TØI report 1487/2016

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Internationalisation in road transport of goods: safety outcomes, risk factors and measures

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ISSN 0808-1190
ISBN 978-82-480-1296-2 Elektronisk versjon
Oslo, May 2016

Title:	Internationalisation in road transport of goods: safety outcomes, risk factors and measures	**Tittel:**	Internasjonalisering i godstransport på veg: sikkerhetskonsekvenser, risikofaktorer og tiltak
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Date:	05.2016	**Dato:**	05.2016
TØI report:	1487/2016	**TØI rapport:**	1487/2016
Pages	178	**Sider**	178
ISBN Electronic:	978-82-480-1296-2	**ISBN Elektronisk:**	978-82-480-1296-2
ISSN	0808-1190	**ISSN**	0808-1190
Financed by:	The Research Council of Norway	**Finansieringskilde:**	Norges forskningsråd
Project:	3879 - Increasing foreign actors in road and sea transport of goods in Norway	**Prosjekt:**	3879 - Increasing foreign actors in road and sea transport of goods in Norway
Project manager:	Tor-Olav Nævestad	**Prosjektleder:**	Tor-Olav Nævestad
Quality manager:	Rune Elvik	**Kvalitetsansvarlig:**	Rune Elvik
Key words:	Cabotage Foreign drivers Internationalisation Measures Risk Risk factors Road transport of goods	**Emneord:**	Godstransport på veg Internasjonalisering Kabotasje risiko Risikofaktorer Tiltak Utenlandske sjåfører

Summary:
The present study uses several methods to examine safety outcomes, risk factors and measures associated with increasing internationalization in road transport of goods. A literature review indicates that drivers of foreign heavy goods vehicles (HGVs) generally have twice the risk of domestic drivers. Analysis of Norwegian accident data indicates that in comparison with Norwegian HGVs, foreign HGVs have three times the risk of being involved in a single vehicle accident, twice the risk for a head-on collision, and nearly twice the risk of a collision with a vehicle driving in the same direction. We conclude that two risk factors in particular seem to be important: (1) experience with/competence on Norwegian roads and (2) winter driving. We highlight six measures that seem to be important for transport safety of foreign actors.

Sammendrag:
Denne studien bruker flere metoder for å undersøke sikkerhetskonsekvenser, risikofaktorer og tiltak i forbindelse med økende internasjonalisering i godstransport på veg. En litteraturstudie viser at utenlandske sjåfører av tunge godsbiler generelt har dobbelt så stor risiko som innenlandske sjåfører. Analyser av norske ulykkesdata viser at utenlandske tunge godsbiler har tre ganger høyere risiko for å bli involvert i eneulykker, dobbelt så stor risiko for møteulykker, og nesten dobbelt så stor risiko for kollisjon med et kjøretøy som kjører i samme retning, som norske tunge godsbiler. Vi konkluderer med at særlig to risikofaktorer synes å være viktige: (1) Erfaring med og kompetanse på å kjøre på norske veger og (2) Vinterkjøring. Vi foreslår særlig seks tiltak som synes å være viktige for å øke transportsikkerheten til utenlandske aktører i Norge.

Language of report: English

This report is available only in electronic version.

Rapporten utgis kun i elektronisk utgave.

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Preface

This report is part of a larger research project "Safe Foreign Transport", which lasts from January 2013 to April 2016. The project is funded by the TRANSIKK program of the Norwegian Research Council. Our contact persons at the Research Council of Norway have been Lise Johansen and Mette Brest Jonassen. The aims of the project have been to assess the effect on accident risk of the increasing shares of foreign actors in road and sea transport of goods in Norway; and to provide a scientific knowledge base that Norwegian authorities can use to develop measures to reduce any increased risk identified. Information on the project: «Safe Foreign Transport» can be obtained on the website: www.toi.no/SAFT.

The study is based on accident databases from the Accident Analysis Groups (AAG) of the Norwegian Public Roads Administration (NPRA), Statistics Norway's (SN) database of police reported personal injury accidents, a literature review, 11 interviews with 12 sector experts, field work in rest stops and at a heavy vehicle inspection, a small-scale survey involving Norwegian and foreign drivers of heavy goods vehicles, data from NPRA inspections of heavy vehicles in recent years, and data from towing companies.

We are very grateful to the 12 sector experts who shared their knowledge and views with us in the qualitative interviews. We are also very grateful to the foreign and Norwegian HGV drivers who answered our surveys, and the inspection personnel who let us participate in the heavy vehicle inspection. We appreciate that we have been granted access to the accident data from AAG and SN. We are also very thankful to Arnfinn Eriksen at the NPRA, for providing us with data from heavy vehicle inspections, and for answering our questions about them. We are also very thankful to Fredrik Bergmann at Falck Redning AS for providing us with statistics on towing assistance given to Norwegian and foreign HGVs.

Several people have read and commented earlier versions of this report, and answered our questions during the project period. We are very thankful for their kind and informative assistance. We are also grateful to the members of the reference group of the project, who gave us valuable feedback in a meeting in February 2014. We hope that we have been able to consider all comments.

Tor-Olav Nævestad has written the report with help from Ross Phillips. Phillips has conducted the analyses of AAG-data. Gunhild Meyer Levlin has been involved in survey development, collected survey data from the foreign HGV drivers and written field work notes. Nævestad has conducted analyses of the personal injury data from SN, analysed the small-scale survey data, conducted the literature review, conducted the interviews and the inspection-site field work. Inger Beate Hovi has estimated the vehicle kilometres of foreign and Norwegian HGVs that we use in the risk calculations, and has contributed in different phases throughout the project.

Rune Elvik is responsible for the quality assurance of the report, while Trude Kvalsvik has prepared the report for publication.

Oslo, April 2016
Institute of Transport Economics

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Managing director

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Senior research officer

Content

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Norwegian Centre for Transport Research

Summary:

Internationalisation in road transport of goods: safety outcomes, risk factors and measures

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Oslo 2016, 178 pages English language

The present study uses several methods to examine safety outcomes, risk factors and measures associated with increasing internationalisation in road transport of goods. A literature review indicates that foreign heavy goods vehicles (HGV) drivers generally have twice the risk of domestic drivers. Analysis of Norwegian accident data indicates that in comparison with Norwegian HGVs, foreign HGVs have three times the risk of being involved in a single vehicle accident, twice the risk for a head-on collision, and nearly twice the risk of a collision with a vehicle driving in the same direction. Foreign professional drivers in Norway also seem more likely to trigger fatal accidents than Norwegian drivers. Based on our data, we conclude that two risk factors in particular seem to be important: (1) experience with/competence on Norwegian roads and (2) winter driving. Norwegian roads may be challenging for foreign drivers, e.g. regions with roads of a poorer standard than those normally found on the European continent, and hilly terrain (steep gradient). Foreign HGV drivers have higher risk in the west, central and north regions of Norway, where roads are more demanding. Results also indicate that compared to foreign drivers, Norwegian HGV drivers are better equipped, have more competence for and mastery of winter driving. Norwegian drivers also have a lower perception of risk related to winter driving. We highlight six measures which seem to be important for transport safety of foreign actors: 1) *Increase heavy vehicle inspections,* 2) *Education/information on winter driving and Norwegian road conditions aimed at foreign drivers,* 3) *Clarify (and increase) the responsibilities of transport buyers,* 4) *Expand the authority of the NPRA, 5) Change the sanctioning opportunity from police reports to fines and 6) Increased cooperation between domestic authorities.*

Background and aims

The European Union (EU) promotes a gradual lifting of restrictions on foreign hauliers involved in domestic road transport of goods (cabotage), and a major deregulation was scheduled in 2014. Due to complaints from several member states facing competition from new EU-countries with lower labour costs, this process was postponed. An important aspect related to such deregulation includes potential consequences for transport safety and accident risk factors.

A liberalization of the current road cabotage rules may further increase the share of foreign heavy goods vehicles (HGVs) on Norwegian roads, and previous research indicates that HGVs registered in foreign countries have up to 2.5 times higher accident risk than Norwegian HGVs on Norwegian roads (Nævestad, Hovi, Caspersen & Bjørnskau 2014). Little is however known about the causes of the differences in accident risk between different national groups.

The aims of the present study are to:

1) Examine safety outcomes of increasing internationalisation in (Norwegian) road transport of goods
2) Discuss the importance of potential risk factors.
3) Discuss potential measures to further increase the safety of road transport of goods.

The study is part of a larger research project aiming to assess the effect on accident risk of the increasing shares of foreign actors in road and sea transport of goods in Norway; and to provide a scientific knowledge base that Norwegian authorities can use to develop measures to reduce any increased risk identified. Information on the project: «Safe Foreign Transport» (SAFT) can be obtained on the website: www.toi.no/SAFT. The project is funded by the TRANSIKK program of the Norwegian Research Council.

Multi-method approach

The study employed five different methods to generate data needed to meet each of the three main study aims:

1) *Analysis of accident data*. We studied fatal accidents analysed by the Accident Analysis Groups (AAG) of the National Public Road Authority (NPRA), and accidents from Statistics Norway's (SN) database of police reported personal injury accidents to examine what kind of accidents foreign hauliers are involved in, and risk factors related to these accidents.

2) *Literature review*. We conducted a literature review on safety outcomes, risk factors and measures. The literature review included 25 studies that were relevant to at least one of the three aims of the study listed above.

3) *Qualitative interviews*. We conducted 11 qualitative interviews with 12 sector experts representing employers, employees and authorities, again to inform each of the three aims of the study.

4) *Field work*. We conducted field work with foreign drivers in Norway at various driver rest stops, terminals and parking lots, and with regulatory personnel and drivers involved in heavy vehicle inspections at an NPRA checkpoint.

5*) Small-scale survey*. We conducted a small-scale survey comparing foreign drivers from Central and Eastern Europe (CEE) (N=52), and Western Europe (WE) (N=17) with Norwegian drivers (N=61) and a second group of Norwegian II (N=224) drivers from three companies with good safety cultures. Foreign drivers were recruited at rest stops, while Norwegian drivers (N=61) were recruited through websites. The group of WE drivers was unfortunately too small to be useful for drawing any solid conclusions.

We also draw on NPRA inspection results and statistics from towing companies.

Foreign drivers have twice the risk of domestic drivers

In the literature review, we found eight studies indicating that the HGV accident risk varies by a factor of up to ten in European countries, and that the accident risk of foreign HGVs is approximately two times higher than that of domestic HGVs in the

studied European countries. Thus, it seems that increased internationalisation of road transport of goods in Norway has the potential to increase the number of HGV accidents. It must be noted, however, that Germany has a relatively low HGV related fatality risk (AECOM 2014), despite having probably the highest share of transport with foreign HGVs in Europe (35 %). Future studies of this issue should therefore compare risk and risk factors of foreign and domestic HGVs in Germany.

Analysis of AAG data from 2010-2013 indicates that 17 % of the professional drivers involved in fatal accidents in Norway (N=230), had a foreign nationality (while they account for 6 % of the travelled HGV kilometres in Norway). Results also indicate that foreign professional drivers in Norway seem to be more likely to trigger fatal accidents than Norwegian drivers (Figure S.1).

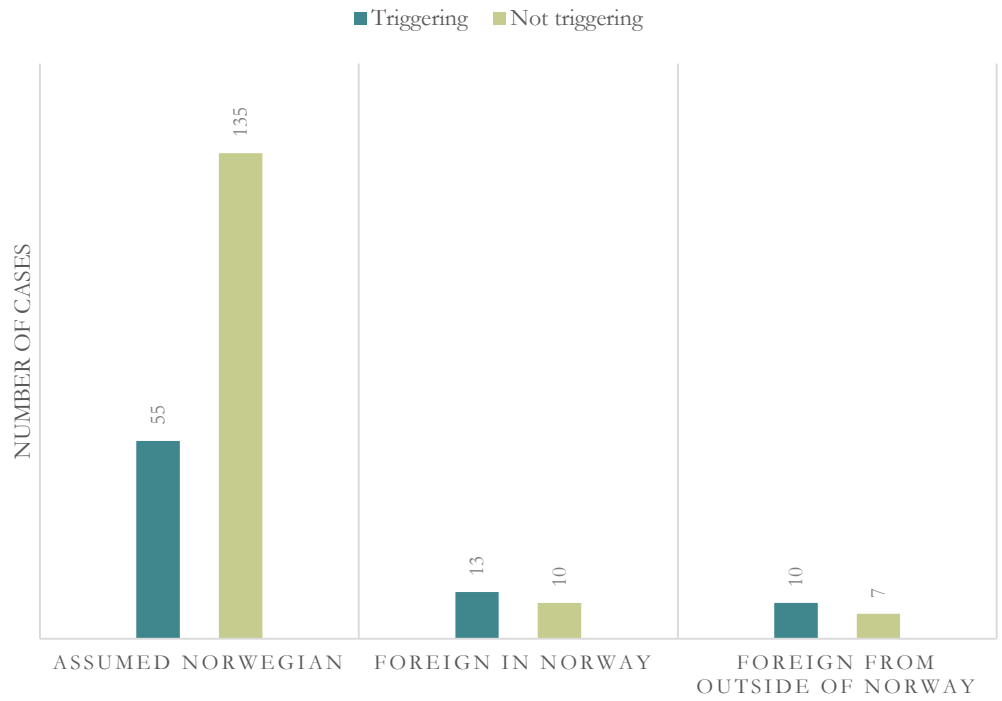


Figure S.1 Number of Norwegian and foreign professional drivers involved in fatal accidents on Norwegian roads between 2010 and 2013 who drove a vehicle classified by AAG as triggering.

Less than a third (29 %) of the Norwegian professional drivers drove "triggering" vehicles but more than half (58 %) of the foreign drivers did so. Of the 40 foreign professional drivers, 35 drove HGVs, while 5 drove buses. The drivers classified as "Foreign in Norway" have driven regularly in Norway for at least 10 years preceding the accidents.

Analysis of police reported traffic accidents with personal injuries from 2007-2012 indicates that Norwegian and foreign drivers also have a different risk of being involved in different accident types (Figure S.2).

