by Hungarian nationals, with the fewest offences committed by non-EU nationals.

Vehicle and cargo safety and security are breached by Hungarian nationals by an order of magnitude more often than by other nationalities, and by non-EU nationals by the least. It is noteworthy that non-EU nationals have the highest rate of this type of infringement (10.59%). In the documents and permits type of offence, Hungarian nationals are the “sole” offenders (92.10%). In the data on road transport of goods by hired vehicles, Hungarian nationals (63.83%) are also followed by a much smaller proportion of EU-26 representatives.

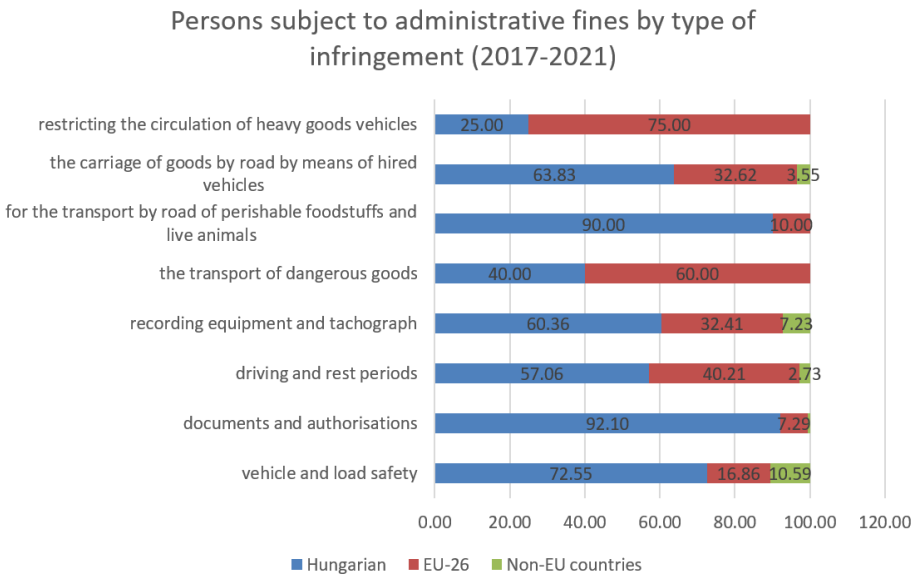

Figure 9. Persons subject to administrative fines by type of infringement (2017–2021).

Source of data: administrative data.

There are no administrative fines imposed outside the EU for restrictions on the movement of heavy goods vehicles, perishable foodstuffs and livestock, dangerous goods, and the number of cases of these types of infringements is very low in the other two clusters examined (37 in total in both clusters over the five years examined). The above graphs show that in terms of frequency, Hungarian nationals and EU-26 commit similar types of offences, with the exception that Hungarian nationals are more evenly matched in terms of driving and rest time offences and offences concerning the use of recording equipment and tachographs. Non-EU nationals have frequently committed infringements in the areas of driving and rest periods and vehicle and load safety, which are sanctioned by administrative fines. It can be said that in the very rare types of infringements (restrictions on the circulation of heavy goods vehicles, transport of perishable foodstuffs and live animals by road, transport of dangerous goods), there are no infringements sanctioned by administrative penalties committed by non-EU nationals.

Checking driving and rest times, the use of recording equipment and tachographs, as well as vehicle and load safety, are of paramount importance, as the transport of goods and freight is mainly carried out by heavy vehicles, which pose a greater risk to road safety due to their greater weight and kinetic energy and the dangerous nature of the goods they carry, and it is therefore important that these vehicles are driven by a well-rested person. The relevant legislation is also stricter for these types of offences. In addition to the reasons mentioned above, the legislator also intends to prevent the exploitation of drivers and to promote fair competition in the freight transport sector.

4.3. Nationality and types of infringement

This chapter compares Hungarian and two foreign nationalities. The two foreign categories examined are the most checked and most fined nationalities: the non-EU Ukrainian and the EU26 Romanian nationalities. For the comparison, a percentage indicator was used, which shows the fines imposed on each nationality per 100

inspections per 100 representatives of that nationality. For the infringements committed, only the first three most frequent types of infringement committed by a given nationality are examined in detail, due to the large size of the data.

