Assessment of the impact of a provision in the context of the revision of Regulation (EC) No 1071/2009 and Regulation (EC) No 1072/2009

Final Report

Study contract no. MOVE/C1/SER/2050-557/SI2.830443

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EXECUTIVE SUMMARY

Objectives and context

Ricardo was commissioned to support the European Commission in the assessment of the impacts of the obligation of regular return of the vehicle to the Member State of establishment (as established in the revised Regulation (EC) No 1071/2009 on access to the occupation of road transport operator).

The provision is defined as follows: *"An undertaking shall organise its vehicle fleet's activity in such a way as to ensure that vehicles at the disposal of the undertaking and used in international carriage return to one of the operational centres in that Member State at least within eight weeks after leaving it."*

The objective of the study is to identify and assess the impacts of this provision on the climate and environment, on congestion and on the economy and internal market. The study considered the potential impact on freight transport operations and the resulting impacts on driver working conditions, taking into account also the parallel implementation of the new requirement that drivers return regularly to their home countries, in accordance with the revised Regulation (EC) 561/2006 on the harmonisation of certain social legislation relating to road transport.

The provision has now been adopted and established in Regulation (EU) 2020/1055 and will apply from 21 February 2022.

Methodology and research tools

The methodological approach applied to meet the objectives of the study was based on the Better Regulation principles. It included the following two tasks:

- **Assessment of current business practices and market conditions:** Developing an understanding of the current market situation is key to assess the impacts of the provision. The methodology includes the development of the baseline (no policy change) scenario against which the impacts of the provision can be assessed. The baseline characterises the current market situation and the expected evolution of the market and business practices in the absence of this provision: in terms of vehicles involved in international road operations, the frequency of their return to their Member State of establishment and their characteristics. It also takes into account the effects of the COVID-19 pandemic.
- **Assessment of impacts of the new provision:** For a number of scenarios representing different market responses to the provision, the analysis examined the impacts arising from the obligation of the return of the vehicle to the Member State of establishment of the operator. The analysis covers the impacts expected in 2023 (first full year of the provision's implementation) on transport activity, the environment, congestion and the economy/internal market. The methodology is based on a combination of quantitative and qualitative assessment:
    - The quantitative assessment is based on a scenario approach to identify and estimate the outcomes in terms of the potential impact on the number, length and load factor of additional vehicle journeys arising from the provision. In addition, the analysis also relied on a cost differentials model that estimates the difference in operating costs for operators of different Member States of establishment when conducting international operations. This is used to understand the cost advantage of operators and how it is expected to develop after the introduction of the provision to help establish how the market might respond. In combination, the identified market responses are used to quantify impacts on transport activity, the environment, congestion and the economy/internal market.
    - Qualitative assessment is also undertaken to provide a more nuanced analysis and complement the quantitative analysis, especially on the

analysis of the impacts on the functioning of the internal market, competition, and other economic impacts (e.g. prices, employment).

The following research tools were used:

- Desk research and data collection to identify, extract and analyse secondary data sources from relevant studies, reports and databases.
- Two surveys to supplement and/or cross-check the evidence gathered through the desk research, including:
    - A survey of the industry and social partners (507 responses from companies engaged in the provision of road freight transport services (e.g. haulier, freight forwarder, logistic provider), trade unions representing drivers of vehicles engaged in the provision of road freight transport services[1], national associations of road haulage / transport operators), and
    - A survey of national authorities (20 respondents).
- A total of four exploratory interviews, 13 interviews and a further two written responses were undertaken to obtain further insights following on the surveys.
- Data requests to fill in gaps outstanding from the surveys and interviews.

Assessment of current business practices and market conditions

The focus of the analysis is on the road freight market which accounts for around three quarters of all inland freight transport activities in the EU27 (in tonne-kilometres). In the future, road freight activity is expected to grow despite the impacts from the COVID-19 pandemic in the short term: a temporary dip in activity is expected but activity is projected to recover and marginally grow in 2023 in the baseline scenario[2].

The provision concerning the regular return of trucks to the Member State of establishment is directly linked to the extent of international road freight activity, which represented 32% of total road freight activity (in tonne-kilometre) in the EU27 in 2019. For this type of activity, which includes bilateral, cross-trade and cabotage operations, vehicles operated by hauliers based in the East[3] carry out a significantly larger portion of the EU total, compared to the size of their domestic market. Their share increases even further when considering cabotage and cross-trade operations:

- Overall, 62% of all international freight activity is carried by vehicles registered in Eastern European Member States.
- In terms of total bilateral operations, vehicles from Western Member States contribute only 21% of the EU27 total compared to 54% undertaken by Eastern Member State vehicles.
- Even more, in terms of cross-trade and cabotage operations, vehicles from the Eastern Member States make up a much larger proportion of the total, providing for 87% and 75% of the total activity respectively.

By definition, the provision is more likely to affect vehicles engaged in operations that do not necessarily involve the return of the vehicle to the Member State of establishment of the operators, that is, cross-trade and cabotage operations. The general pattern for the cross-trade flows in the EU are loading and unloading within a Western European Member

[1] Although not specifically targeted, there was also the option for drivers to complete the survey

[2] Based on the projections from the PRIMES-TREMOVE, COVID Baseline, developed by E3Modelling in mid-2020 and own interpolations for 2023 (European Commission, 2020).

[3] For the purpose of this report, Eastern European Member States include: Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia.

State, performed by a vehicle registered in an Eastern European Member State. Similarly, cabotage operations take place predominantly in Western Member States and are carried out by a combination of hauliers from Eastern, Western, and, to a lesser extent, Southern European Member States.

In this context, the analysis showed that virtually all vehicles of operators based in Western and Southern European Member States tend to return more frequently (i.e., six or more times a year), apart from some Member States (i.e., FI, MT) which have a significant share of vehicles which also return less frequently.

Conversely, only approximately half of the vehicles of Eastern European Member State operators return six or more times per year. There are however significant differences between these Member States: Bulgarian, Latvian, Lithuanian, Romanian and Slovakian vehicles tend to return less frequently (i.e. fewer than six times in a year) but Czech, Hungarian and Slovenian vehicles return more frequently. Furthermore, Estonian and Polish hauliers appear to have an equal or similar share of trucks that return more compared to the share that return less frequently.

Operators whose vehicles return six or more times a year are likely to operate shorter truck cycles[4] (i.e. less than eight weeks). Therefore, these vehicles are expected to already be compliant with the new provision (i.e. if they operate a maximum of 52 weeks in a year, they are, on average, returning at least once every eight weeks, assuming regular cycles).

On the other hand, lower return frequencies are likely to be associated with truck cycles longer than eight weeks. Among those vehicles returning less frequently (i.e., six or fewer times a year), the analysis showed that the majority tends to return only once a year, which suggests that vehicles tend to be involved in very long truck cycles (if they are not returning every eight weeks).

Most long truck cycles seem to include a number of different types of operations but hauliers that are engaged in longer cycles are also those with significant cross-trade and, to a lesser extent, cabotage operations.

In addition, long truck cycle operators tend to be slightly smaller companies (in terms of employees and revenue) and obtain more business via contracts with freight forwarders/forwarding agents. Overall, the EU road haulage market is dominated by small and medium enterprises (SMEs), where firms in the East tend to be smaller and have a considerably lower turnover compared to Western European road hauliers.

The type of vehicles used by longer truck cycle operators tends to be newer and heavier vehicles (>32 tonnes in GVW and Euro VI). This is similar to the vehicle types used by short truck cycle operators, which suggests that this type of vehicles is prevalent in international operations.

In the future, the patterns and characteristics of longer truck cycles are not expected to significantly change in the absence of the provision (i.e., under the baseline) even when considering the impacts of the COVID-19 pandemic.

Assessment of impacts

A scenario approach was developed to represent the potential market responses to the new obligation and derive the impacts on transport activity, the environment, congestion and the economy. Given the uncertainty on how different operators might adjust to the new obligation, three scenarios were identified and are described in Table ES1 to capture the range of possible market responses.

[4] A truck cycle is defined as the round trip that encompasses a combination of assignments that a truck carries out between leaving and returning to the country of establishment of the operator

Table ES1: Description of the scenarios assessed in this study

Scenarios	Description
Simple market compliance (SMC)	A scenario where all affected operators would be minimising any changes to the way they conduct their operations, whilst complying with the new provision. Operators would carry out the same number of assignments as in the business-as-usual case (baseline scenario) but as part of shorter cycles from their current Member State of establishment.
High market restructure (HMR)	A scenario where all operators would make more substantial changes to their operations (e.g. forgo some assignments, scale down operations in certain countries, relocate or open a new entity in another country as a result of this provision). The assignments that could no longer be fulfilled in the same cycle would instead be undertaken by an operator/entity established in another Member State. The new Member State of establishment could be either the Member State in which those assignments take place (i.e., from where it departs/arrives or within that Member State) or another Member State from which the cost differential is lowest (i.e. they are closer to the location of the assignment).
Partial market restructure (PMR)	A scenario which reflects a combination of operators that minimise changes to their operations and operators that make more substantial changes. This is constructed based on the survey responses from the consulted hauliers.

The **simple market compliance** is considered to be the most likely scenario, especially in the timeframe of the assessment:

- Given the above scenario descriptions, the simple market compliance scenario can be considered to be the most straightforward outcome, as operators would need to make fewer adjustments in order to comply with the new requirement. The market restructure scenarios require more significant market changes and adaptation, including the potential relocation of hauliers to other countries.
- The analysis of the cost advantage suggests that those operators directly affected by the measure and most likely to take action (i.e. those established in the East) would still maintain their competitive position even if their trucks would need to return more frequently to their operational base and incur additional costs thereof.

The impacts of the other two scenarios are nevertheless provided to capture the full range of potential outcomes although these scenarios are considered less probable.

The main impacts of the scenarios on transport activity and the environment are presented in Table ES2.

Table ES2: Summary of main impacts of the scenarios on transport activity and the environment: total and as a change compared to international freight total values in 2023

Scenarios	SMC	PMR	HMR
Impact on number of journeys created (in thousands)	1,915 (2.0%)	1,016 (1.1%)	1,137 (1.2%)
Impact on vehicle-kilometres (in millions)	2,528 (4.8%)	706 (1.4%)	436 (0.8%)
Impact on CO_2 emissions (in thousand tonnes)	2,900 (4.6%)	810 (1.3%)	500 (0.8%)

Scenarios	SMC	PMR	HMR
Impact on NO_x emissions (in tonnes)	619 (7.8%)	173 (2.2%)	107 (1.4%)
Impact on $PM_{2.5}$ emissions (in tonnes)	221 (5.0%)	62 (1.4%)	38 (0.9%)

Under the simple market compliance scenario, up to 1.9 million **new journeys** could arise in 2023 compared to the baseline (business-as-usual case), representing an increase of 2% in international road freight journeys in 2023. It is assumed that the affected hauliers are not able to find cargo for the additional journeys and thus all potential journeys arising due to the need to return more frequently to the Member State of establishment are included in this scenario[5].

The majority of the additional journeys in this scenario would be carried out by hauliers based in the Eastern European Member States which are those whose vehicles are more likely to be engaged in cycles longer than eight weeks in the baseline.

By comparison, the restructuring scenarios represent a lower increase in the number of journeys with respect to the baseline (ranging between 1 and 1.1 million new journeys). Under these scenarios, new operators or a new entity of the original operators based in a different Member State would partially or fully replace the original operators. This would lead to additional journeys from vehicles registered in both Western and Eastern European Member States as the new Member States of establishment are likely to be in central Europe, including many Western European countries and a number of Eastern European countries which are not located in the outer periphery.

Of all scenarios, the lowest number of journeys is expected to be generated by the PMR scenario. This is explained by the level of empty running associated with the potential new journeys[5]: a higher share of journeys would originate from East-based hauliers which have lower levels of empty running compared to their Western and Southern counterparts. On the other hand, a larger share of journeys arising from the HMR scenario would be undertaken by West-based hauliers (due to the relocation of hauliers or transfer of activity to the West).

In terms of **vehicle kilometres** which reflect the additional distance travelled in those new journeys, an increase of up to 2.5 billion vehicle kilometres could be observed in 2023 due to the adoption of this measure under the simple market compliance scenario. This represents an increase of 4.8% in international road freight vehicle kilometres in 2023. It reflects the long-distance trips which would be performed by trucks mainly travelling between the East and West in order to return at least every eight weeks to their operational bases in Eastern European Member States.

The increase in vehicle kilometres in the restructuring scenarios would be lower (ranging between 0.4 and 0.7 billion) given the shorter distances travelled under these scenarios as the new operators/entities would be based in Member States closer to where the transport operations take place.

The **environmental impacts** from the provision are directly linked to the potential increase in vehicle-kilometres. Overall, the new provision could result in up to 2.9 million tonnes of additional CO_2 emissions in 2023, under the simple market compliance scenario, representing an increase of 4.6% on the international road freight emissions in

[5] It is assumed that a journey is only new and additional to the baseline if empty. Otherwise, the operators which are able to find a load to transport in those journeys could be displacing (bilateral) journeys already occurring in the baseline.

2023 in the baseline. Similar to the results in vehicle kilometres, the market restructuring scenarios are responsible for lower impacts: 0.5 to 0.8 million tonnes of additional CO_2 emissions expected in 2023, representing a 0.8% to 1.3% increase in international road freight emissions.

In addition, costs of air pollution due to negative health effects and other damages were estimated at €25.9 million associated to an increase in NOx and PM2.5 emissions in 2023 under the simple market compliance scenario. For the restructuring scenarios, these costs are expected to range between €4.5 and €7.2 million.

Examining three border crossing points (BCP) in the core TEN-T network, the **congestion impacts** of the provision were assessed. Waiting times on the non-Schengen BCPs selected were found to increase in the simple market compliance scenario due to additional return journeys from West to East: increase from 130 to up to 282 minutes on Vidin – Calafat BCP (BG-RO), and from 55 to up 162 minutes on Nadlac – Nagylak BCP (RO-HU). Conversely, only minor impacts were estimated in scenarios with market restructure due to the lower number of induced return journeys arising between East and West Member States. On the other hand, no significant impacts were found on the BCP between Poland and Germany for any of the scenarios considered, as current waiting times are already very low and traffic would only increase marginally on this BCP.

The analysis also looked into **impacts on the economy/internal market**. The following conclusions were drawn:

- Market operators will incur additional costs in order to comply with the new provision. The nature and size of the compliance costs depends on the market response.
- An analysis of the impact of the more frequent return of vehicles on operating costs of hauliers suggests that Eastern hauliers are still expected to keep their cost advantage compared to Western hauliers for transport operations that take place in Western European countries. While the latter is an important finding, it should be noted that the competitiveness position of hauliers within the market is determined not only by the cost advantage but also other aspects such as quality and timeliness, especially in market segments dependent on more time-sensitive delivery. There is no evidence indicating significant changes in these other competitiveness factors as a result of the measure.
- The new provision could lead to an increase in freight rates due to: (1) hauliers passing through the additional costs arising from the measure and (2) potential changes in the available transport capacity that can increase prices for certain types of operations.
- Competition is expected to be negatively affected due to the change in the available transport capacity in certain market segments as well as a potential increase in the size of firms.
- Employment impacts are expected to be more substantial when there is a more significant restructuring of the market, i.e., operators relocate to a different Member State of establishment as a result of the measure: in the high market restructuring scenario, up to 29% of current truck drivers established in Eastern European countries could be displaced to other EU regions.
- By shortening truck cycles, the measure is also expected to affect how drivers return to their countries, with an increased use of the truck for the return trip also anticipated. This reorganisation could facilitate compliance with the return of the driver obligation.

All in all, the analysis showed that the provision is likely to create additional journeys, regardless of the scenario considered, resulting in potential negative impacts, especially on the environment. At the same time, these negative impacts are not compensated by any additional benefits from trade as the volume of cargo transported by freight is assum

ed to remain unchanged.

1 INTRODUCTION AND OVERVIEW

1.1 Introduction and objectives of the study

Ricardo performed a study to support the European Commission in the assessment of the impacts of the obligation of regular return of the vehicle to the Member State of establishment (as established in the revised Regulation (EC) No 1071/2009 on access to the occupation of road transport operator).

The measure[6] is defined as follows:

"An undertaking shall organise its vehicle fleet's activity in such a way as to ensure that vehicles at the disposal of the undertaking and used in international carriage return to one of the operational centres in that Member State at least within eight weeks after leaving it."

International carriage is divided into the following types of operations or movements[7]:

- **Bilateral operations:** between two Member States where the vehicle carrying out the assignment is registered in one of these Member States
- **Cross-trade operations:** between two Member States where the vehicle carrying out the assignment is registered in a third Member State
- **Cabotage operations:** within one Member State where the vehicle carrying out the assignment is registered in a different Member State.

It is understood that the measure applies to all operations of trucks abroad, where vehicles are fully owned, hired or leased and in the electronic register of transport undertakings. There is no formal definition of an operational centre, but it usually represents physical premises where activities of the operator are managed and where documents are stored This is linked to conditions for the establishment of operator in the Member State. Return of the vehicle is understood to be to the Member State where the vehicle is registered. An outcome of the measure is that vehicles that previously operated longer cycles abroad will now have to return at least every eight weeks.

A truck cycle is defined as the round trip that encompasses a combination of assignments that a truck carries out between leaving and returning to the country of establishment of the operator.

The objective of the study is to identify and assess the impacts of this measure on the climate and environment, on congestion and on the economy and internal market. The study considered the social impacts on drivers as well as business operations. The study also took into account the new requirement that the drivers return regularly to their home countries, in accordance with the revised Regulation (EC) 561/2006 on the harmonisation of certain social legislation relating to road transport.

1.2 This report

This is the **final report** for the study "Assessment of the impact of a provision of Regulation (EC) No. 1071/2009 on access to the occupation of road transport operator and Regulation (EC) No. 1072/2009 on access to the international road transport market" (hereafter, the 'study'). The work is under specific contract number MOVE/C1/SER/2020-557/SI2.830443 implementing framework contract number MOVE/A3/2017-257.

[6] The terms 'measure' and 'provision' are used interchangeably in this report when referring to the new obligation for the regular return of vehicles to their Member State of establishment.

[7] The terms 'operations' and 'movements' are used interchangeably in this report when referring to bilateral, cross-trade and cabotage

The purpose of this report is to provide:

- A sound analysis of the findings along with factual conclusions – Sections 3, 4 and 5
- A final assessment of current business practices as regards the return of the truck to the Member State of establishment for the different groups of operators from the EU27 Member States – Section 3
- A final assessment of the impacts of the new provision on the obligatory return of the truck to the Member State of establishment – Section 4.

This final report is accompanied by a Stakeholder Consultation Summary summarising the results of the stakeholder consultation activities.

1.3 Background to the measure

As part of its *Europe on the Move* strategy to deliver smart, socially fair and competitive mobility by 2025 (European Commission, 2017a), the European Commission has proposed a number of legislative initiatives which target the road haulage sector. These initiatives, which form part of Mobility Package I (one of three Mobility Packages adopted between May 2017 and May 2018), included the proposal for the revision of **Regulations 1071/2009 and 1072/2009 governing access to the road haulage market**, in conjunction with two other legislative proposals (one on drivers' rest periods and on tachograph rules, and one on enforcement provisions for social legislation and the posting of drivers).

Regulations (EC) No 1071/2009 and 1072/2009 (henceforth referred to as Road Haulage Legislation) set out the conditions that need to be met for access to the occupation of road haulage operator and to operate on the international road haulage market. The objectives of the proposal for their revision were to address shortcomings in the existing Regulations and modernise the rules with a view to ensuring the smooth functioning of the single market, changing the existing rules to respond to the current circumstances (targeting, in particular, the use of letterbox companies and updating the rules on cabotage as well as strengthening the levels of enforcement overall), and partially expanding the scope of the Regulations to light commercial vehicles (LCVs).

The proposal followed an ex-post evaluation of the Regulations undertaken in 2016 (European Commission, 2016) (and supported by the work carried out by Ricardo for DG MOVE (Ricardo et al, 2015)) and was also based on the findings from the impact assessment of a proposal for their revision in 2017 (European Commission, 2017b) (also supported by a study carried out by Ricardo for DG MOVE (Ricardo, 2017)).

Following the European Commission's proposal in May 2017, discussions and negotiations continued with the other EU institutions. In this process, additional amendments were put forward, including amendments to Article 5 in the Regulation (EC) No 1071/2009 on the conditions relating to the requirement of establishment.

Among others, the first text voted by the European Parliament in April 2019 (European Parliament, 2019) included an additional requirement (Amendment 128 to Regulation EC 1071/2009, Article 5(1)), which set out that the operator's fleet of vehicles *"shall perform, in the framework of a transport contract, at least one loading or one unloading of goods every four weeks in the Member State of establishment*".

The text subsequently agreed between the Council and the European Parliament in December 2019[8] included an adjustment to this time period, requiring an eight-week

[8] We note that the text agreed also included an additional provision that allows Member States to apply the restrictions applying to cabotage to the initial or final road legs of combined transport. The assessment of this provision concerning combined transport is not within the scope of this study.

return (rather than a four-week return). Furthermore, it no longer necessitated the loading/unloading of goods in the Member State of establishment, as set out below:

"An undertaking shall organise its vehicle fleet's activity in such a way as to ensure that vehicles at the disposal of the undertaking and used in international carriage return to one of the operational centres in that Member State at least within eight weeks after leaving it."

Furthermore, this provision would act in conjunction with another new provision concerning the regular return of the driver introduced by Mobility Package 1 (Regulation 2020/1054 amending the Regulations on driving and resting times and on tachograph). This provision poses an obligation for road undertakings to organise their drivers' work to enable them to return home for a weekly rest within each period of four consecutive weeks. The provision refers to two possible places to be considered as 'home', namely the employer's operational centre where the driver is normally based in the Member State of the employer's establishment, or the drivers' place of residence when the latter differs from the employer's place of establishment. It establishes that it is up to the driver to choose the place of return among the two options provided by employer.

The provision on the regular return of trucks has now been adopted and established in Regulation (EU) 2020/1055 and will apply from 21 February 2022.

Despite the majority in the Council supporting the compromise, multiple Member States, namely Bulgaria, Cyprus, Hungary, Latvia, Lithuania, Malta, Poland and Romania as well as Estonia (Council of the European Union, 2020), issued statements expressing their deep concerns. They argued that the provisional agreement on Mobility Package I not only contradicts the EU's climate ambitions by leading to an increase in the number of empty runs of trucks, but also goes against the stated aim of Mobility Package I of ensuring a level playing field by putting some Member States at a disadvantage based on their geographical location.

Their arguments are also reflected in a number of studies and statements issued by industry associations which highlight the potential for negative impacts from the adoption of this specific provision. As indicated in one of these statements by the International Road Transport Union (IRU) (IRU, 2018), trucks currently return to the country of establishment no more than twice a year[9]. It was argued that the obligation for the same trucks to return every three to four weeks[10] could increase the mileage of heavy goods vehicles by between 80 and 135 million vehicle kilometres per year. It was also suggested that this could have a considerable impact on the empty mileage and the additional vehicle mileage could generate up to 100,000 tonnes of additional truck CO_2 emissions per year. Another study undertaken by KPMG with input from the Union of International Haulers from Bulgaria (KPMG, 2020) found that CO_2 emissions could increase by 71,162 tonnes from vehicles operated by hauliers from Bulgaria that would need to comply with this provision, representing a 2% increase in total CO_2 emissions from vehicles owned by Bulgarian companies providing international road transport. Furthermore, they estimated 32.8 additional hours of waiting time, on average, to pass a key border cross point due to the increase in the number of vehicles returning to Bulgaria.

From its side, the European Commission has accepted the compromise but has also raised concerns that the obligation for the regular return of trucks could lead to '*inefficiencies in the transport system and to an increase in unnecessary emissions, pollution and congestion*'[11] thus not being in line with the ambitions of the European

[9] Although not specified, this is expected to refer to part of the industry involved in international road haulage market.

[10] This statement was published before the proposed provision was amended from a four-week return period to an eight-week period.

[11] https://data.consilium.europa.eu/doc/document/ST-5424-2020-ADD-4/en/pdf

Green Deal and the European Council's endorsement of the objective of achieving a climate-neutral EU by 2050. Thus, in order to better understand the possible impacts caused by the new provision, the European Commission has decided to carry out an assessment of this provision. On the basis of this assessment, the Commission may decide to come forward with a targeted legislative proposal before the proposed provisions enter into force.

2 METHODOLOGY

2.1 General overview of methodology

The aim of this study is to assess the impacts of the obligation for the regular return of the vehicle, taking into account how this might also interact with the new obligation for the regular return home of the driver. The focus is on road freight transport activity. The analysis is undertaken for a specific year, 2023, which is the first full year when the new measure will be applicable.

The methodological approach applied to meet the objectives of the study was based on the Better Regulation principles and informed by a range of research tools. It included the following two tasks.

1. Assessment of current business practices and market conditions

Developing an understanding of the current market situation is key to assess the impacts of the provision. The methodology includes the development of the baseline (i.e. no policy change) scenario against which the impacts of the provision can be assessed. The baseline characterises the current market situation and the expected evolution of the market and business practices in the absence of this provision for the following areas:

- **Transport activity:** to characterise the existing and future traffic flows in the EU (in terms of tonne-kilometres, tonnes, vehicle journeys, average loads and empty runs).

  The new measure is expected to affect more directly operators which undertake international operations, and, in particular, cross-trade and cabotage operations which do not require the vehicle to return to the country of establishment. It is therefore crucial to understand any differences in the importance of these types of international operations for hauliers based in different Member States as well as identify the most important country pairs for these operations that could be affected by the measure.

- **Frequency of the return of trucks:** to establish the patterns in terms of the duration of truck cycles as well as provide an overview of the share of vehicles and type of operations, operators and their characteristics (e.g. type of vehicles used) that are most likely involved in cycles shorter and longer than eight weeks.

  The measure will require an increase in the frequency of the return of trucks to the Member State of establishment of the operator for those engaged in longer truck cycles. It is therefore important to establish the current frequency of return of vehicles by Member State as well as the characteristics of operators that will be directly affected by the new obligation and will need to adjust their business operations to comply with the new requirement.

- **Functioning of the internal market:** to establish the market structure[12], and competitive forces as well as the social landscape.

  The measure has the potential to affect operators differently depending on the market conditions. It is therefore important to establish the specific market dynamics of the road haulage sector. In addition, given the adoption of the measure on the regular return of the driver, it is also important to gain an understanding of current practices in this regard as to identify how the two measures (on the return of the truck and the return of the driver) could work together.

The results and findings of this assessment are presented in Section 3.

[12] Market structure refers to the organisational and other characteristics of the market that help establish the type of competition

2. Assessment of impacts of the new provision

The assessment of the impacts of the new obligation of the regular return of trucks is based on the potential response of individual operators to comply with the new provision. There are a range of factors that may influence the response of these operators (e.g. costs, ability to find a load in the return journey), which are explored in the analysis. Impacts are assessed for 2023 only which is the first full year when the new measure will be applicable.

Given the uncertainty on how different operators might adjust to the new obligation, a **scenario approach** was developed to represent three potential market responses. These range from a scenario where all operators would make small changes to the way they conduct their operations in order to comply with the new obligation to a scenario where all operators would need to make more substantial changes to their operations, resulting in a more significant market restructuring. While the scenarios assessed are a simplification of reality, they provide a systematic approach to understand the extent of the effects of this measure in a consistent and transparent manner. The analysis identifies and focuses on the most likely scenario on the basis of the available evidence and is complemented by the other two scenarios to provide an overview of the potential extent of impacts that could arise from this provision.

On the basis of these scenarios, the impacts are derived for:

- **Transport activity:** change in the number of vehicle journeys and distances driven (in journeys and vehicle-kilometres).
- **Environment:** change in CO_2 emissions and other pollutant emissions.
- **Congestion:** examining the bottlenecks on the basis of a case study for three border crossings.
- **Economy and internal market**: including the impact of the provision on the transport costs for market operators (located in different Member States), market prices and quality of services, competition and level playing field, labour market and driving conditions, and monitoring and enforcement for authorities.

The methodology is based on a combination of quantitative and qualitative assessment. The quantitative assessment is based on the three scenarios developed to identify and estimate the outcomes in terms of the potential impact on the number, length and loading of vehicle journeys. In addition, the analysis also relied on a cost differentials model that estimates the difference in operating costs for operators of different Member States of establishment when conducting international operations. This is used to understand the cost advantage of operators and how it is expected to develop after the introduction of the provision and help establish how the market might respond. In combination, the identified market responses are used to quantify impacts on transport activity, the environment, congestion and the economy. Qualitative assessment of the changes that cannot be quantified or modelled is also undertaken to provide a more nuanced analysis and complement the quantitative analysis.

Note on the comparisons undertaken

The analysis considers differences between Member States both in terms of their current practices and the expected responses to the adopted provision. To enable the analysis of the expected impacts, we have categorised Member States based on the level of operating costs of the hauliers established in their territory. The three clusters defined indicate a similar impact to their cost competitiveness (Table 2-1). The three cost-based clusters also coincide with broader geographical Member State groupings and are hereafter referred by their geographical identification. We also considered potential different impacts for central and peripheral states within the "Eastern European" cluster.

Table 2-1: Choice of Member

State clusters used in the analysis

Member State cluster	Member States included	Description
West / Western European	Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, Netherlands and Sweden.	Hauliers from these countries face relatively higher operating costs. Annual operating costs per vehicle in 2019 are estimated at €152,000. Covers most of the Member States included in the Blue Banana corridor of road freight in the EU[13], where a significant part of international road transport activity occurs, plus the Nordic countries, Austria and Ireland.
South / Southern European	Cyprus, Greece, Italy, Malta, Portugal and Spain.	Haulage costs are lower than in Western European Member States but higher than in Eastern European Member States. Annual operating costs per vehicle in 2019 are estimated at €131,000. These Member States are mostly detached from the Blue Banana corridor
East / Eastern European	Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia.	Hauliers from these countries face relatively low operating costs. Annual operating costs per vehicle in 2019 are estimated at €97,000. Covers also a number of the largest haulier nations (i.e. highest number of companies per capita). Where relevant, a differentiation between central and peripheral countries within this cluster is provided in the analysis.

Research tools

The research tools that supported the analysis included **desk research** on the available literature (reports, studies and other material) and extraction of data from relevant databases and other data sources to deliver the variables in the baseline and policy scenarios. It also included the use of **stakeholder engagement tools** to collect data and other input from a number of different categories of stakeholders. These are described in more detail in the following sections.

[13] https://ec.europa.eu/transport/themes/infrastructure/rhine-alpine_en

2.2 Desk research and data collection

We have conducted desk research to support the various parts of the analysis. For this study the focus of desk research was on the identification, extraction and analysis of secondary data sources (studies, reports, databases). All of the literature is referenced throughout the report and a list is compiled in the references section at the end of this report.

In terms of data collection, we have identified and extracted relevant data, mainly from Eurostat databases, including those used as inputs to develop the indicators and the baseline scenario and to support the analysis of the impacts of the change to policy. The data sources used in this study are referenced throughout the report.

2.3 Stakeholder consultation

Stakeholder consultation based on combination of a targeted online survey and follow-up interviews was used to collect relevant evidence to supplement and/or cross-check the evidence gathered through the desk research. These methods allowed us to collect input from a broad range of stakeholders representing different viewpoints and interests from the following:

- Companies engaged in the provision of road freight transport services (e.g. haulier, freight forwarder, logistic provider);
- National associations of road haulage / transport operators;
- Trade unions representing drivers of vehicles engaged in the provision of road freight transport services;
- Drivers of vehicles engaged in road freight transport; and
- National competent and enforcement authorities involved in monitoring and enforcement of existing regulation compliance.

The targeted stakeholder survey ran from 24 August 2020 to 25 September 2020 and consisted of three different surveys to collect inputs from each of the identified stakeholder groups. The final version of the surveys can be viewed in Annex 1. A summary of the target audience and topics covered in each survey is provided in Table 2-2.

Table 2-2: Summary of survey tools used

Survey	Target audience	Topics covered
Stakeholder survey*	Companies engaged in the provision of road freight transport services (e.g. haulier, freight forwarder, logistic provider) Trade unions representing drivers of vehicles engaged in the provision of road freight transport services	Current business practices and market situation; Potential impacts on the road freight market including on operations, associated costs**, economic and social impacts; and Impacts of recent events on the sector, specifically the COVID-19 pandemic and Brexit.
National associations survey	National associations of road haulage / transport operators	Same as above.

Survey	Target audience	Topics covered
National authorities survey	National competent and enforcement authorities involved in monitoring and enforcement of existing regulation compliance.	Current monitoring and enforcement practices; Authority responses to the new measure; Potential market responses to the new measure including general impacts; Additional data collection of any available information on road haulage operations; and Impact of recent events on the sector specifically the COVID-19 pandemic and Brexit.

* *Although not specifically targeted, there was also the option for drivers to complete the survey.*

*** Questions on costs were shown to companies engaged in the provision of road freight transport services only.*

2.3.1.1 Surveys of stakeholders

The two identical surveys to national associations and other stakeholders (as indicated in Table 2-2) were sent to a total of 224 stakeholders including 66 road haulage associations/company contacts, 49 freight forwarder / logistics contacts and 109 trade union/ worker union contacts. The road haulage, freight forwarder and logistics associations were all requested to distribute the online survey link to their members to complete. Within each of these target groups, stakeholders from all EU-27 Member States were contacted.

A total of 507 complete responses to the survey were received from across the stakeholder groups, with an overview provided in Table 2-3 below. Responses were received from all Member States with the exception of IE, EL, HR and CY. It is noted that the total number of responses varies from question to question as not all respondents answered all questions. Responses were also received from NO and UA.

Table 2-3: Summary of responses by Member State

Member State	National associations	Road haulage operators/ freight forwarders	Trade unions	Drivers
Austria (AT)	✓	✓	✓	✓
Belgium (BE)	✓	✓	✓	
Bulgaria (BG)	✓	✓	✓	✓
Cyprus (CY)				
Czech Republic (CZ)	✓	✓		
Germany (DE)	✓	✓		✓
Denmark (DK)	✓	✓	✓	
Estonia (EE)	✓	✓	✓	✓
Greece (EL)				
Spain (ES)		✓	✓	
Finland (FI)	✓	✓		
France (FR)	✓		✓	
Croatia (HR)				

Member State	National associations	Road haulage operators/ freight forwarders	Trade unions	Drivers
Hungary (HU)	✓	✓		
Ireland (IE)				
Italy (IT)	✓	✓	✓	
Lithuania (LT)	✓	✓		✓
Luxembourg (LU)		✓		
Latvia (LV)		✓	✓	
Malta (MT)		✓		
The Netherlands (NL)		✓	✓	
Poland (PL)	✓	✓	✓	✓
Portugal (PT)		✓		
Romania (RO)		✓	✓	✓
Sweden (SE)	✓	✓	✓	
Slovenia (SI)	✓			
Slovakia (SK)		✓		
TOTAL	19 responses from 15 Member States	434 responses from 21 Members States	21 responses from 13 Member States	31 responses from 7 Member States
Non-EU Member States	Norway (1), Ukraine (1)	N/A	N/A	Norway (1)

Of the 434 responses received from road haulage operators, freight forwarders and logistics companies, 405 indicated they carry out hire and reward operations. Details of the split of these responses by Member State is provided in the Stakeholder Consultation Summary. Overall, more responses were received from Eastern European stakeholders compared to Western and Southern European stakeholders.

2.3.1.1.1 Translations

Stakeholders were given the option of completing the survey in any of the official EU languages with the exception on Maltese and Irish. The translations were created using the EU survey machine translation tool. Where possible these were reviewed by native speakers to identify and address errors in the machine translations. Further details are described in Stakeholder Consultation Summary.

On the basis that responses were submitted in 20 different languages in addition to English, it is felt that this was a valuable way of reaching a wider audience and may have contributed to the response rate.

2.3.1.2 Survey of national authorities

The survey of national authorities was sent to 94 authority contacts and 39 transport attaché contacts from all EU-27 Member States. A total of 20 respondents completed the survey from 16 Member States. Responses were received from BG, CY, DE, DK, EE, ES, FR, HU, IE, IT, LV, MT, PL, RO, SE,

SI.

The UK authority also responded to survey but was excluded and NL responded that they consider it too early in the implementation process to answer questions regarding the impact of the obligation to regularly return the vehicle to the Member State of establishment and therefore could not answer the survey. Responses were not received from AT, BE, CZ, EL, FI, HR, LT, LU, PT or SK, despite reminders being sent and transport attachés also being contacted.

2.3.2 *Targeted interviews*

2.3.2.1 Exploratory interviews

As part of the survey development stage, four exploratory interviews were carried out with the associations identified below in order to get a better understanding of the relevant issues to ensure these issues are properly addressed in the data collection tools (surveys and interviews); and to discuss the data collection approach and identify the best possible approach in reaching their members. These interviews were carried out with the following stakeholders between 14 – 23 July 2020.

- The International Road Transport Union (IRU) representing hauliers at EU level
- The European Association for Forwarding, Transport, Logistics and Customs Services (CLECAT), representing multinational, medium and small freight forwarders and Customs agents
- The European Transport Workers' Federation (ETF), representing drivers
- The Confederation of Organisations in Road Transport Enforcement (CORTE), representing national transport authorities in the field of road transport, road security and road safety

The key outputs from the exploratory interviews are summarised in the Stakeholder Consultation Summary.

2.3.2.2 Interview programme

To supplement the information collected via the surveys, a small number of targeted interviews were carried out with a range of stakeholders. Of target number of 26 (in addition to the four exploratory interviews), 13 interviews were carried out and a further two written responses were received with seven national associations, four hauliers, one trade union and three national authorities taking part. A number of challenges were faced when arranging the interviews, principally the short timeframe of three weeks from 21 September to 9 October 2020 for carrying out interviews following closure of the surveys, on the basis that stakeholders also needed a minimum of one week notice.

A summary of the interviewees is provided in Table 2-4. The interview checklist used is provided in Annex 1.

Table 2-4 Summary of interview targets

Stakeholder group	Number of interviews conducted compared to target	Organisation name	Member State
National associations of road haulage / transport operators	7/8	Union of International Hauliers	BG
		Bundesverband Güterkraftverkehr Logistik und Entsorgung (BGL) e.V.	DE
		ERAA	EE

Stakeholder group	Number of interviews conducted compared to target	Organisation name	Member State
		ANITA	IT (written)
		TLN	NL
		UNTRR - The National Union of Road Hauliers from Romania	RO
		NLA & DTL	Nordic & DK
Companies engaged in the provision of road freight transport services (e.g. haulier, freight forwarder, logistic provider)	4/8	Anders Nielsen & co/ Ancotrans	DK
		Raseborg Express Ab	FI
		UAB Lekpas	LT
		Centrans Sp. Z.o.o	PL
Trade unions representing drivers of vehicles engaged in the provision of road freight transport services	1/4	Sindicatul Lucratorilor din Transporturi	RO
National competent and enforcement authorities involved in monitoring and enforcement of existing regulation compliance.	3/6	Ministry of Economic Affairs and Communications of the Republic of Estonia	EE (written)
		Transport Malta	MT
		Ministry of Transport; Road Transport Administration; Ministry of Interior; State Police	LV
TOTAL	**16/26**		

2.3.3 *Data Requests*

Complementary to the survey and the interviews, the study team carried out two main data requests for the purpose of filling gaps outstanding from the surveys and interviews:

1. Regarding truck cycles, sent to national associations and national authorities via email:
   - Approximate estimate of numbers of vehicles used predominantly or only for international operations; and
   - The share of these vehicles returning six or more times per year to the Member State of Establishment.
2. With respect to current and future costs, sent to road haulage operators as a short online survey to complete:
   - Estimation of the share of overhead costs (including the costs of operational centres and other facilities) in relation to current total annual costs for road haulage operators; and
   - Expected impact on overhead costs for haulage operators associated with

relocation of the main operational centre to a more central location in the EU as a response to the measure and in order to minimise (empty) return trips (including the costs of operational centres and other facilities).

In addition to these formal data requests, the study team reached out to two load matching platforms, seeking additional information on market dynamics in order to better judge our estimates on empty running. One of the two contacts agreed to a brief discussion and some information regarding market dynamics in relation to empty running was shared with the study team.

Further details on the response rate to the data requests is provided in the Stakeholder Consultation Summary.

2.4 Research limitations - robustness of the findings

A key limitation of this study was a general lack of secondary data on the current business practices of international road haulage operators, mainly related to the frequency of the return of their vehicles to their Member State of establishment and the characteristics of long truck cycle operators (compared to short truck cycle operators). This can be attributed to the absence of relevant legislation and monitoring requirements in most Member States on these practices. Prior to the entry into force of this provision, there is only a requirement for vehicles to return at least once a year to the Member State of establishment of their operator for the regular roadworthiness tests (set out by Directive 2014/45/EU).