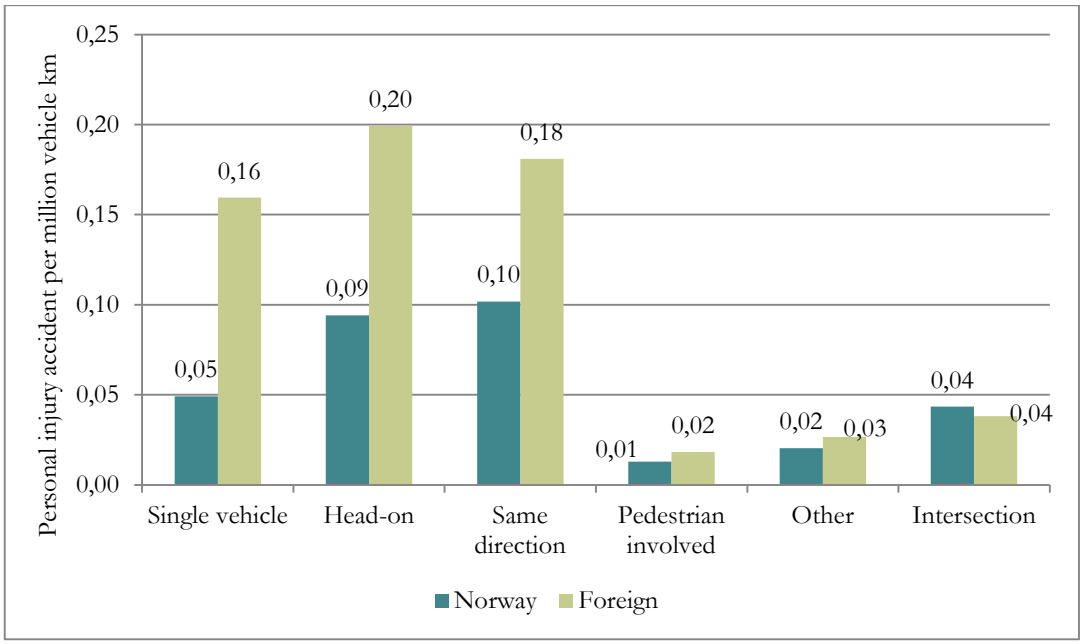


Figure S.2 The risk of different accident types for Norwegian (N=3320) and Foreign HGVs (396) involved in police reported traffic accidents with personal injury in Norway 2007-2012.

Foreign HGVs have a three times higher accident risk of single vehicle accidents than Norwegian HGVs, twice the risk of head-on collisions, and nearly twice the risk of collisions with vehicles driving in the same direction. The risk of being involved in intersection collisions is similar for Norwegian and foreign HGVs, probably because Norwegian HGVs have a higher share of their driving in densely populated areas with more intersections, while foreign HGVs have a higher share of their driving on main roads. Only the differences between Norwegian and foreign HGVs' risk of single vehicle accidents, head-on accidents and accidents with vehicles driving in the same direction are statistically significant (at the 5 % level).

Risk factors

We identify 12 potential risk factors related to internationalisation of the haulier industry in Norway, based on previous research and interviews: 1) winter driving, 2) drivers' transport safety behaviours, 3) company follow up of drivers' transport safety behaviours, 4) safety culture, 5) organization of transport assignments, 6) safety management, 7) competence, training and experience, 8) technology and equipment, 9) economy, competition and pay, 10) rules and enforcement, 11) working hours and fatigue and 12) the road and road environment. We are unable to conclude on the importance of several of these risk factors, either because we have not measured the relative importance of these risk factors in our survey, or because results from the different methods that the study employs diverge. Nevertheless we can say that two risk factors seem to be important: (1) experience with/competence on Norwegian roads and (2) winter driving.

Experience with and competence for Norwegian roads/conditions

According to the results of the literature review, Norwegian roads may be challenging for foreign drivers, e.g. regions with roads of a poorer standard (e.g. narrow, many

curves) than those normally found on the European continent, and hilly terrain (steep gradient).

In line with the assumption that the Norwegian road network is demanding for foreign drivers, previous research (Nævestad et al 2014) indicates that HGVs from non-Scandinavian countries have a three times higher accident risk than Scandinavian vehicles in the western, central and northern regions of Norway (where the roads are more challenging). HGVs from non-Scandinavian countries have twice the risk of accidents in western/central/northern Norway that they have in the south/east. In comparison there is little difference between accident risks for Scandinavian HGVs in these two parts of the country. Thus, we may assume that it is more difficult for foreign drivers to drive in some parts of Norway, perhaps because they lack the experience and competence of Norwegian drivers.

Interviewees underlined that Norwegian road conditions place strong demands on (foreign) drivers' competence. Driving safely is strongly dependent on driver' experience, which allows them to judge situations correctly, evaluate risks and adapt their speed to conditions. Because of their experience, the Norwegian drivers are able to recognize dangerous situations and judge risks correctly.

For the foreign drivers, on the other hand, the Norwegian roads may come as a surprise, interviewees suggested. Driving in hilly terrain requires a lot of driver competence and experience, for instance related to using motor brakes and adaptation of speed. Being foreign to the Norwegian road conditions, with varying standards and sometimes poor roads, is a disadvantage in itself, because you do not know what to expect, or how to adapt to the conditions.

In the small-scale survey we included a question to compare drivers' competence on winter loading by asking them to respond to the statement: "In the winter, I load the trailer so that I get maximum weight on the driving axle" (Figure S.3).

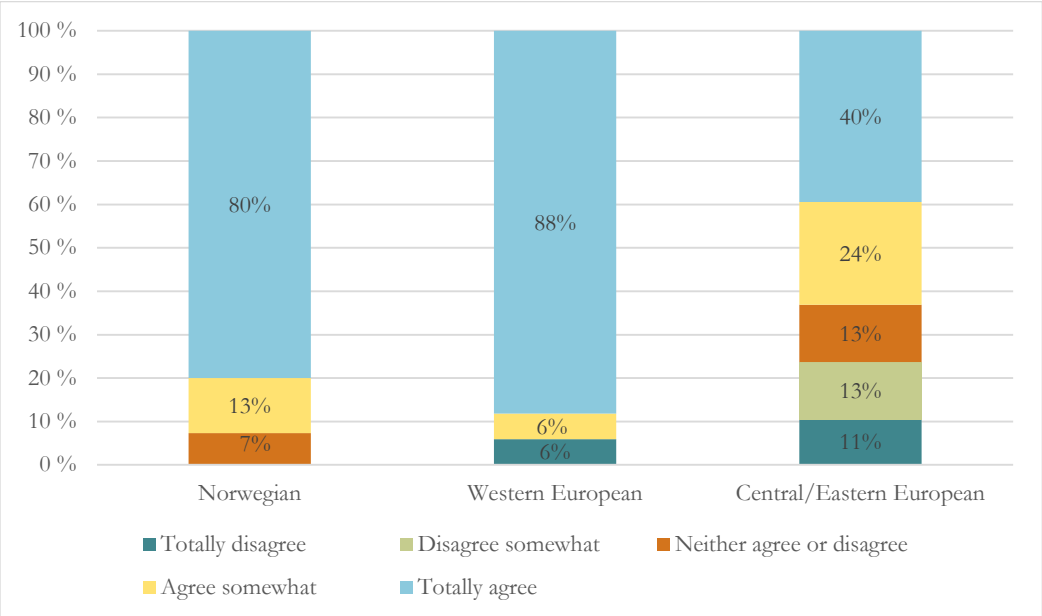


Figure S.3 National groups' distributions of answers to the statement: «In the winter, I load the trailer so that I get maximum weight on the driving axle" Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=45).

80 % of the Norwegian and 88 % of the WE drivers correctly agreed with the statement, while only 40 % of the CEE drivers did. This indicates that the former groups have a better competence on loading for winter conditions.

Winter driving

Analysis of personal injury accident data indicates that a greater share of accidents involving HGVs from non-Scandinavian countries occur in the winter (62 %) than those involving HGVs from Scandinavian countries (53 %). In addition, HGVs from non-Scandinavian countries (38 %) have a greater proportion of their accidents on road surfaces with ice/snow/slippery conditions than the Scandinavian (29 %) vehicles have. This may indicate that foreign HGVs have a higher accident risk in the winter than Norwegian HGVs.

Interviewees agreed that winter driving is the main safety challenge related to foreign drivers in Norway. This challenge is multi-faceted. Foreign HGVs are less suited to Norwegian winter conditions as they often have two axles, providing them with a poorer grip than three axle HGVs, which can lift the rear "boggi" axle and increase the weight on the driving axle. Winter equipment (tyres, snow chains) has previously been a challenge, but it seems that this situation has improved.

Results indicate that, given their different exposure to winter roads, it seems that foreign drivers and especially drivers from CEE have a higher risk of being in need of towing assistance when driving on Norwegian winter roads than Norwegian drivers.

In the small-scale survey, we examined several aspects of winter driving (Figure S.4).

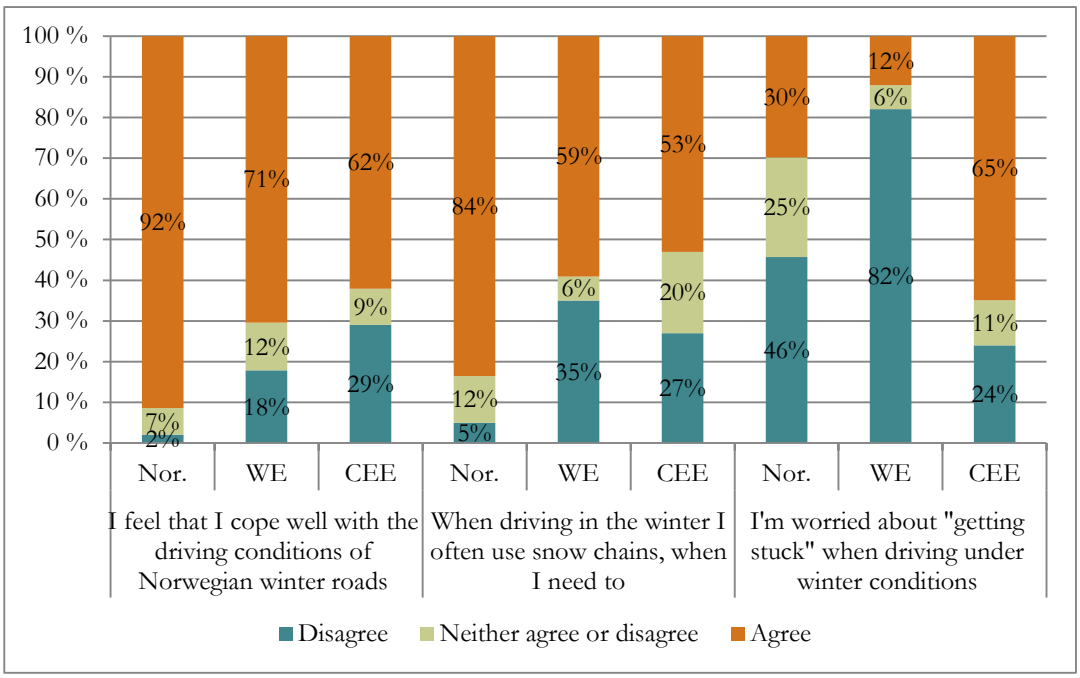


Figure S.4 National groups' distributions on three questions on feeling of mastery related to winter driving, snow chain use and perception of risk of "getting stuck" while driving under winter conditions. Per cent. Norwegian (Nor.) (N=61), Western European country (WE) (N=17), Central/Eastern European country (CEE) (N=45).

Figure S.4 indicates that Norwegian drivers have a stronger feeling of mastery of winter conditions than foreign drivers, especially compared to drivers from CEE. We also found that CEE drivers are more worried about "getting stuck" when driving under winter conditions than Norwegian drivers (Figure S.4). Interviewees believed that foreign HGV drivers have a considerably greater risk of "getting stuck" under winter conditions than Norwegian HGV drivers.

Drivers from CEE reported of a lower number of snow chains for their trucks/ trailers than Norwegian drivers, and it seems that the Norwegian drivers are more inclined than the two other groups to use snow chains when they need to. Also, the Norwegian drivers report a higher incidence of winter tyres on their vehicles when driving on winter roads. NPRA inspection data (2012-15) on winter equipment indicates that this has improved in recent years.

In 2011, the NPRA, "If Forsikring", "Falck Redning AS" and "Viking" started a cooperation project to map where accidents occur on Norwegian roads. Figure S.5 shows the causes of damage for foreign (N=747) and Norwegian (N=2663) HGVs that were given towing assistance and registered in this project.

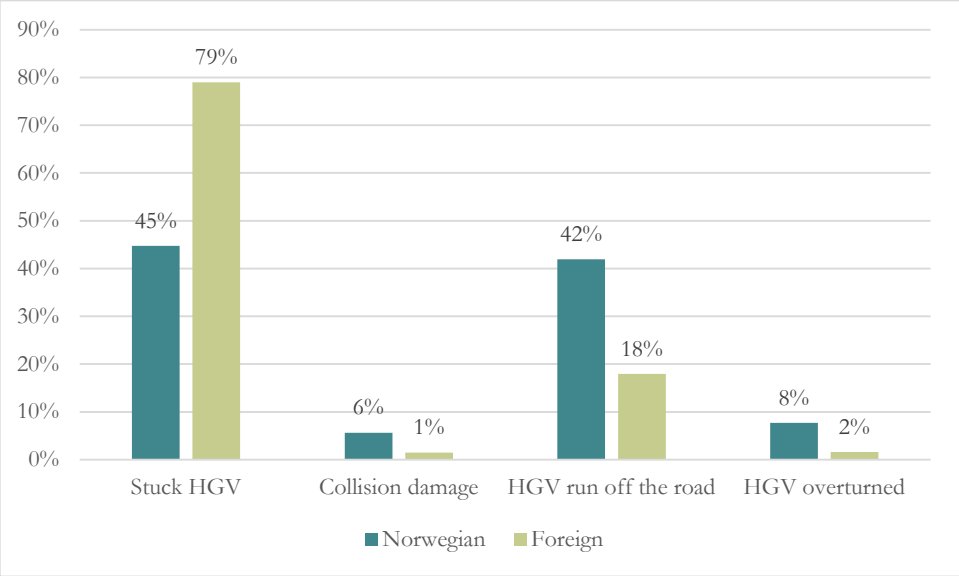


Figure S.5 Cause of damage for foreign (N=747) and Norwegian (N=2663) HGVs that were given towing assistance and registered in the "FOU-Bilberging" project from January 1st 2013 to November 2015. Source: Falck Redning AS.