For every 100 Hungarian nationals checked, 5.22 administrative fines were imposed on Hungarian nationals. An evenly balanced proportion of Hungarians infringed the types of offences relating to driving and rest periods, recording equipment and tachograph (31.35%). The third most frequent offence was failure to comply with the requirements relating to documents and licences (18.96%) (**Figure 10**).

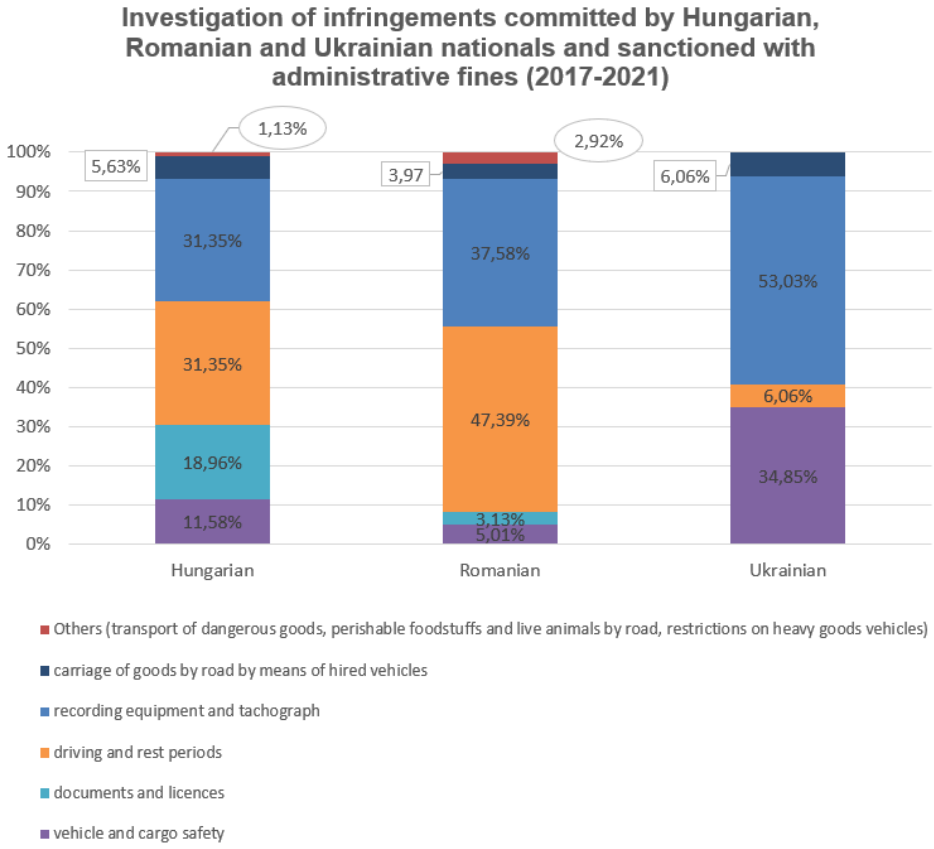

Figure 10. Investigation of infringements committed by Hungarian, Romanian and Ukrainian nationals and sanctioned with administrative fines (2017–2021).
Source: official data.

For every 100 vehicles of Romanian nationality checked, 9.54 administrative fines were imposed on Romanian nationals. Romanian offenders were most likely to have infringed the provisions on driving time and rest periods (47.39%) and on recording equipment and tachograph (37.58%), followed by vehicle and load safety (5.01%) (**Figure 10**).

There are 7.68 administrative fines per 100 vehicles of Ukrainian origin checked. Most Ukrainian nationals were found to have infringed the provisions on recording equipment and tachograph (53.03%), vehicle and load safety (34.85%), driving time and rest periods (6.06%) and road haulage with hired vehicles (6.06%) (**Figure 10**).

It can be seen that there is a similarity between Hungarian and Romanian nationals in that driving and resting time and tachograph offences are the most

common, although Romanian nationals have a higher proportion of driving and resting time offences.