Since the announcement of this provision (and its version previously voted by the European Parliament which established a four-week return), a number of studies have been published on this topic, which shed some light on the current practices of operators as well as potential impacts of the new provision. These have been commissioned by industry associations and, in some cases, focus only on specific Member States which are more affected by the new obligation. These were considered for this study, but their results were interpreted with caution, recognising the potential for bias in the results.

There was therefore a need to undertake primary data collection to obtain insights on the current business practices of road haulage operators across the EU27. To this end, an extensive stakeholder consultation was organised (as described above), targeting stakeholders from several groups in order to collect input from multiple sources. This allowed the study team to build a dataset on the frequency of the return of vehicles used in international transport operations and gain an understanding of current business practices more generally (e.g. types of vehicles used, type of operators, etc). This was primarily done on the basis of hauliers' input. Although the number of hauliers taking part in this survey was much higher than in the previous studies (support studies for the evaluation and impact assessment of Regulations (EC) No 1071/2009 and 1072/2009), the sample is still relatively small, compared to the entire road haulage market. There is also an overrepresentation of the Eastern European hauliers and an underrepresentation of Southern European hauliers. This is somewhat expected due to the particular interest of Eastern European stakeholders in this study since the proposed measure is seen as potentially having a direct impact on their business model. This is associated with the fact that Eastern European hauliers undertake the largest share of the most affected international operations. As such, this does not necessarily affect the validity of the results obtained as it allowed the collection of data to assess the potential impact on the most likely affected operators by the measure.

When possible, we also addressed the above limitations by cross-checking the figures provided by the surveyed hauliers with the input from other stakeholders (e.g., industry associations, national authorities and trade unions). In addition, interviews were conducted to obtained specific insights and data requests were sent to industry associations and national authorities to confirm the data for key indicators for the analysis. This improved the robustness of the data collected.

For other indicators on transport activity and the functioning of the internal market, there was solid evidence available from existing literature and datasets. In particular, Eurostat databases on road freight transport measurement (road_go) were extensively used to characterise the existing traffic flows in the EU. Micro-data from Eurostat on road freight transport measurement statistics (i.e., on vehicle-kilometres, average load, share of empty running and type of vehicles by Member State pair) was also sought but could not be provided due to confidentiality reasons. Nevertheless, the relevant team within Eurostat provided support to the team by assessing the validity of the assumptions put together by the team on the basis of stakeholder input and desk research.

The literature and datasets consulted while performing the impact assessment support studies for both the road haulage legislation and the social legislation in road transport were also important sources of evidence for establishing the current market structure, key players and competitive forces as well as gaining an understanding of the current working conditions and labour market.

This evidence on the current business practices and market conditions was used also to inform the assessment of the impacts of the obligation on the regular return of vehicles and to establish assumptions for their quantification (e.g. frequency of vehicle returns, number of vehicles engaged in international operations).

Other assumptions (e.g. on potential market responses, level of empty running in future additional journeys) were also rooted on the stakeholder input obtained during the consultation for this study. To minimise potential bias in stakeholders' responses, these inputs were triangulated by considering the views of different stakeholder groups which have different stakes in the topic. In addition, the interpretation of the results was supported by the views of experts in this field.

A final limitation relates to input provided by stakeholders on the impacts. As it is common in such consultation processes, responses from stakeholders on expected impacts are often influenced by their position. For this reason, inputs on the assessment of impacts are only one of the sources of evidence used. The scenario approach implemented, and the use of the cost differentials model combined with the literature findings were the primary sources that informed the assessment of the impacts. All of the results from surveys and interviews have been interpreted as a means to gain a deeper understanding of different positions of respective stakeholders and to provide broader support for other evidence (triangulation).

3 ASSESSMENT OF CURRENT BUSINESS PRACTICES AND MARKET CONDITIONS

In order to assess the impacts of the provision concerning the regular return of trucks to the Member State of establishment, it is important to first establish the current business practices and market conditions for operators.

This section provides the analysis of the main indicators that characterise the current market situation to develop the baseline scenario in 2023, i.e., the no-policy change scenario which describes the status quo and the expected evolution of the market and business practices in the absence of this provision.

This section is organised as follows:

- Section 3.1 on transport activity which characterises the existing and future traffic flows in the EU (in terms of type of operations, vehicle journeys and loads).
- Section 3.2 on the frequency of the return of trucks which establishes the patterns in terms of the duration of truck cycles as well as provides an overview of the share of vehicles and type of operations and operators that are most likely involved in cycles shorter and longer than eight weeks.
- Section 3.3 on the functioning of the internal market which establishes the market structure, key players and competitive forces as well as the social landscape.

3.1 Transport activity

3.1.1 *Current road freight activity*

Road transport accounts for around three quarters of all inland freight transport activities in the EU27 (in tonne-kilometres). In 2019, the total volume of road freight transport in the EU27 is estimated at around 1,760 billion tonne-kilometre and 13.7 billion tonnes[14].

Figure 3-1: provides the total road freight activity per Member State of vehicle registration for 2019[15], expressed in terms of million tonnes transported as well as million tonne.km. It shows that vehicles registered in Germany (23% of total EU27 tonnage) have by far the highest total road freight activity in terms of total tonnage transported across the EU27 countries but Polish vehicles have the highest road freight activity in terms of million tonne.km (20% of total EU27 million tonne.km) across Europe.

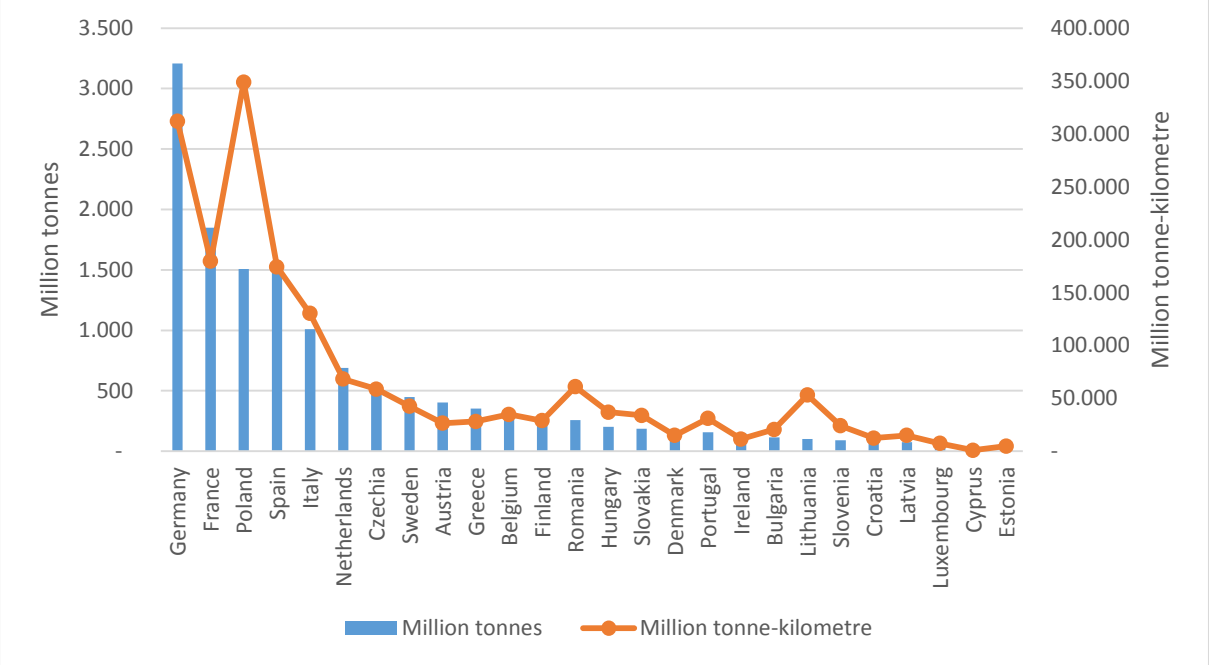
It is worth noting that, although there is largely a correlation between Member State ranking regarding their performance in million tonnes and million tonne-kilometre, certain Member States (e.g. Poland, Romania, Lithuania) present a large disparity between these two metrics. Where the Member State is ranked higher in the tonne-kilometres metric compared to its ranking when the tonne metric is used, this implies that vehicles registered in the country may be involved in longer trips, typically international trips. Some Member States may not present as much road freight as expected given their economic activity due to other freight modes (such as rail and inland waterways) having a larger share than average of the total freight demand.

[14] Source: Eurostat, 2019, online data code: ROAD_GO_TA_TOTT. We note that EU27 total values are not available for 2019 due to a few missing MS values (Ireland, Italy and Spain). As such the missing MS values were extrapolated and an aggregated EU27 total was created for 2019. In 2018 total road freight activity was 1,763 billion tonne-kilometre and 13.2 billion tonnes.

[15] We note that Eurostat provides data by country of registration of the vehicle. We will assume that this corresponds to the country of establishment of the operator for the purposes of this report. This is a reasonable assumption given Article 5 from Regulation (EC) No 1071/2009 which sets out that one of the conditions relating to the requirement of establishment in a Member State is that the undertaking must have at its disposal one or more vehicles which are registered or otherwise put into circulation in conformity with the legislation of that Member State.

In the following sections we compare the transport activity of Member States using predominantly the metric of tonne-kilometre as this provides also an indication of the distances driven by vehicles of each Member State.

Figure 3-1: Total road freight activity per Member State of vehicle registration



Source: Eurostat, 2019, online data code: ROAD_GO_TA_TOTT

The provision concerning the regular return of trucks to the Member State of establishment will affect international road freight activity, which represented 32% of total road freight activity (in tonne-kilometre, Table 3-1) in the EU27 in 2019.

For this type of activity, which includes bilateral, cross-trade and cabotage movements, vehicles registered in specific Member States are particularly significant as shown in Table 3-1: below. Compared to the size of their domestic market, vehicles from these Member States seem to carry out a significantly larger portion of the EU international trade activities volume. By far, Polish vehicles account for the largest volume of international road freight in terms of tonne-kilometre, representing 33% of international movements across the EU27 total. This is a substantially larger portion compared to the 13% of EU27 domestic activity taking place in Poland (i.e. trips occurring entirely within Poland, performed by trucks also registered in Poland). Other relevant Member States include Lithuania and Romania representing 17% and 12% of all cross-trade activity as well as 10% and 8% of all cabotage activity, respectively, despite only representing less than 3% of the total EU27 domestic activity each. On the other hand, German vehicles account for around a quarter of all EU27 domestic movements but contribute significantly less to international transport.

Table 3-1: Proportion of total road freight activity (in million tonne-kilometre) per MS of vehicle registration, 2019

MS of vehicle registration	Million tonne-kilometres				Million tonne-kilometre (% of EU27 total)				
	Bilateral*	Cross-trade*	Cabotage*	Domestic	Bilateral*	Cross-trade*	Cabotage*	Domestic	International
Belgium	9,722	924	1,352	22,831	2%	1%	3%	2%	2%
Bulgaria	3,306	2,319	917	14,009	1%	2%	2%	1%	1%
Czechia	10,638	884	485	46,708	3%	1%	1%	4%	2%
Denmark	1,573	62	133	13,223	0%	0%	0%	1%	0%

Germany	28,649	1,508	1,564	280,154	7%	1%	3%	24%	6%
Estonia	961	153	218	3,462	0%	0%	0%	0%	0%
Ireland	426	54	89	10,991	0%	0%	0%	1%	0%
Greece	8,756	-	46	19,395	2%	0%	0%	2%	2%
Spain	68,561	2,490	2,865	100,432	17%	2%	6%	8%	13%
France	9,211	79	284	170,030	2%	0%	1%	14%	2%
Croatia	4,882	1,118	259	6,218	1%	1%	1%	1%	1%
Italy	12,417	-	499	117,339	3%	0%	1%	10%	2%
Cyprus	13	-	-	845	0%	0%	0%	0%	0%
Latvia	4,069	1,657	924	8,315	1%	1%	2%	1%	1%
Lithuania	9,949	20,970	4,792	17,406	2%	17%	10%	1%	6%
Luxembourg	2,110	2,930	1,372	969	1%	2%	3%	0%	1%
Hungary	14,598	5,069	871	16,413	4%	4%	2%	1%	4%
Netherlands	25,196	2,744	1,823	38,574	6%	2%	4%	3%	5%
Austria	6,552	818	542	18,532	2%	1%	1%	2%	1%
Poland	125,063	45,023	20,134	158,732	31%	37%	43%	13%	33%
Portugal	12,235	4,527	1,085	13,167	3%	4%	2%	1%	3%
Romania	18,758	14,106	3,864	24,313	5%	12%	8%	2%	6%
Slovenia	8,730	7,726	1,212	6,343	2%	6%	3%	1%	3%
Slovakia	14,546	5,167	1,125	13,103	4%	4%	2%	1%	4%
Finland	1,148	45	184	27,471	0%	0%	0%	2%	0%
Sweden	651	-	53	41,900	0%	0%	0%	4%	0%
Total EU27	**402,720**	**120,373**	**46,691**	**1,190,876**	**100%**	**100%**	**100%**	**100%**	**100%**
% Share of total road freight	23%	7%	3%	68%					

**indicates international movements*
Source: Eurostat, 2019, online data code: ROAD_GO_TA_TOTT; No data for Malta available

The above analysis reveals important differences in the total road freight activity between Member States groups (Western, Eastern and Southern) as are summarised in Table 3-2. In terms of domestic operations, the majority of activity takes place in Western Member States (52%) with the rest divided between the Eastern (26%) and Southern (21%) ones. However, the picture is very different for international operations. In terms of total bilateral operations, vehicles from Western Member States contribute only 21% of the EU27 total compared to 54% undertaken by Eastern Member State vehicles. Even more, in terms of cross-trade and cabotage movements, vehicles from the Eastern Member States make up a much larger proportion of the total, providing for 87% and 75% of the total activity respectively.

Table 3-2 Road freight activity as a proportion of EU27 total by MS group (in tonne-kilometres)

	As a share of EU27 total		As a share of EU27 total		
MS group	Domestic	International	Bilateral*	Cross-trade*	Cabotage*
Western MS	52%	18%	21%	8%	16%
Eastern MS	26%	62%	54%	87%	75%
Southern MS	21%	20%	25%	6%	10%
Total EU27	100%	100%	100%	100%	100%

**indicates international movements*
Source: Eurostat, 2019, online data code: ROAD_GO_TA_TOTT

The provision can potentially affect the vehicles from the countries which undertake the cross-trade and cabotage operations as (unlike bilateral transport operations) they do not necessarily involve the return of the vehicle to the Member State of establishment of the operators. It is thus important to consider the relative importance of these type of operations for each Member State of establishment of hauliers operating in Europe.

Looking into the split between the types of international operations performed, at EU27 level, bilateral flows are the most important ones, representing 71% of all EU27 international activity (Table 3-3:). However, for some Member States, cross-trade and cabotage flows represent a more significant part of their international operations. As before, hauliers from Western and Southern Member States tend to be most involved in bilateral movements, whilst hauliers from Eastern Member States tend to also undertake a significant volume of cross-trade and cabotage operations. There are however importance differences within these groups:

- Amongst Western European countries, Luxembourg undertakes a substantial volume of cross-trade and cabotage movements (46% and 21% of their total international road activity, respectively).
- Amongst Southern European countries, it is worth highlighting the case of Portuguese-registered vehicles which also show a larger share of cross-trade and cabotage movements. This is because of cross-trade between Spain and other Member States, and cabotage within Spain due to Portugal's geographical location. There is a need for Portuguese international hauliers to travel through Spain to reach other Member States, and therefore a natural triangulation of trips including Spain may occur.
- Amongst Eastern European countries, Czech Republic (and to a lesser extent Croatia, Estonia and Hungary) have a higher proportion of bilateral tonne-kilometres when compared to other Eastern Member States. This could be a result of these Member States having higher operational costs compared to the other Eastern Member States, making cross-trade and cabotage less attractive.

Table 3-3: Total international transport (in tonne-kilometres) per MS of vehicle registration for bilateral, cross-trade and cabotage operations

Country of vehicle registration	Million tonne-kilometres			Million tonne-kilometres (% of MS total)		
	Bilateral	Cross-trade	Cabotage	Bilateral	Cross-trade	Cabotage
Belgium	9,722	924	1,352	81%	8%	11%
Bulgaria	3,306	2,319	917	51%	35%	14%
Czechia	10,638	884	485	89%	7%	4%
Denmark	1,573	62	133	89%	4%	8%
Germany	28,649	1,508	1,564	90%	5%	5%
Estonia	961	153	218	72%	11%	16%
Ireland	426	54	89	75%	9%	16%
Greece	8,756	-	46	99%	0%	1%
Spain	68,561	2,490	2,865	93%	3%	4%
France	9,211	79	284	96%	1%	3%
Croatia	4,882	1,118	259	78%	18%	4%
Italy	12,417	-	499	96%	0%	4%
Cyprus	13	-	-	100%	0%	0%
Latvia	4,069	1,657	924	61%	25%	14%
Lithuania	9,949	20,970	4,792	28%	59%	13%
Luxembourg	2,110	2,930	1,372	33%	46%	21%

Country of vehicle registration	Million tonne-kilometres			Million tonne-kilometres (% of MS total)		
	Bilateral	Cross-trade	Cabotage	Bilateral	Cross-trade	Cabotage
Hungary	14,598	5,069	871	71%	25%	4%
Netherlands	25,196	2,744	1,823	85%	9%	6%
Austria	6,552	818	542	83%	10%	7%
Poland	125,063	45,023	20,134	66%	24%	11%
Portugal	12,235	4,527	1,085	69%	25%	6%
Romania	18,758	14,106	3,864	51%	38%	11%
Slovenia	8,730	7,726	1,212	49%	44%	7%
Slovakia	14,546	5,167	1,125	70%	25%	5%
Finland	1,148	45	184	83%	3%	13%
Sweden	651	-	53	92%	0%	8%
Total EU27	**402,720**	**120,373**	**46,691**	**71%**	**21%**	**8%**

Source: Eurostat, 2019, online data code: ROAD_GO_IA_LTT; No data for Malta available

The same split in international road freight activity is shown in Table 7-1 in Annex 2 measured in thousand tonnes transported. The proportions of cabotage increases to 16% of the total in this case (EU27 average). This is to be expected as cabotage trips take place within one Member State, and so trips are typically shorter in length compared to bilateral and cross-trade.

3.1.2 *Future road freight activity (including impacts of COVID-19)*

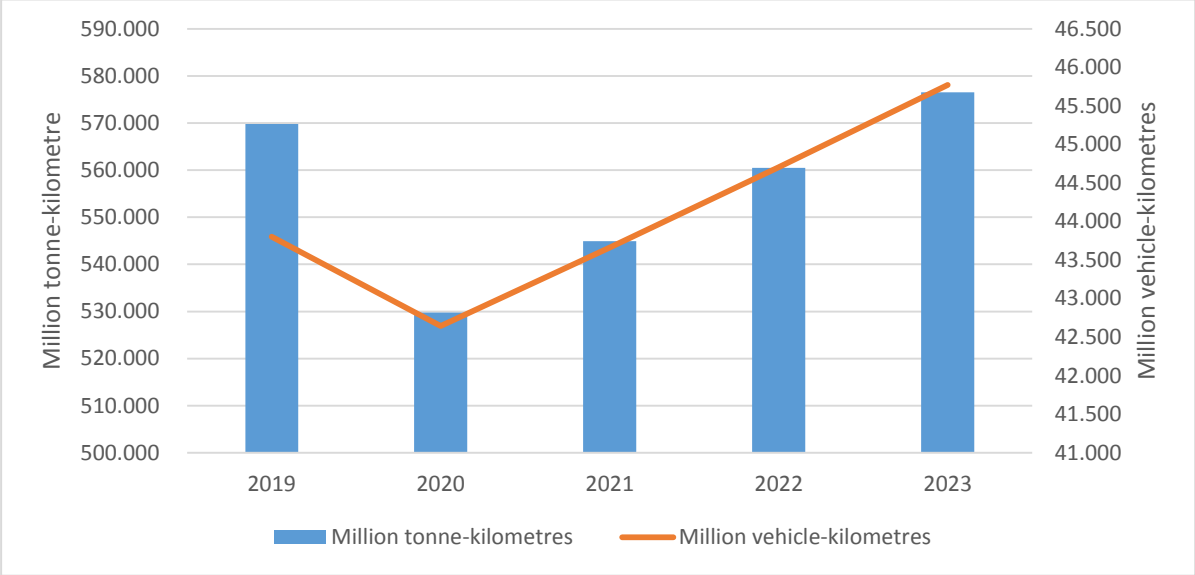
In the future, road freight activity is expected to grow despite the impacts from the COVID-19 pandemic in the short term[16]. As shown in Figure 3-2, the growth from 2020 to 2023[17] is expected to be similar both in terms of tonne-kilometre and vehicle-kilometre, although the impact of the COVID-19 pandemic on tonne-kilometre is greater than vehicle-kilometre based on own interpolations of projections from the PRIMES-TREMOVE, COVID Baseline, developed by E3Modelling in mid-2020 (European Commission, 2020).

From 2019 to 2020, activity in terms of tonne-kilometre is expected to decrease by 7%, whilst for vehicle-kilometre activity is only expected to decrease by 2.6%. This indicates that vehicles might be under-utilised during 2020; with the underutilisation trend occurring in the following years up to 2023 as the increase in vehicle-kilometres is larger than the increase in tonne-kilometres. After 2020, activity is expected to recover. Overall, between 2019 and 2023, an increase of 1.2% and 4.5% is expected in road freight activity in terms of tonne-kilometre and vehicle-kilometre.

[16] The proposed methodology for extrapolating international road freight activity for each Member State considering the impacts of COVID-19, whilst preserving the anticipated future shares of bilateral, cross-trade and cabotage movements is provided in Annex 3.

[17] Data for 2023 reflect own interpolation based on 2020 and 2025 projections from the PRIMES-TREMOVE model.

Figure 3-2: Projections of road freight transport activity to 2023 (in million tonne-kilometres and million vehicle-kilometres) including the impacts of COVID-19 pandemic



Source: Ricardo estimation based on Eurostat data for 2019 and interpolations of PRIMES-TREMOVE results, COVID Baseline scenario, developed by E3Modelling

The projected 2023 road freight activity split between international and domestic is not expected to change significantly (as explained in the extrapolation methodology used in Annex 3). The total freight volumes are shown in Table 3-4 below.

Table 3-4: Total transport activity projected for 2023 (in million tonne-kilometres) for each movement type

	Bilateral	Cross-trade	Cabotage	Domestic
Million tonne-kilometres	407,502	121,802	47,245	1,205,016
% total	23%	7%	3%	68%

Source: Ricardo estimation based on Eurostat data for 2019 and interpolations of PRIMES-TREMOVE results, COVID Baseline scenario, developed by E3Modelling

3.1.3 *Number of international vehicle journeys*

The number of international vehicle journeys[18] sheds further light on the pattern of international traffic flows across Europe. As the relative share of each type of international operation at the Member State level is not expected to change significantly between 2019 and 2023, only the current (2019) journeys are presented in this section.

Our analysis focuses on the top 15 bilateral, cabotage and cross-trade flows in the EU to give an indication of the highest flows across the EU.

The top 15 bilateral flows are presented Table 3-5 below. Overall, nine out of the top 15 concern activity between two Western Member States and only one is between two Eastern Member States. In addition, Germany (9 out of the top 15) and Netherlands (6 out of the top 15) are the most common countries of loading and unloading. However, the highest number of vehicle journeys occur between Germany and Poland, undertaken by Polish registered vehicles.

[18] Vehicle journeys are calculated by dividing total tonnage flows (from Eurostat) by the calculated average load presented below (loaded and unloaded). The average load (currently presented in section 3.1.4) is only available at a MS aggregated level; therefore, it is assumed that the average load is the same for all types of transport operations (domestic, bilateral, cross-trade, and cabotage) and between each of the country pairs per MS of vehicle registration.

Table 3-5: Top 15 bilateral flows in terms of vehicle journeys (in thousands)

MS of registration	MS of loading	MS of unloading	Thousand vehicle journeys (2019)	Proportion total journeys	Million vehicle.km (2019)
Poland	Poland	Germany	3,196	5.2%	2,079
Poland	Germany	Poland	2,672	4.3%	1,805
Netherlands	Germany	Netherlands	2,289	3.7%	502
Netherlands	Netherlands	Germany	2,250	3.7%	603
Netherlands	Netherlands	Belgium	2,165	3.5%	338
Netherlands	Belgium	Netherlands	1,642	2.7%	253
Spain	Spain	France	1,539	2.5%	1,131
Germany	Germany	Netherlands	1,216	2.0%	284
Spain	France	Spain	1,157	1.9%	792
Germany	Netherlands	Germany	886	1.4%	242
Belgium	Belgium	France	878	1.4%	236
Germany	Germany	France	806	1.3%	285
Germany	Germany	Austria	766	1.2%	216
Poland	Poland	Czechia	687	1.1%	271
Czechia	Czechia	Germany	680	1.1%	257
Total top 15	**All above**	**All above**	**22,829**	**37%**	**9,292**
Total all flows	All	All	61,560	100%	35,003

Source: Ricardo estimation based on Eurostat data for 2019

In terms of cabotage, the top 15 such pairs of haulier and host Member State make up around 60% of all cabotage journeys in the EU27. Table 3-6 below shows that these movements take place predominantly in Western Member States and are carried out by a combination of hauliers from mostly Eastern Member States (Poland, Lithuania, Romania and Latvia), with some hauliers based in Western Member States (Netherlands, Belgium, Luxembourg and Germany), and to a lesser extent Southern Member States (Spain). By far, the highest proportion of cabotage journeys is performed by Polish trucks operating in Germany, which makes up nearly a quarter of all cabotage journeys in the EU27.

Table 3-6: Top 15 cabotage flows in terms of vehicle journeys (in thousands)

MS of registration	MS of cabotage	Thousand vehicle journeys (2019)	Proportion total journeys	Million vehicle.km
Poland	Germany	3,441	23%	1,313
Netherlands	Belgium	925	6%	52
Netherlands	Germany	805	5%	99
Poland	France	499	3%	218
Lithuania	Germany	450	3%	184
Lithuania	France	365	2%	201
Belgium	France	326	2%	71
Spain	France	322	2%	183
Luxembourg	Belgium	316	2%	34
Romania	Germany	304	2%	91
Poland	Netherlands	266	2%	37
Romania	France	251	2%	95
Luxembourg	France	211	1%	52
Latvia	Sweden	208	1%	36
Germany	Austria	185	1%	14
Total top 15	**All above**	**8,874**	**57%**	**2,682**
Total all flows	All	14,792	100%	4,179

Source: Ricardo estimation based on Eurostat data for 2019

The top 15 cross-trade flows in terms of vehicle journeys represent over a quarter of all cross-trade journeys, are shown in Table 3-7 below. The general pattern for these cross-trade flows are loading and unloading within a Western European Member State and performed by a vehicle registered in an Eastern European Member State.

Unlike the cabotage journeys, there is no single flow with a particularly high share of the total cross-trade journeys. It is however worth noting that 14 out of the top 15 flows involved Germany as either the Member State of loading or unloading; with a significant amount of transport activity from/to France, the Netherlands and Belgium. Vehicles registered in Poland are responsible for the top 6 flows cross EU27 and make up 11 out of the top 15.

Table 3-7: Top 15 cross-trade flows in terms of vehicle journeys (thousands)

MS of registration	MS of loading	MS of unloading	Thousand vehicle journeys (2019)	Proportion total journeys	Million vehicle.km
Poland	Germany	France	524	3%	388
Poland	Netherlands	Germany	513	3%	245
Poland	Germany	Netherlands	426	3%	194
Poland	Belgium	Germany	425	3%	221
Poland	France	Germany	382	2%	288
Poland	Germany	Belgium	337	2%	172
Netherlands	Germany	Belgium	276	2%	71
Lithuania	Germany	France	267	2%	222
Lithuania	France	Germany	231	1%	178
Netherlands	Belgium	Germany	228	1%	78
Poland	Italy	Germany	228	1%	222
Poland	Germany	Italy	196	1%	209
Poland	France	Belgium	183	1%	87
Poland	Czechia	Germany	183	1%	100
Poland	Germany	Czechia	182	1%	92
Total top 15	**All above**	**All above**	**4,581**	**27%**	**2,769**
Total all flows	All	All	16,269	100%	10,718

Source: Ricardo estimation based on Eurostat data for 2019

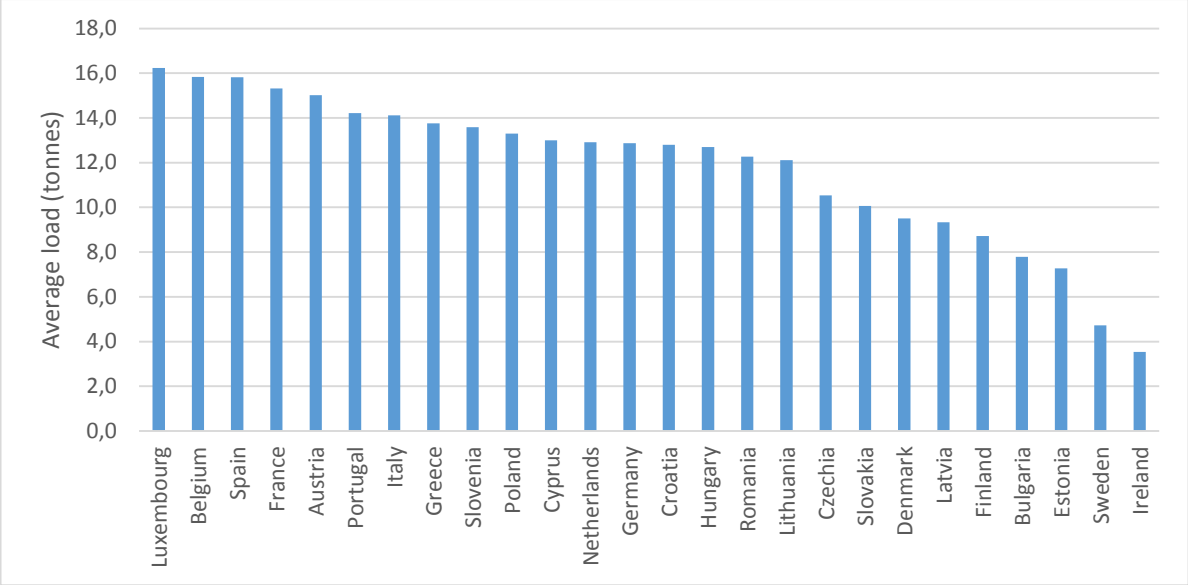
3.1.4 *Average load per vehicle journey*

Average load is an important indicator to understand the volume of cargo moved in each vehicle journey[19]. Figure 3-3 below shows that average load per journey tends to vary between the different Member States, with Southern and Western Member States presenting higher average loads (occupying the top 8 positions in terms of average load per journey), whilst Eastern Member States generally present lower average loads (occupy 9 of the bottom 13 Member States). The same differences are expected in 2023 (not pictured) since no significant changes are expected to the relative freight activity of each Member State.

It is worth noting that a low average load does not necessarily mean inefficient road freight movements, as it does also depend on the types of vehicles used by hauliers of each Member State.

[19] As data on vehicle-kilometre per Member State pair is not publicly available from Eurostat, the average vehicle load (in tonnes per vehicle) has been calculated at a Member State of vehicle registration aggregated level.

Figure 3-3: Average load per vehicle journey (in tonnes) for a vehicle registered in each MS, loaded international journeys only



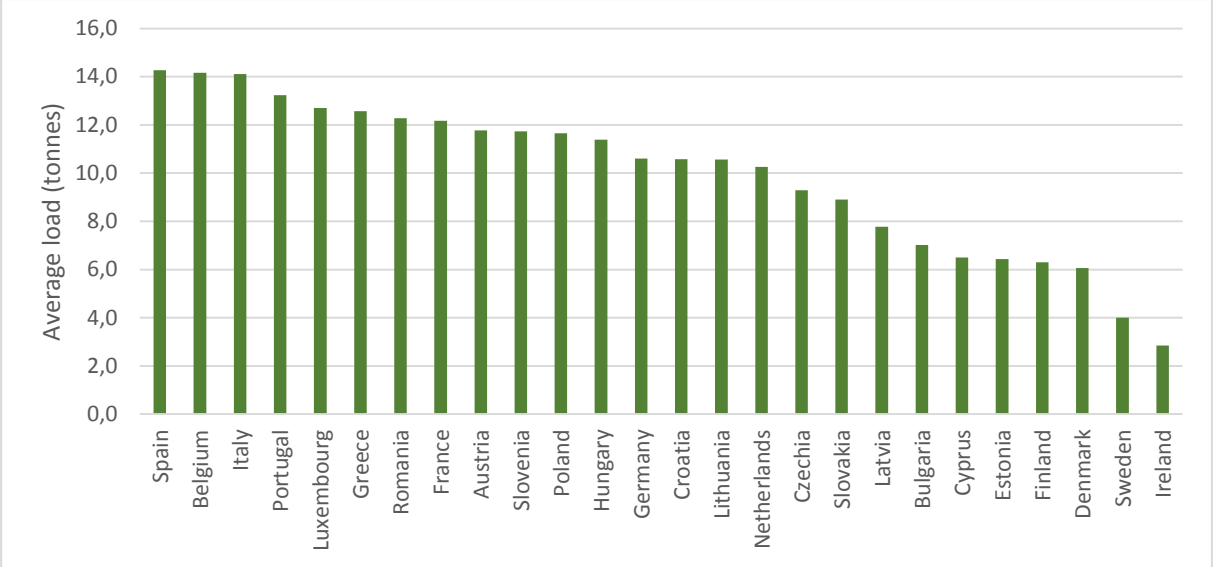
Source: Ricardo estimation based on Eurostat data for 2019

The above figure includes journeys where the vehicle is not running empty. When considering the average load per vehicle journey including the unloaded (empty) journeys, the average load per vehicle journey decreases, as expected (Figure 3-4 below[20]). Similar trends are still observed, with many of the Western and Southern Member States still having a higher load per vehicle journey, although certain Member States are affected more than others by the unloaded journeys. For example, Romania has almost no unloaded journeys, according to the publicly available Eurostat data[21], whilst Luxembourg, France and Austria have a larger proportion of unloaded journeys which reduces the average load per journey for these Member States.

[20] Further analysis into empty running is provided in Section 3.1.5 below.

[21] Summary of annual road freight transport by type of operation and type of transport (Mio Veh-km) [ROAD_GO_TA_TOTT], for Loaded – international transport – total, and Unloaded – international transport - total

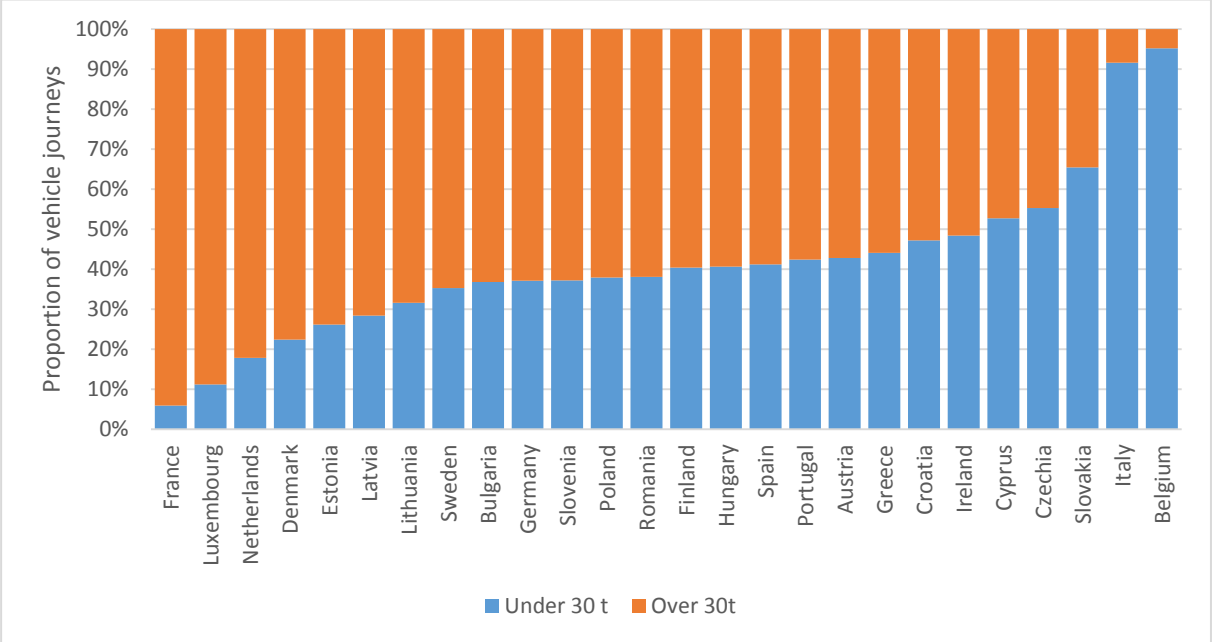
Figure 3-4: Average load per vehicle journey in tonnes for a vehicle registered in each MS, total international journeys (loaded + unloaded)



Source: Ricardo estimation based on Eurostat data for 2019

Figure 3-5 below shows the proportion of total vehicle journeys by maximum permissible weight for each Member State. Comparing this to Figure 3-3 above, inefficiencies can be highlighted for countries with a low average load per vehicle journey, and a high proportion of heavy vehicles (over 30t) being used in journeys. For example, Bulgaria has an average load of just less than 8 tonnes per vehicle journey (ranked fourth lowest compared to other Member States), whilst having a high proportion (63%) of vehicles over 30t. This signifies that vehicles are being underutilised in terms of total tonnage transported per maximum permissible weight. Luxembourg also has a very high proportion of heavy vehicles (89% over 30t); however, vehicles registered in Luxembourg also have the highest average load at over 16 tonnes per vehicle journey.

Figure 3-5: Proportion of vehicle journeys by maximum permissible weight, total road freight transport (2019)



Source: Eurostat, 2019, online data code: [ROAD_GO_TA_VM]

When looking at average load and vehicle types used at a Member State group level (Western, Eastern and Southern European Member States), the trucks registered in

Eastern European Member States appear to be the least utilised (Table 3-8). This is due to vehicles registered in Eastern European Member States having the lowest average load factor (11.1 tonnes), whilst having a high proportion of vehicle journeys undertaken by trucks over 30 tonnes GVW.

Table 3-8 Member State group level proportion of journeys undertaken by vehicle weight class and overall average load

Member State group	Proportion of vehicle journeys by trucks under 30 t	Proportion of vehicle journeys by trucks over 30t	Average load all trucks (tonnes)
West	44%	56%	11.47
East	40%	60%	11.07
South	39%	61%	14.18

3.1.5 *Empty running*

Information on trucks operating without a load, herein referred to as empty truck runs, is an important indicator of inefficiencies within the market. These inefficiencies relate to the level of potentially avoidable cost, greenhouse gases and air pollutant emissions and other externalities.

Empty runs are defined as the proportion (%) of the vehicle-kilometres that are driven without a load. Empty runs vary depending on purpose and geographical extent. Domestic road freight activity is found to have a higher share of empty running than international activity: in 2019, 31% of domestic vehicle kilometres were empty [22], compared to only 16% of international activity. This confirms a similar relationship identified within a 2014 European Commission report, which reported a higher share of domestic empty running compared to international **(European Commission, 2014)**.