Figure S.5 indicates that foreign HGVs are more likely to "get stuck", while Norwegian HGVs are more likely to run off the road. This is in line with a hypothesis about behavioural adaptation that was suggested by the interviewees. According to this hypothesis, Norwegian HGV drivers feel safer and more confident while driving on winter roads, because of their equipment and their experience. They therefore drive faster. When they encounter problems on winter roads, they therefore tend to run off the road. The foreign HGV drivers on the other hand, drive slower because they have poorer tyres, older vehicles, possibly less experience and thereby feel less safe. As a consequence, they are more likely to get stuck on winter roads. It is important to note that this is merely a hypothesis.

It seems that foreign heavy vehicles are overrepresented among the vehicles that got "stuck" while driving on winter roads, as 33 % (N=590) the 1781 HGVs that were "stuck" on winter roads were foreign. In comparison, 11 % of the HGVs involved in

personal injury accidents in Norway were foreign. Foreign HGVs accounted for six per cent of the average domestic transport in Norway in 2009-2012.

Measures

We discuss 13 main categories of measures addressing risk factors for foreign actors transporting goods on Norwegian roads, based on the literature review, interviews and the small-scale survey: 1) Increase the number of heavy vehicle inspections, 2) Establish a national electronic register, 3) Enforce payment of fines, 4) Increase cooperation with EU/EEA countries, 5) Clarify rules and regulations, 6) Organize and increase cooperation between domestic authorities, 7) Increase the authority of some authorities, 8) Clarify (and increase) the responsibilities of transport buyers, 9) Target foreign drivers with information campaigns, 10) Introduce certification/approval systems, 11) Educate to improve competence for winter driving, 12) Establish technical requirements for driving in Norway, and 13) Make roads more self-explanatory for foreign drivers. We conclude that six of these measures in particular are important for transport safety:

1) *Increase heavy vehicle inspections.* Increased numbers of heavy vehicle inspections was suggested in the "Report on road cabotage in Norway" (2014), and this recommendation was followed by an increase in the budget for heavy vehicle inspections. Interviewees were relatively content with the effectiveness of the current HGV inspections, although they also highlighted issues that could be improved further. This measure is effective (Elvik 2002), and should be maintained/increased.

2) *Education/information on winter driving and Norwegian road conditions aimed at foreign drivers.* Giving foreign drivers' education on winter driving may be useful, as we have seen that competence differs between Norwegian and foreign drivers. This training could include a mandatory course in driving on slippery roads (if it is designed to not lead to "over confidence"), information about how to load in the winter, fit snow chains, other equipment required for driving in the winter and so on. This education/information should also focus on how to drive safely in hilly terrain, how to avoid over heating of brakes and engine (and fires) and on how to drive safely on (poor) Norwegian roads in the western, central and northern parts of Norway. Driver education should be supplemented by information campaigns like the current "Trucker's guide to driving in Norway".

3) *Clarify (and increase) the responsibilities of transport buyers.* Clarifying and increasing the responsibility of the different parties involved in goods transport, especially the transport buyers seems to be a positive measure. If an accident happens, the driver is generally held responsible today, although transport safety regulations state that e.g. the forwarders have a "responsibility to contribute" to transport safety. Interviewees therefore stated that this regulation should be put to use in practice. Forwarders, transport companies in which drivers are employed, and those sending and receiving the goods, set the premises for transport safety, and it therefore seems fair to involve them and formalize their responsibility accordingly. The current, voluntarily "Trygg Trailer" campaign is an excellent example of how people involved in the transport (e.g. transport buyers, or those who send/supply the goods) may contribute to safe transport.

4) *Expand the authority of the NPRA* Interviewees argued in favour of giving the NPRA an increased authority to issue "on-the-spot-fines" (gebyr) for a larger range of violations than they have the authority to sanction today. This applies for instance

to violations of rules on driving time and rest periods. It seems unnecessary to have to report drivers to the police for smaller violations of these rules, and the NPRA is competent at inspecting this. Although the police can press charges, the NPRA cannot, but the NPRA does have the authority to impose fines on some violations, and this authority could be expanded to also apply to other "less serious violations".

5) Change the sanctioning opportunity from police reports to fines A certain amount of the transport violations which are reported to the police are dismissed by the prosecutors, e.g. due to insufficient resources to investigate these cases. Thus, it seems like a good idea to change the sanctioning opportunity on certain transport violations from police report to on-the-spot-fine ("gebyr" "forenklet forelegg"). This applies both to the police and the NPRA.

6) Increased cooperation between domestic authorities. The quality of the cooperation between different inspection authorities varies. Developing a more formalized and increased cooperation between regulating authorities: NPRA, Labour Inspection Authority, the police, customs and tax authorities has therefore been suggested, including a joint inspection strategy. In February 2016 the NPRA announced that they are establishing a new organizational unit focusing on transport related crime. The unit is likely to start up by the first half of 2016. This is a positive measure, and we hope that it involves a formalized cooperation with other inspection authorities, including the personnel conducting heavy vehicle inspections.

Finally, we also discuss other measures that could be considered further, but which we do not emphasize as much as the six above mentioned measures. These are: technical requirements for driving in some parts of Norway in the winter, enforce payment of fines, increased cooperation with EU/EEA countries, clarification of rules, road design, introduce certification/approval systems and app-communication with foreign drivers in Norway.

Reporting effects in the small-scale survey?

The results of the small-scale survey yielded some findings that were counter-intuitive and appear to be at odds with previous research and other findings in this study. These findings were related to the safety commitment of managers and colleagues, training, self- reported accidents and self-reports of falling asleep behind the wheel, driving while fatigued, speeding and seat belt use of drivers in their companies. We found that CEE and WE-drivers report a very high level of safety, and receive very high scores for some safety culture items in their firms. In some cases, they exceed the scores of Norwegian firms (Norwegian II sample) with a documented history of targeted safety work and very low accident levels, which would be expected to outperform any random group of HGV drivers.

The results from the small-scale survey are also not supported by the estimations of HGV accident risk in this study, which show that the accident risk for HGVs from CEE-countries and WE-countries is significantly higher than that of Norwegian HGVs. We therefore hypothesize that the survey results are not straightforwardly comparable between national samples, and should be used with extreme caution. There may be several potential explanations for this. It is important to note that most of these are hypotheses that should be examined further in future research:

1) *Small samples*. The samples are small (in the case of WE-drivers, extremely small), and respondents may not be representative.

2) *Respondents in different countries have different points of reference.* The drivers may refer to different baselines or have different anchoring: if safety standards vary substantially between different nationalities or cultures, evaluative judgments could be passed relative to radically different expectations. Thus, respondents from different countries have different expectations to the safety commitment of their managers and their colleagues, and the safety level of their businesses.

3) *Experience with and trust in surveys.* Drivers from different nationalities or cultures may relate to surveys differently. Norwegian drivers are accustomed to being subjects of various tests and surveys. Drivers from other nationalities, however, may be less culturally attuned to these kinds of surveys, and react to them differently. It is conceivable, for instance, that promises of anonymity are not trusted.

4) *Awareness of comparison.* Drivers may be aware that they will be compared to other groups, and respond correspondingly. We intentionally omitted to inform the Norwegian sample that they would be compared to foreign drivers, as we believed this might compromise results. In the sample of foreign drivers, however, this was more complicated. In spite of the fact that they were not informed about the comparison, they would perhaps take this as a given, as they were approached in their capacity as foreign drivers in Norway. Since these two groups are competing in the same market, it is conceivable that this influenced responses.

5) The items are not good enough. When questionnaires generate results that are unexpected, and when actual objective differences (e.g. differences in accident risk) between groups not are reflected in survey results, we should also consider whether the items account sufficiently for the different contexts of the groups we compare.

6) *National culture and reporting.* Measuring safety culture and reporting culture by means of surveys (i.e. self-reports) is in one sense paradoxical, as giving straightforward answers is dependent on a culture which encourages the communication of negative issues (i.e. a good reporting culture). A previous study of safety culture in construction in Denmark, UK and The Netherlands found that Eastern European migrant workers generally rated their managers more positively than employees who were born in the respective countries. The study suggests that that Eastern European migrant workers' deference to authority may explain this result. Deference to authority is as a trait of national culture that may explain over-reporting of positive results. It may perhaps also explain under-reporting of negative results. Although these questions are interesting, it is impossible for us to conclude on this. These hypotheses should therefore be examined further in future research.

Questions for future research

The current study lacks data to conclude on the importance of several of the risk factors for foreign HGV accidents, and the different methods we used in some cases, provide divergent results on the risk factors. This indicates the need for more research, particularly in the following areas.

1) *Drivers' transport safety behaviours.* The literature review indicates that speed too high for the circumstances, failure to use seat belt and insufficient information gathering are the most important risk factors in fatal accidents triggered by drivers at work. Our analysis of fatal accident data also indicates that these factors are associated relatively more often with accidents triggered by foreign than by Norwegian

professional drivers, but the small-scale survey did not support this conclusion. More research is needed.

2) *Company regulation of drivers' transport behaviours.* The literature review also indicates that company regulation of drivers' transport safety behaviours is an important precondition for safe transport behaviours. More research is needed, because the present study has not compared the policies of the foreign and Norwegian companies on this issue.

3) *Safety culture.* According to the results of the literature review, it is likely that foreign drivers carry with them influences from the traffic safety cultures of their home country, influenced by traffic rules, the police enforcing the rules, road user interaction, driver licensing and driver education. We did not measure national safety culture adequately in the present study, although we suggest that national culture (deference to authority) may have influenced the way that respondents have answered. Deference to authority should be examined in future studies.

4) *Organization of transport assignments and safety management system.* The literature review indicates that organization of transport assignments and safety management systems are important for transport safety, but the present study has unfortunately not assessed the prevalence of this in foreign versus domestic hauliers and the consequences for safety.

5) *Economy, competition and pay.* The literature review results diverge when it comes to the issue of whether and how competition may influence the safety level in HGV transport. Even though there was little concrete knowledge about the prevalence of different pay systems among foreign drivers, interviewees stressed that commission pay among foreign drivers may be detrimental to transport safety. The small-scale survey indicates that fixed payment is more prevalent in both foreign groups of drivers compared with the Norwegian drivers in the sample. This is surprising.

6) *Technology and equipment.* The literature review, interviews and NPRA inspection data do not support the conclusion that the lower technical standard of foreign HGVs constitutes an important risk factor. However, interviewees suggested that foreign HGVs are generally less suited to Norwegian roads, especially in the winter, as the majority of them are semi tractors with only two axles compared to Norwegian tractors with three axles. The small-scale survey indicates that Norwegian drivers report to be more stressed because of technical problems with their vehicles or equipment than foreign drivers. This may be due to different expectations. More research is needed.

7) *Working hours and fatigue.* The literature review shows that HGV drivers have long working days (average of 10.6 hours), and that many HGV drivers spend considerable time on physical tasks (e.g. loading/unloading) in addition to driving. International research shows that between 36 % and 64 % professional drivers report to have fallen asleep behind the wheel one time or another. Analysis of fatal accident data indicates that time pressure, stress and fatigue, are the most usual "abnormal" conditions registered for foreign professional drivers involved in fatal accidents, just as is the case for the Norwegian drivers. AAG data indicate that fatigue is just as important, or more important in accidents triggered by foreign HGV drivers, as it is in accidents triggered by Norwegian drivers. The small-scale survey, on the other hand, indicates that foreign drivers, especially from CEE, are less inclined to have fallen asleep behind the wheel and to drive while fatigued than Norwegian drivers. The differences are surprisingly big and hard to explain.

Transportøkonomisk institutt
Stiftelsen Norsk senter for samferdselsforskning

Sammendrag:

Internasjonalisering i godstransport på veg: sikkerhetskonsekvenser, risikofaktorer og tiltak

TØI rapport 1487/2016
Forfattere: Tor-Olav Nævestad, Ross Phillips, Gunhild Meyer Levlin og Inger Beate Hovi
Oslo 2016 178 sider

Denne studien bruker flere metoder for å undersøke sikkerhetskonsekvenser, risikofaktorer og tiltak i forbindelse med økende internasjonalisering i godstransport på veg. En litteraturstudie viser at utenlandske sjåfører av tunge godsbiler generelt har dobbelt så stor risiko som innenlandske sjåfører. Analyser av norske ulykkesdata viser at utenlandske tunge godsbiler har tre ganger høyere risiko for å bli involvert i eneulykker som norske tunge godsbiler, dobbelt så stor risiko for møteulykker, og nesten dobbelt så stor risiko for kollisjon med et kjøretøy som kjører i samme retning. Utenlandske sjåfører i Norge ser også ut til å ha høyere sannsynlighet for å utløse dødsulykker enn norske sjåfører. På bakgrunn av dataene våre kan vi konkludere med at særlig to risikofaktorer synes å være viktige: (1) Erfaring med og kompetanse på å kjøre på norske veger og (2) Vinterkjøring. Norske veger kan være utfordrende for utenlandske sjåfører, med dårligere vegstandard enn det som vanligvis finnes på det europeiske kontinentet, og kupert terreng (bratt stigning). Utenlandske sjåfører av tunge godsbiler har høyere ulykkesrisiko per km. kjørt i Vest-Norge, Trøndelag og Nord-Norge, hvor vegene er mer krevende. Resultatene tyder på at norske sjåfører av tunge godsbiler er bedre utstyrt, har mer kompetanse på, høyere mestringsfølelse og lavere risikooppfatning knyttet til vinterkjøring enn utenlandske sjåfører i Norge. Vi foreslår særlig seks tiltak som synes å være viktige for å øke transportsikkerheten til utenlandske aktører i Norge: 1) Øke kontrollene av tunge kjøretøy, 2) Utdanning/informasjon om vinterkjøring og norske vegforhold rettet mot utenlandske sjåfører, 3) Avklare (og øke) transportkjøperes ansvar, 4) Mer myndighet til Statens vegvesen, 5) Endre sanksjoneringsmulighetene fra anmeldelser til bøter og 6) Økt samarbeid mellom nasjonale myndigheter.