A comparison of offences committed by Ukrainian and Romanian nationals shows that vehicle and cargo safety is present for both nationalities, but the rate is significantly higher for Ukrainian nationals.

There is also a relatively low proportion of administrative fines for offences concerning documents and permits for Hungarian nationals and for offences concerning the carriage of goods by road in hired vehicles for Ukrainian nationals.

The stark difference is that Ukrainian nationals have only committed four types of infringements that are punishable by administrative fines. In the category of documents and permits, there were no infringements for Ukrainians and a negligible number (3.13%) for Romanians, mainly due to border control.

5. Conclusion

On the basis of this analysis, we conclude that the controls of the County Transport Authorities reflect the geographical location of a region. The EU 26 cluster is dominated by Romanian nationals, due to the fact that Hungary is an important transit country for Romania in reaching the western and southern parts of Europe, which is also reflected in the economic relations based on geographical proximity and historical traditions, as illustrated by the economic cooperation between Kassa-Miskolc-Debrecen-Nagyvárad (**Figure 2**).

The higher share of Poles in this cluster is not surprising either, because the Polish freight fleet is the leading fleet in the EU, so Polish freight transport uses Hungary as a transit point for its pan-European activities, in addition to Poland's Hungarian economic links. According to EUROSTAT data, Poland has been included in the list of the TOP 20 country flows in intraEU road freight transport as a major third country carrier in 2021 for 15 relations (**Table 3**).

Table 3. Top 20 country-to-country flows in intra-EU road freight transport, 2021.

Rank	Pair of countries		Total (million tonnes)	Hauliers of first country (%)	Hauliers of second country (%)	All other hauliers (%)	Main other haulier
1	Germany	Netherlands	89.6	27.4	50.9	21.7	Poland
2	Germany	Poland	70.4	3.7	95.4	1.0	Lithuania
3	Belgium	Netherlands	57.5	17.7	71.8	10.4	Poland
4	Belgium	France	56.2	42.3	25.6	32.1	Lithuania
5	Spain	France	47.7	80.9	6.3	12.7	Portugal
6	Germany	France	47.5	29.3	12.0	58.7	Poland
7	Belgium	Germany	44.1	15.8	28.3	55.9	Poland
8	Austria	Germany	40.8	30.4	31.6	37.9	Poland
9	Czechia	Germany	25.8	65.1	15.1	19.8	Poland
10	Germany	Italy	24.4	15.8	21.8	62.4	Poland
11	France	Italy	23.5	19.5	35.0	45.5	Poland
12	Spain	Portugal	22.2	55.9	44.1	-	-
13	France	Netherlands	18.7	10.1	45.7	44.3	Poland

Table 3. (*Continued*).

Rank	Pair of countries		Total (million tonnes)	Hauliers of first country (%)	Hauliers of second country (%)	All other hauliers (%)	Main other haulier
14	Czechia	Poland	16.9	6.7	93.0	0.3	Romania
15	Germany	Spain	14.5	2.9	61.9	35.2	Poland
16	Austria	Italy	14.0	26.2	18.2	55.6	Slovenia
17	Germany	Denmark	12.4	45.0	7.1	47.9	Poland
18	Czechia	Slovakia	11.2	35.3	64.0	0.6	Hungary
19	Poland	Slovakia	9.7	93.4	6.6	-	-
20	Italy	Poland	9.3	-	98.9	1.1	Lithuania

(-) Not applicable

Source: Eurostat (road_go_ta_tott), (road_go_ia_ugtt), (road_go_ia_lgtt), (road_go_cta_gtt).

In the non-EU cluster, the number of those of Ukrainian nationality is rising, reflecting the region's main road links, the most significant of which is the V. Pan-European Corridor No. V (Venice-Trieste-Ljubljana-Maribor-Budapest-Uzhhorod-Lviv-Kiev), which is part of the TEN-T Mediterranean Corridor, one of its intermodal hubs is the Záhony-Csap-Agczernye logistics area at the Ukrainian-Hungarian-Slovakian border of the region, where goods are transhipped from the broad-gauge railways from Russia and Ukraine to the narrow-gauge railways used in most of Europe, and some of the goods are transported not only by rail but also by road (**Figure 1**).