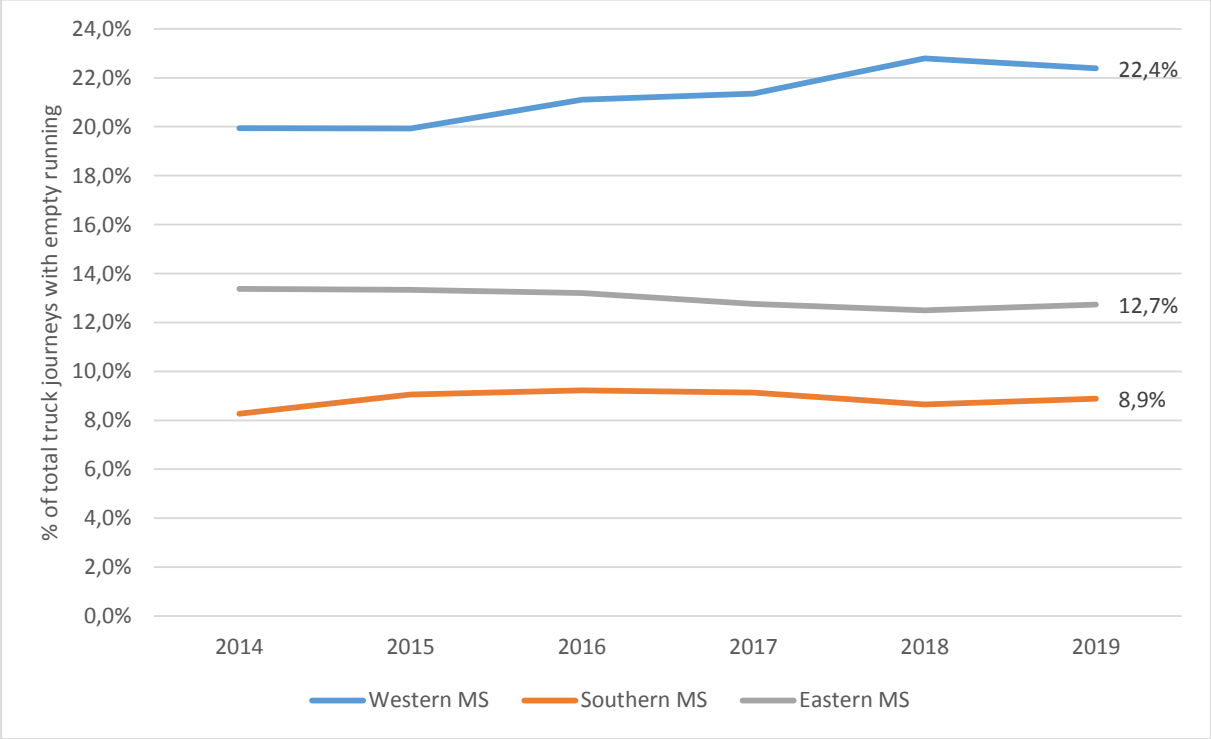
There are however differences between Member States. Figure 3-6 shows a slow sustained growth in the share of empty truck runs from vehicles registered in Western and Southern Member States, with an average annual growth between 2014 and 2019 of 0.5% and 0.1%, respectively. Conversely, vehicles from Eastern Member States have shown efficiency gains in the share of empty truck journeys, with an average annual decline between 2014 and 2019 of 0.1%.

The 2023 baseline could not be reliably established due to the COVID-19 pandemic; as suggested above in section 3.1.2, some level of vehicle underutilisation could be expected but there is not sufficient evidence to estimate the impact of Covid upon 2023 empty running.

The 2019 share of empty running for vehicles registered in Western, Eastern and Southern Member States is 22.4%, 12.7% and 8.9%, respectively. This shows that hauliers in Southern and Eastern Member States are operating more efficiently than hauliers in Western Member States.

[22] https://ec.europa.eu/eurostat/data/database

Figure 3-6: Share of empty running - International road freight transport



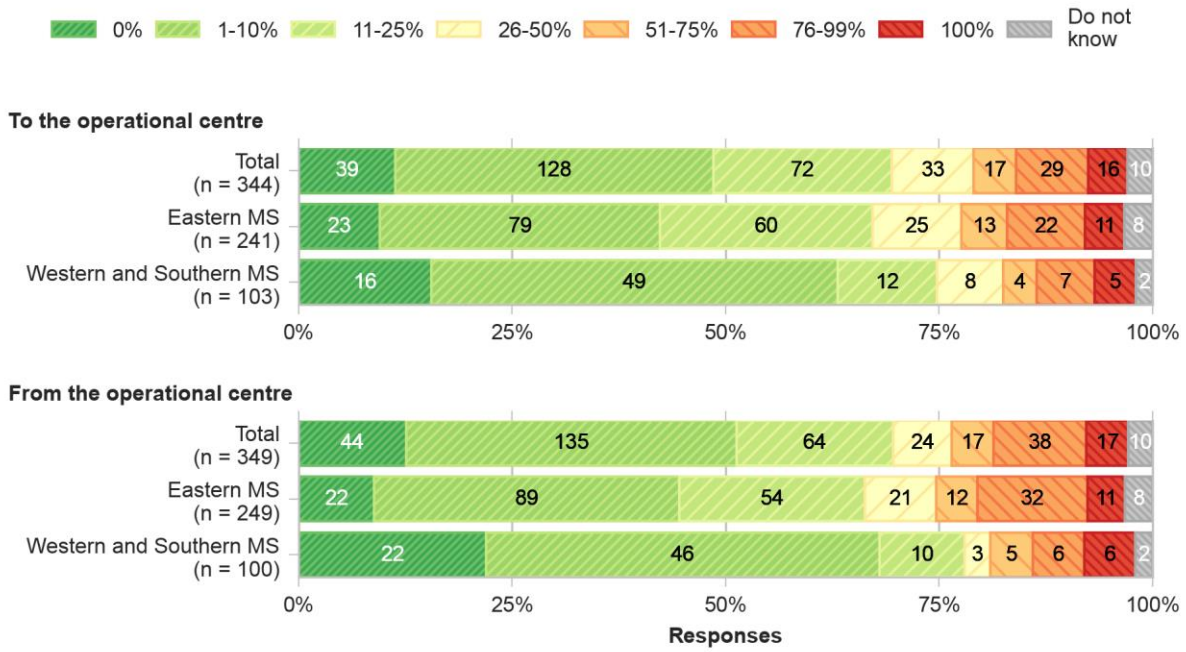
Source: Data for 2014-2019 is from Eurostat, online data code: road_go_ta_vm.

Survey responses provide further insights into empty running in the journeys to and from the operational centre located in the Member States of establishment of the operators.

Figure 3-7 suggests that there are differences in the level of empty running operators experience in the inbound and outbound journeys to their Member State of vehicle registration, compared to the average level of empty running for international trips (based on Eurostat data). Overall, Western European Member States survey responses indicate slightly lower levels of empty running compared to Eastern Member States, which is the opposite pattern observed for empty running in average international journeys:

- For journeys to the operational centre, Western and Southern European Member State respondents (16 of 103) identified 0% empty runs and the larger share (49 of 103) identified 1-10% empty runs; for journeys from the operational centre, 22 of 100 identified 0% empty runs and the larger share (46 of 100) identified 1-10% empty runs. To summarise, over 50% of the stakeholders from Western and Southern European Member States had 10% or less empty journeys to and from the operational centre. For Western European Member States, this is slightly lower than the average levels of empty running for all journeys presented within Figure 3-6 (according to Eurostat).
- In the case of Eastern European Member States, 23 of 241 to and 22 of 249 stakeholders identified 0% empty journeys to/from the operational centre, respectively. The larger share of responses points to 1-10% of empty running (79 of 241 to and 89 of 249 from the operational centre). In summary, over 50% of stakeholders from Eastern European Member States had 11% or higher empty journeys to and from the operational centre. This corroborates the trend in empty running based on Eurostat data in Figure 3-6.

Figure 3-7: Survey responses to "Approximately what proportion of the distance run by vehicles in journeys to/from the operational centre in current truck cycles is run empty?"



Source: Survey of stakeholders undertaken for this study.

Note: Responses from all stakeholders that indicated their Member State have been included in this chart. The stakeholder groups covered by the consultation are: companies engaged in the provision of road freight transport services (e.g. haulier, freight forwarder, logistic provider) and their associations, drivers of vehicles engaged in road freight transport and their trade unions. The total responses vary as not all stakeholders provided an answer to all options.

Stakeholders' views on factors constraining the ability of operators to find a load for international journeys to and from the operational centres can be used to infer potential causes of empty journeys (figures presented in Section 5.1.3 in the Stakeholder Consultation Summary).

The majority of respondents from Eastern European Member States identified the following factors as significantly constraining loaded journeys to and from the operational centre:

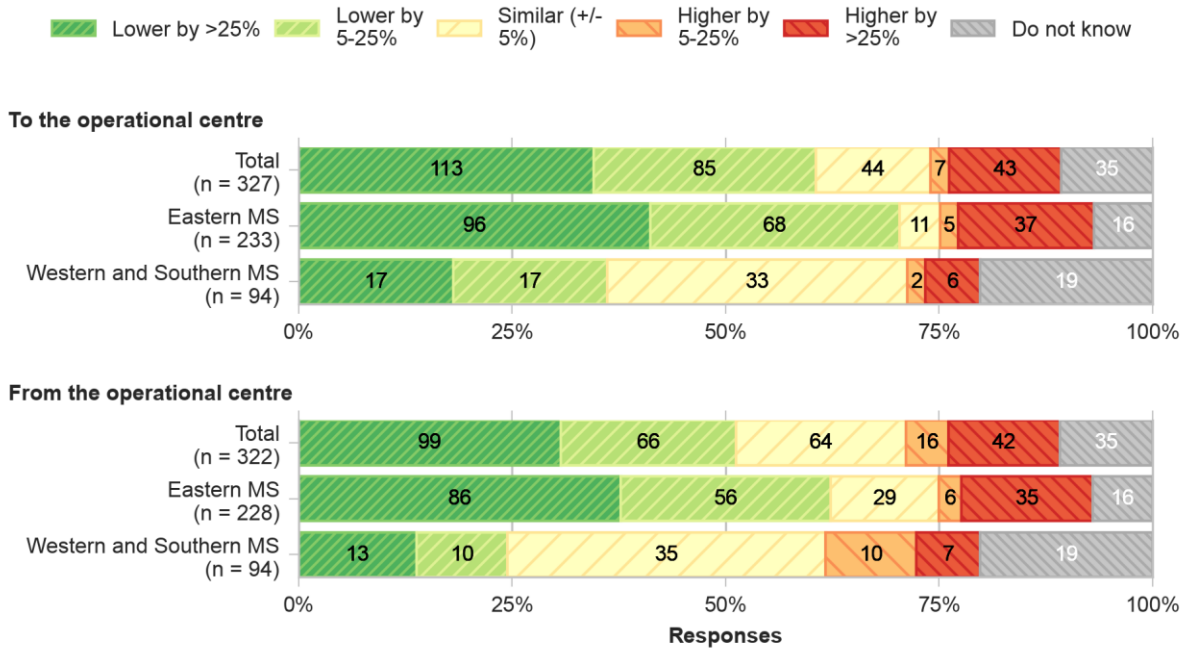
- Low demand for freight from the country of establishment (207 of 240 respondents) and to the operational centre (227 of 245 respondents);
- Risk of delaying the next delivery to the operational centre (119 of 214 respondents);and
- Lower freight rates for backload operations from the operational centre (178 of 212 respondents) and to the operational centre (209 of 232 respondents).

There was not a single factor which stood out from Western and Southern Member State responses which significantly constrained journeys to or from the operational centre, with the majority suggesting that these factors are not at all responsible for the empty running.

Figure 3-8 presents the operators stated differences in international freight rates to and from their operational base compared to their average freight rates. More often, Western and Southern Member States identified that international freight rates to and from operational centres are similar to the average (33 of 94 and 35 of 94 respondents, respectively). Eastern Member State participants supported in larger numbers that freight rates to and from operational centres (96 of 233 and 86 of 228 of respondents, respectively) were 25% less than the average rates they would obtain through cabotage or cross-trade operations.

Figure 3-8: Survey responses to "In your experience, how do freight rates for journeys to/from the operational centre in current truck cycles compare with

the average rates that can be obtained across all transport operations?"



Source: Survey of stakeholders undertaken for this study.

Note: Responses from all stakeholders that indicated their Member State have been included in this chart. The stakeholder groups covered by the consultation are: companies engaged in the provision of road freight transport services (e.g. haulier, freight forwarder, logistic provider) and their associations, drivers of vehicles engaged in road freight transport and their trade unions. The total responses vary as not all stakeholders provided an answer to all options.

3.1.6 *Vehicles used in road freight transport*

In 2019, 61% of the EU road freight transport was undertaken by vehicles with a maximum permissible laden weight over 30 tonnes (Table 3-9). This is for all road freight journeys, and not just for international activity. No further data was available on the type of vehicles used in international transport specifically.

Table 3-9: Vehicle journeys per maximum permissible weight, in thousand journeys, 2019

Country of vehicle registration	10 t or less	From 10.1 to 20 t	From 20.1 to 30 t	From 30.1 to 40 t	Over 40 t
Belgium	838	10,988	4,437	831	:
Bulgaria	493	1,332	1,087	3,711	1,293
Czechia	7,218	10,913	8,339	4,629	16,804
Denmark	202	836	1,260	2,305	5,685
Germany	5,509	44,798	47,829	59,012	107,576
Estonia	10	157	288	79	1,208
Ireland	4,255	1,163	1,513	1,605	5,801
Greece	1,771	5,677	4,287	13,414	1,501
Spain	3,832	23,980	18,736	63,831	2,580
France	:	1,545	5,459	5,242	107,178
Croatia	291	1,812	958	684	2,745
Italy	1,353	40,867	16,725	5,083	321
Cyprus	672	520	181	799	433

Country of vehicle registration	10 t or less	From 10.1 to 20 t	From 20.1 to 30 t	From 30.1 to 40 t	Over 40 t
Latvia	90	619	629	2,281	1,091
Lithuania	65	1,032	1,014	3,969	606
Luxembourg	7	267	126	473	2,698
Hungary	433	3,383	2,109	7,712	938
Netherlands	1,452	5,645	2,465	980	43,093
Austria	731	4,455	7,679	5,907	11,302
Poland	10,880	19,092	12,113	65,304	3,583
Portugal	1,648	2,000	1,266	6,375	299
Romania	337	3,520	2,886	4,334	6,647
Slovenia	303	1,124	1,013	1,458	2,670
Slovakia	11,679	2,526	1,994	2,367	6,197
Finland	1,565	1,461	3,010	3,458	5,470
Sweden	105	2,904	8,219	6,443	14,173
Total	**55,739**	**192,616**	**155,622**	**272,286**	**351,892**
Total (%)	**5%**	**19%**	**15%**	**26%**	**34%**

Source: Eurostat, 2019, online data code: ROAD_GO_TA_MPLW

Aggregating the total vehicle journeys per Member State group shows that the majority of journeys (54%, Table 3-10) performed by vehicles registered in the Western European Member States are undertaken by those in the over 40 tonne weight class. This is contrasting to the proportion of journeys undertaken by this weight class by vehicles registered in Eastern European Member States (18%) and Southern European Member States (2%). However, it should be reiterated that these results are for all road freight journeys, and not just international trips.

Table 3-10 Proportion of road freight vehicle journeys per GVW and per MS group

MS Group	10 t or less	From 10.1 to 20 t	From 20.1 to 30 t	From 30.1 to 40 t	Over 40 t
East	13%	18%	13%	39%	18%
West	3%	13%	15%	15%	54%
South	4%	33%	19%	41%	2%

3.2 Frequency of return of trucks to the Member State of establishment of the operator

Understanding the current frequency of the return of trucks to the Member State of establishment is crucial to establish the current practices of operators and assess the impacts of the provision.

Prior to the entry into force of this provision, there are no specific requirements for vehicles to return regularly to the Member State of establishment of their operator. Only Directive 2014/45/EU on periodic roadworthiness tests for motor vehicles and their trailers requires vehicles to return at least once a year for their roadworthiness test in the Member State where they are registered.

The sections below analyse the available data on the average and range of the duration of truck cycles by Member State of establishment of operators and explore any relevant differences with respect to the type of operations and type of operators involved in shorter and longer truck cycles. This is mainly based on the findings from the stakeholder

consultation for this study.

3.2.1 *Findings on the average and range of the duration of truck cycles by Member State of establishment of operators*

Data on the duration of truck cycles or frequency of the return of vehicles used in international transport operations is not typically covered in existing datasets or the literature.

A number of recent studies that have analysed the potential impacts of this provision provide some information on this indicator, but these are based on limited data sources and reach different conclusions. A study undertaken by Transport & Mobility Leuven for LINAVA (the Lithuanian national road carriers' association) and UNTRR (the Romanian national association of road carriers) (Transport & Mobility Leuven, 2019) assumes that vehicles only return once or twice a year (i.e. are engaged in cycles longer than eight weeks) and suggests that the patterns vary between EU15 and EU13 Member States[23], with trucks from the latter group of countries likely to return less often. Conversely, another study undertaken for TLP (the Polish employers association of transport and logistics) (Klaus, 2019) assumes that trucks typically return six to eight times per year, which indicates that their cycles may or may not be longer than eight weeks depending on how many weeks per year they are in operation.

The input provided by stakeholders as part of the consultation for this study also sheds light and provides further details on the current practices of the operators in this respect[24].

Table 3-11 shows the current frequency of return of trucks by Member State cluster. It was estimated based on the input from the surveyed stakeholders (including hauliers, industry associations, trade unions, drivers, and national authorities) and adjusted based on the information provided via the data requests by industry associations and/or national authorities which aimed to obtain data for Member States not represented in the survey and validate specific Member State estimates that seemed to significantly deviate from the cluster average. These data were subsequently extrapolated to the entire market on the basis of the fleet size of each Member State of establishment used in international operations and are presented by Member State cluster below. More details on their estimation are provided in Section 5.1.3 of the Stakeholder Consultation Summary.

Table 3-11 shows that the frequency of return of trucks varies by Member State. Virtually all[25] vehicles of operators based in Western European Member States tend to return more frequently (i.e., six or more times a year) compared to operators based in Eastern European Member States. Only approximately half of the vehicles of Eastern European Member State operators return six or more times per year. The input on the frequency of return of operators established in Southern Member States suggests that they exhibit similar patterns to those of Western European Member States.

Operators whose vehicles return six or more times a year are likely to operate shorter truck cycles (i.e. less than eight weeks) and thus be already compliant with the new

[23] EU15 includes: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom. EU-13 includes: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia

[24] Stakeholders were asked to provide information for 2019.

[25] Note that there is a small share of vehicles operators based in Western European Member States which return less frequently but this is negligible and thus not captured by the rounded figures presented in the table.

provision (i.e. if they operate a maximum of 52 weeks in a year, they are, on average, returning at least once every eight weeks, assuming regular cycles[26]).

On the other hand, lower return frequencies are likely to be associated with truck cycles longer than eight weeks – assuming they operate a maximum of 52 weeks in a year.

Table 3-11 also shows that among those vehicles returning less frequently (i.e., six or fewer times a year), the majority tends to return only once a year, which suggests that vehicles tend to be involved in very long truck cycles (if they are not returning every eight weeks).

Table 3-11: Share of vehicles used in international operations per frequency of return for Western, Eastern and Southern European Member States

Truck cycles	Long cycles (over eight weeks)					Short cycles (eight weeks and under)	
Area of establishment	Once a year	Twice a year	Three times a year	Four times a year	Five times a year	Six times a year	More than six times a year
West	0%	0%	0%	0%	0%	0%	100%
East	32%	9%	2%	2%	7%	5%	43%
South	0%	0%	0%	0%	0%	0%	100%

Source: Stakeholder consultation undertaken for this study.

It is also worth noting some variations within the Member State clusters (full results provided in Annex 5):

- Amongst the Western European countries, the responses received suggest that the Finnish operators appear to have a small share of trucks that return less frequently (once or twice per year). Operators from all other countries have vehicles that practically always return at least six times per year[25].
- Amongst Eastern European countries, the responses suggest that Czech, Slovenian and Hungarian operators might return more frequently (i.e., majority of vehicles returns more than six times per year), whilst Estonian and Polish operators seem to have an equal or similar share of trucks that return more often compared to the share that return less frequently. Bulgarian, Latvian, Lithuanian, Romanian and Slovakian vehicles return less frequently (i.e., the majority of vehicles returning once or twice a year).
- For Southern operators, the Maltese operators' trucks appear to only return once or twice a year due to the specific circumstances of this country (i.e. insular).

No input was obtained for Belgium, Greece, Cyprus and Croatia.

3.2.2 *Type of operations involved in longer vs shorter truck cycles*

By definition, longer truck cycles (i.e. longer than eight weeks) are more likely to comprise operations that do not necessarily involve the return of the vehicle to the Member State of establishment of the operators, that is, cross-trade and cabotage operations.

The analysis in the previous section (Table 3-2 in Section 3.1) demonstrates that Eastern European-based hauliers, who are more likely to be engaged in longer truck cycles, are also responsible for the largest share of cross-trade and cabotage operations between EU Member States (i.e., 87% and 75% as a share of total tonne-kilometres, respectively).

[26] It is worth noting that, although these vehicles are returning more than six times per year, it is still possible they would be away for stretches longer than 8 weeks, but, for the purpose of keeping this analysis manageable, it is assumed that they will be compliant with the new provision as they would not necessarily need to change their return patterns but rather rebalance their existing operations to meet the requirements of the provision.

On the other hand, those Eastern European-based hauliers which are less likely to be involved in longer cycles (CZ, HU, SI) are also those that are less focused on cross-trade and cabotage operations as illustrated in Table 3-3: from the previous Section 3.1.

The input provided by stakeholders as part of the consultation for this study is largely in line with this analysis (more details are provided in Section 5.1.3 of the Stakeholder Consultation Summary). According to the responses of the surveyed hauliers conducting hire and reward operations, cross-trade operations are more relevant for long truck cycle operators compared to short truck cycle operators; the opposite pattern can be observed for bilateral operations. There are however no significant differences observed for cabotage operations.

All in all, most truck cycles, individually, seem to include a number of different types of operations and no specific pattern or sequence of operations emerges (i.e., there is no operation type that seems to be more prevalent than the others within longer or shorter truck cycles). However, hauliers that are engaged in longer cycles are also those with significant cross-trade and, to a lesser extent, cabotage operations.

3.2.3 *Type of operators involved in longer vs shorter truck cycles*

This study also explored whether there are any significant differences between the type of operators undertaking mainly longer truck cycles compared to those undertaking mainly shorter cycles, in terms of the size of the operator (i.e., number of employees, turnover), type of cargo transported (e.g., bulk, general cargo, etc), and contract arrangements (e.g. direct contracts, contracts with freight forwarders, etc).

The analysis is based on the input provided by the surveyed hauliers conducting hire and reward operations, exploring differences between those that only undertake short or long truck cycles. This is provided in Section 5.1.3 of the Stakeholder Consultation Summary.

Overall, the consultation results reveal only minimal differences between the type of operators only undertaking short or long truck cycles. It appears that long truck cycle operators are slightly smaller companies (in terms of employees and revenue) and obtain more business via contracts with freight forwarders/forwarding agents.

3.2.4 *Type of vehicles involved in longer vs shorter truck cycles*

The analysis of the stakeholder input suggests that operators involved in all types of cycle duration favour trucks over 32 tonnes (see in Section 5.1.3 of the Stakeholder Consultation Summary for more details). In addition, the majority of hauliers also use fleets primarily consisting of vehicles registered between 2014 and 2020, regardless of the cycle duration. This indicates that vehicles used in international trips of all kinds are more likely to be larger and newer vehicles. This is somewhat expected as they are more efficient and cheaper to run over long distances.

On the basis of the survey results extrapolated to the entire EU fleet used in international operations, Table 3-12 below shows the estimated proportion of vehicles of different GVW (Gross Vehicle Weights) used in long cycles in the EU. This is an important indicator for calculating the additional emissions caused by the new measure, as larger vehicles have higher emission factors.

Table 3-12 Proportion of vehicles used in long cycle trips only

MS / GVW class	<3.5	3.5 t - 7.5 t	7.5 t - 16 t	16 t - 32 t	> 32 t
EU weighted average[27]	2%	0%	0%	5%	93%

Source: Ricardo estimation based on survey results

[27] The weighted average is calculated using the total vehicles per Member State used in international transport and the proportions of vehicles for each MS from the survey results.

To calculate air pollutant emissions, it is also necessary to identify the Euro standard of the truck. The year when vehicles are first registered in an EU Member State provide a strong proxy for this.

Table 3-13 shows the estimated proportion of vehicles of different Euro standards used in long cycles in the EU. The 2020 values were estimated on the basis of the survey results and extrapolated to the entire EU fleet used in international operations. Given the expected fleet renewal rate, the proportion of new truck registrations in 2017 was used to establish the annual addition of Euro VI trucks between the years of 2020 to 2023.

As can be seen, in 2020 most vehicles were Euro VI (91%). In the projection to 2023 the Euro VI share is expected marginally increased by approximately by 1.5%.

Table 3-13 Euro standard for each Member State in long truck cycles only

MS	Pre-Euro III	Euro III	Euro IV	Euro V	Euro VI
EU weighted average, 2020	0%	0%	1%	5%	94%
EU weighted average, 2023	0%	0%	1%	4%	95%

Source: Ricardo estimation based on survey results

3.2.5 *Conclusions for the baseline scenario in 2023*

There is no evidence to suggest that the characteristics and patterns of truck cycles described above would significantly change between 2019 and 2023 in the absence of the provision (i.e., under the baseline). The COVID-19 pandemic is also not expected to lead to any decisive changes to the observed patterns confirmed by stakeholders taking part in the consultation for this study (more details are provided in the in Section 5.4.1 of Stakeholder Consultation Summary).

As derived in Section 3.1 above, no significant changes to the traffic flows by country of establishment of the operators performing international operations are expected. Thus, hauliers from countries of establishment with significant cross-trade and, to a lesser extent, cabotage operations, are expected to continue to be involved in longer cycles in the baseline.

All in all, the baseline scenario in 2023 is characterised by truck cycles of varying durations depending on the Member State of establishment of operators:

- On the one hand, **trucks used by hauliers established in Western European Member States** are anticipated to be mainly engaged in cycles shorter than eight weeks, although some variation within the group of Western countries is expected, with Finnish hauliers operating also significantly longer cycles.
- The patterns appear to be similar for **trucks used by Southern European hauliers**, which typically operate shorter cycles, despite some exceptions.
- On the other hand, **trucks used by hauliers established in Eastern Member States** are anticipated to be engaged in cycles both shorter and longer than eight weeks. The use of longer truck cycles is more prevalent amongst Bulgarian, Latvian, Lithuanian, Romanian and Slovakian operators. However, Czech, Hungarian and Slovenian operators seem to be mainly involved in shorter cycles, whereas Estonian and Polish hauliers appear to have a similar share of trucks involved in both shorter and longer cycles.

3.3 Functioning of the internal market

This section aims to establish the current market structure, key players, competitive forces so as to understand competition and the level playing field in the baseline. As part of this, we analyse relevant differences in the cost structure of hauliers in the EU and elabora

te cost projections to 2023.

The social landscape is also established to understand the current working conditions and labour market, alongside the new obligation for the regular return home of the driver.

3.3.1 *Market structure and level of competition*

Transport activity in the EU can be carried out by specialised companies that provide road haulage services to third parties (i.e. hire and reward) or by other companies for their own purposes (i.e. own account). The focus of our study is on hire and reward hauliers which are covered by the Regulation where this provision was introduced. In addition, business statistics of the road haulage sector in the EU include only hire and reward operations, while own account transport are considered part of the activity of other economic sectors. Hereafter, the road haulage market will only refer to hire and reward operations. It should also be noted that the analysis of the market structure in this section encompasses all road transport, both domestic and international.

The road haulage market in the EU-27 in 2017 comprised around 523,000 enterprises[28]. The size of firms is relatively small on average, with 5.8 full time employees (FTE) per enterprise on average across Member States. Firms in the West tend to be larger; they employed on average 7.6 FTE per enterprise compared to 5.1 in the East and 3.5 in the South in 2017. Enterprises located in Western European countries have also a considerably higher turnover compared to Eastern and Southern European road hauliers (see Table 3-14). These figures support the broad understanding that the EU road haulage market is dominated by small and medium enterprises (SMEs).

In 2017 Western European firms represented 50% of the market in terms of turnover (down from 52% back in 2012) while the share of Southern European hauliers was 28% (down from 29% back in 2012). France (14.4%), Germany (13.7%), Italy (14.7%) and Spain (10.2%) are the largest players. With respect to 2012, road hauliers from Western and Southern European countries have slightly decreased their market share in favour of road hauliers located in the East, which have increased their market share from 19% to 22% in 5 years (see Table 3-14). There is no evidence to indicate that this trend will change significantly in the next years should the provision on the regular return of the truck not be adopted.

Table 3-14: Business statistics for the road haulage sector in the EU in 2017 by country of establishment

Area	Market Share 2017 (% total turnover)	Market Share 2012 (%total turnover)	Number of Enterprises	Annual Turnover Per Enterprise (Thousand Euro)	FTE per enterprise
West	50	52	124,791	1,428	7.6
South	28	29	191,264	431	3.5
East	22	19	207,312	408	5.1
EU-27			523,367	804	5.8

Source: Eurostat [sbs_sc_sca_r2].

We find basically two distinct segments within the road haulage market (Ricardo, 2017). A first segment is composed of micro-companies (i.e. fewer than 10 employees or self-employed), which represents the 90% of enterprises and account for close to 30% of turnover. These firms tend to compete mainly on price, with labour costs being a key

[28] Eurostat, Annual detailed enterprise statistics for services (NACE Rev. 2 H-N and S95) [sbs_na_1a_se_r2], NACE code H4941 (Freight transport by road), extracted on July 2020. Data for 2018 is available on Eurostat for many countries but has still significant gaps. For completeness, we used 2017 at this stage.

determinant of competitiveness. The second segment is made up of a limited number of medium firms that provide complex logistics services. Firms in this segment compete on price, range and quality of the services offered. Around 1% of enterprises employ more than 50 persons, but these account for around 40% of sector turnover. The rest of the market share is operated by small companies (i.e. 11-50 employees) with a hybrid behaviour between these two.

Subcontracting plays a major role in road haulage (Ricardo, 2017). Very often there is vertical cooperation of hire and reward companies with large pan-European logistics companies at the top controlling the largest contracts but subcontracting much of that down the chain. Cost pressures for logistics providers mean that many heavily rely on subcontracting less profitable operations to smaller enterprises and owner-operators.

Small enterprises and owner drivers either form small consortiums to obtain work, rely on subcontracting from larger firms or identify loads through freight exchange platforms. A long-term trend suggests that freight integrators and forwarding agents (that is to say, a person or company that organises shipments for third parties) will play an important and a growing role in the organisation of international road freight movements, helping to optimise the entire supply chain, improving vehicle usage and reducing empty running (AECOM, 2014).

Results from the survey conducted for this study confirm the major role of subcontracting in the road haulage market (see in Section 5.1.1 of Stakeholder Consultation Summary). Overall, 128 out of 356 (35%) hauliers responded that they either always or normally rely on contracts with freight forwarders or forwarding agents, with additional 59 out of 356 (17%) stating that they very often use this contractual arrangement. Direct contracts with individual firms are much more common for hauliers based in Western and Southern European countries, while subcontracts with freight forwarders or forwarding agents are found more often for hauliers based in Eastern European countries. Survey respondents indicate a very limited use of freight forward exchanges.

In addition, horizontal cooperation between logistic service providers has been a well identified trend over the last decades and has become an important form within the logistics sector to extend their service portfolio and reduce costs (Schmoltzi & Wallenburg, 2011) (Pan, et al., 2019).

The liberalisation of the sector has also led to an aggregation of road haulier firms at EU level. Transport companies with a foreign subsidiary represent some 15% of total turnover and 9% of total employment in the EU road freight transport sector (De Wispelaere & Pacolet, 2018). 'Flagging out' a part of the business activity is mainly performed by large freight transport companies located in the EU-14 Member States. Subsidiaries are often established in EU-13 Member States to benefit from lower labour costs. However, it should be noted that most transport companies with foreign subsidiaries have also a subsidiary in EU-14 Member States.

Even though the road haulage market has recently witnessed a rapid expansion of larger operators offering integrated logistics services along with intense corporate restructuring (Technavio, 2016), there is no evidence suggesting a lower level of competition.

The EU road haulage market is highly competitive and price-sensitive because it is dominated by a large number of small companies and owner-operators that compete for subcontracts from large companies or for loads identified by other means (e.g. online freight exchange platforms). Market segments related to general cargo (e.g. containership, pallets) in large volumes essentially compete on price, while segments related to specialised transport, high value commodities or just in time deliveries tend to give more weight to other aspects such as quality and timeliness.

The relatively low entry barriers to starting a transport company mean that companies which exit the market regularly re-enter it or are replaced by new undertakings. This shows the resilient nature of the sector, which appears to adapt quickly to changes and economic developments (European Commission, 2014).

As per the transport demand projections in Section 3.1.2, the road haulage sector is

estimated to have witnessed a 7% decrease in demand in tonne-kilometre from 2019 to 2020 as a result of the COVID-19 pandemic effects. However, a recent report by the IRU (IRU, 2020) provides an early warning on the risk of bankruptcies within the road haulage sector as a result of an average revenue drop by 20% in Europe in 2020.

3.3.2 *Cost structure and level of prices*

This section is based on the cost differentials model which has been developed to provide a like-for-like comparison of cost structures within the road haulage market in the EU. A detailed description of the model, including main assumptions and data sources is provided in Annex 4.

The cost differentials model estimates road haulage annual operating costs per vehicle for different cost components (labour, fuel, overheads, maintenance, etc.) by Member State of establishment. Although the focus of the study is on international transport activity, we present here the costs for domestic operations to facilitate the interpretation of key cost differences between Member States. However, the only cost component that would change when considering international trips is fuel, as hauliers switch to fuel costs of the country where they are undertaking the operation but other cost components keep being linked to the country of registration (i.e. labour, maintenance, overheads, etc.) from their country of establishment. Moreover, the like-for-like comparability of cost structures between different Member States is ensured by considering equivalent levels of activity in terms of annual mileage per vehicle. The analysis hereafter is based on the cost differentials model in 2019 and projections to 2023 based on interpolations of PRIMES-TREMOVE results, COVID Baseline for road freight transport.

Road haulage is a labour-intensive sector and, as such, labour costs, which include gross wages and social security costs, are a key cost component. Differences in labour costs within the EU road haulage market are a significant driver of market dynamics.

In 2019, labour costs for Western European hauliers were estimated to be 179% higher on average than for Eastern European firms (Table 3-15). This cost difference is reflected in a higher share of labour costs in total operating costs for Western European firms.

Although the projected growth rate of labour costs by 2023 is higher in Eastern European Member States compared to Western European Member States, labour costs in the West are still expected to be 171% higher than those in the East. Labour costs in Southern European countries are approximately halfway between West and East values (see Table 3-15).

Table 3-15: Projected annual labour costs per vehicle under current business practices and market conditions. Prices in €2019

Area of establishment	Share of labour costs in operating costs	Labour costs 2019	Projected labour costs 2023	Change in labour costs 2019-2023
West	38%	58,807	62,044	5.5%
South	31%	41,728	46,114	10.5%
East	22%	21,068	22,889	8.6%

Source: Cost differentials model (see section Annex 4 for more details).

Fuel costs are also a key cost component, which represents a share of 27%-37% in annual operating costs. In this case, however, the cost differences between EU countries are not so significant. Fuel costs in Western European countries are only 15% higher compared to the lower fuel costs found in Eastern European countries. As above mentioned, our cost differentials model considers equivalent levels of activity per vehicle in terms of overall kilometres driven per year. Hence, differences in fuel costs are essentially due to differences in fuel prices and vehicle fuel efficiency among Member States.

The lower demand for fuel as a result of the COVID-19 pandemic has caused a significant drop in fuel prices. Following the projections on fuel price from the COVID-19 baseline in PRIMES-TREMOVE and own interpolations for 2023, we estimate that fuel costs in 2023 will still be lower than those in 2019 for many Member States. The drop in fuel costs in 2023 compared to 2019 levels is most significant in Eastern European Member States, adding to their cost advantage with respect to hauliers based in Western European countries (see Table 3-16).

Table 3-16: Projected annual fuel costs per vehicle under current business practices and market conditions. Prices in €2019

Area of establishment	Share of fuel costs in operating costs	Fuel costs 2019 (annual)	Fuel costs 2023 (annual)	Change fuel costs 2019-2023
West	27%	41,121	38,897	-5.4%
South	33%	43,646	39,571	-9.3%
East	37%	35,853	31,585	-11.9%

Source: Cost differentials model (see Annex 4 for more details).

Besides labour and fuel costs, our cost differentials model also accounts for costs of maintenance, financing, tyres, insurance, overheads, and ownership taxes. However, these have a lower significance and are assumed to be constant over the 2019-2023 period (with constant 2019 prices).

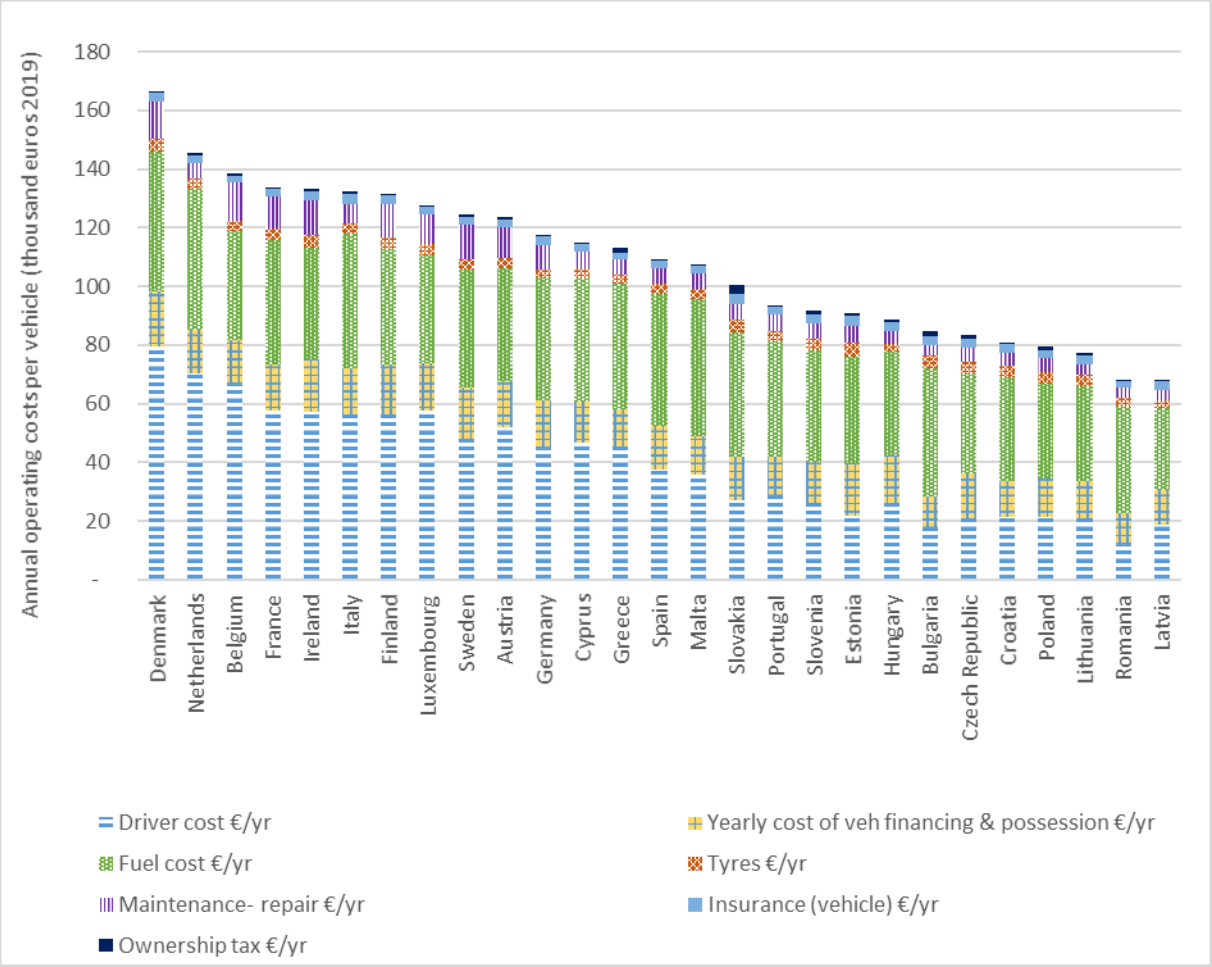
Figure 3-9 illustrates the overall cost structure of domestic road transport for the base year across the EU. Overall, the projection of total operating costs for domestic transport in 2023 looks very similar to 2019 figures. A more prominent drop in fuel costs in Eastern European countries more than offsets a higher growth rate for wages. This means that overall differences in total operating costs for domestic transport within EU Member States are expected to remain fairly constant over the 2019-2023 period (see Table 3-17).

Table 3-17: Projected total operating costs per vehicle for domestic transport under current business practices and market conditions. Prices in €2019

Area of establishment	Annual operating costs 2019	Annual operating costs 2023	Change operating costs 2019-2023
West	154,796	156,672	1.2%
South	133,210	134,982	1.3%
East	96,796	95,151	-1.7%

Source: Cost differentials model (see Annex 4 for more details).

Figure 3-9: Cost structure of domestic road freight transport across EU Member States in 2019. Prices in €2019



Source: Cost differentials model (see Annex 4 for more details).