Bakgrunn og mål

Utenlandske aktørers innblanding i det nasjonale markedet for godstransport på veg (kabotasje) er begrenset av det norske og europeiske regelverket i dag. EU fremmer imidlertid en gradvis reduksjon av slike konkurransebegrensninger. En liberalisering av kabotasjeregelverket var derfor planlagt å tre i kraft i januar 2014. Denne prosessen ble imidlertid utsatt på grunn av innsigelser fra flere medlemsland, stilt overfor konkurranse fra nye EU-land med lavere lønnskostnader. I denne rapporten fokuserer vi på trafikksikkerhetsaspektene ved en eventuell deregulering.

En liberalisering av gjeldende regler for kabotasje på veg vil antakelig øke antallet utenlandske tunge godsbiler på norske veger. Tidligere forskning indikerer at utenlandskregistrerte tunge godsbiler har opptil 2,5 ganger høyere risiko for ulykker med personskade på norske veger enn norske tunge godsbiler (Nævestad, Hovi, Caspersen og Bjørnskau 2014). Vi vet imidlertid lite om årsakene til forskjellene i ulykkesrisiko mellom de ulike nasjonale gruppene.

Målene med den foreliggende studien er derfor å:

1) Undersøke sikkerhetskonsekvensene av økende internasjonalisering av godstransport på veg (i Norge).
2) Diskutere betydningen av ulike risikofaktorer.
3) Diskutere potensielle tiltak som kan forbedre sikkerheten knyttet til godstransport på veg ytterligere.

Studien inngår i et større forskningsprosjekt som har som hovedmål å vurdere om økningen av utenlandske aktører som transporterer gods på veg og sjø i Norge har effekt på ulykkesrisiko, og bidra med kunnskap som norske myndigheter kan bruke for å utvikle risikoreduserende tiltak. Informasjon om prosjektet: «Safe Foreign Transport» (SAFT) foreligger for øvrig på www.toi.no/SAFT. Prosjektet er finansiert av Norges forskningsråd sitt TRANSIKK program, og varer fra januar 2013 til april 2016. For mer informasjon se: www.forskningsradet.no/transikk

Metoder

Vi har benyttet fem ulike metode for å få svar på de tre målene med studien:

1) *Analyse av ulykkesdata.* Vi har studert dødsulykker analysert av Statens vegvesens Ulykkesanalysegrupper (UAG), og ulykker fra Statistisk sentralbyrås (SSB) database over politirapporterte personskadeulykker for å undersøke hva slags ulykker utenlandske tunge godsbiler er involvert i, og risikofaktorer knyttet til disse.

2) *Litteraturstudie.* Vi har gjennomført en litteraturstudie av sikkerhetskonsekvenser, risikofaktorer og tiltak. Litteraturstudien inkluderte 25 studier som var relevante for minst ett av de tre målene for studien.

3) *Kvalitative intervjuer.* Vi har gjennomført 11 kvalitative intervjuer med 12 sektoreksperter som representerer arbeidsgivere, arbeidstakere og myndigheter.

4) *Feltarbeid.* Vi har gjennomført feltarbeid med utenlandske sjåfører på ulike rasteplasser, terminaler og parkeringsplasser. Vi har også gjennomført feltarbeid med kontrollpersonell og sjåfører som har deltatt i tungbilkontroller på en av Statens vegvesens kontrollstasjoner.

5*) Spørreundersøkelse.* Vi har gjennomført en liten spørreundersøkelse hvor vi har sammenliknet utenlandske sjåfører av tunge godsbiler fra sentral/øst Europa (N=52), og vest Europa (N=17) med norske sjåfører (N=61) og en annen gruppe av norske sjåfører (N=224) fra tre godstransportbedrifter med gode sikkerhetskulturer. Vi refererer til dette siste utvalget som Norge II. De utenlandske sjåførene ble rekruttert på rasteplasser, mens de norske sjåførene (N=61) ble rekruttert gjennom websider. Norge II utvalget ble rekruttert gjennom NHO transport i forbindelse med en tidligere studie. Gruppen av sjåfører fra vest Europa er dessverre for liten til at vi kan trekke noen konklusjoner om disse.

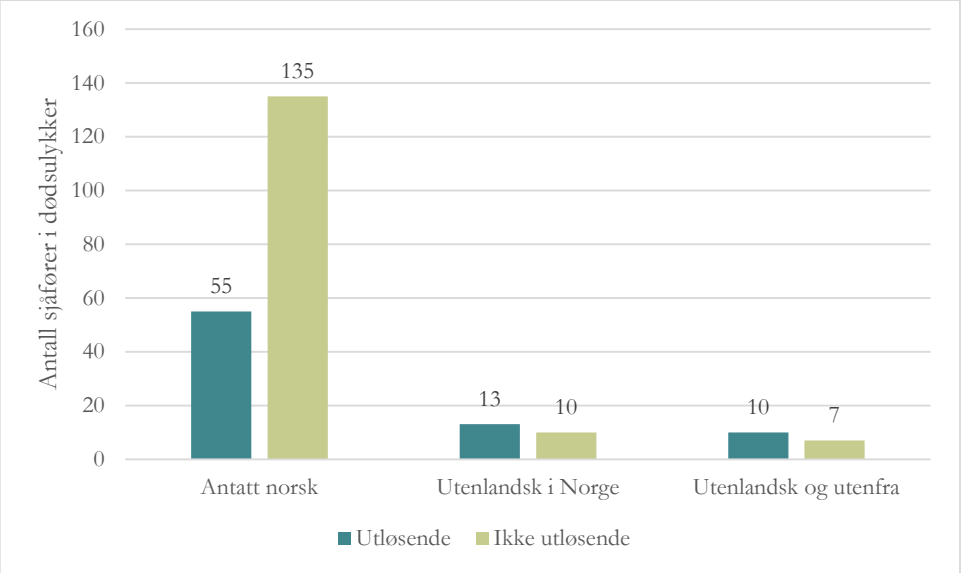
Vi drar også veksler på statistikk fra Statens vegvesens tungbilkontroller og statistikk fra bergingsselskapers bistand til tungbiler.

Utenlandske sjåfører har dobbelt så høy risiko

I litteraturstudien fant vi åtte studier som indikerer at risikoen for tunge godsbiler varierer med en faktor på opptil ti i europeiske land, og at ulykkesrisikoen til

utenlandske tunge godsbiler er omtrent to ganger høyere enn risikoen for innenlandske tunge godsbiler i de undersøkte europeiske landene. Det kan derfor se ut til at økt internasjonalisering av godstransport på veg kan føre til et økt antall ulykker med tunge godsbiler. Det må imidlertid påpekes at Tyskland har en relativt lav risiko for alvorlige ulykker med tunge godsbiler (AECOM 2014), til tross for en høy andel (35 %) transport med utenlandske tunge godsbiler. Fremtidig forskning bør derfor studere risikoen til utenlandske og innenlandske godsbiler i Tyskland.

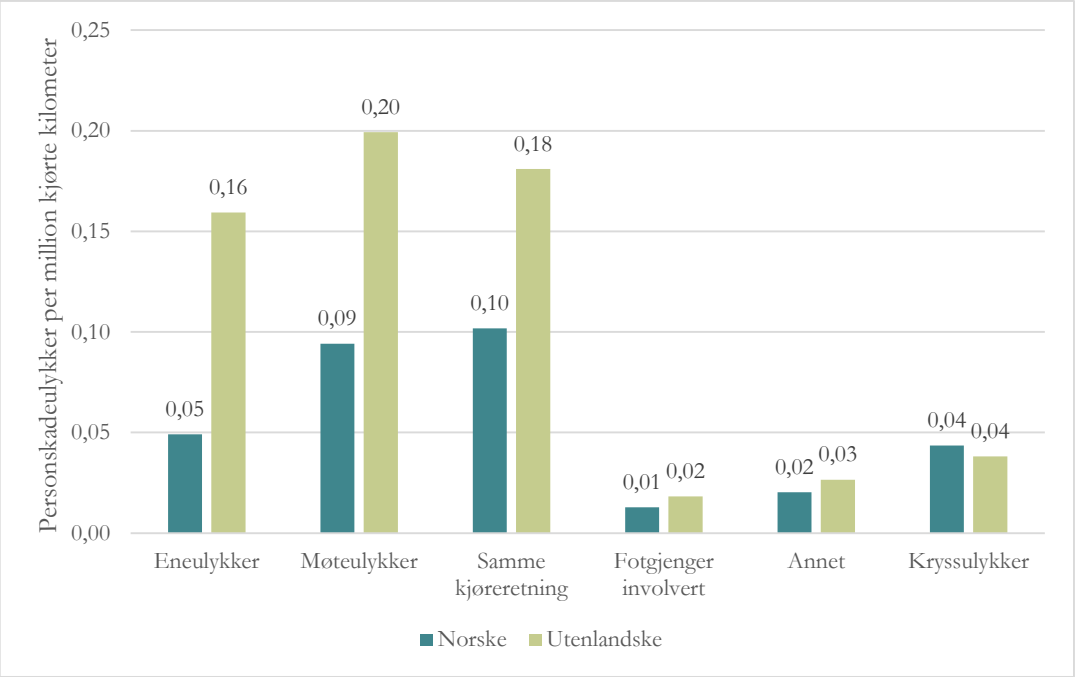
Våre analyser av UAG-dataene for perioden 2010-2013 viser at 17 % av yrkessjåførene som var involvert i dødsulykker i trafikken i Norge (N=230) var utenlandske (samtidig som de stod for 6 % av trafikkarbeidet). Resultatene kan tyde på at utenlandske yrkessjåfører i Norge har høyere sannsynlighet for å utløse dødsulykker enn det norske yrkessjåfører (Figur S.1).



Figur S.1 Antall norske og utenlandske yrkessjåfører involvert i dødsulykker på norske veger, 2010-2013 som kjørte et kjøretøy som ble klassifisert som «utløsende» for ulykken av UAG.

Figur S.1 indikerer at mindre enn en tredjedel (29 %) av de norske yrkessjåførene kjørte kjøretøy som ble definert som «utløsende», mens mer enn halvparten (58 %) av de utenlandske sjåførene gjorde det. Tallene for de sistnevnte er imidlertid små. Av de 40 utenlandske yrkessjåførene i UAG-dataene kjørte 35 tunge godsbiler, mens 5 kjørte busser. Sjåførene som klassifiseres som «Utenlandsk i Norge» kjørte jevnlig i Norge de siste 10 årene før ulykken.

Analyser av politirapporterte trafikkulykker med personskader i perioden 2007-2012 indikerer at norske og utenlandske sjåfører av tunge godsbiler har ulik risiko for å bli involvert i ulike ulykkestyper (Figur S.2).



Figur S.2 Risikoen for ulike ulykkestyper for norske (N=3320) og utenlandske (N=396) tunge godsbiler involvert i politirapporterte trafikkulykker med personskader i Norge 2007-2012.

Figur S.2 viser at utenlandske tunge godsbiler har tre ganger høyere risiko for å bli involvert i eneulykker sammenliknet med norske tunge godsbiler. I tillegg har de dobbelt så stor risiko for møteulykker, og nesten dobbelt så stor risiko for kollisjon med et kjøretøy som kjører i samme retning. Risikoen for å bli involvert i kollisjoner i kryss er imidlertid lik for norske og utenlandske tunge godsbiler, antakelig fordi norske tunge godsbiler har en høyere andel av sitt trafikkarbeid i tettbefolkede områder med flere kryss, mens de utenlandske i større utstrekning kjører på hovedveger. Det er kun forskjellene mellom eneulykker, møteulykker og kollisjoner med kjøretøy som kjører i samme kjøreretning som er statistisk signifikante (på 5 %-nivå).

Risikofaktorer

Vi har identifisert 12 risikofaktorer knyttet til internasjonalisering av godstransport i Norge, basert på tidligere forskning og kvalitative forskningsintervjuer: 1) vinterkjøring, 2) sjåførers transportsikkerhetsatferd, 3) bedrifters oppfølging av sjåførers transportsikkerhetsatferd, 4) sikkerhetskultur, 5) organisering av transport, 6) sikkerhetsledelse, 7) kompetanse, opplæring og erfaring, 8) teknologi og utstyr, 9) økonomi, konkurranse og lønn, 10) regler og håndhevelse, 11) arbeidstid og trøtthet, 12) vegen og vegmiljøet. Vi har ikke hatt mulighet til å fastslå betydningen av alle disse risikofaktorene, enten fordi vi ikke har målt betydningen av dem selv, eller fordi de ulike metodene som vi bruker gir ulike resultater. Vi konkluderer imidlertid med at særlig to risikofaktorer synes å være viktige, fordi de ulike metodene våre gir konsistente resultater for disse risikofaktorene: (1) Erfaring med og kompetanse på å kjøre på norske veger og (2) Vinterkjøring,

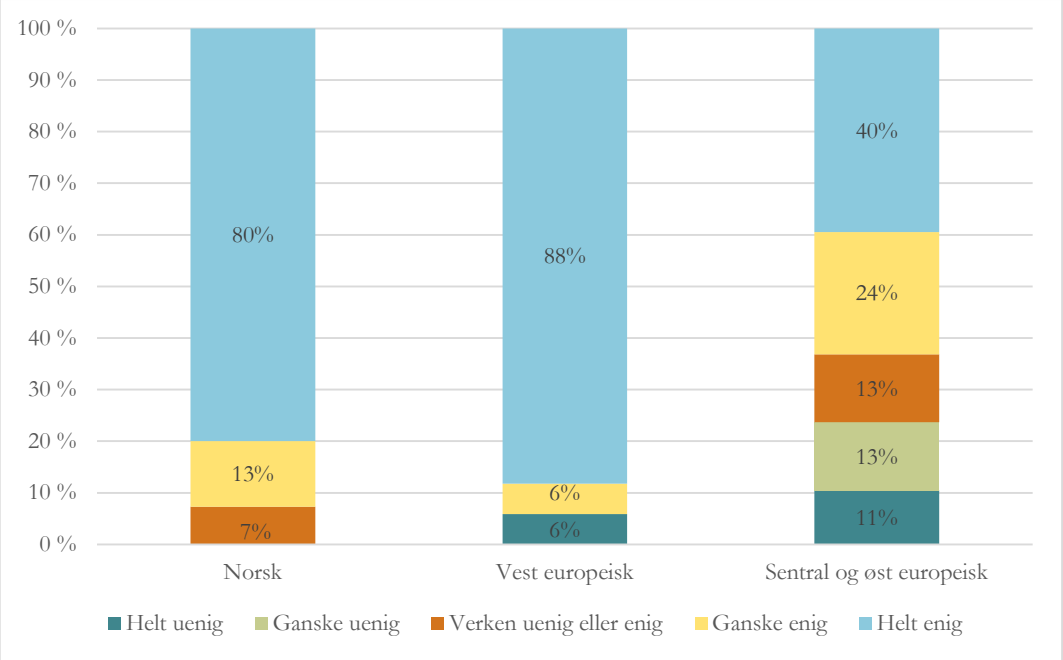
Erfaring med og kompetanse på å kjøre på norske veger