For Russia, the Pan-European Road Corridor V via Kiev is an important link to the western half of Europe, yet Russian nationals are only the third most frequently checked nationality in the non-EU cluster. This may be due to the fact that most of the goods coming from Russia travel by rail, as well as to the preferential route Berlin-Poznan-Warsaw-Brest-Minsk-Smolensk-Moscow-Nizhny Novgorod (No. II) and the Kiev terminus Berlin/Dresden-Nizhny Novgorod (No. III). Wrocław-Katowice-Krakow-Lviv-Kiev corridor.

An analysis of the fines imposed as a result of the checks shows that compliance is predominant. Based on the data, if we look at the number of administrative fines imposed, Hungarian nationals are in the vast majority (65%), but due to the different magnitude of the checks, we thought it appropriate to use a percentage indicator, which shows that the group of EU-26 inspectors is the group with the most non-compliant behaviour (10.72 administrative fines imposed for this category for every 100 EU-26 inspections). It is possible to link the nationalities and the types of offences and infringements and the practical usefulness of the data obtained will become increasingly important in the near future, as one of the objectives of road safety enforcement is to promote road safety and, to this end, to detect as many offences as possible. The detection of infringements is even more important in the ever growing freight transport and haulage sector, which is mainly carried out by vehicles with a higher gross vehicle weight, which, due to their weight and kinetic energy, the type of goods they carry and often their dangerous nature, e.g., ADR, also present a higher risk of traffic accidents, both in terms of personal injuries and environmental and infrastructure damage and impacts. This study can help road inspectors in their daily

work, as the results of the study can be linked to predictive analytics, which can be applied to identify which localities are more likely to be at risk of road traffic offences when selecting the vehicle to be inspected. The other important data for the application of predictive analytics is which types of offences are more likely to be committed by the localities to be checked, thus allowing a more focused control. Predictive analytics is used in many areas of life. It is used in commerce, service companies (e.g., banks, insurance companies), utility companies (e.g., water and electricity suppliers), law enforcement and criminal justice. The operating principle of prediction is the same in all areas. Prediction software uses mathematical statistical methods (e.g., regression, correlation) and AI to predict certain future events with a certain margin of error. The field of law enforcement is more specialised in that AI teaches criminological theories to the software (e.g., the theory of nearrepetition). In law enforcement, it is used to predict the location, time and offender of crimes (some software can also predict victims). Law enforcement software is mainly used to predict street crime (e.g., The authors base this opinion on the contribution of the first Hungarian preventive policing software, Ferenc Traub, who argues that any act can be predicted if it occurs in a sufficiently large number of cases, including most types of traffic accidents. This software indicates on a hot spot map when, where and what type of crime is likely to occur in the next time interval (up to two weeks). For offences, the authors hypothesise that, as with crime, a map could be used to show offences that are likely to occur in the future. Demonstrative presence of the authorities (e.g., wearing uniforms) could prevent some offences (i.e., not being committed due to the presence of the authorities), while others would increase the detection efficiency of the authorities. On this basis, research work could be continued in the future to profile the types of offences committed by foreign nationals, and in the case of Hungarian nationals, could also help the work of road traffic control officers. Predictive analytics can be 460 used by road traffic controllers in the course of their daily work, on the one hand, because 461 nationality can predict the likelihood of a violation when selecting the vehicle to be checked, 462 and on the other hand, because by typing the nationality of the persons fined and the types of 463 violations committed by them, they can pay more attention to the detection of violations that 464 can be linked to a given nationality.

In the case of infringements, it can also be said that prevention, rather than retaliation, is the long-term way to improve road safety, and therefore the primary objective of the authorities' road inspectors is not to impose administrative fines, but to prevent traffic accidents, among other things, because road freight transport and haulage typically involves vehicles carrying 469 heavier goods, with greater kinetic energy, often with a higher risk of accidents, and the 470 personal injuries and environmental - infrastructure damage caused by accidents are also greater.

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