As discussed, our cost differential model considers an equivalent level of activity per vehicle (e.g. mileage per vehicle per year). This is necessary to disentangle the level of activity from the cost structure. However, it should be noted that central European countries benefit from shorter transport distances because of their higher accessibility to the transport network and the denser trade activity. Results from a recent JRC study (Persyn, et al., 2019) at a NUTS-2 level indicate that transport costs follow a core-periphery structure within the EU, where geographically central regions benefit from shorter trips and reduced fuel consumption, and more peripheral regions tend to benefit from lower salaries within the transport sector.

The analysis also considered market prices (i.e. freight rates) charged on freight transport operations undertaken within each Member State. According to Eurostat data[29], real freight rates (i.e. corrected for inflation) within the road haulage market have increased slightly in the West and the East and decreased in the South over the past period 2015-2019. It is worth noting some particular cases within the East. Romania has experienced a drastic increase in real prices of 44%, while some Baltic countries such as Estonia or Lithuania have increased their real prices by around 10%.

[29] Eurostat, Service producer prices - annual data [sts_sepp_a], extracted in July 2020

Table 3-18: Changes in real prices (freight rates) in the road haulage market across the EU over the period 2015-2019

Area of establishment	Change in real freight rates 2015-2019
West	1.3%
South	-1.6%
East	1.4%

Source: Eurostat [sts_sepp_a]

Given the higher level of competition within the road haulage market, profit margins in the sector are generally very small (Ricardo et al, 2015). This means that prices will tend to reflect costs of transport operations. However, operators could potentially apply cross-subsidies and increase the price in more inelastic market segments while charging rates even below costs for market segments with higher demand elasticity.

According to the German road haulage association BGL, the hauliers they represent have very tight profit margins of around 1%. Other sources suggest that average profit margins for European hauliers would be around 2-3% and up to 6% for large market players (Doll, et al., 2016). BGL stated that Eastern European hauliers are more likely to have a higher margin in international transport operations because of their lower operating cost level. BGL provided anecdotal evidence on drastic price drops as a result of the Covid-19 pandemic to support this assumption.

Overall, market prices are expected to follow an equivalent evolution to that for operating costs over the period 2019-2023.

3.3.3 *Labour market and driving conditions*

The road haulage sector in the EU-27 employed around 3 million people in 2017, which represents around 2% of the total employment, according to Eurostat data. As shown in Table 3-19, the share of the road haulage sector within the economy-wide employment is higher for Eastern European countries, with a 2.5% compared to a 1.2% in Southern European countries and 1.5% in Western European countries. The labour market and its underlying drivers described below are not expected to change substantially by 2023.

Road freight transport has been experiencing a progressive shortage of professional drivers, which affects the competitiveness of the sector (European Parliament, 2009). Results from a survey conducted by IRU (IRU, 2019) indicate that the supply of drivers currently meets an employment demand of 79%, leaving a visible driver shortage of around a fifth of available positions. The IRU study finds that the image of the sector, the working conditions, the challenge of attracting female drivers and the ageing labour force are key drivers of the shortage of professionals in the sector. The shortage affects all regions of the EU. In Poland, for example, the shortage of drivers is expected to grow to 20% of labour demand (around 200,000 drivers) (pwc, 2019).

Driver shortage has led to a strong increase in the number of drivers from non-EU countries being employed in the EU. The number of driver attestations issued to these drivers has almost doubled between 2014 and 2016 to around 76,000 (2.5% of the total workforce in the road haulage sector). Most of them are employed in Poland, Lithuania, Slovenia and Spain (European Commission, 2017c).

Permanent and full-time contracts are the most common form of contracting. However, subcontracting is also prominent, often involving complex subcontracting chains across borders to benefit from hiring on the basis of lower wage levels (European Commission, 2010).

The level of wages differs substantially among Member States, being around €38k per annum per FTE in the West, around €20k in the South and around €9k in the East (see Table 3-19)[30].

Table 3-19: Employment indicators

Area of establishment	Road freight employment over total employment	Average annual wage per FTE
West	1.5%	38,405
South	1.2%	19,579
East	2.5%	8,862

Source: Eurostat [sbs_sc_sca_r2].

The increasing internationalisation of the sector, which results in longer truck cycles especially for peripherical countries, is often associated to poorer working conditions in terms of long driving times, insufficient rest, time spent away from appropriate facilities (European Commission, 2017c).

The so-called 'Driving time regulation' (Regulation 561/2006) established minimum requirements with regard to maximum driving times, minimum breaks and daily/weekly rest periods. The regular daily rest period is set at a minimum of 11 hours, while a reduced daily rest period has a duration of between 9 and 11 hours. The regular weekly rest period is set at a minimum of 45 hours, while a reduced one can be shortened to a minimum of 24 consecutive hours. Daily and reduced weekly rest periods can currently be spent in a vehicle, as long as it has sleeping facilities (European Parliament, 2020).

A review of the 'Driving time regulation' (Regulation 2020/1054) was approved by the European Parliament in July 2020. Under the amended Regulation, which entered into force on 20 August 2020, weekly rest periods of drivers involved in international operations can be arranged with greater flexibility over a period of four consecutive weeks by allowing drivers to take two consecutive reduced weekly rest periods. Another provision clarifies that drivers are not allowed to take a regular weekly rest of 45 hours or more in a truck cabin.

More important for the purposes of this study is the obligation under the revised Regulation for road undertakings to organise their drivers' work to enable them to return home for a weekly rest within each period of four consecutive weeks. The provision refers to two possible places to be considered as 'home', namely the employer's operational centre where the driver is normally based in the Member State of the employer's establishment, or the drivers' place of residence when the latter differs from the employer's place of establishment. The Regulation establishes that it is up to the driver to choose the place of return among the two options provided. This provision is expected to lead to a new organisation of road haulage operations where drivers return home more often.

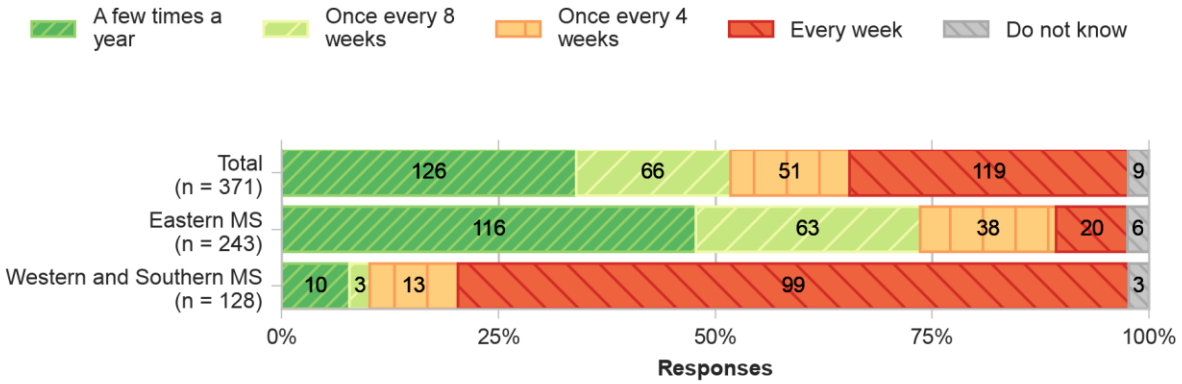
The stakeholder survey asked about the frequency of return for drivers previous to the application of the new provision. As presented in Figure 3-10, 192 respondents (out of 371 who responded to this question) stated that the frequency of return of drivers was lower than once every 4 weeks. From these, 179 are from Eastern European countries, while only 13 are from Western or Southern Member States. This shows that drivers working for hauliers established in Eastern European countries clearly return less often to their homes. Many hauliers who responded to the survey argue that some drivers prefer

[30] It should be noted that these wages do not compare with labour costs in Table 3-15, because wages are calculated per full-time employee (FTE) rather than per vehicle and do not incorporate social security costs or other labour costs.

to stay away from their country of establishment for longer periods of time for a number of financial and personal reasons.

DG Move has recently published Questions and Answers[31] on implementation of certain provisions of Mobility Package I, including the new provision on a regular return of a driver to 'home'. According to the clarification provided: *"the employer is obliged to offer to the driver a possibility of return to either his or her place of residence or to the employer's operational centre where the driver is normally based, through an appropriate organisation of the work. Such organisation has to be actively undertaken, without particular request by the driver. As regards the concrete place of rest, this is a matter for the driver to consider and does not require the employer nor the driver to keep any particular evidence."* It follows from this clarification that a driver may not return home every four weeks if he/she chooses to spend a weekly rest elsewhere.

Figure 3-10: Survey responses to "On average, how often do drivers you employed in 2019 return home to spend their regular weekly rest?"



Source: Survey of stakeholders undertaken for this study.

Note: Responses from all stakeholders that indicated their Member State have been included in this chart. The stakeholder groups covered by the consultation are: companies engaged in the provision of road freight transport services (e.g. haulier, freight forwarder, logistic provider) and their associations, drivers of vehicles engaged in road freight transport and their trade unions, national authorities. The total responses vary as not all stakeholders provided an answer to all options.

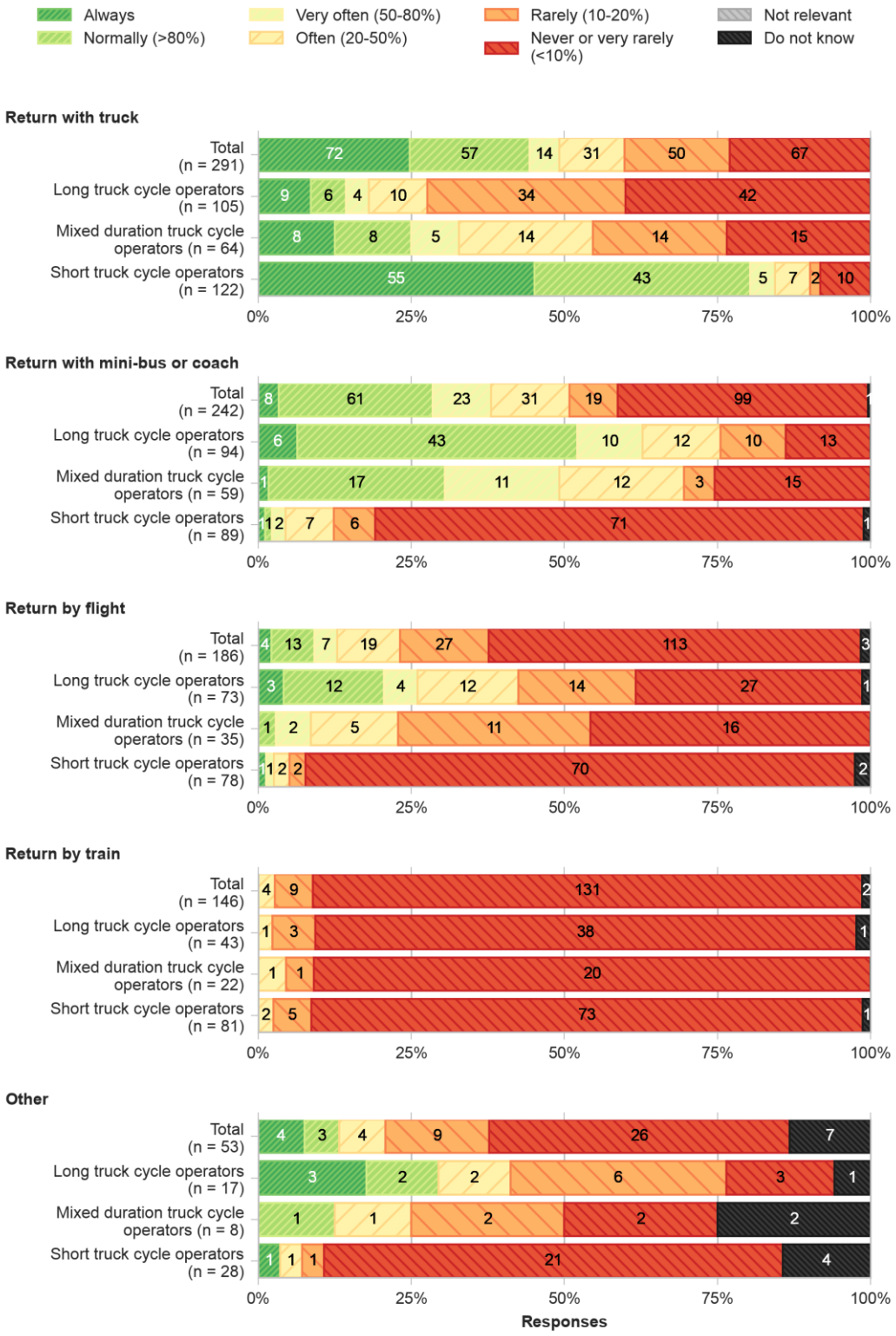
As shown in Figure 3-11, 129 out 291 hauliers (44%) who responded to this question stated that their drivers either always or normally returned home with the truck. The duration of the truck cycle is a key factor to understand whether drivers return with the truck or by other modes. In short cycles, truck drivers typically return with the truck while some longer cycles are organised in such a way that drivers return home by other means. In response to the survey, 98 out of 122 (80%) of hauliers typically involved in short truck cycles indicated that they always or normally return with the truck, while only 16 out of 64 (25%) hauliers typically involved in long truck cycles responded so. Among those not returning by truck, minibus or coach seems to be the most common transport option. Those responding they use other modes mostly organise the return by car.

According to a Finnish haulier, larger companies involved in long truck cycles tend to organise minibuses for drivers to return home. However, in smaller companies, drivers generally return by car (either provided by the company or by the driver). As pointed out by BGL, the return with the truck is part of drivers' working time, while the return by other transport modes is sometimes taken from drivers' spare time.

[31] https://ec.europa.eu/transport/modes/road/mobility-package-qa_en

Again, there are substantial differences across Europe. While in Western or Southern European countries a majority of drivers either always or normally return home with the truck, the share of those returning by truck is clearly lower in Eastern European countries.

Figure 3-11: Survey responses to "How often do these drivers use the following transport modes to return home from assignments to spend their regular weekly rest?"



Source: Survey of stakeholders undertaken for this study.

Note: This chart only includes the responses from the surveyed hauliers conducting hire and reward operations. Short cycle operators include the hauliers whose vehicles all return six or more times per year. Long cycle operators include the hauliers whose vehicles all return less than six times per year. Mixed duration cycle operators include the hauliers with a share of vehicles that return six or more times per year and the remaining share return less than six times per year.

4 ASSESSMENT OF IMPACTS OF THE NEW PROVISION

This section provides the assessment of the impacts arising from the obligation of the return of the truck to the Member State of establishment of the operator on transport activity, the environment, congestion and the economy. Impacts are assessed for 2023 only, which is the first full year when the new measure will be applicable.

The analysis in this section is based on a combination of quantitative and qualitative assessment. The quantitative assessment is based on a scenario approach to model the potential responses of the road freight market as a whole to the new obligation. In total, three scenarios were identified which provide an indication of the range of outcomes and impacts. The analysis focuses on the most likely scenario, complemented by the other two scenarios to provide an overview of the potential extent of impacts that could arise from this provision.

The scenarios are the basis to identify and estimate the outcomes in terms of the potential impact on the number, length and loading of vehicle journeys, which are in turn used to quantify impacts on transport activity, the environment, congestion and the economy. Qualitative assessment of the changes that cannot be quantified or modelled is also undertaken to provide a more nuanced analysis and complement the quantitative analysis.

This section is organised as follows:

- Section 4.1 outlines the potential responses of the individual operators to the new provision, and discusses the main factors that influence their response.
- Section 4.2 provides the assessment of the potential responses of the market as a whole based on a scenario approach, on the basis of the individual operators' responses outlined in the section above.
- Section 4.3 provides the assessment of the impacts of the new provision on transport activity, the environment, congestion and the economy

4.1 Potential responses of operators

4.1.1 *Overview*

All operators whose vehicles are currently engaged in truck cycles[32] longer than eight weeks will need to make adjustments to their operations as their vehicles will need to return to the operational centres in their Member State of establishment at least every eight weeks.

For each operator, two broad types of responses were identified. Each type groups responses which are expected to result in similar outcomes in the market which are then used to derive and quantify impacts. These two types of responses were labelled as Response A and Response B for the purpose of this report and are described below.

Response A

The affected operator would aim to undertake the same number of assignments as they would in the business-as-usual case (baseline scenario) but as part of shorter cycles from their current Member State of establishment.

As a result of this provision, the operators' vehicles would need to return more regularly to the operational centre in their current Member State of establishment, potentially

[32] A truck cycle is defined as the round trip that encompasses a combination of assignments that a truck carries out between leaving and returning to the country of establishment of the operator.

resulting in additional vehicle journeys. To this end, they might need to re-organise their operations; this could involve:

- A1: An increase in the duration of cycles that are shorter than 8 weeks to undertake (part of) the assignments that the trucks currently operating longer cycles will be unable to complete.
- A2: An increase in their capacity, i.e., more vehicles would be used to be able to deliver the same volume of services as they would in the business-as-usual case (baseline scenario).

Response B

The affected operator would no longer be able to fulfil the same assignments as part of shorter cycles from their current Member State of establishment.

This would entail a change in the business model of the affected operator, for example[33]:

- B1: Retain the same vehicle capacity but forgo a number of assignments due to the additional time required for the vehicles to return more regularly;
- B2: Scale down operations in certain countries where they currently operate due to the extra costs and competition from other operators;
- B3: Relocation of activity to operational centres in another Member State to maintain the same level of business.

As a result, another operator (or a new entity of the same operator if relocating the operational centre – response B3) established in a different Member State[34] would replace it and undertake those assignments. Additional journeys, if any, would be undertaken by the new operator/entity.

This is a response worth considering since the costs of returning to the country of establishment for the original operator could be too high to continue providing the same service as before. A discussion of the factors that can influence the response of the operators is provided in Section 4.1.2.

In addition, other responses to the measure might also take place such as:

- Collaboration between firms or mergers / acquisitions, as suggested during the exploratory interviews.
- Relocation of the operational centre within the Member State but closer to the border: it is possible that these will be moved or opened next to key cross-border points.

These changes can take place at the same time as the other responses identified above (i.e., are not mutually exclusive) and are also assessed in the following sections.

4.1.2 *Factors influencing the potential responses of operators*

There are a range of factors that can influence the response of these operators. These are likely to come down to an assessment of the impact of the obligation on the competitive advantage of operators based in different Member States. As described in Section 3.3, the road haulage sector is characterised by a large number of small firms that tend to compete mainly on price, with labour costs being a key determinant of

[33] Note that these are examples of how individual operators might respond to the measure, having in common the outcome, i.e., leading to a change in the Member State of establishment of the operator undertaking the potential new journeys created by the measure.

[34] It is assumed that other operators from the same Member State would not pick up these assignments.

competitiveness. The resulting costs and revenues associated with the additional vehicle journeys potentially caused by the introduction of the measure may therefore be important factors:

- Additional vehicle journeys represent additional costs (e.g. fuel, tyres, drivers, etc.) which are mostly linked to the distance the vehicle would run on those journeys. This will differ per Member State depending on the country of establishment of the operator and the location of their operations. If additional vehicles need to be added to their fleet to keep the same level of operations, there would also be an increase in capital costs as well as operational costs such as maintenance and vehicle taxes.
- Additional revenues could be obtained if the operator would manage to find a load for those additional vehicle journeys.

The operator is more likely to continue undertaking the same assignments as part of shorter cycles in their current Member State of establishment (i.e. Response A) if the costs of additional (return) journeys are compensated by additional revenues, i.e. operator successfully **finds cargo for the additional vehicle journeys**. Alternatively, this is also likely if the additional costs are absorbed – e.g. the operator is able to pass-on the cost increase to freight rates and/or absorb profit loss, whilst still maintaining their **cost advantage** compared to their competitors (e.g. operators established in other Member States). This is important since operators tend to compete mainly on price and therefore providing a service at lower costs than their competition is an important element of their competitiveness. On the other hand, the operators are likely to be unable to maintain the same level of business as before if they cannot keep their competitive advantage.

Cost advantage and the ability to find a load for the return journey are therefore key aspects of the analysis. Other relevant factors are also considered. This is covered in the next sections.

4.1.2.1 Cost advantage

This section focuses on cost advantage as a key driver of competitiveness within the road haulage market. However, as described in section 3.3.1, quality and timeliness can also be important competitiveness elements, especially in market sectors dependent on more time-sensitive delivery.

The analysis of the cost advantage is based on the cost differentials model described in Text Box 4-1.

Text Box 4-1: Description of cost differentials model

The model estimates the difference in operating costs for operators of different Member States of establishment when conducting international operations. To do this it assumes that when undertaking international operations, hauliers incur fuel costs of the country where they are undertaking the operation but keep other cost components (i.e. labour, maintenance, overheads, etc.) from their country of establishment. This is used to derive the cost advantage of cabotage with respect to domestic operations and of cross-trade with respect to bilateral operations. The model is also used to estimate the costs of additional return journeys to the country of establishment, and the extent to which the lower cost structures suffice to compensate for the additional distance travelled.

It should be noted that the cost differentials model considers an equivalent annual mileage per vehicle across Member States for a like-for-like comparison of operational costs per vehicle. However, central Member States benefit from shorter transport distances as they are closer to transport demand and have a better road network access. Our model does not capture potential effects on vehicle productivity arising from the different accessibility levels.

More details are provided in Annex 4.

Cost of one additional return journey

Based on the cost differentials model, we first calculate the costs of an additional inbound and outbound journey to return to the operational centre in the country of establishment and back to the host country where the operation takes place (henceforth two-way return journey). This is used to assess the total costs of the additional return journeys needed to fulfil the obligation to return every eight weeks. For these additional return journeys operators may be less likely to secure cargo and thus attract additional revenue to cover for these costs.

To estimate the cost of the two-way return journey, we follow the same approach as taken for international transport operations (described in Text Box 4-1). The average distances between Member States on road transport are taken from our Origin-Destination distance matrix described in Appendix 7. The costs of return journeys are assessed by Member State pair and then aggregated at cluster level (results at Member State pair level are presented in Annex 8). The aggregation considers average costs across all Member States falling within the cluster of origin and destination, respectively.

Table 4-1 presents the results on the cost of a two-way return journey. The cost of the two-way return journey ranges from around €1,500 to around €6,000. The lower bound is found in return journeys within Eastern European Member States while the maximum value is associated to return journeys from the South area to the West.

It should be noted that these costs are driven not only by different operating costs structures but also by distances between Member States, which explains why the South-South return trip is more expensive than the West-West. A recent study on the impacts of the Mobility Package estimated a cost of €1,600 for a two-way return journey from Lithuania to Central Europe (Klaus, 2019). Our cost estimate of the two-way return journey from Lithuania to Germany is around €1,800, which appears to be consistent with the figure found in the previous literature.

With respect to total operating costs, additional costs of a two-way return journey represent around 2.7% of annual operating costs per vehicle on average. Taking the extreme case of a road journey from Portugal to Finland, this can be up to 6.2% of annual operating costs per vehicle (see Annex 8 for detailed results per Member State).

Table 4-1: Estimated additional costs of a two-way return journey in 2023. Prices in €2019

Area of establishment	Location of transport operation	Cost of two-way return journey (€)
West	West	2,412
West	South	6,033
West	East	3,704
South	West	5,077
South	South	4,483
South	East	4,689
East	West	2,376
East	South	3,690
East	East	1,474

Implications for cost advantage

We define cost difference per Member State pair (*i,j*) as the operating cost per vehicle of

an international cabotage operation in country *j* undertaken by a haulier established in country *i* divided by the costs of an equivalent domestic operation undertaken by an operator established in country *j.*

By aggregating international costs by areas (West, South, East), we can represent the cost difference in cross-trade operations. Then the cost difference per area pair (*I,J*) is defined as the average operating cost of a cross-trade (or cabotage) operation within area *J* undertaken by a haulier established in the area *I* divided by the costs of an equivalent bilateral (or domestic) operation undertaken by an operator established in area *J*.

With this definition, cost differences can be used to assess the cost competitiveness of international cabotage or cross-trade operations vis-à-vis domestic or bilateral operations under different policy scenarios.

For the purpose of this section, we assess a case where vehicles return to the country of establishment five times more per year compared to the baseline (henceforth additional returns hypothesis). This represents the case where vehicles were only returning to the country of establishment once a year in the baseline (i.e. to undertake the technical inspection) and six times per year under the policy scenario (i.e. every eight weeks). Additional costs of return journeys as per Table 4-1 are incorporated into the costs of international operations (cabotage and cross-trade), while it is assumed that the costs of domestic and bilateral operations remain unchanged. The cost differentials calculation as defined above is used to evaluate the impacts of the provision on the relative competitiveness of different operations. In the analysis presented in Section 4.3.4.1, the actual cost impacts from the provision are estimated by considering the final results on the frequency of truck return by origin-destination pair.

Results are shown in Table 4-2. Under the additional returns hypothesis, relative cost differences would be reduced but cost advantages would be mostly kept. In the baseline, the current cost of cabotage or cross-trade operations within the West undertaken by Eastern European hauliers are 65% of the costs for the equivalent domestic or bilateral operation with Western hauliers. The costs of additional return journeys increase this ratio to 74% under the additional returns hypothesis. Therefore, the average cost advantage of Eastern European hauliers undertaking cross-trade or cabotage operations in the West is not expected to change significantly as a result of the policy.

In contrast, the cost advantage that Southern European hauliers had when undertaking cross-trade or cabotage operations within the West could be lost under the assumption that vehicles return to the country of establishment five times more per year compared to the baseline.

Within clusters, cross-trade and cabotage operations would also become more expensive compared to bilateral or domestic operations. For example, a cabotage or cross-trade operation within the East conducted by Eastern hauliers would be 108% of the equivalent bilateral or domestic operation.

Table 4-2: Cost difference between cross-trade or cabotage operations and the equivalent bilateral or domestic operations in 2023 for the baseline and the additional returns hypothesis by area of establishment of haulier and area where the transport operation is undertaken

Area of establishment	Location of transport operation	Cost difference in baseline scenario (*)	Cost difference in additional returns hypothesis (*)
West	West	100%	108%
South	West	87%	103%
East	West	65%	73%
South	South	100%	117%

Area of establishment	Location of transport operation	Cost difference in baseline scenario (*)	Cost difference in additional returns hypothesis (*)
West	South	116%	139%
East	South	76%	89%
East	East	100%	108%
West	East	157%	177%
South	East	135%	160%

Source: Ricardo analysis

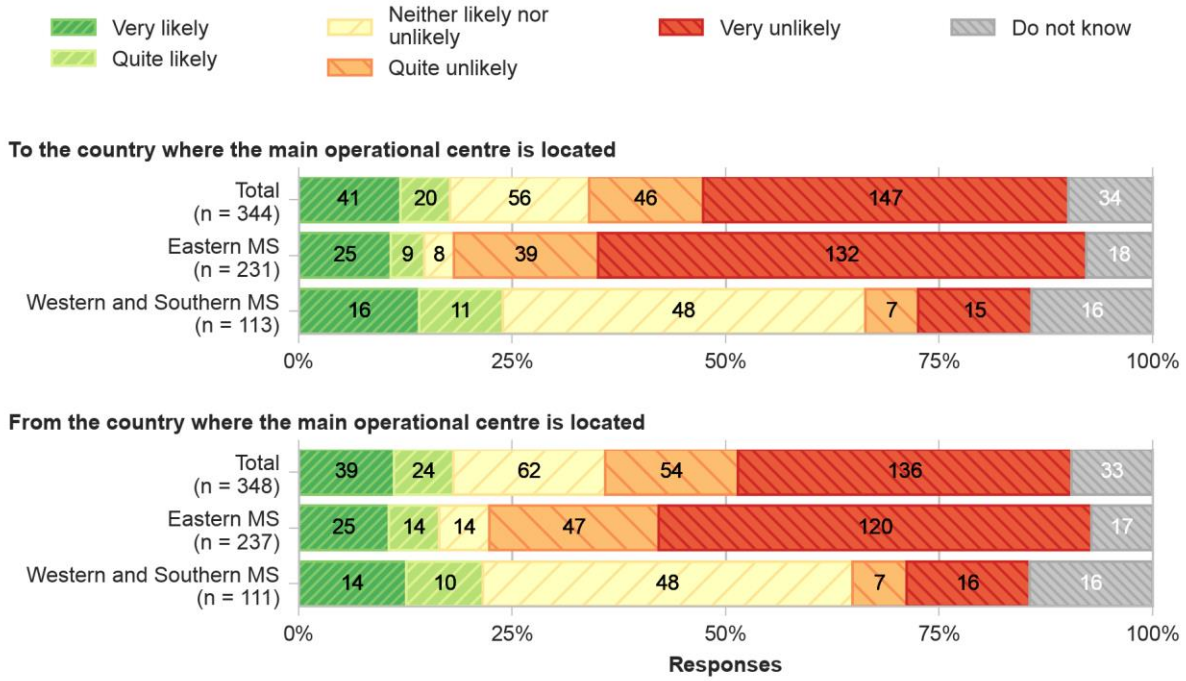
Note: (*) The cost difference of a pair (i,j) is defined as the vehicle operating costs in international cabotage or cross-trade operations within an area (j) undertaken by hauliers established in (i) divided by the vehicle operating costs of the equivalent domestic or bilateral operations undertaken by hauliers established in (j)

4.1.2.2 Ability to find a load for the return journey

The ability to carry a load for the return journeys (both the journey back to the operational centre and the journey to the country of operation) is also an important factor as it represents an opportunity for additional revenues on a journey that will have to be completed even if empty.

Stakeholder input from the exploratory interviews suggested that it might be difficult for operators to find cargo to transport in the return journeys and this will depend on the balance of supply and demand of freight transport. However, the stakeholders' views provided during the main consultation presented in Figure 4-1 show that, while the majority of Eastern European Member State stakeholders think that finding additional loads is very unlikely to and from the operational centre (132 of 231 and 120 of 237 respondents, respectively), Western and Southern European Member State stakeholders mostly responded that it is 'neither likely nor unlikely' (48 of 113 and 48 of 111 respondents, respectively).

Figure 4-1: Survey responses to "How likely or unlikely would it be to secure a load for the potential additional journeys (both the journey to the operational centre and the journey from this location) arising from this new requirement?



Source: Survey of stakeholders undertaken for this study.

Note: Responses from all stakeholders that indicated their Member State have been included in this chart. The stakeholder groups covered by the consultation are: companies engaged in the provision of road freight transport services (e.g. haulier, freight forwarder, logistic provider) and their associations, drivers of vehicles engaged in road freight transport and their trade unions. The total responses vary as not all stakeholders provided an answer to all options.

According to the literature on this topic (McKinnon, 2006) this ability to secure a load for potential additional journeys is dependent on a number of factors and barriers, including:

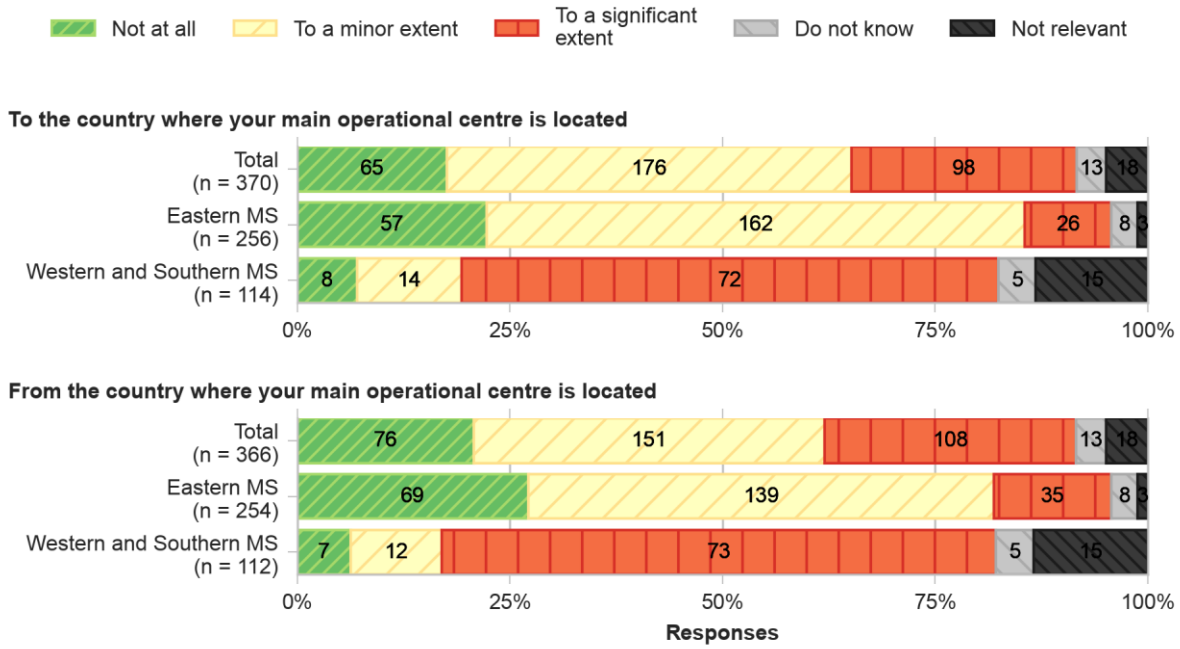
- Geographical imbalances in freight traffic flows;
- Risk to create delays to the next outbound delivery;
- Lack of access to information on available loads;
- Incompatibility of vehicles and products.

As part of the consultation for this study, stakeholders were also asked about the factors that might affect their capacity to secure a load for those additional journeys to and from the country of operation with a reasonable profit. Hereunder we present the principal factors identified by survey responses. Responses to questions on other factors can be found in section 5.2.1 of the Stakeholder Consultation Summary.

Regarding the existence of market opportunities to find cargo to be transported from/to the country where the operational centre is located (Figure 4-2), the majority of respondents from Western and Southern European Member States indicated that they are able to find opportunities to a significant extent for journeys to (72 of 114 respondents) and from (73 of 112 respondents) their operational centre. However, respondents from Eastern European Member States suggest they might not be able to secure additional loads as there are limited market opportunities to (162 of 256 respondents) and from (239 of 254 respondents) their operational centres[35].

[35] Eastern Member State operators are likely to be involved in longer cycles and thus will be most affected by the provision.

Figure 4-2: Survey responses to "To what extent are there market opportunities to find cargo to be transported from/to the country where your main operational centre is located?"

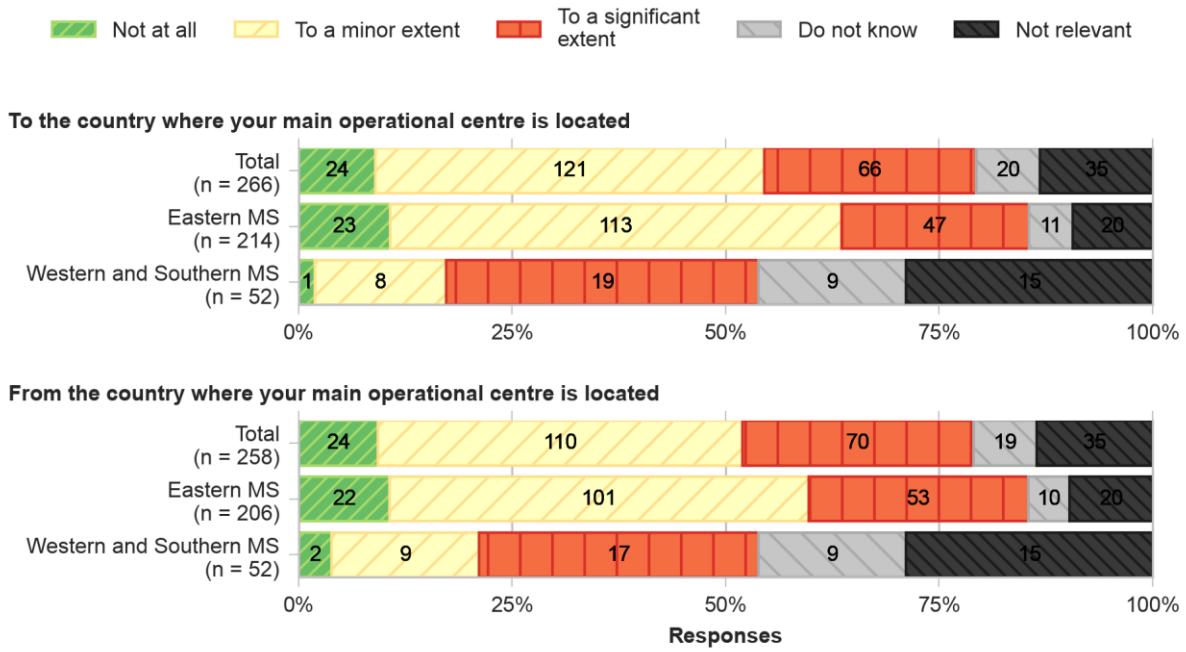


Source: Survey of stakeholders undertaken for this study.

Note: Responses from all stakeholders that indicated their Member State of establishment have been included in this chart. The stakeholder groups covered by the consultation are: companies engaged in the provision of road freight transport services (e.g. haulier, freight forwarder, logistic provider) and their associations, drivers of vehicles engaged in road freight transport and their trade unions. The total responses vary as not all stakeholders provided an answer to all options.

Survey responses which highlight the ability to get information that leads to securing loads for journeys to and from the operational centre are presented within Figure 4-3. These suggest that the lack of information is a contributing factor to operators established in Eastern European Member States being unable to secure loads. As before, Western and Southern European Member States most common response was 'To a significant extent', which suggests most respondents are able to get information regarding loads to (19 of 52) and from (17 of 52) their operational centre. Conversely, the majority of Eastern Member States responded with 'To a minor extent' to source information on loads to (113 of 214) and from (101 of 206) their operational centre.

Figure 4-3: Survey responses to "To what extent are you able to find information about these opportunities?"



Source: Survey of stakeholders undertaken for this study.

Note: Responses from all stakeholders that indicated their Member Stat of establishment have been included in this chart. The stakeholder groups covered by the consultation are: companies engaged in the provision of road freight transport services (e.g. haulier, freight forwarder, logistic provider) and their associations, drivers of vehicles engaged in road freight transport and their trade unions. The total responses vary as not all stakeholders provided an answer to all options.

Some stakeholders elaborated further on factors affecting the capacity to secure loads for additional journeys to and from the operational centre. Factors given are:

- Trade imbalance between the haulier's Member State and operational centre, i.e., not enough exports to the haulier's Member State – was suggested by a German haulier;
- An association of road freight companies from a peripheral Member State identified that current numbers of trucks would not be sufficient to maintain current levels of freight. It was highlighted that procurement of additional trucks will be necessary to maintain current levels of service, as there will be a greater frequency of truck returns.

The same stakeholders were also asked to provide their views on how the obligation for the regular return of the vehicle would affect international freight rates compared to the current averages. Responses on potential effects of the measure include (see section 4.3.4.2 for more details on the impact of the measure on freight rates):

- The Ministry of Economic Affairs and Communications of the Republic of Estonia identified that the need laden return journeys might lead to hauliers accepting lower rates.
- An association representing road freight companies established in an Eastern European peripheral state identified that more return journeys are likely to decrease freight rates.
- Transport Malta suggested that increased operational costs will be passed onto the client, which will result in higher costs of goods.

4.1.2.3 Other factors

In addition to the cost advantage and the ability to find a load for the return journey, there are also other factors that are likely to play a role in the response of these

operators, namely the ability to increase capacity (i.e. add new vehicles to their fleet) and the extent of the costs of relocation to a different Member State.

Operators remaining in their current Member State of establishment (i.e. Response A) might need to increase their capacity to carry out the same assignments as in the baseline, i.e., more vehicles would be used to be able to deliver the same volume of services as they would in the business-as-usual case. This could lead to an increase in capital costs as well as operational costs such as maintenance and vehicle taxes. Section 4.3.4.1 below assesses the cost impacts of the provision and finds that one-off costs of new vehicle capacity to retain the same level of operations could be below €100k.

On the other hand, operators that would consider relocating to another Member State (i.e. Response B3) would also face additional costs arising from the relocation process. As described in section 4.3.4.1 below, ongoing overhead costs could increase between 10% and 40% (due to the increase in labour costs and administrative costs) and additional one-off costs could range from €10,000 to €1.5 million. In practice, relocation costs would largely depend on the size of the firm and the specific relocation process (e.g. through establishment of new company and premises, acquisition, merging, etc.).

All in all, operators would need to balance out the potential costs of additional capacity if remaining in the current Member State and the costs of relocation, in addition to considering the impacts of the additional return journeys on their costs, revenues and, ultimately, competitive position.

4.2 Analysis of the market responses

The actual market response (as a whole) will be a combination of the responses of the individual operators which will range between the two types identified earlier (i.e. Response A where operators aim to retain the same level of activity despite the new provision, and Response B where operators adjust their level of activity due to the impact of the new provision).