Litteraturstudien vår viser at norske veger kan være utfordrende for utenlandske sjåfører, for eksempel på grunn av veger med dårligere vegstandard. Mange av de norske vegene er smalere og har flere (krappe) svinger enn det som vanligvis finnes på det europeiske kontinentet. I tillegg går vegene oftere gjennom kupert terreng med bratt stigning og fall. Disse vegene blir enda mer krevende på vinterføre. I tråd med antakelsen om at deler av det norske vegnettet er krevende for utenlandske sjåfører, viser tidligere forskning (Nævestad mfl 2014) at tunge godsbiler fra «øvrige land» har tre ganger så høy risiko som skandinaviske godsbiler i Vest-Norge/Trøndelag/Nord-Norge, hvor vegene er mer krevende. Ulykkesrisikoen til godsbiler fra «øvrige land» er dobbelt så høy i disse delene av Norge som den er i Sør-/Øst-Norge. I kontrast til dette er det liten forskjell i ulykkesrisikoen til skandinaviske tunge godsbiler mellom disse to delene av landet. Vi kan derfor anta at det er mer krevende for utenlandske tungbilsjåfører å kjøre i noen deler av landet, kanskje fordi de ikke har den samme erfaringen og kompetansen som norske sjåfører.

De intervjuede understreket at norske veger og kjøreforhold stiller store krav til (utenlandske) sjåførers kompetanse. Det å kjøre sikkert på norske veger krever lang erfaring, slik at sjåførene kan vurdere situasjoner korrekt, bedømme risiko og tilpasse farten til forholdene. På grunn av sin lange erfaring med norske veger, kan norske sjåfører tidlig gjenkjenne farlige situasjoner og gjøre korrekte risikovurderinger.

De intervjuede mente at de norske vegene kan by på overraskelser for utenlandske sjåfører. Det å kjøre i kupert terreng krever mye kompetanse og erfaring, for eksempel knyttet til bruk av motorbremser, retarder og tilpasning av fart. Det å være fremmed for norske veger og kjøreforhold er en risikofaktor i seg selv, fordi du ikke vet hva du kan forvente, eller hvordan du skal tilpasse deg til forholdene.

Vi inkluderte følgende spørsmål i spørreundersøkelsen: "Jeg laster tilhengeren slik at jeg får maks vekt på bilens drivaksel ved vinterføre", for å sammenlikne sjåførenes kompetanse på det å laste for norske vinterveger (Figur S.3).



Figur S.3 Nasjonale gruppers svarfordelinger på påstanden: "Jeg laster tilhengeren slik at jeg får maks vekt på bilens drivaksel ved vinterføre". Norske (N=61), Vest europeiske land (N=17), Sentral og Øst europeiske land (N=45).

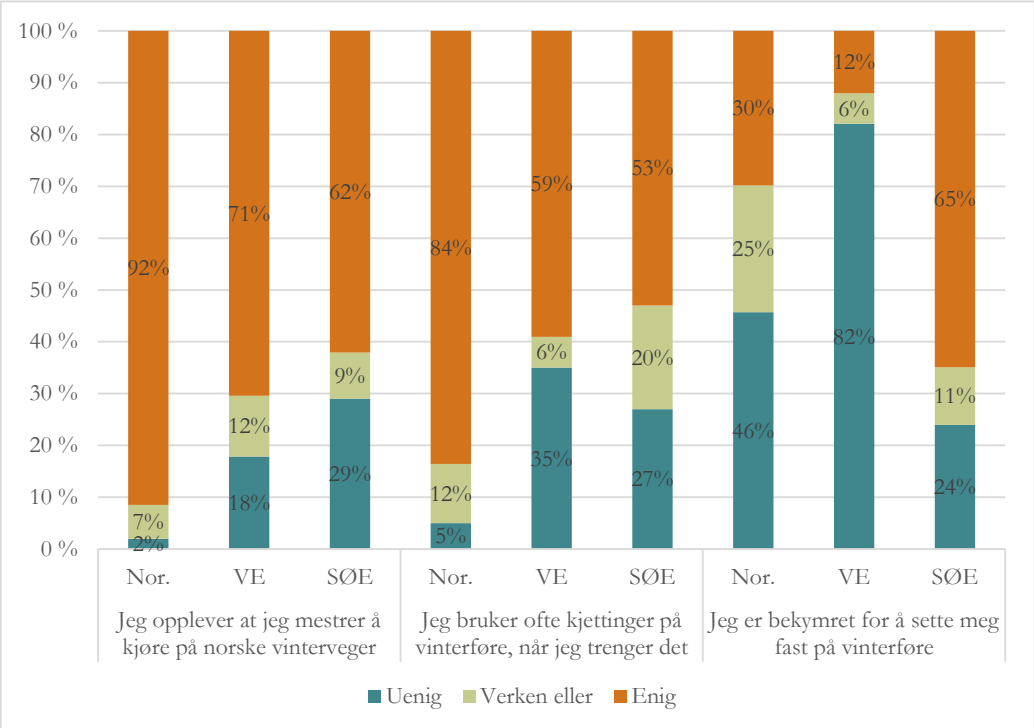
80 % av de norske sjåførene og 88 % av de vest europeiske sjåførene var helt enige i påstanden, mens kun 40 % av de sentral og øst europeiske sjåførene var enige. Dette indikerer at de to første gruppene har bedre kompetanse på vinterlasting.

Vinterkjøring

Analyser av data fra personskadeulykker indikerer at skandinaviske tunge godsbiler har en lavere andel ulykker i vinterhalvåret (53 %) enn det kjøretøy fra «øvrige land» har (62 %). I tillegg har tunge godsbiler fra «øvrige» land (38 %) en større andel av sine ulykker på veger med snø, is og glatte forhold enn det skandinaviske godsbiler (29 %) har. Dette kan indikere at utenlandske tunge godsbiler har en høyere ulykkesrisiko om vinteren enn det norske godsbiler har.

De intervjuede mente at vinterkjøring er den største sikkerhetsutfordringen for utenlandske sjåfører i Norge. Denne utfordringen er mangefasettert. Utenlandske tunge godsbiler ser ut til å være noe mindre egnet for norske vinterforhold, siden de ofte har to aksler på trekkvognen og derfor noe dårligere veggrep på glatt føre enn det trekkvogner med tre aksler har. Sistnevnte kan løfte den bakre «boggiakselen» og dermed øke vekten på drivakselen. Vinterutrustning (dekk, kjetting) har tidligere vært en utfordring, men det ser ut til at denne situasjonen har bedret seg.

I spørreundersøkelsen undersøkte vi en rekke aspekter ved vinterkjøring (Figur S.4).



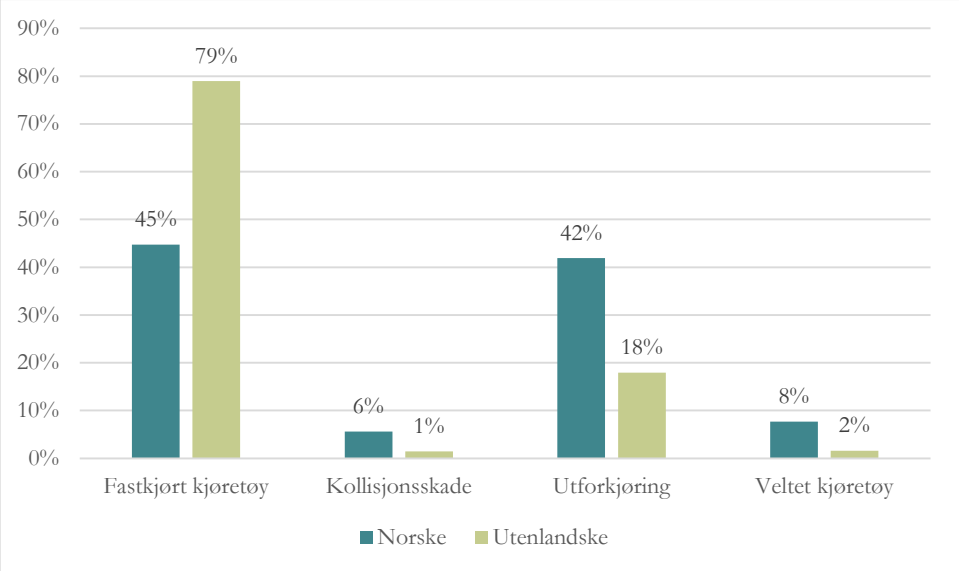
Figur S.4 Nasjonale gruppers fordeling på tre spørsmål om mestringsfølelse knyttet til vinterkjøring, bruk av kjetting og bekymringer for å sette seg fast på vinterføre. Norske sjåfører (Nor.) (N=61), Vest europeiske sjåfører (VE) (N=17), Sentral og øst europeiske sjåfører (SØE) (N=45).

Figur S.4 viser at de norske sjåførene har en sterkere mestringsfølelse knyttet til vinterkjøring enn utenlandske sjåfører, særlig sjåfører fra sentral og øst Europa. Vi ser også at de sistnevnte er mer bekymret enn de andre gruppene for å sette seg fast på vinterføre. De intervjuede mente at utenlandske tunge godsbiler har en betydelig høyere risiko for å sette seg fast på norske vinterveger enn norske tunge godsbiler.

Resultatene indikerer, gitt gruppenes ulike eksponering for vinterveger, at utenlandske sjåfører, særlig sjåfører fra sentral og øst Europa, har en høyere risiko for å trenge bergingshjelp på norske vinterveger enn norske sjåfører.

Sjåfører fra sentral og øst Europa rapporterte om et lavere antall kjettinger til sine trekkvogner og tilhengere enn de norske sjåførene, og det ser ut til at de norske sjåførene er mer tilbøyelige til å bruke kjettinger når de trenger det enn sjåfører i de to andre gruppene. De norske sjåførene rapporterte i større grad enn de utenlandske at de har vinterdekk på sine kjøretøy når de kjører på vinterveger. Resultater fra Statens vegvesens vinterkontroller (2012-15) indikerer imidlertid at denne situasjonen har bedret seg de siste årene.

I 2011, startet Statens vegvesen, If Forsikring, Falck Redning AS og Viking et samarbeid for å kartlegge hvor ulykker skjer på norske veger. Figur S.5 viser årsaker til skader for utenlandske (N=747) og norske (N=2663) tunge godsbiler som fikk bergingshjelp og som ble registrert i dette samarbeidsprosjektet.



Figur S.5 Skadeårsaker for utenlandske (N=747) og norske (N=2663) tunge godsbiler som fikk bergingshjelp og som ble registrert i prosjektet "FOU-Bilberging" fra 1. januar 2013 til november 2015. Kilde: Falck Redning AS.

Figur S.5 indikerer at utenlandske tunge godsbiler i større grad enn norske setter seg fast på norske veger enn norske tunge godsbiler, mens norske tunge godsbiler i større grad enn utenlandske kjører av vegen. Dette er i tråd med en hypotese om atferdstilpasning som ble foreslått av de intervjuede. I henhold til denne hypotesen, opplever de norske sjåførene av tunge godsbiler større grad av mestring (jf. Figur S.4), og de føler seg sikrere enn utenlandske sjåfører på vinterføre. Dette kan skyldes erfaring og utstyr. De norske sjåførene kjører derfor fortere enn de utenlandske på vinterveger. De utenlandske sjåførene, på den annen side, har mindre erfaring og

kanskje dårligere og eldre utstyr. De føler seg derfor mindre sikre, og kjører saktere enn de norske. Resultatet av dette er at de norske gjerne kjører av vegen når de mister kontrollen, mens de utenlandske sjåførene gjerne setter seg fast. Det er viktig å påpeke at dette kun er en hypotese.

Det ser ut til at utenlandske tunge godsbiler er overrepresentert blant de som kjører seg fast på vinterføre, siden 33 % (N=590) av de 1781 tunge godsbilene som kjørte seg fast på vinterføre var utenlandske. Til sammenlikning var 11 % av de tunge godsbilene som var involvert i personskadeulykker i Norge utenlandskregistrerte. Utenlandske tunge godsbiler sto for seks prosent av den innenlandske transporten av gods i Norge i perioden 2009-2012.

Tiltak

Vi diskuterer 13 hovedkategorier av tiltak rettet mot risikofaktorer for utenlandske aktører innen godstransport på norske veger, basert på litteraturstudien, intervjuene og spørreundersøkelsen: 1) Øke antall tungbilkontroller, 2) Opprette et nasjonalt elektronisk register, 3) Forbedre innkreving av bøter, 4) Utvide samarbeidet med EU-/EØS-land, 5) Avklare regler og forskrifter, 6) Organisere og øke samarbeidet mellom norske myndigheter, 7) Utvide enkeltmyndigheters fullmakter, 8) Klargjøre (og utvide) transportkjøperes ansvar, 9) Kampanjer rettet mot utenlandske sjåfører, 10) Innføre sertifiserings- og godkjenningssystemer, 11) Opplæringstiltak for å øke utenlandske sjåførers kompetanse på vinterkjøring, 12) Innføre tekniske særkrav for kjøring i Norge, 13) Gjøre veger mer selvforklarende for utenlandske sjåfører. Vi konkluderer med at seks av disse tiltakene er spesielt viktige for trafikksikkerheten:

1) Øke antall tungbilkontroller. Det å øke antall tungbilkontroller ble foreslått i «Rapport om kabotasje på veg i Norge» (2014), og denne anbefalingen ble etterfulgt av en økning i budsjettet for tungbilkontroller. De intervjuede var relativt fornøyde med effekten av dagens tungbilkontroller, selv om de også påpekte temaer som kan forbedres ytterligere. Dette tiltaket er effektivt (Elvik 2002), og bør opprettholdes/utvides.

2) Opplæring/informasjon om vinterkjøring og norske vegforhold rettet mot utenlandske sjåfører. Å gi utenlandske sjåfører opplæring i vinterkjøring kan være et godt tiltak, siden vi har sett at norske og utenlandske sjåfører har ulik kompetanse. Denne opplæringen kan omfatte et obligatorisk kurs i kjøring på glatt føre (som er designet slik at den ikke gir «overdreven tro på egne ferdigheter»), informasjon om lasting for vinterforhold, legging av kjettinger, bruk av annet utstyr for vinterkjøring, osv. Denne opplæringen/ informasjonen bør også fokusere på hvordan man skal kjøre sikkert i bratt terreng, hvordan unngå overoppheting av bremser og motor (og branner) og hvordan kjøre sikkert på (dårlige) norske veger i nord-, vest-, og midt- Norge. Slike opplæringstiltak bør suppleres med informasjonskampanjer som det eksisterende "Trucker's guide to driving in Norway".

3) Avklare (og øke) transportkjøperes ansvar. Det ser ut til at det å øke ansvaret til de ulike partene som er involvert i godstransport, spesielt transportkjøperne vil være et fruktbart tiltak. Dersom en ulykke inntreffer, holdes i dag sjåføren ansvarlig, selv om lovverket sier at f.eks. speditører har et «ansvar for å medvirke» til transportsikkerhet. De intervjuede mente derfor at dette regelverket burde håndheves i praksis. Speditører, transportselskapene der sjåførene er ansatt, og de som sender og mottar varene legger premissene for transportsikkerheten, og det virker derfor rimelig å

involvere dem og å formalisere ansvaret deretter. Den nåværende, frivillige «Trygg Trailer»-kampanjen er et utmerket eksempel på hvordan aktører involvert i transport (for eksempel transportkjøpere, eller de som sender/leverer varene) kan bidra til sikker transport.

4) Utvide Statens vegvesens myndighet. De intervjuede argumenterte for å gi Statens vegvesen utvidet myndighet til å utstede bøter for et større antall overtredelser enn de i dag har mulighet til. Dette gjelder f.eks. for brudd på regler om kjøre- og hviletid. Det fremstår som unødvendig å måtte melde førere til politiet for mindre regelbrudd, og Statens vegvesen har den nødvendige kompetansen til å utføre disse kontrollene. I motsetning til politiet, har ikke Statens vegvesen myndighet til å ta ut tiltale, men de har myndighet til å ilegge bøter for enkelte overtredelser, og denne fullmakten kan utvides til også å gjelde andre «mindre alvorlige overtredelser».

5) Endre sanksjoneringsmulighet fra politianmeldelse til bøter. En del transportrelaterte overtredelser som meldes til politiet, blir avvist av påtalemyndigheten, f.eks. på grunn av manglende ressurser til etterforskning. Dermed fremstår det som en god idé å endre sanksjoneringsmulighetene for enkelte transportrelaterte overtredelser fra politianmeldelse til gebyr eller forenklet forelegg. Dette gjelder både politiet og Statens vegvesen.

6) Økt samarbeid mellom nasjonale myndigheter. Det kan se ut til at kvaliteten på samarbeidet mellom ulike kontrolletater varierer noe. Det har derfor blitt foreslått å formalisere og øke samarbeidet mellom disse, for eksempel Statens vegvesen, Arbeidstilsynet, politiet, Tollvesenet og Skatteetaten. Det har også blitt foreslått å etablere en felles kontrollstrategi. I februar 2016 informerte Statens vegvesen om opprettelsen av en ny enhet som skal fokusere på transportrelatert kriminalitet. Denne enheten skal etter planen starte opp i løpet av første halvdel av 2016. Dette er et positivt tiltak, og vi håper at det innebærer et formalisert samarbeid med andre kontrolletater, inkludert personalet som daglig arbeider med kontroll og tilsyn av tunge kjøretøy.

Endelig diskuterer vi også andre tiltak som kan vurderes videre, men som vi ikke legger like mye vekt på som de seks ovennevnte. Disse er: tekniske krav for kjøring i enkelte deler av Norge om vinteren, bedre innkreving av bøter, økt samarbeid med EU/EØS-land, avklaring av regler, vegutforming, sertifiserings- og godkjenningssystemer og app-kommunikasjon med utenlandske sjåfører i Norge.

Rapporteringseffekter i spørreundersøkelsen?

En del av resultatene fra spørreundersøkelsen var overraskende, og ser ut til å gå på tvers av tidligere forskning og andre funn i studien. Disse funnene var knyttet til sjåførenes egenrapportering av ledere og kollegaers holdninger til sikkerhet, opplæring, selvrapporterte ulykker, selvrapportert sovning bak rattet, selvrapportert kjøring i trøtt tilstand, kollegers kjøring med for høy fart etter forholdene og kollegers beltebruk. Vi fant at sjåfører fra sentral og øst Europa og vest Europa rapporterte svært høye sikkerhetsnivåer og fikk veldig gode skårer på enkelte av målene for organisatorisk sikkerhetskultur. På enkelte mål skåret disse gruppene høyere enn norske transportbedrifter som er kjent for å ha god sikkerhetskultur og høyt sikkerhetsnivå (Norge II utvalget). Dette er uventet og vanskelig å forklare.

Resultatene fra spørreundersøkelsen er heller ikke i tråd med estimatene for ulykkesrisiko som vi har gjort på bakgrunn av SSBs statistikk over politirapporterte

ulykkesdata. Disse viser at tunge godsbiler fra sentral og øst Europa og vest Europa har omtrent dobbelt så høy risiko som norske tunge godsbiler. Spørreundersøkelsen vår viser derimot at de utenlandske godsbilene har et høyere sikkerhetsnivå på flere områder. Det er derfor ikke helt uproblematisk å sammenlikne resultatene fra de ulike nasjonale utvalgene i spørreundersøkelsen, og disse bør derfor anvendes med stor forsiktighet. Det kan finnes flere mulige forklaringer på disse problemene. De fleste av disse forklaringene er hypoteser som bør undersøkes nærmere i fremtidig forskning.

1) Små utvalg. Utvalgene i undersøkelsen er små (særlig utvalget av vest europeiske sjåfører er ekstremt lite), og respondentene er muligens ikke representative for sin gruppe.

2)) *Respondenter i ulike land har ulike referansepunkter.* Dersom sikkerhetsstandarder varierer betydelig mellom ulike land eller kulturer, kan vurderingene som sjåførene gjør når de svarer på undersøkelsen bli gjort på grunnlag av svært ulike forventninger. Sjåfører fra ulike land kan for eksempel svare på grunnlag av svært ulike og tatt-for-gitte forventninger til ledere og kollegers fokus på sikkerhet, og til virksomheters sikkerhetsnivå osv.

3) Erfaring med og tillit til spørreundersøkelser. Sjåfører fra ulike land eller kulturer kan forholde seg forskjellig til spørreundersøkelser. Mens norske sjåfører er vant til å delta i ulike tester og undersøkelser, kan førere av andre nasjonaliteter ha mindre kultur for dette, og derfor forholde seg annerledes til en spørreundersøkelse. Det kan for eksempel tenkes at de ikke har tillit til forskernes garantier om anonymitet.

4) Bevissthet om sammenligning. Sjåførene kan ha skjønt at de vil bli sammenlignet med andre grupper, og svart deretter. Vi unnlot bevisst å informere det norske utvalget om at de ville bli sammenlignet med utenlandske sjåfører, siden vi mente dette kunne påvirke resultatene. I utvalget av utenlandske sjåfører var dette mer komplisert: Til tross for at de ikke ble informert om at de ville bli sammenlignet, kan de ha tatt en slik sammenligning for gitt, siden de ble kontaktet i egenskap av å være utenlandske sjåfører i Norge. Siden disse to gruppene konkurrerer i samme marked, kan det tenkes at dette har påvirket svarene.

5) Målene våre er ikke gode nok. Når spørreundersøkelser gir uventede resultater og objektive forskjeller mellom gruppene (som for eksempel forskjeller i ulykkesrisiko) ikke gjenspeiles i resultatene, bør vi også vurdere om spørsmålene vi har brukt i tilstrekkelig grad er i stand til å fange opp de relevante forskjellene mellom gruppene.

6) Nasjonal sikkerhetskultur og rapportering. Måling av sikkerhetskultur og rapporteringskultur ved hjelp av spørreundersøkelser (dvs. egenrapportering) er i en viss forstand paradoksalt, siden det å gi oppriktige svar forutsetter en kultur som oppmuntrer til rapportering av negative forhold (dvs. en god rapporteringskultur). En studie av sikkerhetskultur i bygg og anleggsbransjen i Danmark, Storbritannia og Nederland fant at østeuropeiske arbeidsinnvandrere generelt vurderte sine ledere mer positivt enn ansatte som var født i landene. Studien foreslår at østeuropeiske arbeidsinnvandreres «respekt for autoriteter» kan forklare dette resultatet. Respekt for autoriteter er et trekk ved nasjonal kultur som kan forklare overrapportering av positive resultater, og kanskje også underrapportering av negative resultater. Dette er interessante spørsmål, men det er ikke mulig for oss å trekke noen konklusjoner om dette på grunnlag av våre resultater.

Spørsmål for fremtidig forskning

Denne studien mangler data for å konkludere om betydningen av flere av risikofaktorene vi diskuterer. De ulike metodene vi brukte ga dessuten sprikende resultater når det gjelder risikofaktorer i noen tilfeller. Dette demonstrerer behovet for videre forskning, spesielt innenfor de følgende områdene:

1) Sjåførers trafikksikkerhetsatferd. Litteraturstudien viser at for høy hastighet for forholdene, manglende bruk av bilbelte og utilstrekkelig informasjonsinnhenting er de viktigste risikofaktorene i dødsulykker som utløses av sjåfører i arbeid. Vår analyse av data fra dødsulykker viser også at disse faktorene relativt oftere er til stede i ulykker utløst av utenlandske enn norske yrkessjåfører. Spørreundersøkelsen støtter imidlertid ikke konklusjonen om at disse risikofaktorene er mer utbredt blant de utenlandske sjåfører. Her er det behov for mer forskning.

2) Bedrifters oppfølging av sjåførenes transportatferd. Litteraturstudien viser også at bedrifters oppfølging av sjåførenes trafikksikkerhetsatferd er en viktig forutsetning for sikker transportatferd. Siden studien ikke har sammenlignet utenlandske og norske selskapers policy på dette området, trengs videre forskning.

3) Sikkerhetskultur. Ifølge litteraturstudien er det sannsynlig at utenlandske sjåfører er påvirket av trafikksikkerhetskulturen i hjemlandet, som igjen formes av trafikkreglene, politiets håndheving av reglene, samhandling mellom trafikanter, førerkortregler og føreropplæring. Vi har ikke målt nasjonal sikkerhetskultur i denne studien, selv om vi foreslår at nasjonal kultur («respekt for autoriteter») kan ha påvirket respondentenes svar. Respekt for autoriteter bør studeres nærmere i fremtidig forskning.

4) *Organisering av transport og sikkerhetsstyringssystem*. Litteraturgjennomgangen indikerer at organisering av transport og sikkerhetsstyringssystemer er viktig for transportsikkerhet. Innenfor rammene av denne studien har det dessverre ikke vært mulig å se på utbredelsen av dette i utenlandske og norske transportfirmaer, eller på sikkerhetsmessige konsekvenser.

5) *Økonomi, konkurranse og lønn*. Resultatene i litteraturgjennomgangen spriker når det gjelder spørsmålet om hvorvidt og hvordan konkurranse kan påvirke sikkerhetsnivået i tungbiltransport. De intervjuede foreslo at akkordlønn blant utenlandske sjåfører kan slå negativt ut for transportsikkerheten. Spørreundersøkelsen indikerer at fastlønn er mer utbredt i begge gruppene av utenlandske førere enn blant de norske sjåførene i utvalget. Dette er overraskende.

6) *Teknologi og utstyr*. Litteraturstudien, intervjuene og Statens vegvesens kontrolldata indikerer ikke at lavere teknisk standard på utenlandske vogntog utgjør en viktig risikofaktor. Imidlertid mente de intervjuede at utenlandske vogntog generelt er mindre tilpasset norske vegforhold, spesielt om vinteren, siden de fleste av dem er toakslede trekkvogner, mens norske trekkvogner gjerne har tre aksler. Spørreundersøkelsen tyder på at norske sjåfører rapporterer mer stress knyttet til tekniske problemer med kjøretøy eller utstyr enn utenlandske sjåfører. Dette kan skyldes ulike forventninger, og mer forskning er nødvendig for å avklare dette.

7) *Arbeidstid og trøtthet*. Litteraturstudien viser at tungbilsjåfører har lange arbeidsdager (gjennomsnittlig 10,6 timer), og at mange av tungbilsjåførene bruker mye tid på fysisk arbeid (f. eks. lasting/lossing) i tillegg til kjøring. Internasjonal forskning viser at mellom 36 % og 64 % av yrkessjåfører rapporterer å ha sovnet bak rattet. Analysen

av data fra dødsulykker tyder på at tidspress, stress og trøtthet er de mest utbredte «unormale» tilstandene registrert hos både norske og utenlandske yrkessjåfører innblandet i dødsulykker. Trøtthet er like viktig eller viktigere i ulykker utløst av utenlandske tungbilsjåfører som i ulykker utløst av norske sjåfører. Spørreundersøkelsen indikerer derimot at utenlandske sjåfører, særlig sentral og øst europeiske, sjeldnere har duppet av bak rattet og sjeldnere kjører når de er trøtte enn norske sjåfører. Forskjellene er uventet store og vanskelige å forklare.