Given the uncertainty on how different operators might adjust to the new obligation, a scenario approach was developed to represent the potential market responses. While the scenarios assessed are a simplification of reality, they provide a systematic approach to understand the extent of the effects of this measure in a consistent and transparent manner. In combination, the scenarios provide an indication of the range of outcomes and impacts.

This section provides a description of the scenarios assessed, includes a discussion on their likelihood and specifies the parameters that define them so that their impacts in terms of additional journeys can be determined.

4.2.1 *Overview of the scenarios*

Three scenarios were developed:

1. **Simple market compliance (SMC):** A scenario where all operators would be minimising any changes to the way they conduct their operations, whilst complying with the new provision. This reflects the case where all the operators would follow Response A identified above.
2. **High market restructure (HMR):** A scenario where all operators would make more substantial changes to their operations (e.g. forgo some assignments, scale down operations in certain countries, relocate or open a new entity in another country as a result of this provision). This reflects the case where all the operators would follow Response B identified above. This would lead to more significant changes in terms of the location of establishment of operators undertaking assignments across Europe.
3. **Partial market restructure (PMR):** A scenario which reflects a combination of operators that minimise changes to their operations and operators that make more substantial changes. It is constructed based on the stated preference of

individual operators following each of the responses (A or B) according to the survey results.

Table 4-3 provides a more detailed description as well as the rationale for their selection.

Table 4-3: Description of scenarios for quantitative assessment of the market responses

Scenario name	Description	Rationale for their selection
Simple market compliance (SMC)	Operators from the same country would carry out the same number of assignments as in the business-as-usual case (baseline scenario) but as part of shorter cycles from their current Member State of establishment. Due to the extra time spent on the return journeys, operators from the same country, as a whole, might need to re-organise their fleet, by either adding new vehicles or using vehicles engaged in short cycles more intensively (i.e., extending their duration). In practice, smaller operators in a given country might not be able to invest in new vehicles or re-organise their fleet to maintain the same level of activity but this scenario would still hold true as long as other operators established in the same country or new entrants would be able to provide additional capacity to ensure that the same number of assignments is undertaken by operators from the same country of establishment.	This scenario takes place assuming affected operators maintain a competitive edge even if they have to undertake additional return journeys. As described earlier, on the basis of the operational cost dynamics, it is possible that the operators of longer truck cycles will be able to maintain their relative cost advantage over others and thus the provision will not lead to a significant change to their business operations, other than they will need to return more frequently and possibly increase their vehicle fleet to maintain their activity.

Scenario name	Description	Rationale for their selection
High market restructure (HMR)	All operators engaged in cycles longer than eight weeks in the business-as-usual case (baseline scenario) would not be able to fulfil the same assignments from their current Member State of establishment as part of cycles shorter than 8 weeks. Instead, these assignments would be undertaken by a different operators or a new entity of the same operator established in another Member State – i.e., there would be a different Member State of establishment of the operator for these journeys. The new Member State of establishment could be either the Member State in which those assignments take place (i.e., from where it departs/arrives or within that Member State) or another Member State from which the cost differential is lowest (i.e. they are closer to the location of the assignment).	This scenario takes place if the original operators cannot cope with the new requirement (e.g. because they cannot invest in new vehicles) and would: scale down operations in certain countries, retain the same vehicle capacity and accept some reduction in the level of business across all countries, and/or relocate the operational centre to another Member State.
Partial market restructure (PMR)	A share of the operators would carry out the same number of assignments as they would in the business-as-usual case (baseline scenario) but as part of shorter cycles from their current Member State of establishment. The remaining share would not be able to maintain the same level of activity as in the baseline and, thus, operators/entities established in another Member State would undertake these assignments instead – i.e., there would be a different Member State of establishment of the operator for these journeys.	This scenario reflects the fact that operators might respond to the provision differently. It is based on the survey results of the consulted hauliers to identify the share of operators which would make more substantial changes to their operations.

The analysis focusses on the most likely scenario on the basis of the available evidence and is complemented by the other two scenarios to provide an overview of the potential extent of impacts that could arise from this provision.

4.2.2 *Discussion on the likelihood of the scenarios*

Given the scenario descriptions, the simple market compliance scenario can be considered to be the most straightforward outcome, where operators would make fewer adjustments in order to comply with the new requirement. The market restructure scenarios require more significant market changes and adaptation, including the potential relocation of hauliers to other countries (i.e., establishment of new operational centres).

In addition, the analysis of the cost advantage suggests that those operators directly affected by the measure and most likely to take action (i.e. based in the East) would be able to maintain their competitiveness over other operators (i.e., established in other Member States) and therefore they would be able to pass-on the cost increase associated

to the additional return journeys and/or absorb the profit loss (if they cannot find sufficient cargo to transport on these journeys to generate additional revenue), whilst still maintaining their cost advantage.

This analysis however does not take into account other factors that affect the competitiveness of operators (such as quality and timeliness, especially in segments related to specialised transport, high value commodities or just-in-time deliveries) nor does it consider the investment capacity of these hauliers to increase their fleet as to be able to maintain the same level of activity (more details on these costs are provided in Section 4.3.4.1 below).

The high market restructure scenario, on the other hand, reflects the situation where the affected hauliers would not be able to maintain their competitiveness and/or invest in the necessary capacity to maintain the same level of activity. It could make more business sense to scale down operations in certain markets or even relocate their business, especially in the long-term, should the additional costs incurred with the additional return journeys prove not to be sustainable. However, the share of smaller companies operating in the haulage market suggests that relocation of their business to another country might not be possible for a significant part of the market, taking into account the associated relocation costs (more details on these costs are provided in Section 4.3.4.1 below).

In this context, the **simple market compliance** is more likely, especially in the timeframe of the assessment.

4.2.3 *Parameters that define the scenarios*

The sections below outline the main aspects that characterise the scenarios and determine the additional return journeys that may result from this provision, including:

- The type of response of operators to the new obligation
- The number of vehicles affected by the provision
- The potential (maximum) additional vehicle journeys that could arise due to the new provision (and the corresponding additional costs)
- Share of empty running in the potential additional vehicle journeys
- The countries of departure and arrival of the truck for the additional vehicle journeys

The methodological approach and the main assumptions are described in more detail in Annex 5.

4.2.3.1 Type of responses of operators to the new obligation

The type of responses to the new provision is a key assumption that differentiates the three scenarios considered:

- **Simple market compliance (SMC):** This reflects the case where all the operators would follow Response A identified above.
- **High market restructure (HMR):** This reflects the case where all the operators would follow Response B identified above.
- **Partial market restructure (PMR):** This is constructed based on the likelihood of operator following each response (A or B) according to the survey results.

The **simple market compliance scenario** represents the case where all affected operators respond in the same way to the new requirement (i.e., follow Response A identified above): they would continue carrying out the same number of assignments as in the business-as-usual case (baseline scenario) but as part of shorter cycles.

The **high market restructure scenario** represents the case where all affected operators also respond in the same way to the new requirement but they would not be able to fulfil the same assignments from their current Member State of establishment as part of cycles shorter than eight

weeks (i.e., follow Response B).

In the case of the **partial market restructure scenario**, there is a mix of responses considered which are determined based on the survey results. The analysis of these results suggest that, on the whole, there might be significant changes to the market, where the establishment of operators undertaking assignments across Europe might change substantially (i.e., Response B).

According to the responses of the operators engaged in longer truck cycles, the majority indicated they will scale down operations in certain countries, relocate the operational centre to another Member State and/or retain the same vehicle capacity and accept some reduction in the level of business across all countries (i.e., similar to Response B2, B3 and B1, respectively).

A smaller number of operators seems to suggest that they would be able carry out the same journeys as in the baseline from their original Member State of establishment (i.e., Response A). Their trucks would need to return to their operational centre every eight weeks but they would be able to maintain the same level of activity by increasing their vehicle capacity and/or increase the duration of cycles that are shorter than 8 weeks to undertake the assignments that the trucks currently operating longer cycles will be unable to complete.

4.2.3.2 Vehicles affected by the provision

Informed by the analysis of the current frequency of the return of trucks provided in Section 3.2, the number of **vehicles engaged in cycles longer than eight weeks** are estimated to be approximately 230,000[36] in the EU27 (Table 7-3 in Annex 5). The majority (99.8%) are anticipated to be operated by Eastern European-based hauliers.

These vehicles represent the fleet which is likely to be directly and mostly affected by the provision since they are currently not in compliance with the new obligation and thus would have to return more frequently to keep operating under the new provision. There is no difference in the number of vehicles affected between the scenarios considered.

In addition, although already compliant with the new obligation, **vehicles engaged in shorter cycles** in the baseline could also be affected if their cycles are extended to take on loads that have been "released" by trucks having to return more frequently.

This is a possible response from the operators to the direct impacts of the provision on the vehicles operating longer cycles. Given the potential time lost in the additional return journeys, operators might need to increase capacity to maintain the same level of activity. To this end, they could use vehicles engaged in shorter cycles to meet this capacity (instead of adding new vehicles to their fleet).

The available evidence, as introduced below, suggests that this response is likely for some operators but will not be the expected market response in most cases. Given the complexity associated to the use of vehicles engaged in shorter and longer cycles, it was not possible to determine the extra capacity required to maintain the same level of activity or quantify the share of this capacity that could be met by vehicles operating shorter cycles in the baseline.

Overall, the viability of extending the duration of short cycles depends on the observed patterns in terms of the frequency of return of vehicles and their characteristics. The analysis presented in the earlier Section 3.2 shows that about 43% of the vehicles used

[36] The number of vehicles only accounts for vehicles used only or predominantly for international operations. Given that the same vehicle can be used for both domestic and international operations in a given year, a similar approach to that of Full Time Equivalent (FTE) is used to measure the share of vehicles in the fleet that perform international road freight. More details on this approach are provided in Annex 5.

by East-based hauliers (which are the hauliers mostly engaged in longer cycles) return more than six times per year. However, if vehicles used in shorter cycles are already intensively used throughout the year then they might not have capacity to extend their cycles. In addition, there are also other factors which are likely to be relevant for this response, such as the location of the operations and restrictions in terms of compatibility between the cargo and the vehicle. If the vehicles engaged in shorter cycles do not operate in the same regions or are not compatible with the cargo transported by vehicles engaged in longer cycles in the baseline, then the use of the former is limited.

Nevertheless, the survey results suggest that almost half of the operators involved in long truck cycles consider this a viable option: 38 out of 98 (42%) hauliers which undertake only long cycles and 24 of 55 (44%) hauliers which undertake a mix of short and long cycles indicated this is very or quite likely – see Section 5.2.1 of the Stakeholder Consultation Summary for more details. It is however unclear to what extent they would be used to cover the assignments undertaken by trucks involved in longer cycles as to be able to assess this in more detail.

4.2.3.3 Potential (maximum) additional journeys

The type of responses that characterise the scenarios can result in additional vehicle journeys, which will differ with the scenario according to the share of operators that follow each type of response (A or B).

In the case of operators which would take Response A, their trucks would need to return to their operational centre at least every eight weeks, creating additional journeys[37]. This increase depends on the frequency of return of the vehicles in the baseline. There would be no change in the Member State of establishment for these additional journeys.

In the case of operators that would take Response B, this would result in a change in the Member State of establishment which would also create additional journeys if the new Member State of the operator/new entity is located nearby the countries where the assignments take place (but it is not the host country)[38]. An example of this is provided in the text box below.

Text Box 4-2: Example of additional vehicle journeys created by Response B

For example, assignments that would have been undertaken by a Lithuanian haulier between Germany and France would now be undertaken by a new entity/operator established in Poland (i.e., nearby country). This would still generate additional journeys but of a shorter distance. However, if the new entity or operator would be established in Germany or France (i.e. host country), there would be no net additional journeys (i.e., the vehicle would be already returning to the country whilst completing the assignment which would become a bilateral movement instead of a cross-trade movement).

[37] It is worth noting that if the capacity of vehicles engaged in shorter cycles is used and the duration of their cycles extended, the additional number of return journeys could be lower. However, it was not possible to quantify this as explained in the section above.

[38] A change in the Member State of establishment could also lead to a decrease in the number of journeys that concern the return of the vehicle to the original country in the baseline. However, it is possible that these existing return journeys could be loaded, especially considering that these operators only tend to return very few times per year. As a result, there would still be a need to carry out such a journey (even if by a different operator) if there is a relocation such that the cargo is still transported between the concerned country pairs. For this reason, this potential decrease is not quantified in the analysis.

4.2.3.4 Share of empty running in the potential additional vehicle journeys

A very important consideration for the quantification of the impacts of this new obligation rests on the share of the potential additional journeys which would be incremental to those in the baseline scenario.

Under the general assumptions of the scenarios where the same volume of cargo (in tonnes) in the baseline would be transported in each scenario, the operators which are able to find a load to transport in those journeys could be displacing (bilateral) journeys already occurring in the baseline As a result, under all scenarios, a new return journey is only considered to be additional to the baseline if empty. In practice, some of the additional journeys may run empty (for certain segments of the journey) or may displace a share of the cargo already transported in the baseline in a fragmented way. These latter additional journeys would be laden but, at the same time, the existing journeys would be carried out by vehicles carrying less cargo such that the overall volume of cargo transported in the market is the same.

In the simple market compliance scenario, all potential (maximum) additional journeys arising are included as to represent the situation of hauliers not being able to find cargo for the additional journeys and, thus, their vehicles run empty in all the return journeys.

In the market restructuring scenarios (PMR and HMR), it was assumed that the share of empty running in these journeys is below 100% as it is likely that hauliers would be relocating or scaling down operations to also minimise the level of empty running in additional journeys.

Under these two scenarios, the expected share of empty running in these vehicle journeys in 2023 were estimated based on stakeholder input and cross-checked with analysis done by Eurostat on the basis of the micro-data on the current level of empty running. More details on the approach and estimates are provided in Annex 5. The results are presented in Table 4-4 by cluster. Overall, the analysis indicates that the share of empty running in additional return journeys in the PMR and HMR scenarios is higher than the current average empty running in international road freight journeys (see more details in Annex 5), especially in the case of West-based hauliers for which the difference is the highest. This is not unlikely given that the figures presented in Table 4-4 cover only journeys in addition to those present in the baseline.

Table 4-4 also shows that the share of empty running is expected to be lower for East-based hauliers for same movements. This difference between East and West-based hauliers is somewhat expected due to differences in cost advantage (described earlier) which would result in East-based hauliers being more competitive than their Western counterparts for the same movements. However, it is unclear whether the share of empty running for journeys undertaken by Western European hauliers should be as high; there is however no additional evidence to be able to adjust these estimates.

In addition, the share of empty running is anticipated to be lower for South-based hauliers compared to West-based hauliers when coming back to South but not when going to West, which could reflect trade imbalances. These differences in the direction of the flow are not as significant for movements between East and West, although there are also trade imbalances between the two regions and thus a similar result could be expected. There is however no evidence to help adjust these estimates.

Table 4-4: Share of empty running in the potential additional vehicle journeys in 2023 by cluster

	Haulier established in:		
Movement	East	West	South
East - West	56%	89%	
West - East	58%	89%	
South - East	57%		92%
East - South	62%		79%

Movement	Haulier established in: East	West	South
West - South		90%	75%
South - West		89%	93%
East - East	63%		
West - West		90%	
South - South			94%

Source: Ricardo analysis

4.2.3.5 Countries of departure and arrival of the truck for the potential additional vehicle journeys

The countries of departure of the return journeys are expected to be those where most of the cross-trade and cabotage activity of the operators take place. In line with the analysis on transport activity in the baseline (Section 3.1), the majority of the additional journeys are expected to originate in the West, where most trade occurs.

The country of arrival of the return journey of the vehicle is the Member State of establishment of its operator. This will be different from the Member State of establishment in the baseline in the case of the partial and high market restructure scenarios.

For the partial market restructure and high market restructure scenarios, there will be a change in the Member State of establishment arising due to the response to the measure of those operators which are expected to scale down operations in certain countries, relocate the operational centre to another Member State and/or accept some reduction in the level of business across all countries (i.e., those following Response B).

For the purposes of the quantitative assessment, the assumption is that the new Member State of establishment will be primarily a new country different from the countries where most of the activity occurs (i.e., the countries of departure of the additional journeys). In this case, additional journeys are still expected to arise but of shorter distance as explained above. On the other hand, if the new Member States of establishment would be the countries where this activity takes place, there would be no additional journeys created compared to the baseline scenario.

The cost differentials model is used to provide an indication of which new countries might replace the original Member State of establishment based on the cost advantage of hauliers of operating in different EU Member States (see Annex 5 for more details on the methodology). The choice of the new Member State of establishment is based on minimising the cost of the return journey and, at the same time, ensure a positive cost advantage (>0%) of the operator compared to domestic operators[39].

Overall, the analysis of the cost advantage suggests that, for operations taking place in countries in the West, the new Member State of establishment is likely to be a Western European Member State in most cases, mainly due to their proximity to the country where the operations take place. This also reflects the fact that there are differences in the operating costs between Western European countries and, thus, by operating from a different Member State located in the West to another Western European country, hauliers can still maintain a cost advantage and minimise the costs with the return journey. For example, hauliers operating to Denmark can be based in Belgium and still maintain a competitive advantage compared to hauliers based in Denmark due to differences in cost advantage between Western European Member States.

As expected, for operations taking place in Eastern European countries, other East-based hauliers are likely to also replace the original operators (based on their proximity to the

[39] A sensitivity analysis on this threshold is undertaken and presented in Annex 9.

location of activity). For operations taking place in countries in the South, both East and South-based hauliers are expected to replace the original operators.

4.3 Assessment of impacts

On the basis of the scenarios defined above, this section provides an assessment of the impacts of the obligation of the return of the truck to the Member State of establishment of the operator on:

- Transport activity: change in the number of vehicle journeys and distances driven (in journeys and vehicle-kilometres).
- Environment: change in CO_2 and other pollutant emissions.
- Congestion: changes in waiting times on three border crossings and expected overall congestion effects.
- Economy and internal market, including on costs for market operators, market prices and quality of services, competition and level playing field, labour market and driving conditions, and monitoring and enforcement for authorities.

Impacts are assessed for 2023 only which is the first full year when the new measure will be applicable.

4.3.1 *Impact on transport activity*

The impacts on transport activity include the additional traffic flows that directly result from the new obligation (measured both in terms of additional journeys and additional vehicle-kilometres to account for distances travelled) as well as other impacts on the patterns of existing traffic flows (i.e., share of bilateral, cross-trade and cabotage flows) and on freight activity more generally (including the potential for modal shift).

4.3.1.1 Additional journeys

The adoption of the new provision is expected to lead to a total of **1.0 million to 1.9 million new journeys in 2023** compared to the baseline, depending on the scenario considered (Table 4-5:).

The largest number of additional journeys is expected to arise from the simple market compliance scenario. In this scenario, the majority of the additional journeys arise from hauliers based in the Eastern European Member States (1,912,000) as their vehicles are more likely to be engaged in cycles longer than eight weeks in the baseline (Figure 4-4). Under this scenario, they will need to return more frequently to the Member State of establishment in the East.

The high market restructure scenario, on the other hand, reflects the fact that the original operators (the majority based in the East) would scale down operations in certain countries, relocate their operational centre to another Member State and/or accept some reduction in the level of business across all countries. Under this scenario, new operators or a new entity of the original operators based in a different Member State would replace the original operators (this different Member State would still be more cost competitive than the host country). This would lead to additional journeys from vehicles registered in Western European Member States (580,000) as the new Member States of establishment are likely to be in central Europe, including many Western European countries and a smaller number of Eastern European countries which are not located in the outer periphery.

Of the two restructuring scenarios, the lowest number of journeys is expected to be generated by the PMR scenario. This is explained by the level of empty running

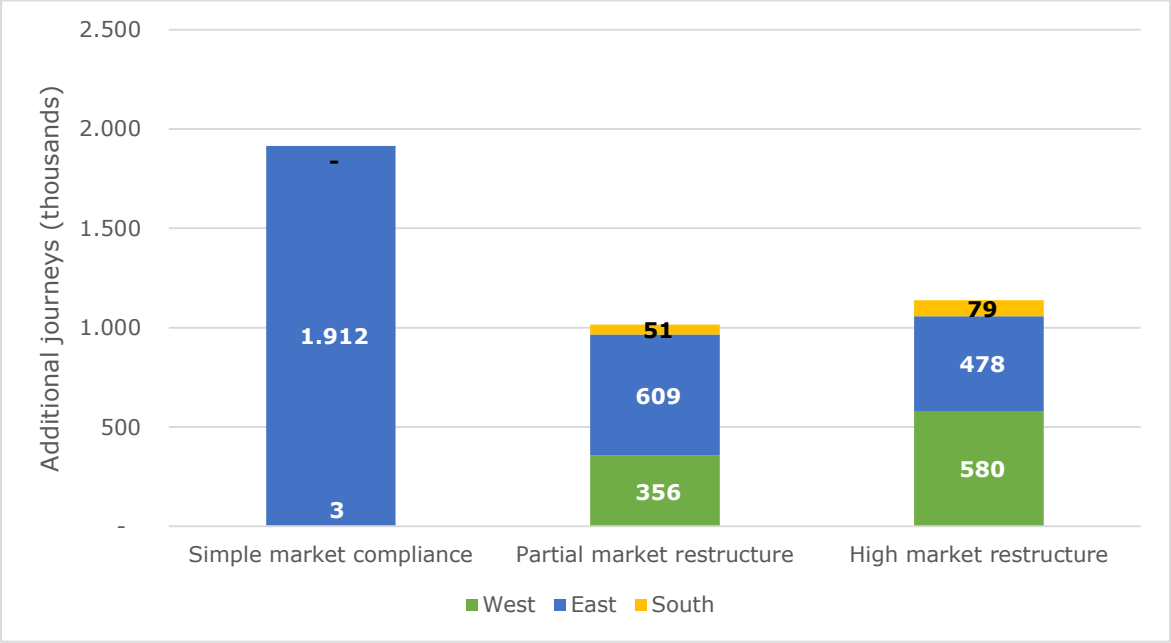
associated with the potential new journeys[40]: a higher share of journeys would originate from East-based hauliers which have lower levels of empty running compared to their Western and Southern counterparts.

Table 4-5: Additional journeys (in thousands) per MS cluster for each scenario, 2023

Scenario	Hauliers based in: West	East	South	Total
Simple market compliance	3	1,912	-	**1,915**
Partial market restructure	356	609	51	**1,016**
High market restructure	580	478	79	**1,137**

Source: Ricardo analysis

Figure 4-4: Additional journeys per scenario for each MS cluster group, 2023



Source: Ricardo analysis

4.3.1.2 Additional vehicle-kilometres

The additional journeys from each scenario were combined with the average distance between Member State pair calculated from Eurostat data (see Annex 6) to calculate the total additional vehicle-kilometres arising from this measure.

Overall, an increase ranging between **0.44 billion and 2.53 billion vehicle kilometres** could be observed in 2023 due to the adoption of this measure.

Similar to the impacts in terms of additional journeys, the greatest increase in vehicle-kilometres in 2023 is expected from the simple market compliance scenario. This is a result of the long-distance trips which would be created from trucks returning every eight weeks (Table 4-6). Within the high market (and also partial market) restructure scenario, operators have relocated their operational centres to be closer to the location of freight demand in some cases, therefore avoiding long-distance additional journeys. In other

[40] It is assumed that a journey is only new and additional to the baseline if empty. Otherwise, the operators which are able to find a load to transport in those journeys could be displacing (bilateral) journeys already occurring in the baseline.

cases, other operators located in nearby countries may replace the original operators, reducing further the number of long-distance additional journeys.

Table 4-6: Additional vehicle-kilometres (in millions) per MS cluster for each scenario, 2023

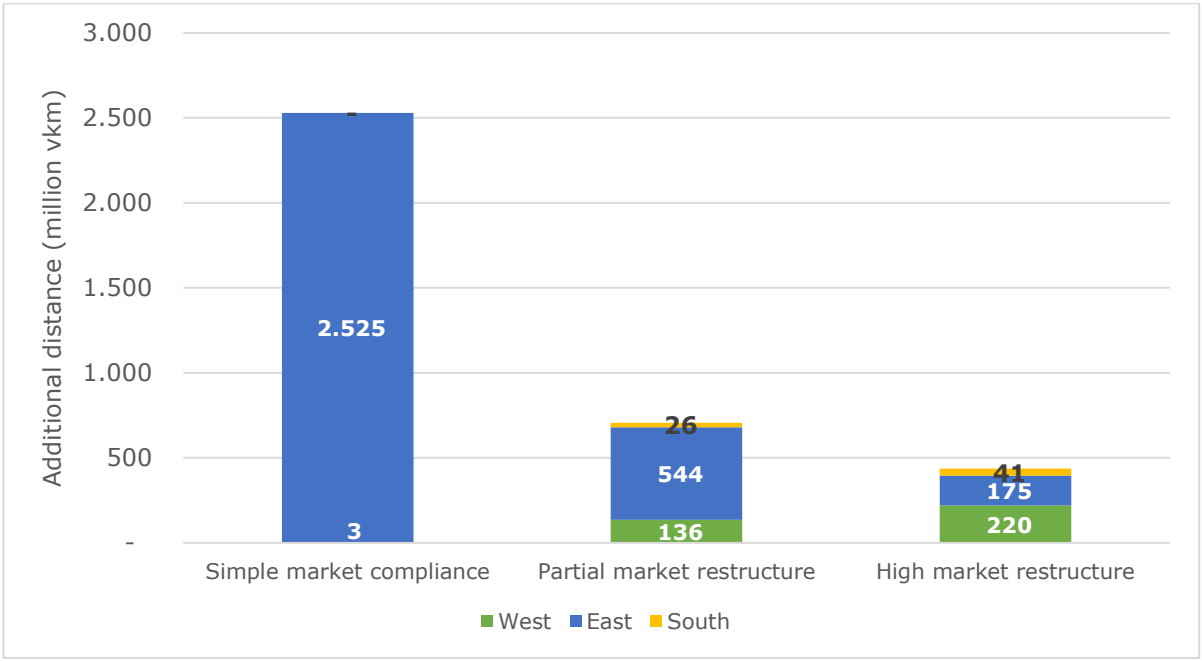
Scenario	Hauliers based in:			Total	Average trip length (vehicle-km)
	West	East	South		
Simple market compliance	3	2,525	-	**2,528**	1,320
Partial market restructure	136	544	26	**706**	695
High market restructure	220	175	41	**436**	383

Source: Ricardo analysis

Despite having a higher number of additional journeys compared to the partial market restructure scenario (Table 4-5), the high market restructure scenario has less additional vehicle kilometres than the partial market restructure scenario. This can be explained by the average trip length (Table 4-6) for each scenario, which is far shorter in the high market restructure scenario compared to the other two scenarios. This is due to the operators relocating their operational centres closer to the freight demand, as explained above.

The simple market compliance and the partial market restructure scenarios show that the highest increase in additional distance occurs from vehicles registered in Eastern European Member States (Figure 4-5). This is a result of a higher number of additional journeys being attributed to vehicles registered in these Member States (Figure 4-4). Within the high market restructure scenario, the highest increase in additional distance occurs from vehicles registered in Western European Member States, which is consistent with this scenario showing the highest number of additional journeys performed by vehicles based in these Western European Member States (Figure 4-4).

Figure 4-5: Additional vehicle-kilometres (in millions) per MS cluster per scenario, 2023



Source: Ricardo analysis

Comparison with international road freight activity

The additional activity estimated for 2023 represents an increase of 0.8% to 4.8% of the

total international road freight vehicle-kilometres in 2023, and an increase of 1.0% to 2.0% of the total international road freight journeys in 2023 (Table 4-7).

Table 4-7 Additional road freight activity from the modelled scenarios compared to overall international road freight activity

Scenario	Additional vehicle-km (millions, 2023)	% International vehicle-km (2023)	Additional journeys (thousands, 2023)	% International journeys (2023)
Simple market compliance	2,528	4.84%	1,915	1.98%
Partial market restructure	706	1.35%	1,016	1.05%
High market restructure	436	0.83%	1,137	1.18%

Source: Ricardo analysis based on Eurostat activity data

4.3.1.3 Other impacts on road traffic flows

In addition to creating new journeys, compared to the baseline, the new obligation on the return of the vehicle could also have an impact on the overall patterns of traffic flows in the EU in terms of the locations from where operators undertake those flows. This varies with the scenario.

In the simple market compliance scenario, the affected operators will continue to perform the same assignments as in the baseline, and, therefore, the only impact will be in terms of the additional journeys caused by vehicles returning to the Member State of establishment of the operators. This would represent an increase in bilateral operations by vehicles registered in these Member States.

Within the partial and high market restructure scenarios, there will be changes in the Member State of establishment of the operators for certain flows, whereby a haulier has either chosen to relocate their main location or another haulier has taken over the previous freight flows. In these cases, there could be a shift towards more cabotage and cross-trade within/between countries that are closer to the Member State of establishment of the operator. In addition, if the new Member State of establishment is the country in which the flow takes place, then a cabotage operation in the baseline would become a domestic operation, and the cross-trade operation would become a bilateral operation.

The consulted hauliers were also asked to indicate how the type of international operations they carry out might change. The majority of the stakeholders from Eastern European Member States identified the potential for a decrease in long-haul cross-trade operations (170 of 244, i.e., 70%) and in long-haul cabotage operations (118 of 221, i.e., 53%), unlike their counterparts in Western and Southern Member States which do not expect any changes. This difference in views is likely to reflect the fact that the most affected operators by this obligation are based in the East. However, it is also worth noting that, overall, a large share of the stakeholders from Eastern European Member States identified the potential for a decrease in all types of operations across the board (including also bilateral, short-distance cross-trade, and short-distance cabotage operations) which could suggest they expect there may be wider impacts on the market as a whole. This could point to their expectations of how the market overall might be affected by the new provision. More details on these results are provided in Section 5.2.1 of the Stakeholder Consultation Summary.

4.3.1.4 Potential impacts on modal shift

The inland freight transport market is dominated by road haulage with an average share (in tonne-km) in 2018 of 75%[41] across EU-27 Member States, while railways account for 19% of tonne-km and inland waterways for the remaining 6%. However, there are large disparities among Member States. While the share of inland waterways is very significant in the Netherlands (43%) or railways represent a high proportion of the market in Baltic countries (e.g. 75% in Latvia), the road sector is the dominant mode in some Member States such as Spain with 95% of freight (in tonne-km) transported by road.

The potential for modal shift away from road haulage to other modes or vice versa will depend on the expected impact on road haulage prices. Where freight rates of road haulage increase as a result of the measure, there could be a potential modal shift away from road haulage, as alternative modes could appear more competitive by comparison. On the other hand, a lower price in some market segments could lead to a modal shift towards road haulage, which would be associated to increased environmental costs if alternative modes (i.e. rail or inland waterways) generate lower emissions.

In this sense, according to expected price impacts from Table 4-18, the simple market compliance scenario could potentially lead to a modal shift away from road haulage in operations within Western European countries and an increased share of road haulage in bilateral operations between Eastern and Western European countries. Conversely, scenarios with partial or high market restructuring could slightly increase prices in all types of operations as operating costs in the new Member State of establishment are expected to be higher and at least partially reflected in higher prices. Hence leading to a potential modal shift away from road haulage to alternative modes.

In practice, price is a major determinant factor of modal choice, but other aspects such as travel time, reliability, or frequency of services will also strongly influence a potential modal shift (Arencibia, et al., 2015) (de Jong, 2014). Hence, since price impacts are expected to be relatively minor while other factors are not expected to change as a result of the measure, the resulting modal shift away from (or towards) road haulage is expected to be small in general. It could be somewhat significant where an alternative mode for cross-border trade is already well developed, such as inland waterways between the Netherlands, Germany and Belgium. In addition, the potential for a modal shift to rail freight may only be associated to long-haul operations (e.g. long-haul cross-trade) as rail transport tends to benefit from economies of scale and it becomes relatively more competitive in long-haul transport (den Boer, et al., 2018).

This assessment is largely aligned with the views from stakeholders (see Section 5.2.2 of Stakeholder Consultation Summary). A majority of stakeholders from all groups (170 out of 256) responded that they do not expect any impacts on modal shift.

4.3.2 *Environmental impacts*

The environmental impacts from the provision will be directly linked to the potential increase in traffic flows (in vehicle-kilometres)[42]. The changes in CO_2 and air pollutant emissions arising from this provision for the scenarios considered are presented below by EU cluster. The methodology for their estimation is presented in Annex 7.

It is noted that the additional environmental impacts in this report are modelled for the year 2023. The environmental impacts of the additional vehicle journeys as a result of the measure would likely change after 2023, as the share of more efficient and alternative powertrains (electric, hydrogen) in the EU fleet is expected to increase. The uptake of lower emission vehicles would see the environmental impacts of the additional

[41] According to Eurostat data [TRAN_HV_FRMOD]. This includes both domestic and international operations. International road haulage operations of vehicles registered in the reporting country have been "territorialised" to the different Member States based on Eurostat modelling

[42] Modal shift has not been included in the modelling

journeys decrease, as per vehicle-kilometre, alternative powertrains would have lower carbon and air pollutant emissions. However, the total effect would depend also on the overall increase in international freight journeys as a result of an increase in freight demand. The natural increase of freight journeys beyond 2023 could result in a further number of additional journeys caused by the measure.

4.3.2.1 Carbon emission results

Overall, the new provision could result in **0.5 million to 2.9 million tonnes of additional CO_2 emissions in 2023** (Table 4-8).

The simple market compliance scenario produces the highest amount of additional emissions from the scenarios, as a result of having the highest additional journeys and highest additional vehicle-kilometres out of the three scenarios (shown in Table 4-5 above). This is because the market does not restructure, resulting in trucks in long-distance traffic corridors running additional empty trips. In contrast, the high market restructure has the lowest additional emissions, despite having a higher number of additional journeys than the partial market restructure scenario. This is because the additional journeys in the high market restructure scenario are much shorter on average than those in the other scenarios (see Table 4-6).

Table 4-8: Additional carbon emissions ($ktCO_2$) per MS cluster for each scenario, 2023

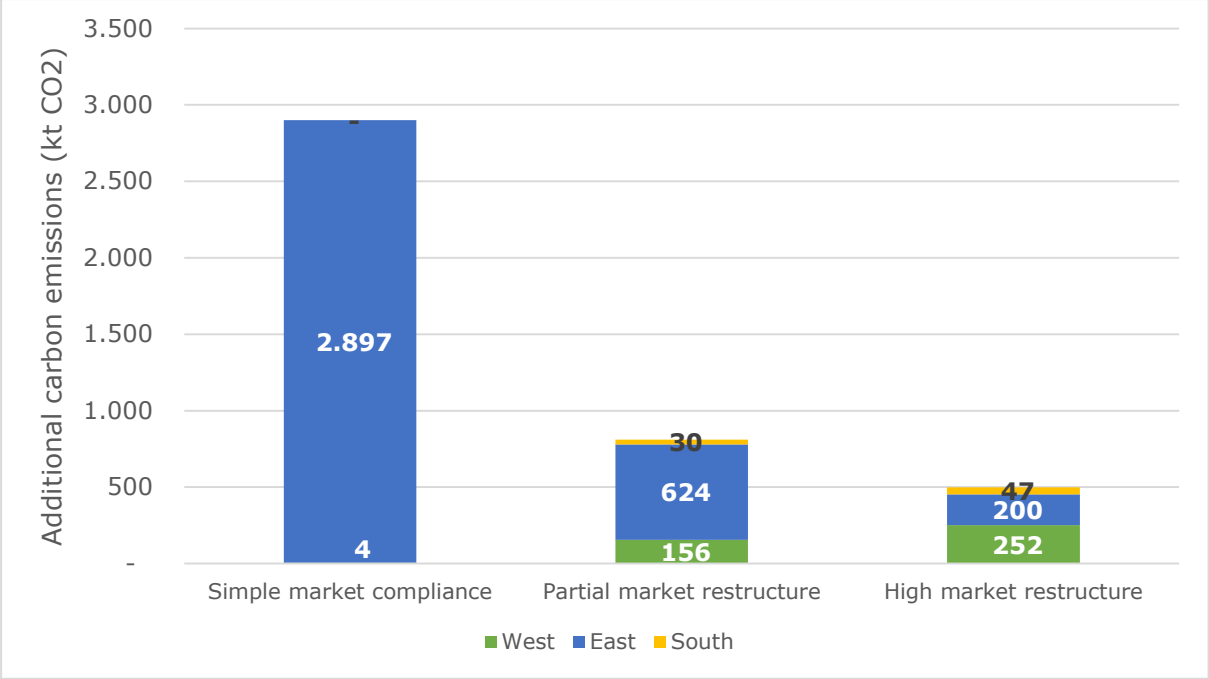
Scenario	Hauliers based in:			Total	Cost of additional carbon emissions (m€)[43]
	West	**East**	**South**		
Simple market compliance	4	2,897	-	**2,900**	€ 290
Partial market restructure	156	624	30	**810**	€ 81
High market restructure	252	200	47	**500**	€ 50

Source: Ricardo analysis

The additional emissions are highest in the simple market compliance and the partial market restructure scenarios for the vehicles registered in Eastern Member States, as shown in Figure 4-6 below. For the high market restructure scenario, the additional emissions for vehicles registered in Western European Member States are highest, at 250 $ktCO_2$.

[43] Based on a carbon price of €100 per tCO_2, as per the Handbook on external costs of transport (European Commission, 2019a)

Figure 4-6: Additional carbon emissions per scenario for each MS cluster group, 2023



Source: Ricardo analysis

Comparison with international road freight emissions

Based on the baseline scenario results for total road freight emissions (184 million tonnes of CO_2 emissions), we estimated that a total of around 63 million tonnes of CO_2 emissions would be attributable to all international road freight within the EU27 in 2023[44].

Therefore, the additional CO_2 emissions estimated for 2023 represent **an increase of 0.8% to 4.6% on the total international road freight emissions in 2023** in the baseline (Table 4-9), which is similar to the share of international vehicle-kilometres presented earlier in Table 4-7.

Table 4-9: Additional CO2 emissions from the modelled scenarios compared to overall international road freight CO2 emissions in 2023

Scenario	Total additional emissions 2023 (ktCO2)	Proportion of total road freight emissions	Proportion of international road freight emissions
Simple market compliance	2,900	1.58%	4.63%
Partial market restructure	810	0.44%	1.29%
High market restructure	500	0.27%	0.80%

Source: Ricardo analysis

Comparison with similar studies

[44] This calculation of international road freight emissions is based on the total road freight emissions in the baseline scenario adjusted for international emissions using the Eurostat share of international road freight activity. This provides a reasonable estimate but is subject to the limitation in each dataset, and is for indicative purposes only.

A report by KPMG on the impacts of the new measure specifically tailored to Bulgarian freight hauliers found that mandatory homecomings could result in a 2% increase of carbon emissions from vehicles owned by Bulgarian companies providing international transport (KPMG, 2020). This is within the range of additional emissions presented in this report, which found that an increase on overall international road freight emissions could range from 0.8% to 4.6% at the EU level. However, the specific methodology used in the KPMG study is unclear, so direct comparisons with this study should be treated with caution.

An open letter on the potential consequences of obligatory return of the truck was also issued by IRU in 2018 (IRU, 2018). Within this open letter it is stated that the return of trucks every three to four weeks could increase the mileage of HGVs by 80 to 135 million vehicle kilometres per year, resulting in an increase of 100,000 tonnes of carbon emissions, which is lower than the impacts calculated in this report: our analysis shows an increase of 0.4 to 2.5 billion vehicle kilometres per year (Table 4-6), and an increase in emissions of between 0.5 and 2.9 million tonnes of CO_2 emissions (Table 4-8). This result is inconsistent, especially since the IRU letter considers a more frequent mandatory return of the truck (i.e., three or four weeks instead of eight weeks). The reason for this is unclear without a proper examination of the methodology presented in the IRU open letter.

4.3.2.2 Air pollutant emission results

The analysis in this section focusses on the potential increase in air pollutant emissions, including oxides of nitrogen (NO_x) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), which are the most relevant pollutants for the transport sector. An EMEP (European Monitoring and Evaluation Programme) compliant methodology was used to calculate air pollutant emissions (more detail can be found on this within Annex 7).

Overall, the new provision could result in **107 to 619 tonnes of additional NO_x emissions and 38 to 221 tonnes of additional $PM_{2.5}$ emissions in 2023.** The emission rate for $PM_{2.5}$ is considerably smaller, which is why total emissions of $PM_{2.5}$ are lower than NO_x.

Similar to the analysis of impacts on CO_2 emissions, Table 4-10: shows that the largest air pollutant emissions occur within the simple market compliance scenario. This is due to the shorter-distance additional journeys arising from the high market restructure scenario. Overall, the additional NO_x emissions estimated for 2023 represent an increase of 1.35% to 7.81% and the $PM_{2.5}$ emissions represent an increase of 0.86% to 4.98% on the total international road freight emissions in 2023 in the baseline[45].