1 Introduction

1.1 Postponed liberalization of cabotage restrictions

European market pressures have led to an increase in the shares of foreign hauliers in the Norwegian transport sector in recent years, and today about six percent of the goods transport on Norwegian roads is done by foreign hauliers (Nævestad, Hovi, Caspersen & Bjørnskau 2014). Most of this is international transport, in and out of Norway. The involvement of foreign hauliers in domestic transport of goods within Norway (cabotage) is profoundly limited by Norwegian regulations. A liberalization of the current road cabotage rules may, however, further increase the share of foreign heavy goods vehicles (HGVs) on Norwegian roads.

Cabotage, meaning the national carriage of goods for hire or reward carried out by non-resident hauliers on a temporary basis in a host Member State, is governed by EU-Regulation (EC) 1072/2009 as of 14 May 2010. The purpose of this regulation was to reduce empty trips after unloading of international transport operations. According to the regulation, every haulier may perform up to three cabotage operations within a seven day period starting the day after the unloading of the international transport.

Since the 1980s the European Union (EU) has introduced measures to deregulate the freight market. As part of the accomplishment of the common market, the European Commission has pushed for a removal of market barriers to liberalize EU-Regulation (EC) 1072/2009 and allow cabotage. In line with this, a major deregulation of domestic road transport of goods in the EU/EEA area was scheduled to take place in January 2014.

Due to complaints from several member states facing competition from new EU-countries with lower labour costs the planned liberalization of the cabotage legislation was first postponed to 2015, when a newly elected EU-commission would be in place. After that, the liberalization was postponed again. Social dumping and national competitiveness were the main concerns raised by member states, while little attention was given to the issue of transport safety (cf. European Parliament 2013). In 2008, over 4.800 people were killed in accidents involving HGVs in 23 EU-countries (DaCoTa 2010).

Given the low level of wages in those countries that recently became members of the EU, it is likely that a possible lift of cabotage restrictions will increase the share of Eastern European lorries in Norway. Norway is not member of the EU, but as a member of the European Economic Area (EEA), Norway commits to implementing EU-legislation on economic competition. This includes the potential removal of restrictions on cabotage in the road sector.

1.2 Opportunities for foreign hauliers in road transport of goods

1.2.1 Change in legal framework conditions

The 2009 regulation of European road cabotage was introduced as the previous European Council regulations of cabotage were considered too vague and ambiguous. The preceding Council Regulation from 1993 states for instance that foreign hauliers may operate national road haulage services in another member state, *on a temporary basis* (Council Regulation 3118/93). However, distinguishing between temporary and permanent transport services was not easy in practice, as precise definitions were missing (ECORYS 2006). Moreover, because of its vague formulation, the preceding cabotage regulation was very difficult to enforce in the respective member countries (ECORYS 2006).

Although the new cabotage regulation is clearer than the former, the EU-member states choose somewhat different approaches when it comes to the implementation and enforcement of the regulation (European Parliament 2013). Moreover, Sternberg (2013) concludes that the new directive 1072/2009 has created a considerable grey zone concerning cabotage, which is exploited by foreign hauliers.

1.2.2 Lower labour costs in some parts of Europe

In May 2004, EU admitted 10 new member states: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia. On January 1. 2007, the so called EU-27 was established, bringing in the new members states of Bulgaria and Romania. When Croatia was included in the European Union July 1. 2013, EU acquired its 28. member state.

The European Union is founded on the principle of a European Single Market. The introduction of the new middle and eastern European EU member states in the preceding decade put, however, pressure on this principle. The labour costs in the new EU-member states are on average very low compared with the western European countries. The average hourly labour costs in Norway are for instance thirteen times that of Bulgaria (Eurostat 2013).

The most important framework condition influencing the competitive abilities of road transport companies is the level of wages (Hovi & Hansen 2011), road transport companies in Central and Eastern Europe are likely to compete on terms that will be detrimental to haulage companies in western Europe. As a consequence, western European countries have largely resisted the introduction of a single European road goods transport market.

Polish hauliers are for instance the largest provider of cabotage services in the EU, with increased competition from Romanian and Bulgarian drivers (European Parliament 2013). Several commentators have predicted the demise of the western European lorry driver. Tillman (2012) asserts that in the case of less complicated "from A to B" shipments, Swedish transport buyers would use cheaper eastern European hauliers, while they would use local hauliers in more complicated shipments. Discussing the consequences of road cabotage liberalization, Policy Research (2013) concludes that in the Netherlands it is likely that vehicles registered in lower wage level countries will perform more cabotage operations. Correspondingly, they conclude that easing restrictions on cabotage will not lead to

opportunities for Dutch registered vehicles. In the Netherlands, as in other western European countries, several industry organizations are calling for the government to intervene to limit the negative socio-economic effects of cabotage (European Parliament 2013). It is important to note, however, that some subsectors within the road goods transport market are more exposed to competition from foreign actors than others (Steen Jensen et al 2014).

1.3 Evidence of increasing internationalisation in Norwegian goods transport

Figure 1.1 shows the distribution of average annual vehicle kilometres distributed according to counties and HGVs' nationality in the period 2009-2012.

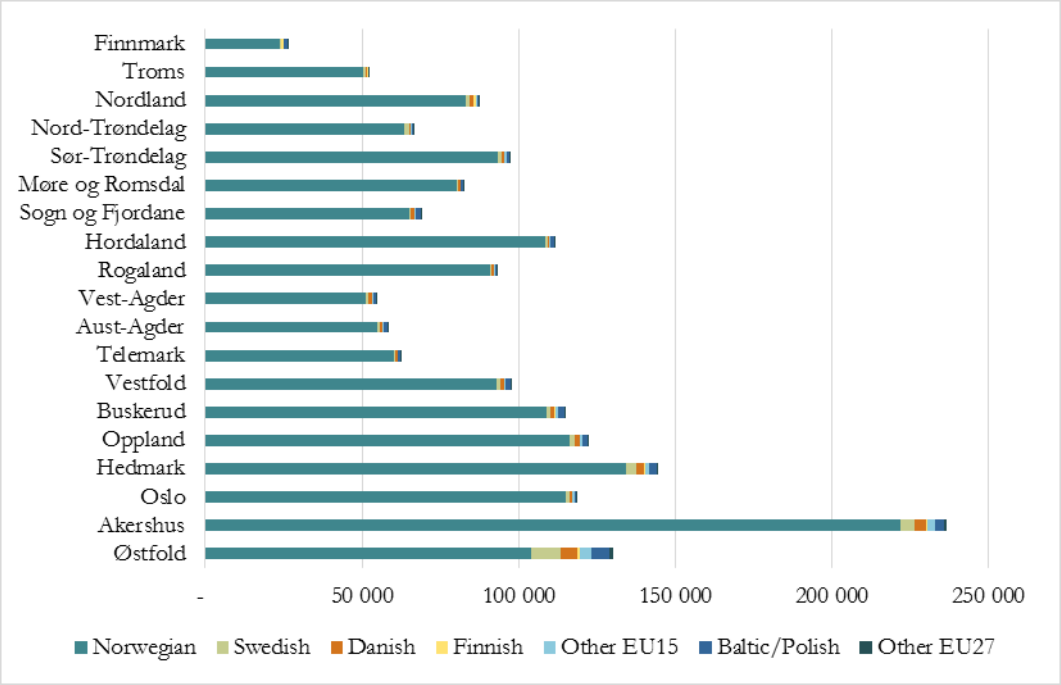


Figure 1.1 Overview of traffic with HGVs in Norway, in million kilometres, for county and HGV nationality. Average for 2009-2012. Source: (Nævestad et al 2014).

Norwegian heavy goods vehicles (HGVs) accounted for the largest share of the total road transport conducted in Norway. Foreign HGVs accounted for almost 6 % of the average domestic transport in total in the period 2009-2012. Following the Norwegian HGVs, Swedish, Danish and Baltic/Polish HGVs comprised a considerable share of the traffic. Swedish HGVs drove 33 million km, Danish HGVs drove 25.5 million km and Polish/Baltic HGVs drove 24.5 million km in Norway in average per year.

Figure 1.2 shows the traffic with foreign HGVs in Norway in the period 2007-2012.

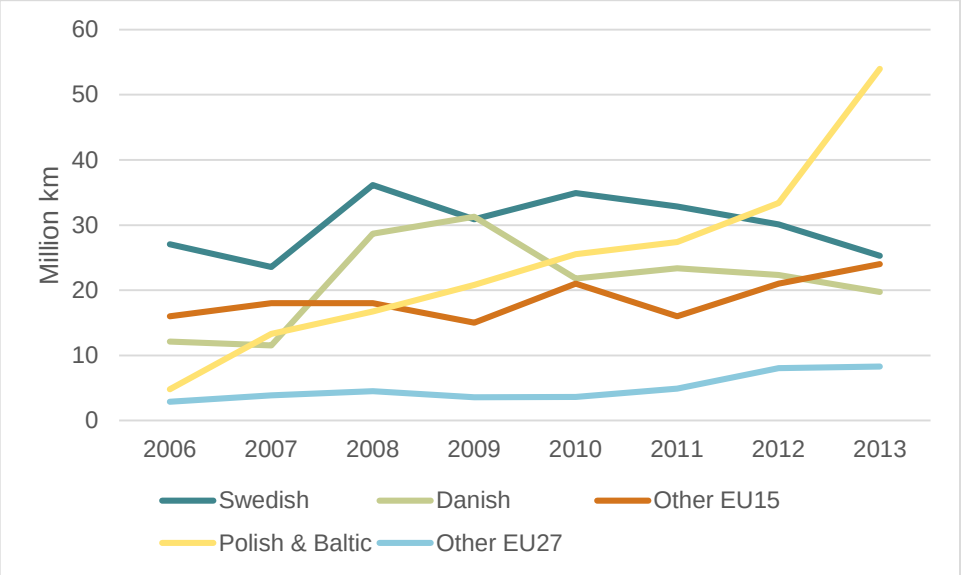


Figure 1.2 Overview of traffic with foreign HGVs by nationality in Norway, in million kilometres.

It seems that a redistribution of actors who transport goods on Norwegian roads is taking place. The Nordic countries have all experienced a reduction in traffic in Norway, compared with the 2008-level. On the other hand, EU nations outside the Nordic region have improved their position. Especially lorries from Poland and the Baltic states have strengthened their position dramatically from 2006 to 2013.

When it comes to cross-border transport, HGVs from Norway and Sweden accounted for the major share of transport in 2012. Baltic and Polish HGVs, however, accounted for a larger proportion in 2012 than in 2000, and it appears that the vehicle km of these countries increase. Nevertheless, these countries transport only 10 % of the total amount of goods involved in the cross-border transport in Norway (Nævestad et al 2014).

Baltic and Polish lorries end up being the group with the highest share of goods transported in a third country (i.e. Norway) in 2011. However, the majority of transport and the transport growth of Baltic/Polish vehicles, is due to import and export, not cabotage.

1.4 Safety outcomes of internationalisation

Based on a possible liberalization of cabotage rules and increased focus on accidents with foreign HGVs on Norwegian roads, a study was conducted in 2014, estimating the accident risk of Norwegian and foreign HGVs in Norway in the period 2007-2012 (Nævestad, Hovi, Caspersen & Bjørnskau 2014).

The study is based on data from 3531 police reported road accidents with personal injuries in Norway in the period 2007-2012. The accidents involved 3716 HGVs distributed among different groupings of vehicle registration countries. 2957 vehicles were Norwegian, 117 Swedish, 49 Danish, 99 from other EU15 countries, 93 Polish or Baltic, 17 HGVs from other EU27 countries, 21 were from other countries, and 363 HGVs had unknown nationality. We cannot calculate the risk of HGVs from countries outside the EU (N=22), because we lack data on their vehicle kilometres in Norway.

Figure 1.3 shows the number of HGVs in police reported traffic accidents with personal injuries per million kilometres for HGVs in Norway from 2007 to 2012, distributed according to the vehicles' country of registration.

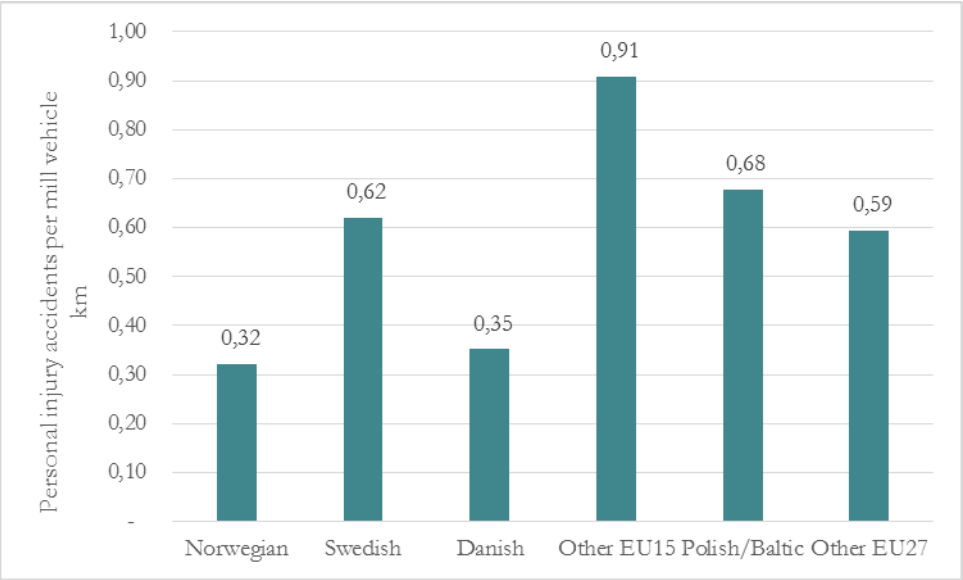


Figure 1.3 Number of heavy goods vehicles in police reported traffic accidents with personal injuries per million kilometres in Norway from 2007 to 2012, distributed according to the vehicles' country of registration. Source: (Nævestad et al 2014).