Table 4-10: Additional air pollutant emissions for the different scenarios, 2023[46]

Scenario	Total additional emissions (tNOx)	Proportion of international road freight emissions (NOx)	Total additional emissions (tPM2.5)	Proportion of international road freight emissions (PM2.5)
Simple market compliance	619	7.81%	221	4.98%

[45] A bottom-up approach is used to estimate the total international road freight emissions, on the basis of the international road freight activity from Eurostat and EMEP-compliant emission factors.

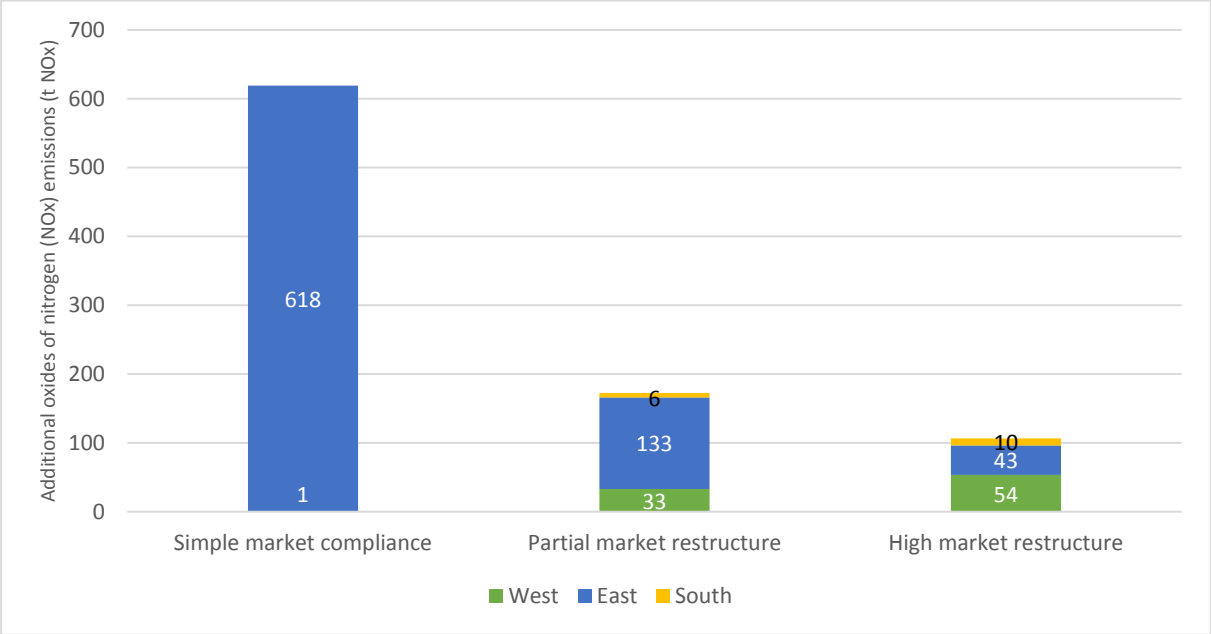
[46] Total international road freight emissions for the 2023 baseline were calculated assuming that trucks were 50% laden, whereas all additional return journeys were assumed to be empty which lowers the engine load. The relationship of air pollutant and greenhouse gas emission rates with engine load varies. Consequently, additional NO_x emissions contribute a higher proportion to total international road freight emissions than $PM_{2.5}$ and CO_2.

Partial market restructure	173	2.18%	62	1.39%
High market restructure	107	1.35%	38	0.86%

Source: Ricardo analysis

Figure 4-7 also shows that, for simple market compliance, trucks from Eastern European Member States contribute to the majority (99%) of additional NO_x emissions. Whilst operators based in Eastern European Member States are still the largest contributor of NO_x emissions in the partial market restructure, proportional contribution decreases. Operators based in Western European Member States become the largest contributor of air pollutant emissions in the high market restructure scenario.

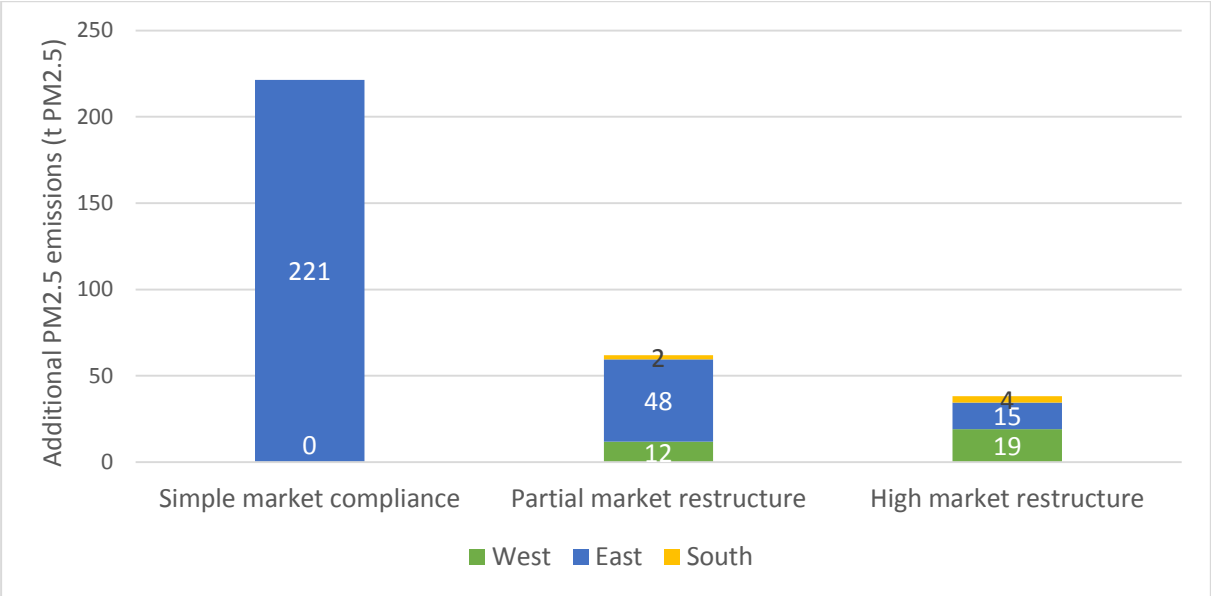
Figure 4-7: Additional NOx emissions (tonnes) per scenario for each MS cluster group, 2023



Source: Ricardo analysis

A similar direction of change can be seen in $PM_{2.5}$ emissions (Figure 4-8). For $PM_{2.5}$ in the simple market compliance scenario, Eastern European Member States' hauliers contribute to 99% of emissions associated with additional journeys. Similar to NO_x, Western European Member States' trucks proportional contribution of $PM_{2.5}$ increases in the partial and high market restructure due to likely operational relocation.

Figure 4-8: Additional $PM_{2.5}$ emissions (tonnes) per scenario for each MS cluster group, 2023



Source: Ricardo analysis

The additional air pollutant emissions have been monetised using rural costs for NOx and $PM_{2.5}$ from the EC Handbook on the external costs of transport (European Commission, 2019a) (Table 4-11). Rural costs were selected as they were considered more representative of the locations where trucks will travel, including motorways. The costs reflect the impacts of the air pollutant emissions on public health (due to inhalation of pollutant particles), crop losses (due to acidic nature of NO_x), material and building damage (due to acidic nature of NO_x, and the damage of building surfaces through particles and dust), and biodiversity loss (due to acidification of soil, precipitation and water from NO_x).

Table 4-11 shows these costs could range between **€4.5 and €25.9 million associated to an increase in both NO_x and $PM_{2.5}$ emissions.** In line with the above analysis, the highest impacts are expected from the simple market compliance.

Table 4-11 Cost (million €) of additional air pollutant emissions for the different scenarios, 2023

Scenario	Cost (€m) of additional emissions 2023 (NOx)	Cost (€m) of additional emissions 2023 (PM2.5)	Total Cost (€m) of additional emissions 2023
Simple market compliance	8.7	17.2	25.9
Partial market restructure	2.4	4.8	7.2
High market restructure	1.5	3.0	4.5

Source: Ricardo analysis

4.3.3 *Congestion impacts*

The increased traffic flows resulting from this measure should be expected to exacerbate congestion issues on certain current bottlenecks across the EU road network. Traffic congestion occurs when vehicles travel at slower speeds because there are more vehicles than the available road capacity allows at that time. On motorways, capacity is generally linked to the number of lanes, but on border crossing points (BCP) custom checks or other constraints (e.g. tolls, tunnels) typically reduce the available capacity on these

sections.

Consultation with hauliers and other relevant market players (e.g. road freight brokers, shippers and freight forwarders) as well as the competent national authorities suggests that significant congestion issues as a result of the measure would be mostly located in non-Schengen BCPs. Data on waiting times from the Green Lanes monitoring programme confirms that while BCPs within the Schengen area generally have waiting times below 15 minutes[47], the most severe queues are found between Schengen and non-Schengen areas due to custom checks. Beyond these points, the small increase in international HGV traffic (around 1-5% in veh-km depending on the scenario as per Table 4-7) may only lead to occasional congestion problems during the holiday periods (e.g. Christmas, Easter, summer) or close to weekends, when there is an increased traffic of passenger cars. Highly affected BCPs are expected to be on routes between Eastern and Western European Member States, as HGV traffic activity is likely to increase on these routes as a result of the provision, especially under the simple market compliance scenario.

Hence, for the purposes of our study, we focus our analysis of congestion impacts on non-Schengen Member States located in Eastern European countries, this concerns Bulgaria and Romania. For these Member States, we have selected the main BCPs within the core TEN-T network for which data on waiting times is available from the Green Lane monitoring programme (see Table 4-12). In addition, given the high share of international trips undertaken by Polish and other Baltic state hauliers passing through the German-Polish border, we have included an additional case study on the main BCP between Poland and Germany (see Table 4-12) to assess potential impacts within the Schengen space as well. The latter represents an upper bound of the potential traffic increases on BCPs within the Schengen area and, hence, the results for the PL-DE case study can be extrapolated to the rest of BCPs as an indication of the maximum congestion impacts that may be expected within the Schengen area.

Table 4-12: Case studies on congestion impacts

Case studies	Rationale
BG-RO in Vidin - Calafat	• Non-Schengen internal cross-border • Orient/East-Med core corridor. • Main road corridor connecting Bulgaria to central Europe • Persistent congestion issues during period June-August 2020 (waiting time of 130 minutes on average) according to data from the European GNSS Agency (GSA)
RO-HU in Nadlac - Nagylak	• Non-Schengen internal cross-border • Orient/East-Med core corridor. • Main road corridor connecting Romania to central Europe • Persistent congestion issues during period June-August 2020 (waiting time of 55 minutes on average) according to data from the European GNSS Agency (GSA)
PL-DE in Frankfurt (Oder)-Swiecko	• Internal cross-border within Schengen space • North sea/Baltic core corridor • Main road corridor connecting the Baltic countries and Poland to Germany, the Netherlands, Belgium and northern France • Very high HGV traffic levels • Average waiting time of around 7 min according to data from the European GNSS Agency (GSA)

Source: Ricardo analysis

Delay times on these bottlenecks are based on the Bureau of Public Roads (BPR) function[48], a simple time-averaged speed–flow function where travel time is proportional to the fourth power of the flow over capacity, which is widely used in motorway traffic studies. This can be expressed as follows:

[47] Maximum crossing time for "green lane" border crossing as per C(2020) 1897

[48] As described in (Small & Verhoef, 2007), for example

$$w = t\left(\frac{n}{k}\right)^4$$

Where:
$w: waiting\ time\ (minutes)$
$t: free\ flow\ travel\ time\ (minutes)$
$n: average\ daily\ HGV\ traffic\ (\frac{trucks}{day})$
$k: capacity\ of\ the\ BCP\ (\frac{trucks}{day})$

Waiting time data is taken from the Green Lane monitoring programme over the period June-August 2020. At the time this analysis was conducted, this was the most comprehensive dataset on waiting times across the selected BCPs which was available. However, it should be noted that these data are likely to be influenced by Covid-related restrictions and potentially by summer holiday influxes leading to higher waiting times than those under normal circumstances. As such, waiting times presented in Table 4-13 should be read as an upper bound of the potential impact. The capacity parameter of the BPR function has been calibrated with current waiting times along with average daily HGVs traffic levels on these BCPs. We have assumed that the free-flow travel time through the BCP is one minute.

To estimate the impact on traffic activity for each BCP, we assumed that traffic activity growth induced by additional journeys for each scenario (as described in section 4.2) is uniformly distributed across all BCPs of the respective Member States. The resulting impact on traffic levels for each BCP is shown in Table 4-13.

By applying the increased traffic levels to the BPR function, we estimate the waiting times on BCPs for the different scenarios (see Table 4-13). These results show that waiting times may increase significantly on the non-Schengen BCPs selected (i.e. on Vidin – Calafat and Nadlac – Nagylak) in the simple market compliance scenario, while minor impacts are expected in scenarios with market restructuring[49,50]. In contrast, no impacts on waiting times for any of the scenarios are expected on the BCP between Poland and Germany.

Since the Poland-Germany BCP represents an upper bound of congestion impacts for BCPs within the Schengen area, it can be concluded that the rest of BCPs within the Schengen area are not likely to be significantly impacted in terms of congestion.

A recent study on the impact of the Mobility Package for Bulgaria (KPMG, 2019) estimated a higher increase in traffic levels (up to 207%) on the Vidin – Calafat BCP as a result of the measure. However, these figures seem to have been derived from broader assumptions which may tend to overestimate the impacts on traffic.[51]

[49] While we could expect reduced traffic levels on these BCPs as a result of the relocation process (i.e. part of the long cycles traffic that used to be empty might now be relocated), potential positive impacts on congestion would be relatively minor given the low current frequency of return of trucks within the Eastern European cluster (see section 3.2). For this, our analysis focuses on negative congestion impacts

[50] Authorities could respond to this effect by increasing the capacity of the BCP. This second-order effect is not included in our analysis

[51] To the best of our knowledge, the study does not consider return journeys in the baseline and assumes that additional journeys would be equally allocated over three BCPs, which will tend to overestimate traffic increases, especially in BCPs with lower traffic, as in Vidin - Calafat

Table 4-13: Impacts on traffic activity and waiting time on selected border crossing points

BCP	Scenario	Current waiting time (min) in 2020	% Increased HGV traffic	Waiting time in scenario (min)
BG-RO in Vidin - Calafat	Simple market compliance	130	21.4%	282
	Partial market restructure	130	3.6%	149
	High market restructure	130	0.0%	130
RO-HU in Nadlac - Nagylak	Simple market compliance	55	31.2%	162
	Partial market restructure	55	5.6%	68
	High market restructure	55	0.0%	55
PL-DE in Frankfurt (Oder)-Swiecko	Simple market compliance	7	5.8%	8
	Partial market restructure	7	0.9%	7
	High market restructure	7	0.0%	7

Source: Ricardo analysis

Note 1: These results do not account for a potential reduction in congestion on these BCPs as a result of relocation, which is considered marginal

Note 2: Current waiting times are based on June-August 2020 data. These values are expected to be influenced by Covid-related restrictions and potentially by summer holiday influxes leading to higher waiting times than those under normal circumstances. As such, waiting times presented here should be read as an upper bound of the potential impact

Congestion impacts found on non-Schengen BCPs would increase average travel time of freight services on these routes. This leads to lower vehicle productivity as more vehicles are needed to fulfil the same freight transport demand and to increased fuel consumption as duty cycles involving low speeds are generally more inefficient. At the same time, traffic congestion increases CO_2 and air pollutant emissions from road haulage operations in a linear fashion, essentially due to inefficiencies in the usage of fuel (Kellner, 2016).

On top of this, congestion on these BCPs would impact journey time reliability such that journey times become more variable. This causes numerous indirect impacts on road freight operations. First, since HGV drivers must adhere to driving and rest time rules, an unexpected delay can lead to a driver running out of driving hours. This may have knock-on effects on the delivery schedule and fleet management. Second, late deliveries are associated to customer dissatisfaction, which may lead to penalties from clients or even lost contracts. Finally, traffic congestion may impact the logistics distribution network, but this effect is largely sector-dependent (McKinnon, et al., 2008). Interview responses from a Romanian haulier organisation and an Estonian public authority support the relevance of the above-mentioned effects of congestion.

4.3.4 *Economic and internal market impacts*

The adoption of this measure is also expected to lead to a range of economic and internal market impacts for the key affected stakeholders: market operators, drivers, national authorities. For each of the scenarios considered, we assess impacts on costs, market prices, and the internal market which mainly concern market operators. Our assessment in this section also includes impacts on the labour market and working conditions which mainly affect drivers. Finally, we assess impacts on monitoring and enforcement activities for public authorities and potential tax revenue losses.

4.3.4.1 Impact on costs for market operators

The nature of compliance costs associated with the measure highly depends on the market response. In the simple market compliance scenario, hauliers typically operating long truck cycles will essentially incur vehicle operating costs as a result of additional empty return journeys. In contrast, within the high market restructure scenario, the response that assumes the relocation of market operators to more central locations would lead to increased administrative and operating costs in line with cost levels of the new host Member States and the one-off costs of the relocation process. The costs associated with the partial market restructure scenario will be a juxtaposition of the abovementioned cost impacts. Table 4-14 shows the main potential cost impacts which are described in detail hereafter.

Table 4-14: Summary of potential cost impacts for the considered scenarios

Scenario	Ongoing costs	One-off costs
Simple market compliance	Vehicle operating costs of additional journeys Costs linked to increased waiting times (hauliers passing through non-Schengen BCPs only)	Purchase of additional vehicles or trailers Administrative costs to adapt transport operations
High market restructure	Increased labour costs for drivers Administrative costs associated to relocation: • higher administrative personnel costs • higher rent price for premises (e.g. operational centre, parking, offices, warehouse) • higher insurance costs • additional business travel costs	Relocation one-off costs: • new company registration or acquisition or merge • purchase of new premises (e.g. operational centre, parking, offices, warehouse) • re-registration of vehicles • legal assistance • recruitment • IT adaptation
Partial market restructure	Combination of the above	Combination of the above

Source: Ricardo analysis

Results from the stakeholders' survey (see Section 5.2.2 of Stakeholder Consultation Summary) suggest that the expectation of compliance costs largely varies across the MS clusters considered. Most Western and Southern European operators do not expect substantial cost increases, while Eastern European operators tend to agree that the measure would imply additional ongoing and one-off costs. This relates to the fact that Eastern European hauliers tend to undertake more long cycles while Western or Southern European hauliers are expected to be only marginally affected.

Costs associated to additional return journeys in the simple market compliance scenario

For hauliers typically operating in long truck cycles, additional (empty or with a low load factor) return journeys to comply with the new provision are likely to lower vehicle productivity by reducing the time available for revenue generating operations. This effect will depend on the extent to which hauliers do not manage to secure cargo on the return journeys or cannot balance short and long cycles and avoid additional costs. A Latvian public authority estimated that income losses associated to lower vehicle productivity

would be higher than 10%. The cost impact of additional return journeys can be split into two: a) the operating costs per vehicle associated to these journeys and b) the one-off costs of new vehicle capacity purchased to keep the same demand levels.

The **additional operating costs per vehicle** for the simple market compliance scenario have been assessed through the cost differentials model described in Annex 4. The additional journeys described in section 4.2 have been an input to the cost differentials model to estimate the additional annual operating costs per vehicle associated to these additional journeys (see operating costs per two-way journey in Table 4-1). The cost differentials model also allows us to assess the extent to which the difference in vehicle operating costs between international operators and domestic operators changes as a result of this measure.

Table 4-15 shows that hauliers established in Eastern European countries would be most impacted by the increase in vehicle operating costs associated with additional journeys in the simple market compliance scenario, because they tend to be more engaged in longer truck cycles. Eastern hauliers operating in Western European countries would observe an increase in vehicle operating costs of around €11,000 per vehicle per year on average. This represents an increase of around 10% with respect to operating costs in the baseline.

This cost impact would reduce the difference in vehicle operating costs between international cabotage or cross-trade operations by Eastern hauliers vis-à-vis domestic or bilateral operations by Western hauliers. However, Eastern hauliers are still expected to keep their cost advantage compared to Western hauliers for transport operations located in Western European countries. While the latter is an important result, it should be noted that the competitiveness of hauliers within the market will be determined not only by the cost advantage but also by aspects of service quality, such as timeliness, especially in segments related to specialised transport, high value commodities or just in time deliveries.

Table 4-15: Impacts on vehicles operating costs in the simple market compliance scenario

Area of establishment	Location of transport operation	Additional annual operating costs per vehicle (Euros 2019)	Cost difference in baseline (*)	Expected Cost difference under simple market compliance scenario (*)
West	West	831	100%	101%
West	South	1,665	116%	118%
West	East	845	157%	158%
South	West	0	87%	86%
South	South	0	100%	101%
South	East	0	135%	134%
East	West	10,894	65%	72%
East	South	15,748	76%	88%
East	East	6,486	100%	107%

Source: Ricardo analysis
Note: (*) The cost difference of a pair (i,j) is defined as the vehicle operating costs in international cabotage or cross-trade operations within an area (j) undertaken by hauliers established in (i) divided by the vehicle operating costs of the equivalent domestic or bilateral operations undertaken by hauliers established in (j)

Table 4-16 shows the total operating cost impacts on affected vehicles as a result of additional return journeys in the simple market compliance scenario. This has been estimated by multiplying the additional journeys between each host Member State and each Member State of establishment by the cost of the associated two-way return journeys. These results indicate that the aggregate impact on annual operating costs will be mainly borne by Eastern European hauliers who would need to cover around €3 billion of additional costs. The cost impact on Western hauliers is expected to be much lower, around €7 million.

Table 4-16: Total impacts on operating costs for affected vehicles in the simple market compliance scenario

Area of establishment	Aggregated additional annual operating cost (million Euros 2019)
West	7
South	0
East	3,394

Source: Ricardo analysis

Hauliers which have to undertake additional journeys to comply with the new obligation are also likely to incur **one-off costs of new vehicle capacity** to meet the same demand levels with less vehicle productivity. In this sense, the Estonian organisation ERAA stated that some Estonian hauliers currently drive the tractor unit only in return journeys. Hence, they could opt to purchase additional trailers if they want to increase the opportunity for carrying cargo on these journeys, assuming there are no spare trailers available. However, if hauliers estimate that the prospect of getting a load in either direction is very low, they might just keep returning the tractor unit, saving some fuel and wear and tear.

According to results from the stakeholder survey (see Section 5.2.2 of Stakeholder Consultation Summary), most Eastern European hauliers (103 out of 228 respondents) state that they expect one-off costs of new vehicle capacity to retain the same level of operations. From those, a majority (72 out of 103) estimate these costs would be below €100k.

Costs associated to relocation in partial and high restructuring scenario

Hauliers relocating to more central Member States as a result of the measure are expected to incur both additional ongoing costs and one-off costs. To satisfy the requirement of establishment in Regulation 1071/2009 (Article 5), the haulier needs to have premises with core business documents and one or more vehicles registered in that Member State, among other considerations[52]. Hence, the relocation process will imply a purchase or rental of new premises (i.e. operational centre, offices, parking, warehouse) in the Member State where they relocate, which will tend to be more expensive compared to the Member State of origin. In addition, as part of the relocation process, hauliers will have to re-register some of their vehicles in the Member State where they relocate.

The relocation process may also lead to administrative costs for the registration of a new company or costs associated to acquisition or merging with companies in the new

[52] We note that the revision of Regulation 1071/2009 also requires that premises in the Member State of establishment should be proportional to the activities of the undertaking. In addition, hauliers should have a clear link between the transport operations carried out and the Member State of establishment, and recruit and employ drivers under the law applicable to labour contracts of that Member State

Member State of establishment. In addition, labour costs both for drivers and administrative personnel will tend to be higher compared to the current Member States of establishment (see Table 3-19 for differences in drivers' wages). Other relocation costs include additional business trips from the new Member State of establishment to the current one, higher insurance costs, recruitment and IT costs.

Road hauliers were asked about relocation costs via a specific data request. Most respondents (20 out of 28) stated that the increase in ongoing overhead costs would range between 10% and 40%. When asked about one-off costs of relocation, respondents provide also a wide range of values ranging from €10k to €1.5m, with 14 out of 24 indicating one-off costs would be higher than €100k. In practice, relocation costs would largely depend on the size of the firm and the specific relocation process (e.g. through establishment of new company and premises, acquisition, merging, etc.) and the country of relocation. In addition, having an operating centre in a more central location might also allow hauliers to use the vehicles more intensively with double- and treble-shifting. This increased productivity could offset some of the higher costs.

4.3.4.2 Impact on market prices and quality of service

The impact on market prices will fundamentally depend on the compliance costs for each market segment and the extent to which these will be absorbed by hauliers or passed-on to customers in terms of increased freight rates. In addition, the level of market prices will depend on potential changes in the available transport capacity for each geographical area and type of operation.

Analysis of the capacity of hauliers to pass-through additional costs

The additional costs as a result of the measure are expected to be at least partially absorbed by hauliers, which means that they would have a limited capacity to pass through costs to customers in terms of increased freight rates. The ability of hauliers to pass-through additional costs will depend on the following aspects summarised in Table 4-17.

Table 4-17: Analysis of the capacity of road hauliers to pass-through additional costs

Parameter	General analysis	Analysis for the road haulage market

Parameter	General analysis	Analysis for the road haulage market
Part of the sector affected	When the cost impact affects the entire sector, the cost differences between firms remains unchanged and, hence, all firms will tend to pass-through the additional costs as there is little incentive for firms to unilaterally absorb the cost increase. Conversely, when a cost increase affects a very narrow market segment, this segment will tend to absorb additional costs to remain competitive.	Additional costs of this measure will mainly be borne by operators undertaking truck cycles longer than 8 weeks in cabotage and cross-trade operations. According to results of section 3.2, this is likely to affect more than half of the vehicles involved in international operations for hauliers based in Eastern European countries. In principle, the market segments affected by the additional costs would be able to partially pass-through additional costs. However, although Eastern European hauliers are likely to keep their cost advantage, they may have incentives to partially absorb costs and keep their competitive advantage vis-à-vis the unaffected part of the market, which may appear relatively stronger as their competitive strengths (e.g. quality and timeliness) would remain unchanged. The incentive to absorb part of the additional cost would be reinforced by the competitive pressure from Eastern European hauliers with shorter truck cycles, which would not be affected by the measure. As per results of section 3.2, Czech, Slovenian and Hungarian operators might return more frequently and could represent a competitive pressures to Bulgarian, Latvian, Lithuanian, Romanian and Slovakian hauliers which tend to be associated with truck cycles longer than 8 weeks.
Level of competition	Under a theoretical perfect competition environment with no market access barriers, firms fix their price very close to marginal costs and have profit margins close to zero. In this context, firms have no capacity to absorb additional costs. Conversely, under an imperfectly competitive market where firms have substantial market power and high profit margins, they will be capable to absorb additional costs.	As described in section 3.3, the road haulage market is characterised by reduced market access barriers and a relatively small business size, leading to a high level of competition and low profit margins. This limits the capacity of hauliers to absorb additional costs.

Parameter	General analysis	Analysis for the road haulage market
Demand elasticity	When demand is inelastic, firms are more likely to pass-through additional costs because this will cause limited demand reductions.	Demand for commodities is known to be rather inelastic to changes in freight rates (Ricardo, 2017), particularly in high value commodities, where transport costs represent a very low share of the final cost of the commodity. This increases the likelihood of hauliers to pass-through additional costs, especially for those involved in high value or specialised operations, typically established in Western European countries.
Diversification of haulier operations	Firms with more diversified operations are more likely to apply cross-subsidisation and compensate additional costs by increasing the price in other market segments, where demand is most inelastic.	The road haulage market is essentially composed of small businesses. Large hauliers or operations controlled by integrated logistic providers are more likely to apply cross-subsidies and compensate additional costs by increasing the price in other market segments.

Source: Ricardo analysis

When asked about the capacity of hauliers to pass-through additional costs to their customers, consulted stakeholders have diverging views. Western European hauliers (or their associations) tend to believe that costs would be fully passed-through, while Eastern and Southern European hauliers generally argue that they will have to absorb these additional costs. The German haulier association BGL argues that while profit margins for Western European hauliers are around 1%[53], profitability could be higher for Eastern European hauliers undertaking international operations because of their lower cost base. In this sense, Eastern European hauliers may be more likely to absorb additional costs. The Romanian hauliers' association UNTRR stated that Romanian companies will be more impacted than other competitors (as they have a larger proportion of long cycles) and will not be able to increase the tariffs in a proportional way to cover the costs.

Overall, from the analysis in Table 4-17 and feedback from stakeholders, we can conclude that operators undertaking truck cycles longer than 8 weeks in international operations, typically established in Eastern European countries, may have incentive to partially absorb additional costs to keep their competitive advantage against the rest of the market that has been less affected by the new obligation. While the cost differentials analysis shows that Eastern European hauliers are likely to keep their cost advantage, no significant changes are expected in the short-term regarding other competitiveness factors (e.g. quality, timeliness). This means that Eastern hauliers may still need to partially absorb the cost increase associated to the measure to keep their overall market competitiveness against market segments that have not been affected at all.

The fact that affected hauliers are also typically associated to small businesses (i.e. less likely to apply cross-subsidisation) and less inelastic demand segments (i.e. low value products) increases their incentive to absorb additional costs. However, the low profitability within the EU road haulage market sets a clear limit to the capacity of hauliers to absorb additional costs. As a result, we expect that additional costs will be

[53] Other sources, however, suggest that average profit margins for European hauliers would be around 2-3% and up to 6% for large market players (Doll, et al., 2016)

partially absorbed by hauliers but only to the extent that impacted hauliers can afford lower profitability margins in the long run.

Analysis of changes in the available transport capacity

In the **simple market compliance scenario**, the market response is dominated by additional return journeys to the Member State of establishment, mostly to Eastern European countries. These additional journeys will significantly increase the available capacity for bilateral operations between Western and Eastern European Member States. As a result, the market price for these freight transport operations will tend to drop in order to secure a cargo on these additional journeys.

In the simple market compliance scenario, operators affected are expected to undertake an equivalent number of assignments as they would in the baseline scenario but as part of shorter cycles from their current Member State of establishment. This would mean that the available capacity for cross-trade and cabotage in central European countries undertaken by hauliers established in the periphery is not expected to change.

In the **high market restructuring scenario**, the predominant market response is a change in the Member State of establishment of operations through a combination of an increased market share of Western hauliers and a relocation of Eastern hauliers to more central Member States. This market restructuring process may cause a slight decrease in the available transport capacity in bilateral operations between Western and Eastern European Member States to the extent that return journeys to the Member State of establishment in Eastern European countries would be reduced. However, as the current frequency of truck returns is low, the capacity drop would be marginal in most segments. This could somewhat increase the price within this market segment.

On the other hand, the available capacity for cross-trade and cabotage operations (a part of which would become bilateral and domestic operations as a result of the relocation process) within Western European countries would decrease, assuming that hauliers already established in the West would somewhat increase their market share.

The outcome of the **partial market restructuring scenario** would be a combination of the above, depending on the share of the different responses and the final market equilibrium.

Overall impact on prices and quality of service

The combination of the analysis above in terms of the costs pass-through and changes in the available supply allows to draw conclusions on the expected direction of changes for market prices (see Table 4-18). This suggest that prices of cross-trade and cabotage operations in Western European countries could increase in both scenarios. On the other hand, prices for bilateral operations between Western and Eastern European Member States would tend to decrease in the simple market compliance, while the high market restructuring is not expected to cause significant impacts on the price for these operations.

Table 4-18: Expected impact on market prices from the scenarios

Scenario	Impact on price of bilateral operations West-East	Impact on price of cross-trade and cabotage operations in West
Simple market compliance scenario	**Decrease** Hauliers will tend to absorb additional costs and decrease prices to the extent possible to secure cargo on additional return journeys	**Increase** While the available capacity is not expected to change, hauliers will tend to partially pass-through costs where they have the highest cost advantage.

Scenario	Impact on price of bilateral operations West-East	Impact on price of cross-trade and cabotage operations in West
High market restructuring scenario	**No change or small increase** Available supply could drop slightly and hauliers may be able to pass-on additional costs	**Increase** Slight drop in supply as hauliers already established in the West would slightly increase their market share. On the other hand, relocated hauliers may be able to pass-through costs of relocation if they can keep their cost advantage
Partial market restructuring scenario	Combination of the above	Combination of the above

Source: Ricardo analysis

The views of stakeholders regarding potential impacts on market prices and quality of service largely vary between those based in Eastern European countries and those established in Western or Southern European Member States (see Section 5.2.2 of Stakeholder Consultation Summary). The position of stakeholders regarding the direction of those impacts is clearly influenced by their market interests.

With regards to expected impacts on the price and quality of service, the haulier association UAB "Lekpas" stated that the quality of service could increase with a higher concentration of services provided by bigger companies, where they usually have more training, but this would come with a significant increase in market prices.

Moreover, since transport is generally a small proportion of the cost of the commodity (Ricardo, 2017), increased freight rates will have a modest impact on the final price of the commodity.

4.3.4.3 Impact on the functioning of the internal market

The application of the measure on the regular return of the truck, as the rest of the Mobility Package, is expected to have impacts on the functioning of the European road haulage market and levels of competition. As a result of the obligation to return to the Member State of establishment every eight weeks, the available transport capacity for cross-trade and cabotage operations could decrease to the extent that hauliers involved in long truck cycles may scale down their operations in central areas. Thus, the specific measure can also be expected to reduce the level of competition in some segments of the freight transport market, given that cross-trade and cabotage operators are in direct competition with hauliers established in Member States where the freight transport activity takes place.

Stakeholders from Eastern European and Western European countries have divergent views on the direction of impacts regarding the functioning of the internal market (see Section 5.2.2 of Stakeholder Consultation Summary). Eastern market operators tend to consider the measure as a market barrier for them that limits competition within the European road haulage market. An Estonian authority pointed out that the measure gives to Central-European transport companies an advantage over the companies located in peripheral countries in the EU. The Romanian haulier association UNTRR stated that this measure challenges fundamental freedoms of the EU and establishes a very dangerous precedent that can be followed in other industries and may lead to the impairment of the EU single market.

Many Eastern European stakeholders also highlighted the fact that the market share of hauliers established in third countries (i.e. outside the EU) could increase with the application of the measure. This is so because additional costs imposed on Eastern European hauliers would make them less competitive over hauliers from third countries (e.g. Russia, Ukraine) in bilateral operations between the EU and those third countries. However, it should be noted that hauliers from third countries have limited ECMT

permits[54] to operate in the EU and, thus, the impact of such competition is not expected to be major or only relevant in a very small scale.

From their side, Western stakeholders generally considered that making it mandatory to have vehicle activity in the country of establishment is an effective measure to put an end to what they see as undesirable business and social practices of so-called 'letterbox' companies in road transport. They highlighted that the EU rules – and the Mobility Package all the same – guarantees, to any road operator who wants to operate in and from any Member State across the EU, the right to establish there, and benefit of the same conditions as local companies. In this sense, in their view, a relocation process to better match the country of establishment with the domestic transport activity would be beneficial for the functioning of the market. Such a situation would be closed to the high market restructuring scenario considered in this study.

Overall, according to results from the stakeholder survey (see Section 5.2.2 of Stakeholder Consultation Summary), most stakeholders from Western European countries (64 out of 114 who responded) expect a moderate or significant decrease in the use of letterbox companies, while 11 out of 114 expect no change. Conversely, respondents from Eastern European countries tend to think that there would be an increase (83 out of 194) or no change (73 out of 194).

The measure will also affect differently market operators depending on their size. As described in section 3.3.1, smaller companies (i.e. fewer than 10 employees or self-employed), represent the 90% of enterprises and account for close to 30% of turnover. These small market operators may not be able to afford relocation costs to a new Member State of establishment and may only be able to respond to the measure by increasing the frequency of return of trucks. This may leave small operators at a competitive disadvantage compared to larger players in some market segments in the partial or high market restructuring scenarios with high relocation.

Similarly, the simple market compliance scenario could also result in a competitive disadvantage for smaller hauliers. As per the cost-pass-through analysis, larger market players are in a better position to pass-through the costs of additional return journeys as they can apply cross-subsidisation across different market segments. In contrast, smaller hauliers may need to partially absorb costs to remain competitive and reduce profitability levels.

This effect would provide incentives to hauliers to concentrate, thereby increasing the average size of firms within the sector. According to results from the stakeholder survey (see Section 5.2.1 of Stakeholder Consultation Summary), around a third of stakeholders involved in long or mixed duration truck cycles (46 out of 150) stated it is likely that they would respond by collaborating with other firms (including merger or acquisitions). This could also accelerate the trend for freight forwarders and logistic integrators to have a more prominent role within the sector. However, the lack of economies of scale in the trucking industry[55] limits the incentive to concentrate, which means that the measure is not likely to substantially change the highly fragmented structure of the road haulage.

As highlighted in section 3.3.1, the presence of a large number of small companies and owner-operators that compete for subcontracts from large companies or for loads identified by other means is a key driver for the high level of competition within the market. Hence, any increase in the size of firms could potentially lead to lower levels of competition.

[54] ECMT permits (European Conference of Ministers of Transport) is a system of multilateral permits for international transport between 43 participating countries, including EU countries, Belarus, the Russian Federation and Ukraine, among others

[55] Truckload operations are characterised by small fixed costs as the bulk of carriers' inputs (vehicle, labour, fuel) can be increased one truck at a time in response to small increases in demand. This is associated to a lack of economies of scale which explains the fragmented nature of the industry (Coyle, et al., 1990)

4.3.4.4 Impact on labour market and working conditions

This section considers the impacts of the measure on the labour market, including potential impacts on employment levels and driver shortage. In addition, we assess impacts on working conditions for drivers, with a particular emphasis on the extent to which the measure would result in an increase, or at least, support the existing level of frequency of the return home of the driver.

The relocation of the Member State of establishment for truck operations as a result of the measure is expected to have significant impacts on the distribution of road haulage **employment** across the EU. Table 4-19 shows that in the high market restructuring scenario, up to 29% of current employment (truck drivers) for road hauliers established in Eastern European countries could be displaced to other EU regions. These results build on the assumption that potentially displaced jobs (in FTE) are proportional to vehicles affected by the measure[56] (described in detail in Annex 5) and that all jobs are displaced out of the Eastern European countries. Since the relocation will partially fall within the Eastern European cluster, these results represent an upper bound of the potential employment displacement.

Table 4-19: Potential displacement in road haulage employment (truck drivers) from Eastern European Member States as a proportion of total road freight employment (in FTE)

Scenario	% Potential displacement of employment
Simple market compliance scenario	No sizeable changes
Partial market restructuring scenario	-18%
High market restructuring scenario	-29%

Source: Ricardo analysis
Note: These results should be read as an upper bound of the potential displacement of employment from Eastern European Member States

As described in section 3.3.3, the **shortage of professional drivers** affects all EU regions. In this sense, the potential displacement of employment from Eastern European countries to more central locations may exacerbate current shortage issues in the areas where the demand for professional drivers is expected to increase. As a second-order effect, this could potentially mean a further migration of drivers from Eastern European countries to Western European countries and perhaps a migration from non-EU to Eastern European Member States. However, as argued by two Western European haulier organisations, the lower competition under the high market restructure scenario from Eastern hauliers in the cross-trade and cabotage segments may allow for wage increases in Western European countries, which would increase the attractiveness of the sector. Some stakeholders, particularly from Eastern European countries, are of the view that shortage ensures better working conditions for drivers, as it gives them a stronger bargaining position against their employers.

The provision within the Mobility Package on the **return home of the driver** every four weeks has been considered as part of the baseline analysis in section 3.3.3. The provision refers to two possible places to be considered as 'home', namely the employer's operational centre where the driver is normally based in the Member State of the employer's establishment, or the drivers' place of residence when the latter differs from the employer's place of establishment. Therefore the measure on the regular return of the truck could in theory only support compliance with the obligation for the regular return of the driver when the driver's place of residence matches the employer's Member

[56] The equivalence of one driver (FTE) per vehicle is considered to be valid for international operations where the vehicle and driver are away from the main operational centre for a long period. In domestic operations, this may not hold as it is more likely to have more than one daily shift per vehicle

State of establishment and if the driver would return together with the vehicle. Otherwise, the return of the truck would not have any positive effect on the regular return of the driver.

The majority of respondents to the stakeholders' survey from Western, Southern and Eastern Member States (229 out of 327) believe that the measure will moderately or significantly increase the frequency of the return home of the driver. Those who are in the opinion that the measure will not increase or even decrease the frequency of return of the driver are mostly from Eastern European Member States.

There is also an indirect link between the measure and the impacts on **working conditions**, as a second-order effect that follows on from changes in the duration of truck cycles. Longer truck cycles are often associated with poorer working conditions in terms of long driving times, insufficient rest, and time spent away from appropriate facilities (European Commission, 2017c). However, many Eastern European hauliers argue that complying with the 8 weeks limit will add operational complexity and will increase the stress level of drivers, which negatively impacts working conditions and the attractiveness of the sector.

4.3.4.5 Impact on public authorities

The implementation of this measure is also expected to somewhat affect the monitoring and enforcement actions of national authorities. Most public authorities (13 out of 16) who responded to the survey agreed that there will be at least a slight increase in the monitoring and enforcement requirements (7 authorities recorded they would be slightly affected, 6 significantly).

The majority of public authorities that believe they will be significantly affected argued that this will stem from logistical strain on their capacity to enforce the new regime. The Estonian public authority stated that the measure will significantly increase the administrative burden on the licensing authority as it will be needed to recruit and train additional staff to be able to control the return of additional vehicles.

The Maltese authority is expecting a new check to be added to roadside inspections to confirm that a trip to the Member State of establishment was performed within the last past 2 months.

Some public authorities (4 out of 16) made an explicit reference to the extent of the logistical impact of the new regime depending on how and when a new "smart tachograph"[57] would be introduced.

A public authority (IT) indicated that the monitoring and control procedures depend above all on the desirable implementation of system collaboration between the various administrations in charge of controls, as well as the implementation of automatic tracking systems for international carriers that help to reconstruct the routes travelled (i.e. smart tachograph). They stated that a smart tachograph would facilitate checks and avoid the burden for drivers and companies to note the route location, as well as reducing the risk of potential circumvention of the obligations relating to the type of route.

The Irish authority pointed out that, from 02 February 2022 up until the full rollout of Smart Tachograph version two has been completed, enforcers will have to manually examine additional records and data to determine when the vehicle left its Member State of establishment and when the vehicle returned.

The full rollout of smart tachograph version two is envisaged by mid-2025 according to the amended Regulation 165/2014. The Regulation provides legal basis for amending technical specifications for smart tachographs to introduce new functionalities in the

[57] Smart tachographs have a Global Navigation Satellite System (GNSS) module, allowing the automatic recording of the location of the vehicle along with a second motion sensor and a dedicated short-range communications (DSRC)

recording equipment, which will allow controlling compliance with the new provisions on driving and rest times introduced by the Mobility Package I. The new version of smart tachograph will enable controlling drivers' activities, including the places where the working period starts and ends, over the period of 56 days. This new feature will help to control compliance with the obligation of a return of a truck every 8 weeks. The amended Regulation requires retrofitting all vehicles in international operations with the smart tachograph version two four years after the adoption of the implementing act on smart tachograph two.

The Latvian public authority stated that the lack of a definition of "operational centre of the undertaking" may create confusion in the application of the requirements.

Germany, Spain and Romania reported that their existing institutions and policies would not find the new regime problematic to introduce. In this sense, the German authority stated that the new measure will be monitored and enforced during already existing checks at the operational centres.

Concerning fiscal impacts from the measure, the potential market restructuring or changes in road freight operations could lead to changes in revenues for public authorities from taxes and charges associated to road haulage activities. These include fuel taxes, vehicle purchase or registration taxes, ownership or circulation taxes, and road charging systems such as road tolls or vignettes, besides general taxes such as VAT or companies' tax (European Commission, 2019b). The simple market compliance scenario is expected to increase revenues from fuel taxes and road charges associated with the additional return journeys in the Member States of establishment, mostly Eastern European countries. On the other hand, a market response dominated by relocation of Eastern European hauliers to more central locations would represent a transfer of taxation revenue from purchase or registration taxes, ownership or circulation taxes, VAT and companies' tax.

5 CONCLUSIONS

The policy measure assessed in this report concerns the obligation for the regular return of trucks to the Member State of establishment of the operator at least every eight weeks established in Regulation (EU) 2020/1055.

This section summarises the main conclusions of the analysis in relation to:

- Current market conditions and business practices
- Assessment of impacts of the policy measure

5.1 *Current market conditions and business practices*

5.1.1 *Transport activity*

The focus of the analysis is on the road freight market which accounts for around three quarters of all inland freight transport activities in the EU27. In the future, road freight activity is expected to grow despite the impacts from the COVID-19 pandemic in the short term: a temporary dip in activity is expected but activity is projected to recover and marginally grow in 2023 in the baseline scenario.

The extent of road freight activity performed by hauliers from different Member States differs due to the size of their domestic market and/or the size of the road haulage sector that takes part in international transport activity. Overall, domestic operations (i.e., national transport activity undertaken by vehicles and operators established in the country) are more sizeable in the West. On the other hand, international road freight activity, which represented 32% of total road freight activity (in tonne-kilometres) in the EU27 in 2019, is mostly undertaken by hauliers based in Eastern Member States.

Hauliers based in the East were responsible for 62% of all international operations (in tonne-kilometres) in the EU27 in 2019. Their share of the total cross-trade and cabotage operations is the largest: 87% and 75% of all cross-trade and cabotage operations, respectively, are undertaken by these hauliers. The general pattern for these cross-trade flows are loading and unloading within a Western European Member State, performed by a vehicle registered in an Eastern European Member State. Similarly, cabotage movements take place predominantly in Western Member States and are carried out by a combination of hauliers from Eastern, Western, and, to a lesser extent, Southern Member States.

5.1.2 *Frequency of return of trucks*

In this context, the analysis found that vehicles used by operators based in East tend to return less frequently to their Member State of establishment compared to Western and Southern European Member States: 47% of vehicles used by Eastern European hauliers were estimated to have returned more than six times a year, compared to nearly 100% of vehicles used by their Western and Southern counterparts. This suggests that East-based hauliers operate, on average, longer truck cycles (i.e. longer than eight weeks), which are defined as the round trip that encompasses a combination of assignments that a truck carries out between leaving and returning to the country of establishment of the operator.

However, there is some variation in the patterns of truck cycles within the clusters:

- In the case of Western and Southern European Member States, Finnish and Maltese hauliers also operate significantly longer cycles.
- On the other hand, trucks used by hauliers established in Eastern Member States are anticipated to be engaged in cycles both shorter and longer than eight weeks. The use of longer truck cycles is more prevalent amongst Bulgarian, Latvian, Lithuanian, Romanian and Slovakian operators. However, Czech, Hungarian and Slovenian operators seem to be mainly involved in shorter cycles, whereas Estonian and Polish hauliers appear to have an equal or similar share of trucks that return more compared

to the share that return less frequently.

Regarding the characteristics of longer truck cycles, no specific pattern or sequence of operations was identified. Most truck cycles seem to include a number of different types of operations but hauliers that are engaged in longer cycles are also those with significant cross-trade and, to a lesser extent, cabotage operations.

Prior to the entry into force of this new provision on the return of vehicles (21 February 2022), there are no specific requirements for vehicles to return regularly to the Member State of establishment of their operator[58]. There is no evidence to suggest that the characteristics and patterns of truck cycles observed currently would significantly change between 2019 and 2023 in the absence of the provision (i.e., under the baseline). The COVID-19 pandemic is not expected to lead to any decisive changes to the observed patterns. Similarly, hauliers from countries of establishment with significant cross-trade and, to a lesser extent, cabotage operations, are expected to continue to be involved in longer cycles.

In terms of the type of operators involved in these longer cycles, the limited evidence from the consultation undertaken for this study suggests that operators are slightly smaller companies (in terms of employees and revenue) and obtain more business via contracts with freight forwarders/forwarding agents compared to short truck cycle operators. This reflects the patterns observed in the market. Overall, the EU road haulage market is dominated by small and medium enterprises (SMEs), where firms in the East tend to be smaller and have a considerably lower turnover compared to Western European road hauliers.

The type of vehicles used by longer truck cycle operators tends to be heavier vehicles (>32 tonnes in GVW), similar to the vehicle types used by short truck cycle operators, which suggests that this type of vehicles is prevalent in international operations.

5.2 *Assessment of impacts*

The analysis examined the impacts arising from the obligation of the return of the truck to the Member State of establishment of the operator on transport activity, the environment, congestion and the economy. Impacts are assessed for 2023 only which is the first full year when the new measure will be applicable.

To this end, a scenario approach was developed to represent the potential market responses to the new obligation. Given the uncertainty on how different operators might adjust to the new obligation, three scenarios were identified. These capture the range of possible market responses aiming to frame the potential lower and higher range of impacts.

Three scenarios developed were:

- **Simple market compliance (SMC):** A scenario where all affected operators would be minimising any changes to the way they conduct their operations, whilst complying with the new provision. Operators would carry out the same number of assignments as in the business-as-usual case (baseline scenario) but as part of shorter cycles from their current Member State of establishment.
- **High market restructure (HMR):** A scenario where all operators would make more substantial changes to their operations (e.g. forgo some assignments, scale down operations in certain countries, relocate or open a new entity in another country as a result of this provision). The assignments that could no longer be fulfilled in the same cycle would instead be undertaken by an operator/entity established in another Member State. The new Member State of establishment

[58] Only Directive 2014/45/EU on periodic roadworthiness tests for motor vehicles and their trailers requires vehicles to return at least once a year for their roadworthiness test in the Member State where they are registered.

could be either the Member State in which those assignments take place (i.e., from where it departs/arrives or within that Member State) or another Member State from which the cost differential is lowest (i.e. they are closer to the location of the assignment).

- **Partial market restructure (PMR):** A scenario which reflects a combination of operators that minimise changes to their operations and operators that make more substantial changes. This is constructed based on the survey responses.

Given the above scenario descriptions, the simple market compliance scenario can be considered to be the most straightforward outcome, as operators would need to make fewer adjustments in order to comply with the new requirement. The market restructure scenarios require more significant market changes and adaptation, including the potential relocation of hauliers to other countries. In addition, the analysis of the cost advantage suggests that those operators directly affected by the measure and most likely to take action (i.e. based in the East) would still maintain their competitive position even if their trucks would need to return more frequently. In this context, the **simple market compliance** is considered to be the most likely, especially in the timeframe of the assessment. The impacts of the other two scenarios are provided as well to capture the full range of potential outcomes although these scenarios are considered less probable.

The main impacts of the scenarios on transport activity and the environment are presented in Table 5-1 and described in the following sections, together with other impacts on congestion and the economy. The focus is on the SMC scenario as the most likely scenario; the findings for this scenario are complemented by the results of the other two scenarios to provide an overview of the potential extent of impacts that could arise from this provision.

Table 5-1: Summary of main impacts of the scenarios on transport activity and the environment: total and as a change compared to international freight total values in 2023

Scenarios	SMC	PMR	HMR
Impact on number of journeys created (in thousands)	1,915 (2.0%)	1,016 (1.1%)	1,137 (1.2%)
Impact on vehicle-kilometres (in millions)	2,528 (4.8%)	706 (1.4%)	436 (0.8%)
Impact on CO_2 emissions (in thousand tonnes)	2,900 (4.6%)	810 (1.3%)	500 (0.8%)
Impact on NO_x emissions (in tonnes)	619 (7.8%)	173 (2.2%)	107 (1.4%)
Impact on $PM_{2.5}$ emissions (in tonnes)	221 (5.0%)	62 (1.4%)	38 (0.9%)

5.2.1 *Impact on transport activity*

Under the simple market compliance scenario, the adoption of the new provision is expected to lead up to **1.9 million new journeys in 2023** compared to the baseline (business-as-usual case). It is assumed that the affected hauliers are not able to find cargo for the additional journeys and thus all potential journeys arising due to the need to return more frequently to the Member State of establishment are included in this

scenario[59]. This represents an increase of 2% in international road freight journeys in 2023.

The majority of the additional journeys arises from hauliers based in the Eastern European Member States which are those whose vehicles are more likely to be engaged in cycles longer than eight weeks in the baseline.

By comparison, the restructuring scenarios represent a lower increase in the number of journeys with respect to the baseline (ranging between 1 and 1.1 million new journeys). Under these scenarios, new operators or a new entity of the original operators based in a different Member State would partially or fully replace the original operators. This would lead to additional journeys from vehicles registered in both Western and Eastern European Member States as the new Member States of establishment are likely to be in central Europe, including many Western European countries and a number of Eastern European countries which are not located in the outer periphery. Note that the lowest number of journeys is expected to be generated by the PMR scenario. This is explained by the level of empty running associated with the potential new journeys[59]: a higher share of journeys would originate from East-based hauliers which have lower levels of empty running compared to their Western and Southern counterparts. On the other hand, a larger share of journeys arising from the HMR scenario would be undertaken by West-based hauliers (due to the relocation of hauliers or transfer of activity to the West).

The impacts can also be measured in terms of an **increase in vehicle kilometres** associated with the additional distance travelled in those additional journeys. Overall, an increase of up to **2.5 billion vehicle kilometres** could be observed in 2023 due to the adoption of this measure under the simple market compliance scenario, representing an increase of 4.8% in international road freight vehicle kilometres in 2023.

This is a result of the long-distance trips which would be performed by trucks mainly travelling between the East and West in order to return at least every eight weeks to their operational bases in Eastern European Member States.

In the case of the restructuring scenarios, vehicle kilometres could increase between 0.4 and 0.7 billion. The distances travelled under these scenarios would be shorter as the new operators/entities are based in Member States closer to where the transport operations take place.

The new provision also has the potential to affect overall patterns of traffic flows in the EU in terms of the locations from where operators undertake those flows (in addition to creating new journeys, compared to the baseline). This however depends on the market response:

- More significant changes in the location of establishment (i.e., to a location closer to certain Member State flows) as covered by the partial and high market restructure scenarios could lead to a shift towards more cabotage and cross-trade operations within/between countries that are closer to the Member State of establishment of the operator. Furthermore, if the new Member State of establishment is the country in which the flow takes place, then a cabotage operation in the baseline would become a domestic operation, and the cross-trade operation would become a bilateral operation.
- The only impacts expected when there are no significant changes in the countries of establishment of the operators (i.e., the simple market compliance scenario) are associated to the increase in journeys to and from the Member State of establishment which represent additional empty bilateral flows.

[59] It is assumed that a journey is only new and additional to the baseline if empty. Otherwise, the operators which are able to find a load to transport in those journeys could be displacing (bilateral) journeys already occurring in the baseline.

There is also the potential for a change in overall freight activity, if the provision affects the relative competitiveness of road transport vis-à-vis other transport modes. However, the analysis suggests that any changes in terms of modal shift are expected to be small since price impacts are expected to be relatively minor while other factors (such as travel time, reliability, or frequency of services) are not expected to change as a result of the measure. This shift could be somewhat more significant where an alternative mode for cross-border trade is already well developed, such as inland waterways between the Netherlands, Germany and Belgium. In addition, the potential for a modal shift to rail freight may be mostly associated to long-haul operations (e.g. long-haul cross-trade).

5.2.2 *Environmental impacts*

The environmental impacts from the provision will be directly linked to the potential increase in traffic flows (in vehicle-kilometres).

Overall, the new provision could result in up to **2.9 million tonnes of additional CO_2 emissions in 2023**, under the simple market compliance scenario. This represents an increase of 4.6% on the international road freight emissions in 2023 in the baseline. Similar to the results in vehicle kilometres, the market restructuring scenarios are responsible for lower impacts: 0.5 to 0.8 million tonnes of additional CO2 emissions expected in 2023, representing a 0.8%-1.3% increase in international road freight emissions.

In addition, costs of air pollution due to negative health effects and other damages were estimated at **€25.9 million associated to an increase in NO_x and $PM_{2.5}$ emissions in 2023** under the simple market compliance scenario. For the restructuring scenarios, these costs are expected to range between €4.5 and €7.2 million.

In addition, the negative impacts on the environment are not compensated by any additional benefits from trade as the volume of cargo transported by freight is expected to remain unchanged compared to the baseline (i.e., business-as-usual case in 2023).

5.2.3 *Congestion impacts*

The increase in traffic flows resulting from this measure have the potential to exacerbate congestion issues on certain bottlenecks across the EU road network. The focus of the analysis was on three border crossing points (BCP) in the core TEN-T network, where the potential for more significant congestion issues was identified:

- BG-RO in Vidin – Calafat: Non-Schengen internal cross-border in the Orient/East-Med core corridor.
- RO-HU in Nadlac – Nagylak: Non-Schengen internal cross-border in the Orient/East-Med core corridor.
- PL-DE in Frankfurt (Oder)- Swiecko: Internal cross-border within Schengen space in the North Sea/Baltic core corridor

The findings show that waiting times on the non-Schengen BCPs selected (i.e. on Vidin – Calafat and Nadlac – Nagylak) could increase in the simple market compliance scenario due to additional return journeys from West to East. Waiting times would increase from 130 to up to 282 minutes on Vidin – Calafat, and from 55 to up 162 minutes on Nadlac - Nagylak. Conversely, only minor impacts are expected in scenarios with market restructure due to the lower number of induced return journeys arising between East and West Member States. On the other hand, no significant impacts are expected on the BCP between Poland and Germany for any of the scenarios considered, as current waiting times are already very low and traffic would not increase as much as in the other BCPs selected. Since the Poland-Germany BCP represents an upper bound of congestion impacts among BCPs within the Schengen area, it can be concluded that the rest of BCPs within the Schengen area are not likely to be significantly impacted by congestion.

The estimated increase in congestion in turn will affect the average travel time of freight services, potentially leading to lower vehicle productivity and increased fuel consumption

and associated CO_2 and air pollutant emissions from road haulage. In addition, increased congestion could also have an impact on journey time reliability with indirect effects on road freight operations in terms of the ability to maintain the delivery schedule as well as a lower level of customer satisfaction.

5.2.4 *Economic impacts*

The adoption of this measure could also lead to a range of economic and internal market impacts for the key affected stakeholders: market operators, drivers, national authorities.

5.2.4.1 Impact on costs for market operators

It is expected that some market operators will incur additional costs in order to comply with the new provision. The nature and size of the compliance costs depends however on the market response:

- In the simple market compliance scenario, hauliers typically operating long truck cycles could incur additional vehicle operating costs associated to the need for their vehicles to return more frequently. The new return journeys could represent an increase in costs of up to €11,000 per vehicle per year (around 10% increase compared to the baseline) on average for hauliers established in Eastern European countries operating in Western European countries. The increase in operating costs largely varies among Member States depending on the distance of the return journeys. Moreover, one-off costs could also arise if there was a need to purchase new vehicle capacity in order to offset the lower vehicle productivity caused by this provision. The results from the stakeholder consultation suggest that these one-off costs would be below €100,000 per haulier.
- Within the high market restructure scenario, the response that assumes the relocation of market operators to more central locations could lead to increased administrative and operating costs (including labour costs). These are in line with cost levels of the host country and one-off costs associated to the relocation process. The results from the stakeholder consultation suggest an increase in ongoing overhead costs between 10% and 40% and increases in one-off costs ranging from €10,000 to €1.5 million, with 14 out of 24 indicating one-off costs would be higher than €100,000. In practice, relocation costs would largely depend on the size of the firm and the specific relocation process (e.g. through establishment of new company and premises, acquisition, merging, etc.).

An analysis of the impact of the more frequent return of vehicles on operating costs of hauliers in the simple market compliance scenario suggests that Eastern hauliers are still expected to keep their cost advantage compared to Western hauliers for transport operations that take place in Western European countries. While the latter is an important finding, it should be noted that the competitiveness position of hauliers within the market is determined not only by the cost advantage but also other aspects such as quality and timeliness, especially in market segments dependent on more time-sensitive delivery. This means that even if Eastern European hauliers may keep their cost advantage, the unaffected part of the market may gain competitiveness as their competitive strengths (e.g. quality and timeliness) would remain unchanged. Hence, costs associated to additional return journeys may still lead to at least a partial market restructuring and changes in the Member State of establishment.

5.2.4.2 Impact on market prices and quality of service

The new provision could lead to changes in market prices (i.e. freight rates) to the extent that compliance costs are passed-on to customers and there are changes in the available transport capacity.

- Regarding the first aspect, the additional costs arising from the measure are expected to be partially absorbed by hauliers while a share would be passed through to customers in terms of increased freight rates. While the cost

differentials analysis shows that hauliers involved in long truck cycles, mostly located in Eastern European countries, are likely to keep their cost advantage, Eastern European hauliers may still need to partially absorb the cost increase associated to the measure to keep their overall market competitiveness against other market segments that have not been affected equally or at all, including hauliers established in Western European countries but also Eastern European hauliers involved in shorter truck cycles. At the same time, it is worth recognising that the low profitability within the EU road haulage market limits the capacity of hauliers to absorb additional costs. Costs will be partially absorbed by hauliers but only to the extent that impacted hauliers can afford lower profitability margins in the long run.

- Regarding the second aspect, the potential changes in the available transport capacity can impact prices for certain types of operations but this depends on the market response:
    - **Simple market compliance scenario**: additional return journeys will significantly increase the available capacity for bilateral operations between Western and Eastern European Member States, potentially leading to lower prices in those operations. At the same time though, the available capacity for cross-trade and cabotage in central European countries undertaken by hauliers established in the periphery is not expected to change.
    - **High market restructuring scenario:** the change in the Member State of establishment of operators could lead to a slight decrease in the available transport capacity in bilateral operations between Western and Eastern European Member States, increasing the price within this market segment. At the same time, the available capacity for cross-trade and cabotage operations (a part of which would become bilateral and domestic operations as a result of the relocation process) within Western European countries would decrease, assuming that domestic hauliers would increase their market share.

Despite the potential for increased freight rates, overall costs of products are not expected to be significantly affected since transport is generally a small proportion of the cost of the commodity.

5.2.4.3 Impact on the functioning of the internal market

An impact on competition and the level playing field is expected through the change in the available transport capacity in certain market segments as well as a potential increase in the size of firms:

- Competition can be lower in some segments of the freight transport market, particularly in scenarios involving market restructuring, to the extent that hauliers involved in long truck cycles may scale down their operations in parts of Central Europe. This could lead to a decrease in the available transport capacity for cross-trade and cabotage operations. This reflects the fact that hauliers involved in cross-trade and cabotage operators are in direct competition with hauliers established in Member States where the freight transport activity takes place.
- Lower levels of competition can also be expected if the measure leads to high market concentration (i.e., high market share controlled by a small number of firms). Small operators can be at a competitive disadvantage compared to larger players for all the scenarios considered. Smaller operators are less likely to be able to face increased costs which could result in mergers and/or acquisitions by other firms, thereby increasing the average size of firms within the sector. However, the lack of economies of scale in the road haulage industry limits the incentive to concentrate and a significant change in the market structure is not expected.

It is worth noting that stakeholders from Eastern European and Western European

countries have divergent views on the direction of impacts regarding the functioning of the internal market. On the one hand, Eastern European stakeholders tend to consider the measure as a market barrier for them that limits competition within the European road haulage market. On the other hand, Western European stakeholders generally considered that making it mandatory to have vehicle activity in the country of establishment is an effective measure to prevent the use of letterbox companies in road transport which are associated to undesirable business and social practices according to these stakeholder.

5.2.4.4 Impact on the labour market and working conditions

Employment impacts are expected to be more substantial when there is a more significant restructuring of the market, i.e., operators relocate to a different Member State of establishment as a result of the measure: in the high market restructuring scenario, up to 29% of current truck drivers established in Eastern European countries could be displaced to other EU regions. On the other hand, no sizeable impacts are expected if operators remain in the original countries of establishment (i.e. simple market compliance scenario).

By shortening truck cycles, the measure is also expected to affect how drivers return to their countries, with an increased use of the truck for the return trip also anticipated. This reorganisation could facilitate compliance with the return of the driver obligation.

5.2.4.5 Impact on public authorities

There is an expectation among the authorities surveyed (13 out of 16) that there will be at least a slight increase in the monitoring and enforcement requirements due to this new measure. The reasons cited for this were the logistical strain on their capacity to enforce the new regime, e.g. a new check to be added to roadside inspections or the need to use a smart tachograph version two (expected to be available from 2022), as well as the implementation of system collaboration between the various administrations in charge of controls.

The use of the smart tachograph was seen as quite important to enable the enforcement of this provision, as until this is implemented enforcers will have to manually examine additional records and data to determine when the vehicle left its Member State of establishment and when the vehicle returned.

There is however also a smaller number of authorities (DE, ES, RO) that do not expect any problems related to the enforcement of the measure, one noting that the measure can be monitored and enforced during existing checks at the operational centres.

Regarding fiscal impacts from the measure, the simple market compliance scenario is expected to increase revenues from fuel taxes and road charges associated with the additional return journeys in the Member States of establishment, mostly Eastern European countries. On the other hand, market restructuring scenarios would represent a transfer of taxation revenue from Eastern European countries to Western European countries including purchase or registration taxes, ownership or circulation taxes, VAT and companies' tax.

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7 ANNEXES

The following annexes are provided below:

- Annex 1 - Survey questionnaires and interview checklist
- Annex 2 - Current road freight activity in tonnes
- Annex 3 - Methodology for extrapolating international road freight activity
- Annex 4 - Cost differentials model
- Annex 5 - Modelling of the market responses
- Annex 6 - Average distances between MS pair
- Annex 7 – Emission factor development
- Annex 8 – Cost of additional journeys
- Annex 9 - Sensitivity analysis on approach to select new Member State of establishment

7.1 Annex 1 - Survey questionnaires and interview checklist

These are provided as separate PDF documents.

7.2 Annex 2 – Current road freight activity in tonnes

Table 7-1: Total international tonnes per MS of vehicle registration for bilateral, cross-trade and cabotage movements

	Thousand tonnes				Thousand tonnes (% of MS total)				
Country of vehicle registration	Bilateral	Cross-trade	Cabotage	Domestic	Bilateral	Cross-trade	Cabotage	Domestic	International
Belgium	41,233	2,483	6,782	233,447	15%	1%	2%	82%	18%
Bulgaria	4,713	3,367	2,582	103,912	4%	3%	2%	91%	9%
Czechia	24,321	1,433	1,651	473,595	5%	0%	0%	95%	5%
Denmark	3,365	75	607	163,700	2%	0%	0%	98%	2%
Germany	87,008	3,316	9,722	3,108,186	3%	0%	0%	97%	3%
Estonia	1,910	270	866	25,327	7%	1%	3%	89%	11%
Ireland	447	85	225	149,243	0%	0%	0%	99%	1%
Greece	5,826	-	179	348,076	2%	0%	0%	98%	2%
Spain	70,779	2,822	5,814	1,420,585	5%	0%	0%	95%	5%
France	29,852	295	1,558	1,816,943	2%	0%	0%	98%	2%
Croatia	9,535	2,080	906	68,604	12%	3%	1%	85%	15%
Italy	17,615	-	1,483	990,902	2%	0%	0%	98%	2%
Cyprus	24	-	-	29,337	0%	0%	0%	100%	0%
Latvia	5,811	2,745	4,365	60,834	8%	4%	6%	82%	18%
Lithuania	9,718	25,128	11,185	54,771	10%	25%	11%	54%	46%
Luxembourg	12,107	9,125	8,102	25,969	22%	17%	15%	47%	53%
Hungary	23,722	7,213	3,255	168,441	12%	4%	2%	83%	17%
Netherlands	97,668	7,869	19,079	564,393	14%	1%	3%	82%	18%
Austria	18,201	1,179	2,625	380,078	5%	0%	1%	95%	5%

Country of vehicle registration	Thousand tonnes				Thousand tonnes (% of MS total)				
	Bilateral	Cross-trade	Cabotage	Domestic	Bilateral	Cross-trade	Cabotage	Domestic	International
Poland	152,700	66,771	57,948	1,229,031	10%	4%	4%	82%	18%
Portugal	13,605	3,980	2,702	135,579	9%	3%	2%	87%	13%
Romania	14,467	21,001	12,515	208,658	6%	8%	5%	81%	19%
Slovenia	18,495	10,431	4,394	58,455	20%	11%	5%	64%	36%
Slovakia	25,164	9,290	4,060	148,670	13%	5%	2%	79%	21%
Finland	2,071	95	575	267,721	1%	0%	0%	99%	1%
Sweden	1,189	-	193	447,980	0%	0%	0%	100%	0%
Total EU27	**691,546**	**181,053**	**163,371**	**12,682,439**	**5%**	**1%**	**1%**	**92%**	8%

Source: Eurostat, 2019, online data code: ROAD_GO_IA_LTT

7.3 Annex 3 – Methodology for extrapolating road freight activity to 2023

The Eurostat road freight data[60] is used to characterise the base year scenario in 2019. It provides an overview of transport activity by Member State of registration of the vehicles used.

To develop the baseline in the reference year (2023), the 2019 Eurostat data (in tonne-kilometres and vehicle-kilometres) was extrapolated to 2023 based on the PRIMES-TREMOVE data (COVID Baseline) which is available for 2015, 2020 and 2025 and takes into account the impacts of COVID-19 on international and domestic road freight activity.

Checks were carried out on the datasets available from the two sources by comparing the figures for a common year (2015). In terms of total road freight activity (domestic and international) across Europe (in tonne-kilometres), the Eurostat data and PRIMES-TREMOVE data are inline, with less than 1% difference in the two numbers (PRIMES-TREMOVE: 1,628 GTKM, Eurostat: 1,615 GTKM). The PRIMES-TREMOVE data is defined according to the territorially principal (i.e. based on the country where the trip takes place rather than where the vehicle is registered), whereas in this study the interest is in the activity according to the Member State of vehicle registration, making it difficult to compare the two sources.

Given the above, it was not possible to use the data on international road freight activity per Member State from PRIMES-TREMOVE to adjust the Eurostat international road freight activity data directly. Instead, the change in total (domestic and international) road freight activity for EU27 total from PRIMES-TREMOVE was applied to the total road freight activity per Member State from Eurostat, as the Eurostat data is assigned to the MS of vehicle registration, whilst PRIMES-TREMOVE data is assigned based on the location(s) of the movement.

Using this approach, it is assumed that the activity taking place in each Member State will grow at the same rate for all operators regardless of their Member State of establishment. There are two minor issues with this assumption:

i) It disregards potential differences in the growth of trade in certain Member States which could, in turn, mean that we potentially disregard differences for operators of certain Member States of establishment which typically carry out operations from/to/within those Member States whose trade levels might be more affected. However, the analysis of the PRIMES-TREMOVE data shows that the total freight activity change across all Member States is relatively similar in terms of % change during the period under the analysis[61]. As such, applying an average growth rate to all Member State based on the EU total road freight activity will not have a significant impact on the accuracy of the results as operators in different Member State would not be expected to see highly different growth rates.

ii) It does not account for the differential growth of specific types of operations from/to/within each Member State and their performance by operators of specific Member States of establishment, which could potentially lead to different growth rates for domestic and foreign operators. We correct this in step 4 in the approach suggested below by applying a projection into the future for the development of the specific types of operations, assuming that operators from the same Member States will keep carrying them out as seen in the Eurostat statistics.

In addition, given the limited timeframe in scope, this approach shouldn't lead to major deviations.

[60] Eurostat, 2019, online data code: ROAD_GO_TA_TOT

[61] We note that this may not be the case for longer time periods.

The proposed extrapolation approach to estimate the baseline situation at the reference year (2023) is based on the following steps:

1. The % change in total road freight activity (in tonne-kilometres, both domestic and international) from PRIMES-TREMOVE from 2015 to 2020 is +5.6%, whilst the % change in total road freight activity in Eurostat from 2015 to 2019 is +13.6%. In order to capture the impacts of COVID-19 in the Eurostat data, the % decrease from 2019 to 2020 required such that the 2015-2020 change in total road freight matches the +5.6% shown in the PRIMES model was calculated. This was calculated at EU27 aggregated level, and came out at -7% change from 2019 to 2020 for tonne-kilometres.

2. The growth between 2020 and 2025 from PRIMES-TREMOVE was linearly interpolated to obtain the 2020 to 2023 growth. This change was applied to the calculated 2020 adjusted-Eurostat data in step 1 above to achieve the 2023 adjusted-Eurostat data for EU27 total.

3. The calculated changes in total road freight activity between 2019 and 2023 at EU27 aggregated level were applied to the 2019 total road freight activity from Eurostat for each Member State.

4. The above steps give the total road freight activity for each Member State in 2023. These totals were then assigned to one of domestic/national, bilateral, cabotage or cross-trade based on the current (2019) split of each movement type. This assumes there is no COVID-19 impact in the existing trends of domestic/national, cabotage, bilateral and cross-trade regarding their relevant part of international trade. Obviously, any change in overall trade caused by COVID-19 would impact their absolute values, which is captured considering the overall COVID-19 effects in the total road freight values as explained above.

7.4 Annex 4 - Cost differentials model

The cost differentials model first calculates domestic haulier operational costs, including variable costs that depend on vehicle mileage (labour, fuel, tyre, maintenance, etc.) and fixed operational costs (vehicle ownership costs, overhead, etc.). The model then estimates cost differentials for international transport operations as compared to domestic operations. For each country, this compares:

i. A domestic haulier carrying out a transport operation (in their own country), and
ii. All non-domestic haulier carrying out the same transport operation.

The main outputs from the cost model are:

i. Domestic Costs for 2019 baseline and 2023 projection per Member State
ii. International Operators' Costs for 2019 baseline and 2023 projection per Member State pair
iii. Cost differences:
    1. International and domestic operators' cost in the host country
    2. Costs of return journeys to the country of establishment and back to the host country compared to annual operating costs from international transport operations

We use this model to understand cost competitiveness between operators established in different Member States and to inform the analysis of their response to the provision, depending on the costs.

Cost category	Base year 2019	Projection 2023
Driver costs	European CNR Studies Reports: 2012 – 2019, calculated under the real average wages growth rates.	Projection for 2020 - 2023 from updated EC PRIMES Model's real average wages growth, PRIMES-TREMOVE, COVID baseline scenario , and interpolation for 2023[62]
Real Average Wages	Real average wages from 2012 - 2019 were collected from total employees and total salaries for Freight transport by road sector, from Eurostat database [sbs_na_1a_se_r2]: 2012-2018, inflated to 2019.	
Fuel Cost	European CNR Studies Reports: 2012-2019, updated to 2019 under fuel retail price growth	
Fuel Retail prices	European Commission, History Weekly Oil Prices Bulletin (annual average from 2010 - 2019)	Diesel price growth projections for 2020 – 2023 are from updated EU PRIMES Model, COVID baseline,

[62] Only projections for 2025 were available from the COVID baseline and 2023 in derived by interpolation

Cost category	Base year 2019	Projection 2023
		and interpolation for 2023
Ownership tax	CE Delft (2019) Transport taxes and charges in Europe reports, tax for HGVs in 2019.	Assumed to stay constant
Overheads	Different sources, inflated to 2019, including: - European CNR Studies Reports: 2012 – 2019 - RHA Report on Costs (2014) - NERA report on Estimates of Truck Operating Costs Across Europe (2009)	Assumed to stay constant
Tyres; Maintenance & Repair; Vehicle Insurance	European CNR Studies Reports: 2012 – 2019, inflated to 2019; Adjusted by Purchasing power parities (PPPs) indices from Eurostat.database [prc_ppp_ind] and converted the units to Euro under the latest Exchange rates	Assumed to stay constant
Vehicle taxes; Tolls	European CNR Studies Reports: 2012 – 2019, inflated to 2019	Assumed to stay constant
International two-way return journey costs	Distance matrix provided in Annex 6, access distance between each EU27 countries.	Based on total international costs and access distance

Within the model, we are considering some general assumptions to calculate the cost projections to 2023. Firstly, all costs are expressed in constant 2019 prices.

For **domestic operators' costs**, all costs excluding driver costs, fuel costs and labour related maintenance costs are assumed to stay unchanged after 2019, expressed in constant prices of 2019.

i. Driver costs are mainly referenced from the CNR reports for those investigated countries. Gaps for other countries without CNR reports are filled by using Eurostat Labour cost levels for sector 'Transportation and Storage' from 2010-2019, based on the average level by MS groups (W/E/S). Gaps between CNR Year and Model Year filled by Average Wage changes:

[Driver costs 2019] =
[Driver costs CNR 20xx] * [Average wage 2019]/ [Average wage 20xx]

ii. Fuel costs are calculated based on CNR reported fuel cost data. Gaps between CNR Reported Year and Model Year filled by Retail price changes:

[Fuel cost 2019] = [Fuel cost CNR 20xx] * [Retail price 2019] / [retail price 20xx].

Gaps for countries without CNR reports are filled by using retail price differences from oil bulletins, based on the average level by MS groups (W/E/S), basically:

[Fuel cost 2019 for Country i in W/E/S] = [Average Fuel Retail price for W/E/S] * [Retail price in Country i]/[Ave Retail price in W/E/S].

Similarly, fuel costs projections for 2023 are calculated by:
[Fuel cost 2023] = [Fuel cost 2019] * [Retail price 2023] / [retail price 2019].

iii. It is assumed that a 50% share of overheads in maintenance and repair costs are related to labour. As such, a part of these costs would stay constant, and part

would increase in line with driver wages' growth.

For assumptions on **international costs**, it is considered that fuel costs happen in the host country, but other cost components are from the country of establishment, and:

i. Average assessment period for international trips is 30 days
ii. Average annual travel distance per vehicle is the average level of each Member State from CNR report.
iii. Access costs with returns (access costs are included in international costs)
iv. Different return times for different scenario (e.g. 2 for baseline policy, 6 for control policy)

7.5 Annex 5 - Modelling of the market responses

A modelling framework was developed to determine the potential additional return journeys that may result from this provision, based on the potential ways the affected operators might respond to this requirement.

The modelling of the market responses is based on the following general assumptions agreed with DG MOVE.

General assumptions	Description
G1	The total number and type of assignments in the baseline at the EU level would be fulfilled in each scenario, as a minimum
G2	The total cargo (in tonnes) in the baseline at the EU level would be transported in each scenario, as a minimum
G3	The existing movements by Member State pair would be realised as in the baseline, albeit the country of registration of the operator might change (additional journeys are also expected)

Their modelling is also based on specific assumptions for the following variables, which are covered in turn in the following sections:

- The number of vehicles affected
- The potential additional vehicle journeys that could be required due to the new provision
- The type of response of operators to the new obligation
- The countries of departure and arrival of the truck for the additional vehicle journeys
- Share of empty running in the potential additional vehicle journeys
- The country of establishment of the operator undertaking the additional vehicle journeys

Specific assumptions were determined for each Member State. If data was not available for a specific Member State, the variables were estimated based on the relevant EU cluster average, where possible[63].

7.5.1 *The number of vehicles affected*

The vehicles directly affected include the share of the operators' fleet that are involved in cycles longer than eight weeks and will therefore need to return more regularly. These are determined based on the data obtained from the survey conducted for this study. The analysis of this data is presented in Section 3.2.1 and the specific assumptions for the share of vehicles per frequency of return (i.e., once a year, twice a year, etc) for each Member State of establishment is provided in Table 7-2 below. Where we have gaps (i.e., for BE, HR, EL, CY), we assumed the average of the relevant EU cluster for these.

Table 7-2: Share of vehicles per frequency of return

Member State	Once a year	Twice a year	Three times a year	Four times a year	Five times a year	Six times a year	More than 6 times a year
BE	0%	0%	0%	0%	0%	0%	100%
BG	21%	25%	18%	18%	3%	4%	10%
CZ	0%	0%	0%	0%	0%	0%	100%

[63] We note that there was no sufficient data to include MT and CY in the quantification due to the lack of statistics for these countries from Eurostat. Given the small size of these countries, this limitation is not expected to significantly affect the results.

Member State	Once a year	Twice a year	Three times a year	Four times a year	Five times a year	Six times a year	More than 6 times a year
DK	0%	0%	0%	0%	0%	0%	100%
DE	0%	0%	0%	0%	0%	0%	100%
EE	28%	3%	3%	3%	3%	10%	50%
IE	0%	0%	0%	0%	0%	0%	100%
EL	0%	0%	0%	0%	0%	0%	100%
ES	0%	0%	0%	0%	0%	0%	100%
FR	0%	0%	0%	0%	0%	0%	100%
HR	32%	9%	2%	2%	7%	5%	43%
IT	0%	0%	0%	0%	0%	0%	100%
CY	0%	0%	0%	0%	0%	0%	100%
LV	50%	30%	0%	0%	0%	0%	20%
LT	52%	4%	3%	8%	10%	17%	5%
LU	0%	0%	0%	0%	0%	0%	100%
HU	3%	1%	0%	0%	0%	0%	96%
MT	95%	5%	0%	0%	0%	0%	0%
NL	0%	0%	0%	0%	0%	0%	100%
AT	0%	0%	0%	0%	0%	0%	100%
PL	26%	11%	0%	0%	12%	7%	44%
PT	0%	0%	0%	0%	0%	0%	100%
RO	80%	6%	7%	2%	1%	1%	4%
SI	0%	0%	0%	0%	0%	0%	100%
SK	62%	3%	1%	0%	0%	0%	34%
FI	10%	10%	0%	0%	0%	0%	80%
SE	0%	0%	0%	0%	0%	0%	100%

Source: Survey of stakeholders undertaken for this study.

This data is extrapolated to the entire market on the basis of the fleet size of each Member State of establishment used in international operations. As explained in Section 4.2.3.1, these fleet figures represent vehicles used full-year on international operations (similar to the concept of Full Time Equivalent (FTE) for staff). They were estimated based on the total international vehicle-kilometres available from Eurostat and the average mileage of vehicles used in international operations from CNR reports, and subsequently adjusted according to the input provided by stakeholders via the data requests. In general, the input provided by stakeholders via the data requests led to an increase in the number of vehicles estimated.

The vehicles affected were estimated for each Member State and are presented in Table 7-3 below.

Table 7-3: Number of vehicles performing international assignments[36] directly affected by the provision in 2023 (in FTE)

Member State	Number of international vehicles (FTE) affected
BE	-
BG	22,188
CZ	-
DK	-
DE	-
EE	3,200
IE	-
EL	-
ES	-

Member State	Number of international vehicles (FTE) affected
FR	-
HR	2,410
IT	-
CY	-
LV	6,160
LT	18,185
LU	-
HU	1,976
MT	No data
NL	-
AT	-
PL	108,663
PT	-
RO	57,892
SI	-
SK	11,446
FI	374
SE	-
TOTAL	**232,494**

Source: Ricardo analysis

Modelling assumptions

Assumption: Operators not surveyed exhibit same truck cycle patterns as average of surveyed operators within the same cluster. To the extent possible, the figures were validated and/or adjusted on the basis of input provided by other stakeholders (industry associations, trade unions, drivers, national authorities).

7.5.2 *The potential (maximum) additional vehicle journeys that could be required due to the new provision*

For an affected operator, two additional journeys can be expected for each additional return in a given year for each vehicle affected.

The additional returns can be estimated based on the current frequency of the return of trucks that would need to return six times in a year. The additional returns in a year are therefore those in addition to the current frequency of return of the vehicle (Table 7-4).

Table 7-4: Current frequency of return, additional returns in a year per vehicle Additional journeys in a year per vehicle

Current frequency of return of the vehicle	Additional returns in a year per vehicle	Additional journeys in a year per vehicle
Once a year	5	10
Twice a year	4	8
Three times a year	3	6
Four times a year	2	4
Five times a year	1	2
Six or more times a year	0	0

Note: Assumes that the obligation will require six returns per year, minimum.

For the market as a whole, however, the additional returns might not all lead to additional journeys, as they can be offset by an adjustment in the existing journeys which take place in the baseline:

- If the operator is able to find a load to transport in those journeys, this could also represent a substitution of existing (bilateral) journeys, under the general assumptions of the scenarios where the same cargo (in tonnes) in the baseline would be transported in each scenario. This would be the case if the operator re-organising its operations would transport cargo that would have been transported via road in the baseline..
    - In practice, some of the additional journeys would displace only a share of the cargo already transported in the baseline. These additional journeys would be laden but, at the same time, the existing journeys would be carried out by vehicles carrying less cargo such that the overall volume of cargo transported in the market is the same.
- The loads transported by vehicles engaged in longer cycles could also be picked up by vehicles engaged in shorter cycles. As a result, the vehicles engaged currently in longer cycles might not need to undertake all those additional return journeys if they can undertake the same number of assignments together with vehicles operating shorter cycles. .
    - This was assessed in Section 4.2.3.1 on a qualitative basis. Given the complexity associated to the use of vehicles engaged in shorter and longer cycles, it was not possible to determine the extra capacity required to maintain the same level of activity and quantify the share of this capacity that could be met by vehicles operating shorter cycles in the baseline.

The number of additional journeys for the market as a whole is therefore dependent on whether these would be laden or empty. Additional laden journeys would be undertaken only if cargo could be displaced from other transport modes. The share of empty running in the potential additional journeys is covered in Section 7.5.5 below.

Modelling assumptions

Assumption: When the measure enters into force, current cycles that are longer than eight weeks would be split into shorter cycles of up to eight weeks each.

Assumption: The same vehicle type that is engaged in cycles longer of eight weeks will continue to be used in the shorter cycles of eight weeks after the measure enters into force.

Assumption: No additional journeys will be accounted if these are laden and displacing existing bilateral operations.

These assumptions might overestimate the impacts if the loads transported by vehicles engaged in longer cycles could also be picked up by vehicles engaged in shorter cycles. As a result, the vehicles currently engaged in longer cycles might not need to undertake the maximum potential additional return journeys.

7.5.3 *Type of response of operators to the new measure*

As discussed above, we can categorise operators into two types of responses:

- **Response A:** The same operator would carry out the same journeys as in the baseline, but their trucks would need to return to their operational centre every eight weeks.

- **Response B:** The assignments that could no longer be fulfilled in the same cycle would instead be undertaken by an operator/entity established in another Member State.

This is important to define because it will determine whether the Member State of establishment for the potential additional journeys remains the same (Reponses A) or not (Response B).

The share of Responses A and B varies with the scenario (Table 7-5):

- **Simple market compliance (SMC):** This reflects the case where all the operators would follow Response A identified above.
- **Partial market restructure (PMR):** This is constructed based on the likelihood of the response (A or B) of each operator according to the survey results.
- **High market restructure (HMR):** This reflects the case where all the operators would follow Response B identified above.

In the case of the **partial market restructure scenario**, the analysis of the survey results is presented in Section 4.1 above.

Table 7-5: Share of journeys by type of response

Scenario	Response A	Response B
	Operators will continue to be based in the same country as in the baseline	Long truck cycle operators will forgo some assignments, scale down operations in certain countries, relocate or open a new entity in another country
Simple market compliance (SMC)	100%	0%
High market restructure (HMR)	0%	100%
Partial market restructure (PMR)	40%	60%
West hauliers	47%	53%
East hauliers	40%	60%
South hauliers	-	-

Source: Ricardo analysis

Modelling assumptions

Assumption: Operators not surveyed will respond in a similar way as the average of surveyed operators within the same country (or cluster if no responses were received from a specific Member State). The fleet size of the operators is taken into account when extrapolating results from the survey sample to the entire population in each Member State (under the PMR scenario).

7.5.4 *The countries of departure and arrival of the truck for the additional vehicle journeys*

The country of arrival of the return journey of the vehicle is the Member State of establi

shment of its operator.

The countries of departure of the return journeys are determined based on the data from Eurostat on the most common countries of loading/unloading in cross-trade and cabotage operations for each Member State of establishment. The reasoning is based on the fact that if most of their activity takes place between/within those countries, there is a higher chance that their vehicles will be in those regions until they need to return as mandated by the new measure. The metric used to establish the ranking of countries of loading/unloading is tonnage.

Table 7-6 provides an overview of the countries of departure of the return journeys, grouped by cluster. The return journeys are distributed according to the shares calculated to determine the country of departure. There is no difference in the countries of departure identified between the scenarios considered.

Table 7-6: Share of journeys by area of departure for each area of establishment

	Area of departure		
Area of establishment	**West**	**East**	**South**
West	86%	1%	13%
East	78%	8%	14%
South	60%	0%	40%

Modelling assumptions

Assumption: Country of arrival of the vehicle is the Member State of establishment of its operator.

Assumption: Higher levels of activity between/within certain Member States for a given operator suggests that the vehicle will return from one of those Member States to the Member State of establishment of that operator.

Assumption: Tonnage is the selected metric to judge the combination of countries of departure for the additional return journeys.

7.5.5 *Share of empty running in potential additional vehicle journeys*

The share of empty running in potential additional vehicle journeys is crucial to determine whether the potential maximum journeys that could arise due to the provision will be in addition to those in the baseline.

It is assumed that if a truck is laden, its journey will be displacing existing journeys and therefore there is no effect on the market as a whole.

In the simple market compliance scenario, 100% empty running is assumed to represent the situation of hauliers not being able to find cargo for the additional journeys. In the market restructuring scenarios (PMR and HMR), it was assumed that the share of empty running in these journeys is below 100% as it is likely that hauliers would be relocating or scaling down operations to also minimise the level of empty running in additional journeys.

Under these two scenarios, the expected share of empty running in these journeys in 2023 were estimated based on stakeholder input and cross-checked with analysis done by Eurostat.

Overall, the responses from hauliers engaged in hire and reward operations and which undertake long truck cycles suggest that the level of empty running in the potential

additional vehicle journeys in 2023 can be quite substantial (Table 7-7), with those based in the West being more pessimistic about their ability to find a load (we also note this is based in a fewer number of responses compared to those based in the East which are more involved in longer truck cycles). Where there were data gaps, the average of the relevant EU cluster for these countries was assumed.

The literature on this is limited. A study undertaken by KPMG with input from Union of International Haulers from Bulgaria (KPMG, 2020) indicated that 46% of Bulgarian vehicles would be travelling empty in the return journeys (both directions) created due to the new provision. This estimate is in line with the input provided by Bulgarian hauliers to the survey undertaken for this study.

Table 7-7: Share of empty running in additional vehicle journeys in 2023, based on survey responses from affected hauliers

Member State of establishment	From	To
BE	87%	87%
BG	49%	56%
CZ	45%	48%
DK	87%	87%
DE	88%	88%
EE	29%	36%
IE	87%	87%
EL	87%	87%
ES	87%	87%
FR	87%	87%
HR	45%	48%
IT	87%	87%
CY	100%	18%
LV	16%	16%
LT	68%	77%
LU	87%	87%
HU	96%	96%
MT	100%	18%
NL	87%	87%
AT	87%	87%
PL	32%	35%
PT	87%	87%
RO	47%	54%
SI	45%	48%
SK	63%	38%
FI	90%	90%
SE	87%	87%

These estimates are applied to the relevant country pairs for the additional journeys: one of these countries is always the Member State of establishment, and the other is the relevant country of departure (as explained in the section above).

For certain country pairs, these figures have been adjusted based on two approaches.

Firstly, on the basis of Eurostat data on bilateral and cross-trade movements (in tonnes): for those country pairs for which there was no cargo being transported in 2019, it was assumed that all additional journeys in 2023 would also be empty.

Secondly, Eurostat was consulted to check how the estimates obtained based on stakeholder input and the abovementioned Eurostat data (publicly available) compared to their microdata on the level of empty running in journeys realised in 2019 between

country pairs. Although they were not expected to match as they provide information on a different basis (our estimates are for additional journeys in 2023 vs Eurostat data is for current average journeys), this consultation was important to understand how these two indicators compare and identify any significant deviations on these important assumptions for the study.

Overall, the estimates used in this study are higher than the current level of empty running in average journeys for the majority of country pairs, especially when the journeys are undertaken by hauliers based in the West (for which the Eurostat insights suggested that the differences were the highest). However, a few our estimates were actually lower than the current average empty journeys which would indicate a lower level of empty running in additional journeys compared to the market average. Some adjustments were made to the estimates based on these insights as it was assumed that the level of empty running in the additional journeys in 2023 would not be lower than the current market average.

7.5.6 *The country of establishment of the operator undertaking the additional vehicle journeys*

In the case of Response A in the simple market compliance and partial market restructure scenarios, the key assumption is that the same operator would undertake the same assignments as they would if the measure never entered into force.

In relation to the Response B in the partial and high market restructure scenarios, the new Member State of establishment of the operator will be different.

The new country of establishment is selected based on the countries where the operations of the affected hauliers take place as follows: for each new journey, this country of establishment will represent the country of arrival of the journey. The new country of establishment/arrival for the new journeys is assigned based on the results of the cost differentials model which provide the country of establishment for each country of departure of the new journeys.

In the cost differential model, the choice of the new Member State of establishment is based on minimising the return cost subject to a positive cost advantage (>0%). The assumption is that the new Member State of establishment will be primarily a new country different from the countries where most of the activity occurs (i.e., the countries of departure of the additional journeys identified above). Only when the cost differentials model does not provide an alternative, the new Member State of establishment is the country where this activity takes place.

A sensitivity analysis on this threshold is undertaken and presented in Annex 9.

7.6 Annex 6 – Average distances between MS pair

In order to understand the impacts of the additional journeys in terms of total emissions, the length of these journeys has been calculated based on the available Eurostat data. This was estimated using the total tonne-kilometres per Member State pair, and the total tonnage per Member State pair for bilateral and cross-trade movements. This represents actual distances travelled that reflect freight transport patterns, regardless of the location of registration of the vehicle that undertakes those operations. As a result of using real traffic flows[64], one direction of a flow (e.g. BE-IT) may not match the reverse direction of flow (e.g. IT-BE). This imbalance could be a result of a number of factors, including the reverse trips not always taking the same route. In the case where a distance exists in one direction but not the other, the distance for the existing direction is assigned as the distance of the non-existing direction.

Data was not available from Eurostat for each Member State pair as it only contains information where flows already exist today and those which are reported. As there may be market restructuring from the new measure, new freight corridors may appear between certain Member State pairs. In these cases, the distances were infilled using the TERCET NUTS2 distances[65]. The TERCET distances are based on fastest-route road distances between each location; as this is for both directions the distances may not be exactly equal between the two opposing directions. There are many distance pairs between each Member State in the TERCET database and so an average for each Member State pair was taken.

In a very minor number of cases (24 out of 959 total bilateral and cross-trade flows, 2.6%), the distance calculated using the Eurostat data was shorter than the minimum TERCET distance between the Member State pair. These outlier distances often included a waterborne leg (LV-SE, EE-SE) which may have had an effect on the reporting. In these cases, the movement was removed from the database and the distance recalculated for the Member State pair based on the remaining bilateral and cross-trade flows between them. This ensures that the distances presented in the matrix below are both representative of current flows (where they exist today) and feasible.

Table 7-8 below provides the distances used in the calculations for this study.

[64] Self-reported traffic flows taken from Eurostat which define place of loading as the first place where the goods road motor vehicle was loadedon to another mode of transport (usually a ship or a rail wagon), and the place of unloading as the last place where the goods road motor vehicle was unloaded from another mode of transport. https://ec.europa.eu/eurostat/cache/metadata/en/road_go_esms.htm; https://ec.europa.eu/eurostat/documents/3859598/8918419/KS-GQ-17-114-EN-N.pdf/d9d20cec-d12c-491c-bb35-4fcf0ba6f9e0?t=1527169093000

[65] https://gisco-services.ec.europa.eu/tercet/flat-files

Table 7-8: Average distance travelled by goods between MS pair in thousand kilometres, based on Eurostat data where flows exist, infilled with TERCET NUTS2 distances.

MS	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE
BE		2.26	1.05 *	0.92 *	0.38	2.18	0.88	2.68	1.57 *	0.30	1.35	1.19 *	3.88	1.86	1.88	0.17	1.41	2.49	0.16	0.92	1.22	2.01	1.77	1.21 *	1.40	2.21	1.21
BG	2.26		1.44	2.32	1.93	2.59	3.33	0.49	3.40	2.35	1.04	1.24	1.76	2.39	2.19	2.09	0.91	1.81	2.27	1.33	1.71	3.61	0.43	1.14	1.16	3.08	2.82
CZ	1.01	1.44		0.97	0.39	1.65	2.07	1.88	2.14	1.11	0.69	0.99	3.08	1.32	1.33	0.84	0.50	2.32	1.14	0.26	0.36	2.74	1.00	0.61	0.27	2.02	0.96
DK	0.83	2.33	0.98		0.39	1.37	1.98	2.77	2.62	1.61	1.66	1.89	3.97	1.47	1.41	1.00	1.54	2.96	0.75	1.24	0.97	2.84	2.06	1.49	1.27	1.39	0.47
DE	0.35	1.81	0.43	0.45		1.99	1.13	1.84	1.74	0.54	0.95	0.87	3.49	1.74	1.45	0.17	0.96	2.31	0.27	0.40	0.66	2.27	1.45	0.85	0.92	2.03	0.82
EE	2.18	2.60	1.65	1.47	1.96		3.21	3.26	3.97	2.70	2.20	2.79	4.35	0.31	0.58	2.17	1.86	3.84	2.03	1.94	0.92	4.07	2.06	2.08	1.58	0.25	0.60
IE	0.88	3.33	2.07	1.98	1.23	3.21		3.75	2.74	1.08 *	2.51	2.47 *	4.96	2.90	2.77	1.29	2.51	3.55	1.04 *	2.10	2.29	2.78	3.13	2.31	2.42	3.24	2.54
EL	2.67	0.48	1.87	2.75	1.76	3.25	3.74		3.75 *	1.82	1.40	0.86	2.09 *	2.96	2.75	2.50	1.36	1.74	2.19 *	1.74	1.98	3.97	1.11	1.54	1.61	3.67	3.25
ES	1.56 *	3.39	2.00	2.62	1.85	3.97	2.73	3.77		0.75	2.03	1.43	4.99	3.72	3.21	1.87	2.26	3.17	1.89 *	2.02	2.50	0.51	2.82	1.72	2.34	4.04	2.67
FR	0.30	2.34	1.14	1.17	0.52	2.70	1.08	1.79	0.71		1.45	0.76	3.95	2.43	2.33	0.21	1.47	2.30	0.53	1.03	1.50	1.58	1.99	1.29	1.47	2.79	1.41
HR	1.40 *	1.04	0.86	1.66	0.89	2.20	2.50	1.40	2.03	1.39		0.48	2.64	1.89	1.69	1.25	0.27	1.85	1.36	0.36	0.94	2.73	1.00	0.18	0.38	2.62	2.17
IT	1.24	1.34	1.00	1.89	0.85	2.79	2.47	0.89	1.36	0.78	0.50		3.19	2.33	2.13	0.77	0.87	1.20	1.36	0.49	1.45	2.18	1.44	0.37	1.01	3.13	1.90
CY	3.88	1.76	3.08	3.96 *	3.49 *	4.35	4.96	2.10 *	5.00	3.96	2.64	3.19		4.16	3.96	3.71	2.63	3.42	3.89	2.95	3.37	5.21	2.19	2.74	2.82	4.88	4.46
LV	1.86	2.40	1.32	1.48	1.65	0.32	2.90	2.96	3.44	2.43	1.89	2.35	4.16		0.22	1.85	1.56	3.53	1.57	1.62	0.78	3.75	1.82	1.77	1.28	0.53	0.57 *
LT	1.88	2.20	1.20	1.25	1.44	0.59	2.77	2.77	3.21	2.18	1.70	2.19	3.97	0.22		1.73	1.42	3.33	1.67	1.33	0.51	3.63	1.63	1.57	1.08	0.82	0.80
LU	0.15	2.09	0.84	1.00	0.22	2.17	1.30	2.50	1.87	0.19	1.25	0.90	3.71	1.86	1.73		1.20	2.27	0.32	0.88	1.21	1.97	1.89	1.03	1.18	2.26	1.56
HU	1.32	1.03	0.51	1.50	0.94	1.86	2.50	1.36	2.21	1.53	0.29	0.83	2.63	1.56	1.42	1.33		2.22	1.37	0.25	0.70	3.25	0.48	0.41	0.23	2.27	1.57
MT	2.49	1.81	2.32	2.96	2.31	3.84	3.55	1.76	3.17	2.30	1.85	1.20	3.42	3.53	3.33	2.27	2.22		2.63	1.98	2.76	3.39	2.10	1.81	2.37	4.19	3.49
NL	0.16	2.26	0.92	0.72	0.32	2.01	1.04 *	2.19	1.65	0.56	1.46	1.30	3.89 *	1.68	1.72	0.32	1.40	2.63		0.99	1.12	2.15	1.85	1.25	1.40	2.04	1.17
AT	1.03 *	1.33	0.26	1.23	0.41	1.93	2.10	1.75	2.00	1.06	0.40	0.52	2.95	1.62	1.33	0.88	0.29	1.98	1.00		0.72	2.44	0.95	0.27	0.34	2.31	1.42
PL	1.24	1.71	0.38	0.96	0.64	0.92	2.29	2.06	2.41	1.50	0.96	1.44	3.37	0.84	0.50	1.20	0.69	2.76	1.08	0.69		3.12	1.16	1.22	0.38	1.20	0.80
PT	1.99	3.61	2.74	2.84	2.22	4.06	2.77	3.98	0.52	1.52	2.73	2.12	5.21	3.75	3.62	1.97	3.25	3.39	2.04	2.44	3.12		3.62	2.53	3.02	4.11	3.41
RO	1.69	0.42	1.03	2.05	1.42	2.06	3.13	1.17	2.84	2.00	1.07	1.45	2.20	1.82	1.63	1.89	0.33	2.10	1.78	0.95	1.08	3.62		1.05	0.79	2.52	2.63
SI	1.24 *	1.14	0.69	1.49	0.84	2.08	2.31	1.54	1.77	1.24	0.22	0.32	2.74	1.77	1.57	1.04	0.45	1.81	1.24	0.22	1.17	2.53	0.89		0.64	2.50	2.01
SK	1.45	1.16	0.28	1.26	0.92	1.58	2.42	1.62	2.24	1.56	0.42	1.08	2.82	1.28	1.08	1.18	0.22	2.37	1.44	0.33	0.37	3.02	0.65	0.62		1.98	1.24
FI	2.22	3.28	2.15	1.45	2.03	0.29	3.25	3.91	4.04	2.80	2.85	3.14	5.03	0.60	0.82 *	2.26	2.61	4.19	2.04	2.43	1.22	4.11	2.83	2.69	2.37		0.55
SE	1.21	2.82	1.01	0.40	0.79	0.60 *	2.54	3.26	2.67	1.41	2.18	1.90	4.46	0.57	0.68	1.56	1.62	3.49	1.12	1.38	0.80	3.41	2.63	2.01	1.31	0.62	

** indicates where the calculation of the average distance based on Eurostat data has been adjusted based on a check against the minimum TERCET distance between the Member State pair*

7.7 Annex 7 – Emission factor development

7.7.1 Carbon Emission factor development

Using the total emissions (kt of CO_2) and road freight activity (vehicle-kilometre) from PRIMES-TREMOVE, an average emission factor was derived for each vehicle weight class for the modelled years 2020 and 2025 and extrapolated linearly to calculate the 2023 emission factors.

An EU27 average emission factor was used as the additional journeys arising from this new obligation will cross multiple Member States. Using an average factor for the EU27 will reflect average lengths of motorways, speed limits and topography across the EU.

The EU27 emission factor also represents the average fleet age in 2023 used in road freight transport. The survey results showed that typically newer (EURO VI standard) vehicles were used for international operations, regardless of the Member State of establishment. As such, the average emission factor for 2023 could be a slight overrepresentation of the fleet used for longer cycles, as the vehicles used in longer trips may be newer than the overall fleet average.

The key assumption in the analysis is that additional journeys are always empty, as explained in Section 4.2.3.4. For this reason, the average laden factors assumed by PRIMES-TREMOVE were adjusted to represent empty vehicles using the COPERT methodology to account for load factor (European Environment Agency, 1997). The emission factors per weight class for average laden and unladen are shown in Table 7-9 below.

Table 7-9: GHG emission factor per GVW class in 2023 (kgCO2/vehicle-kilometre), for EU27 average laden and unladen.

	GVW class				
EU27	<3.5	3.5 t - 7.5 t	7.5 t - 16 t	16 t - 32 t	> 32 t
Average laden	0.216	0.383	0.641	1.048	1.447
Empty/ unladen	0.177	0.314	0.526	0.859	1.186

Source: own interpolations based on PRIMES-TREMOVE and COPERT

The types of vehicles used in longer truck cycles described in Section 3.1.6 were combined with the unladed truck emission factors calculated from PRIMES-TREMOVE based on own interpolations to estimate an EU27 average emission factor for vehicles typically used in long cycles when unladen. For 2023, the emission factor is **1.150 $kgCO_2$ per vehicle-kilometre**.

7.7.2 Air pollutant Emission factor development

Air pollutant emissions were calculated following the EMEP tier 3 methodology. This utilised motorway speed emission curves from COPERT [66] to calculate hot exhaust emissions for NOx and $PM_{2.5}$. Other speed emission curves are available for Rural and Urban driving, but since the majority of truck driving is by motorway, using exclusively motorway speed curves was considered appropriate for this study. There are various speed emission curves available for a combination of vehicle variables:

1. Euro standard;
2. Load;
3. Vehicle type e.g. Rigid or Articulated truck; and
4. Gross vehicle weight (GVW) of vehicles.

[66] https://www.eea.europa.eu/publications/emep-eea-guidebook-2019/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/road-transport-appendix-4-emission/view

Bearing the above vehicle variables in mind, speed emission curves for 12 tonne rigid and >40 tonne articulated trucks with no load were assumed. Since all journeys included in emission calculations for this study are empty this is considered a suitable approach. The speed assumed for HGV was 72km/h for particulate emissions from brake and tyre wear and 72km/h for exhaust emissions for NOx and $PM_{2.5}$. In addition to the COPERT hot exhaust emissions, emission rates for particulate matter from brake and tyre wear were calculated using the EMEP tier 2 approach[67]. As there were small proportions of Euro IV and Euro V vehicles and other weight classes within the assessed fleet, the emission rates from Euro VI vehicles were scaled using the ratio between EMEP tier 2 emission factors for GWV and Euro standard combinations.

[67] https://www.eea.europa.eu/publications/emep-eea-guidebook-2019/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/1-a-3-b-vi/view

7.8 Annex 8 – Costs of additional journeys

Table 7-12: Additional costs of a (two-way) return journey to the Member State of establishment with respect to annual operating costs per vehicle of international operations (in %) per Member State pair (Member State of establishment in rows and Member State where the operations takes place in columns)

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE
BE	0.0	3.4	1.6	1.4	0.6	3.3	1.3	4.0	2.3	0.5	2.1	1.8	5.9	2.9	3.0	0.3	2.2	5.0	0.2	1.4	1.9	3.0	2.7	1.8	2.1	3.3	1.8
BG	3.4	0.0	2.2	3.4	2.9	3.9	5.1	0.7	5.0	3.4	1.6	1.8	2.7	3.8	3.6	3.2	1.4	2.9	3.3	2.0	2.7	5.4	0.7	1.8	1.7	4.7	4.3
CZ	1.4	2.1	0.0	1.4	0.6	2.4	3.1	2.7	3.0	1.6	1.0	1.4	4.5	2.0	2.1	1.2	0.7	3.7	1.6	0.4	0.6	4.0	1.5	0.9	0.4	2.9	1.4
DK	1.3	3.5	1.5	0.0	0.6	2.1	3.0	4.2	3.9	2.4	2.5	2.9	6.1	2.3	2.3	1.5	2.4	6.2	1.1	1.9	1.5	4.3	3.2	2.3	1.9	2.1	0.7
DE	0.5	2.7	0.7	0.7	0.0	3.0	1.7	2.7	2.6	0.8	1.4	1.3	5.3	2.7	2.3	0.3	1.5	4.2	0.4	0.6	1.0	3.4	2.2	1.3	1.4	3.0	1.2
EE	3.2	3.9	2.5	2.1	2.9	0.0	4.9	4.8	5.8	3.9	3.3	4.1	6.6	0.5	0.9	3.3	2.9	6.3	2.9	2.8	1.4	6.0	3.1	3.1	2.3	0.4	0.9
IE	1.3	4.9	3.1	2.9	1.8	4.8	0.0	5.5	4.0	1.6	3.8	3.6	7.4	4.5	4.4	1.9	3.8	6.7	1.5	3.1	3.5	4.1	4.7	3.5	3.6	4.8	3.8
EL	4.0	0.7	2.9	4.1	2.7	5.0	5.8	0.0	5.6	2.7	2.2	1.3	3.2	4.7	4.5	3.8	2.1	3.3	3.2	2.6	3.1	6.0	1.7	2.4	2.4	5.6	5.0
ES	2.4	5.1	3.1	3.9	2.8	6.1	4.2	5.6	0.0	1.1	3.1	2.2	7.7	5.9	5.3	2.9	3.5	5.8	2.8	3.0	4.0	0.8	4.4	2.7	3.5	6.1	4.1
FR	0.5	3.6	1.8	1.8	0.8	4.2	1.7	2.7	1.1	0.0	2.2	1.2	6.1	3.9	3.8	0.3	2.3	4.5	0.8	1.6	2.4	2.4	3.1	2.0	2.2	4.3	2.2
HR	2.0	1.5	1.3	2.4	1.3	3.3	3.7	2.0	2.9	2.0	0.0	0.7	4.0	3.0	2.8	1.9	0.4	3.0	1.9	0.5	1.5	4.0	1.5	0.3	0.5	3.9	3.2
IT	1.9	2.0	1.5	2.8	1.3	4.2	3.8	1.3	2.0	1.2	0.8	0.0	4.9	3.7	3.4	1.2	1.3	2.3	2.0	0.7	2.3	3.3	2.2	0.6	1.5	4.7	2.9
CY	5.7	2.6	4.7	5.8	5.2	6.5	7.4	3.1	7.3	5.7	4.0	4.7	0.0	6.4	6.3	5.6	4.0	6.3	5.6	4.3	5.2	7.7	3.3	4.1	4.2	7.2	6.6
LV	2.6	3.4	1.9	2.1	2.3	0.5	4.2	4.1	4.8	3.3	2.7	3.3	6.0	0.0	0.3	2.7	2.3	5.4	2.2	2.3	1.2	5.3	2.6	2.6	1.8	0.8	0.8
LT	2.5	3.0	1.7	1.7	2.0	0.8	3.8	3.7	4.3	2.9	2.4	2.9	5.5	0.3	0.0	2.4	2.0	5.0	2.2	1.8	0.7	4.9	2.3	2.2	1.5	1.1	1.1
LU	0.2	3.1	1.3	1.5	0.3	3.2	2.0	3.7	2.7	0.3	1.9	1.3	5.6	2.9	2.7	0.0	1.8	4.3	0.5	1.3	1.9	2.9	2.8	1.6	1.7	3.4	2.3
HU	1.9	1.5	0.8	2.1	1.4	2.7	3.7	1.9	3.2	2.2	0.4	1.2	3.9	2.4	2.2	2.0	0.0	3.6	1.9	0.4	1.1	4.7	0.7	0.6	0.3	3.3	2.3
MT	3.8	2.8	3.7	4.4	3.5	5.9	5.5	2.7	4.8	3.4	2.9	1.8	5.3	5.7	5.5	3.5	3.5	0.0	3.9	3.0	4.4	5.2	3.3	2.8	3.6	6.4	5.4
NL	0.2	3.5	1.4	1.1	0.5	3.1	1.6	3.3	2.5	0.8	2.3	2.0	6.0	2.7	2.8	0.5	2.2	5.5	0.0	1.5	1.8	3.3	2.9	1.9	2.1	3.1	1.8
AT	1.6	2.0	0.4	1.8	0.6	2.9	3.2	2.6	3.0	1.6	0.6	0.8	4.5	2.6	2.2	1.3	0.5	3.8	1.5	0.0	1.1	3.7	1.5	0.4	0.5	3.5	2.2
PL	1.7	2.4	0.6	1.3	0.9	1.3	3.3	2.9	3.4	2.1	1.4	2.0	4.9	1.3	0.8	1.7	1.0	4.3	1.5	1.0	0.0	4.4	1.7	1.8	0.5	1.7	1.1
PT	3.0	5.4	4.2	4.2	3.3	6.2	4.2	5.9	0.8	2.2	4.2	3.1	7.9	5.9	6.0	3.0	5.1	5.9	3.0	3.6	4.9	0.0	5.5	3.9	4.5	6.2	5.1

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE
RO	2.5	0.6	1.6	2.9	2.1	3.0	4.7	1.7	4.1	2.8	1.6	2.1	3.3	2.9	2.7	2.8	0.5	3.2	2.5	1.4	1.7	5.3	0.0	1.6	1.1	3.7	3.9
SI	1.8	1.7	1.0	2.1	1.2	3.1	3.5	2.2	2.6	1.8	0.3	0.5	4.1	2.8	2.5	1.6	0.7	3.0	1.8	0.3	1.8	3.7	1.3	0.0	0.9	3.7	3.0
SK	2.2	1.7	0.4	1.9	1.4	2.4	3.7	2.4	3.3	2.3	0.6	1.6	4.3	2.0	1.8	1.8	0.3	4.1	2.1	0.5	0.6	4.5	1.0	1.0	0.0	3.0	1.9
FI	3.3	4.9	3.3	2.1	3.0	0.4	4.9	5.8	6.0	4.1	4.3	4.7	7.6	0.9	1.3	3.4	4.0	7.9	3.0	3.6	1.9	6.1	4.3	4.1	3.5	0.0	0.8
SE	1.8	4.2	1.5	0.6	1.2	0.9	3.9	4.8	4.0	2.1	3.3	2.8	6.7	0.9	1.1	2.4	2.5	6.4	1.6	2.0	1.2	5.1	4.0	3.0	1.9	0.9	0.0

7.9 Annex 9 – Sensitivity analysis on approach to select new Member State of establishment

7.9.1 Overview of the approach

The approach applied to determine the new Member State of establishment affects the results from the two market restructuring scenarios: PMR and HMR. In these scenarios, a change in the Member State of establishment may represent:

- A situation where hauliers relocate to another country to mitigate the cost disadvantage brought by the additional journeys arising from the provision.
- A situation where the operation is undertaken by a different haulier established in another country as they would be more competitive after the introduction of the provision.

For both cases representing a likely change to the Member State of establishment[68], the approach identifies whether the new country of establishment would be the country where these assignments take place (i.e. host country) or a nearby country offering a cost advantage. In the latter case, the approach also identifies which nearby country is more likely to be the new Member State of establishment. This assessment is done using the cost differentials model.

The cost differentials model estimates the cost advantage of hauliers operating in different EU Member States (see Annex 5 for more details on the methodology). The cost advantage is defined purely on differences in operating costs (i.e. labour, fuel, vehicle possession/financing, maintenance, insurance, taxes and charges, etc.). There are however other factors that may affect the relative competitive position of hauliers (beyond their operating cost advantage) which are not captured by this model. In addition, the cost differential model does not consider relocation costs (e.g. investments in new operational centres or increased overhead costs). In this sense, the cost differential model does not aim to fully explain (or determine) the baseline location equilibrium or the relocation decision as a result of the measure. Rather, the model is used to assess the extent to which a change of Member State of establishment affects the costs of return journeys and the relative operating cost advantage with respect to domestic operators.

Overall, the scenarios provide an assumption on the level of relocation of activities (as per footnote 68) while the cost differentials model provides an assessment of the likely Member State of choice for such a relocation.

The selection of the new Member State of establishment is based on the assumption that the new location allows hauliers to minimise the costs of return journeys (i.e. by moving the country of establishment to a closer location) as long as they can keep a sufficient cost advantage[69] compared to domestic operators (i.e., established in the country where the operations take place).

When there is no country meeting such conditions according to the cost differentials model, it is assumed that the new country of establishment will be the host Member State for the transport operation (i.e., where the operations take place). This considers the fact that establishing in the host country brings also advantages over third countries that cannot be captured within the model (e.g. accessibility, market knowledge, etc.) and hence it is the default option where no other country meets the cost advantage conditions.

[68] In the case of HMR scenario, this includes all the affected operations. In the PMR scenario, this is determined according to the survey responses. More details are provided in Annex 5.

[69] This sensitivity analysis examines variations to the "sufficient" level of cost advantage

The approach is sensitive to the definition of a sufficient level of cost advantage. A minimum threshold for the cost difference between each Member State of establishment and the host Member State needs to be set in that respect. Only countries that have a cost advantage with respect to the host Member State over the threshold will be eligible to be the new Member State of establishment.

The scenarios and their results presented in the main report are based on a **positive cost advantage (i.e., threshold is >0%)**. This reflects the case where hauliers would be willing to move to a nearby country as long as they can keep even a minimum competitive position (determined in terms of their operational costs only) compared to the domestic hauliers established in the host country[70]. The advantage of establishing in the host Member State over a nearby Member State is marginal and, therefore, the new Member State will be as close as possible to the host Member State if this leads to a positive cost advantage.

By favouring the selection of a nearby country (as the threshold is set to achieving a minimum cost advantage), this threshold avoids the situation where the new Member State of establishment would generally be the host Member State. The current high level of cross-trade and cabotage operations in the West undertaken mostly by East-based hauliers suggests that these Eastern European hauliers may be willing to preserve a cost advantage to the extent possible by moving to a closer location (at least for some market segments).

7.9.2 *Sensitivity analysis*

To understand the effect of this threshold assumption, this annex provides the results of a sensitivity analysis based on a higher threshold, i.e., hauliers would have to maintain a more significant cost advantage to move to a neighbouring country instead of the host Member State of the transport operations.

In the baseline, the average cost advantage of Eastern European hauliers (i.e., those most affected by the new provision) with respect to domestic Western European hauliers (i.e., those located in the countries where most of the affected operations, i.e., cross-trade and cabotage, take place) is 33%. This cost advantage is associated to a 'baseline equilibrium" for the current allocation of operations to Member State of establishment[71].

Setting the threshold at 33% represents a situation where the new Member State of establishment would be a nearby country only if hauliers can maintain the cost advantage of the "baseline equilibrium". Otherwise, the assignments will be undertaken by a domestic haulier (or relocated from the Eastern European Member State to the host Member State). This threshold assumes that the relocation to the host Member State is more beneficial unless the baseline advantage can be maintained. However, moving to the host country would mean a loss of the cost advantage.

Unlike the 0% threshold scenarios, this threshold represents cases where hauliers move to a different Member State (other than the host Member State) when the cost difference with respect to the original location is not marginal. As an example, under the 33% threshold scenario, a Bulgarian haulier may relocate to the Czech Republic to undertake assignments in France (as Czech Republic offers a significant cost advantage wrt France). However, operations in Germany that Eastern European hauliers forgo would be

[70] As indicated above, this also includes the situation where another haulier takes on the operations. In this case, the approach determines the country of establishment of this haulier – the country will be one near the host country (i.e., where operations take place) as long as the hauliers from the former country have a cost advantage over the hauliers from the latter country; otherwise the hauliers from the host country take on the operations. For simplicity, we refer to the other case in the main text.

[71] It should be noted however that this is an over-simplification of reality, as it is not the case that the whole market is exactly in equilibrium.

undertaken by hauliers established in Germany as there is no nearby country retaining a cost advantage equivalent to that of the baseline.

7.9.3 *Impact on transport activity and emissions*

Considering the 33% threshold, 561,000 and 370,000 additional journeys could be created, under the PMR and HMR scenarios, respectively. These would all originate in the East. This represents a 45% and a 67% decrease, respectively, in the number of additional journeys compared to the two scenarios on the basis of the 0% threshold. It reflects the fact that, with a higher threshold, more hauliers would be established in the host country and thereby no additional journeys would be created for those (because cabotage and cross-trade operations would become domestic and bilateral operations, respectively). The effect of the change in the threshold is more pronounced in the HMR scenario because there is a higher share of operators whose adaptation to the new provision is expected to lead to a change in the Member State of establishment.

In terms of vehicle kilometres, the effect is smaller: an increase of 631 million and 304 million vehicle kilometres could be observed, under the PMR and HMR scenarios, respectively for a 33% threshold. This represents a 11% and a 30% decrease, respectively, in vehicle kilometres compared to the two scenarios on the basis of the 0% threshold. The change is smaller because the new Member States of establishment are all in the East if considering the 33% threshold, unlike in the 0% threshold where these are likely to be located in central Europe, including many Western European countries and a smaller number of Eastern European countries which are not located in the outer periphery. As a result, the average distance travelled would be higher for the 33% threshold and, thus, vehicle kilometres do not decrease by as much as the number of additional journeys.

Given the linearity between distance travelled and the resulting emissions, the effects are similar in terms of CO_2, NO_x and $PM_{2.5}$ emissions. Compared to the 0% threshold, emissions would be 11% and a 30% lower under the PMR and HMR scenarios, respectively, as indicated in the Table 9-1.

Table 9-1: Summary of main impacts of the scenarios on transport activity and the environment

Scenarios	PMR (Assuming 0% threshold)	PMR (Assuming 33% threshold)	HMR (Assuming 0% threshold)	HMR (Assuming 33% threshold)
Impact on number of journeys created (in thousands)	1,016	561	1,137	370
Impact on vehicle-kilometres (in millions)	706	631	436	304
Impact on CO_2 emissions (in thousand tonnes)	810	724	500	349
Impact on NO_x emissions (in tonnes)	173	154	107	75

Scenarios	PMR (Assuming 0% threshold)	PMR (Assuming 33% threshold)	HMR (Assuming 0% threshold)	HMR (Assuming 33% threshold)
Impact on $PM_{2.5}$ emissions (in tonnes)	62	55	38	27

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