The figure shows that HGVs registered in foreign countries have higher accident risk than Norwegian HGVs on Norwegian roads. Norwegian and Danish HGVs have the lowest accident risk. The accident risk of HGVs from the rest of the EU15 is over 2.5 times higher than the accident risk of Norwegian vehicles. Polish and Baltic vehicles have the second highest accident risk, followed by Sweden[1] and vehicles from other EU27 countries. The accident risk for all national groups are statistically significantly different from the Norwegian at the 5 %-level, except the Danish and other EU27 countries. The average accident risk of HGVs in Norway is 0.34 accidents per million vehicle km.

Nævestad et al (2014) conclude, however, that they know little about the causes of the differences in accident risk between the different national groups, although they suggest that winter driving seems to be an important risk factor, and that HGVs from non-Scandinavian countries have three times higher accident risk than Scandinavian HGVs in the west/central/northern regions of Norway, probably as it is more demanding to drive in these regions. Nævestad et al (2014) also point to four issues that should be examined in future research, and which we therefore devote attention to in the current study: 1) Why do Other EU15 HGVs have the highest accident risk?, 2) Are the national groups' risk of material-damage only accidents distributed in the same way as their risk of personal injury accidents?, 3) What kind of accidents/situations are the different national groups involved in?, and 4) What proportion of the accidents are triggered by foreign drivers?

[1] The result that the accident risk of Swedish HGVs was higher than that of Norwegian and Danish HGVs was unexpected, given previous research (Dacota 2010). However, in the project's reference group meeting March 12. 2014, arguments were presented suggesting that considerable shares of the Swedish HGVs in Norway have foreign drivers (cf. Nævestad et al 2014).

1.5 The aims of the study

The aims of the present study are to:

1) Examine safety outcomes of increasing internationalisation in (Norwegian) road transport of goods.
2) Discuss the importance of potential risk factors.
3) Discuss potential measures to increase the safety of road transport of goods further.

The present study employs the following methods: 1) literature study of safety outcomes, risk factors and measures, 2) analysis of the data from fatal accidents investigated by the Accident Analysis Groups of the Norwegian Public Roads Administration, and personal injury accidents of Statistics Norway, 3) interviews with sector experts, transport buyers, companies, regulators, 4) Field work in heavy vehicle inspections and with foreign HGV drivers in Norway, and 5) small-scale survey directed at both Norwegian and foreign HGV drivers in Norway, examining the importance of various risk factors. We also use data from the NPRA's heavy vehicle inspections.

1.5.1 About the project «Safe Foreign Transport»

The study is part of a larger research project aiming to assess the effect on accident risk of the increasing shares of foreign actors in road and sea transport of goods in Norway; and to provide a scientific knowledge base that Norwegian authorities can use to develop measures to reduce any increased risk identified.

Information on the project: «Safe Foreign Transport» (SAFT) can be obtained on the website: www.toi.no/SAFT. The project is funded by the TRANSIKK program of the Norwegian Research Council, and lasts from January 2013 to April 2016. For more information on the program, confer: www.forskningsradet.no/transikk.

2 Methods

2.1 Introduction

In this chapter we describe how we will use the following five methods to fulfil the aims of our study:

1) Accident analysis based on fatal accident data from the Accident Analysis Groups of the Norwegian Public Roads Administration and Statistics Norway's database of police reported road accidents involving personal injury
2) Literature review of safety outcomes, risk factors and measures
3) Interviews with sector experts representing employers, employees and authorities.
4) Field work with foreign drivers in Norway at various driver rest stops and with regulator personnel and drivers in roadside inspections
5) Small-scale survey aimed at drivers in Norwegian and foreign transport companies, examining the importance of various risk factors.

2.2 What is a risk factor?

In road safety work, the term "risk factor", rather than the term "cause" is normally used to explain accidents (Sørensen, Nævestad, & Bjørnskau, 2010). A risk factor is commonly defined as a circumstance that was present at the time of the accident, without which the accident would not have occurred. A risk factor is thus a necessary but not sufficient condition for the accident. An accident is usually the result of the contributions and interactions between a number of risk factors, where each one not is sufficient for the accident to take place, but where the sum of them result in an accident.

Risk factors are divided into accident factors and injury factors. Accident factors are factors contributing to the occurrence of the accident (e.g. slippery road), while injury factors are factors contributing to the accident's serious consequences (e.g. lacking seat belt use). In this report, we use risk factors when we refer to both injury and accident factors.

Risk factors are also divided into factors associated with the driver (e.g. speeding), the vehicle (faulty brakes), the road (poor road marking) and the road environment (limited visibility).

Finally, risk factors are also divided into triggering risk factors and underlying risk factors. Triggering risk factors include events that occurred during the last seconds before the accident (e.g. falling asleep), and which triggered the accident. Underlying risk factors refer to factors that can explain and contextualise the triggering risk factors (e.g. long working hours, stress, time pressure).

2.3 Analysis of accident data

2.3.1 Accident Analysis Groups (AAG)

As of 2005, all fatal road accidents are investigated by the Norwegian Public Roads Administration's (NPRA's) regional accident analysis groups (AAG). The results of each investigation are documented in a report that describes, among other things, the course of the accident, road and weather conditions, and relevant aspects of road users and vehicles involved (Haldorsen 2010; Sørensen, Nævestad & Bjørnskau 2010). The reports are produced according to a template and are based on the AAG's own inspections, police interviews with involved parties, technical reports from the accident sites and involved vehicles, etc. (Haldorsen 2010). For the vast majority of fatal accidents it is thus possible to examine the factors that have triggered or contributed to the accident.

Certain variables from the in-depth reports are included in an AAG-database. This database can be used to quantitatively analyse fatal accidents and accident factors (Sørensen et al. 2010). The AAG refers to direct causes as "triggering factors" and underlying causes as "situational factors". The AAGs indicate the importance of the different factors by weighting them according to the extent to which each factor has influenced the course of events. The scale runs from 1 to 3, where 1 is to a small extent, 2 is to a significant extent and 3 indicates that the factors played an essential role/was decisive. In seeking to identify the situational factors, the AAG focuses on incident factors. An example of an incident factor is falling asleep, for instance caused by the situational factor "fatigue". The AAG report usually lists situational factors to describe the various incident factors.

Phillips & Meyer (2012) made use of AAG-data to study the prevalence of fatal accidents involving drivers at work. The original AAG-***database*** does not contain variables on work-related driving, although AAG-***reports*** provide relevant and often indirect information about this (Nævestad & Phillips 2013). For instance, the reports often mention road users' travel purpose. On the basis of travel purposes, among other things, it can be deduced whether the various road users involved in the accident were driving at or to/from work, even though the AAG reports rarely state directly whether the car trip took place during the driver's working hours.

Based on all AAG reports from the period 2005-2010, Phillips and Meyer added a new variable on driving during working hours to the AAG-database. It was, for example, concluded that the driver in question was a professional driver if the report stated that the transport of people or goods was this person's main task at the time of the accident and if there was reason to believe that the driver was a driver by profession. In practice, this mostly applied to heavy goods vehicles, bus or taxi drivers at work.

Nævestad & Phillips (2013) use and update Phillips & Meyer (2012) for mapping and analysing serious work-related road accidents (2005-2011). The difference is that Nævestad & Phillips focus on fatal accidents ***triggered*** by drivers at work, rather than hose ***involving*** drivers at work. The goal of Nævestad & Phillips' (2013) study

was to investigate whether, and to what extent, the contributing factors related to the triggering drivers at work and their vehicles could be connected to the work-related aspects of the triggering driver's workplace. The report is also based on reports from the Accident Investigation Board (AIBN) and interviews with nine experts. In the analysis of AAG-data, Nævestad & Phillips (2013) found that too high speed for conditions, failure to use seat belts and lack of information gathering were the main risk factors in fatal accidents triggered by drivers at work.

For the present report, we have updated the database developed through the two previous projects. We have updated for the last available year (i.e 2012). We use and update the variables on drivers at work that we developed in the above projects, but this time we focus on the driver and the vehicle's nationality, and on heavy goods vehicles.

2.3.2 How did we use the AAG material to find out about accidents involving foreign actors?

The AAG material consists of: an in-depth report for each fatal accident on Norwegian roads from and including 2005, and a database with different variables summarising the reports (for each accident the AAG set in variable values along a single row in an Excel spreadsheet).

There are five different spreadsheets representing different classes of variables describing the accidents. This is shown in Table 2.1.

Table 2.1 In the AAG database, variables are placed in one of five different spreadsheets in Excel.

Accident	Traffic unit	Involved persons	Analysis
Region	Region	Region	Unit code (A,B,C)
Year of accident	Unit code (A,B,C)	Unit code (A,B,C)	Analysis factor
Council area	Year of registration	Location within vehicle	Accident factor rating (0,1,2,3)
Accident group	Safety belts	Degree of injury	Injury factor rating (0,1,2,3)
Date, time	Airbag	Age	
Location	Structural soundness	Gender	
Road type	Neck supports	Condition	
Road number	Point of contact	Use of safety equipment	
Light conditions	EuroNcap (technical test)		
Road illumination	ABS/ESC		
Road surface	Collision bags		
Driving conditions	Triggering unit? (Y/N)		
Temperature	Total weight		
Speed limit			
No. lanes			
Central barriers			
Central road marking			
Accident location in relation to lane of origin			

By going through the AAG reports and supplementing the AAG-database with values for new variables, researchers can use the database to investigate new aspects of road accidents. Here, we are interested in accidents involving foreign drivers, so we can add variables describing the driver in order to indicate whether he or she was a professional driver, and also to describe whether he or she was foreign or Norwegian (see below). In this way we can use the database to find out (i) how many fatal accidents in Norway involve foreign drivers, and (ii) if there are special factors or conditions associated with such accidents.

We are especially interested in variables describing each «traffic unit» involved in the accident, each «involved person», and variables describing the «analysis» conducted by the AAG (Table 2.1).

The "traffic unit" variables together describe the safety condition of the vehicles and associated materials, and they can tell us whether "technology and equipment" used by foreign drivers is better or worse, in safety terms, than that used by corresponding Norwegian drivers. This in turn will allow us to make inferences about the framework conditions for foreign actors. The spreadsheet «traffic unit» also contains the variable «triggering unit?», which the AAG use to denote whether or not they thought that the traffic unit precipitated or triggered the accident. This variable is important for finding out whether the foreign drivers drive more or fewer "triggering" vehicles than Norwegian drivers.

The variables describing «involved persons» denote the condition of the road user at the time of the accident, whether or not they used the seatbelt (if relevant), and whether or not they used it correctly. These variables have implications for driver training, framework conditions, and national safety culture as possible causes of accidents involving foreign drivers.

The variables in the spreadsheet «analysis» can be used in order to see if accidents involving foreign drivers have different circumstances from those involving Norwegian drivers. The spreadsheet «analysis» contains for each traffic unit involved in the fatal accident, one or more causal factors. A causal factor can be an injury factor (e.g. driver did not use seatbelt) or an accident factor (e.g. icy road, obstruction to view, driver nodded off). Several factors are often named for each triggering vehicle, allowing one to build up a picture of the circumstances surrounding the accident. In addition, the "analysis" spreadsheet contains any relevant "neutral" factors for each accident, such as poor weather conditions. Such factors are said to be neutral because they associated with the accident, but not with particular vehicles or involved persons. They are nevertheless useful, in that they also add to our knowledge about the types of accident involving foreign drivers.

After the variables professional driver, foreign professional driver, foreign vehicle and foreign firm were registered in the spreadsheet "Involved persons", they were transferred to the spreadsheets "Traffic unit" and "Analysis". The pre-existing variable "triggering vehicle?" was transferred from the spreadsheet "Traffic unit" to "Involved persons" and "Analysis".

2.3.3 Questions

For fatal accidents occurring on Norwegian roads in the period 2010 to 2013 the following questions were examined;

1. How many of the drivers were;
    a. Norwegian professional drivers?
    b. Foreign professional drivers?
2. How many «triggering» vehicles were driven by;
    a. Norwegian professional drivers?
    b. Foreign professional drivers?
3. How many foreign professional drivers drove vehicles registered in a foreign country?
4. How many foreign professional drivers were employed by a foreign firm?
5. Which factors describing (a) the vehicle and associated material (trailer, cargo etc.), and (b) the driver, were different for foreign versus Norwegian professional drivers?
6. Does the AAG's analysis show different circumstances and causes for accidents with foreign versus Norwegian professional drivers?

We also wanted to group the drivers by nationality as far as this was possible.

2.3.4 Meaning of the terms *professional driver* and *foreign*

We added the following variables and associated values to the spreadsheet "involved persons" in the AAG-database, for all accidents occurring between 2010 and 2013;

1. Professional drivers (1=yes, 2=likely, 3=insufficient information, 4=unlikely, 5=no).
2. Foreign professional driver (1=yes, 2=likely, 3=insufficient information, 4=unlikely, 5=no).
3. Foreign vehicle (1=yes, 2=likely, 3=insufficient information, 4=unlikely, 5=no).
4. Foreign firm (1=yes, 2=likely, 3=insufficient information, 4=unlikely, 5=no).

Professional driver was coded positive if the report indicated that the involved person was a driver transporting people or goods at the time of the accident *and* gave reason to believe that the person's occupation was professional driver. In practice persons coded positive were most often truck drivers at work, and in some cases bus or taxi drivers.

A professional driver was coded as foreign if the report stated that the driver had a foreign driver licence or nationality. In some cases the vehicle and/or firm was registered in a foreign country, but the report said nothing about the driver's nationality. In such cases, the professional driver was coded "likely" as foreign. If the professional driver had a foreign license or nationality, but had been living in Norway for more than seven years (and driven a Norwegian vehicle for a Norwegian firm at the time of the accident), he/she was coded "no" on foreign professional driver.

A vehicle was coded as foreign if the report stated that it was registered in another country, or if the driver and/or firm was foreign without a base in Norway. If there was nothing about this in the report, we checked whether the vehicle was registered in Norway using NPRA's database for vehicle information (the registration plate was usually given in the report).

A firm was coded as foreign where this was stated explicitly in the report. In some cases, it was possible to find the name of the firm and then find out more about the

firm on the internet. If the vehicle was registered in Norway and there was no information about the firm in the report, the firm was registered as Norwegian. Transport companies with a main office based in another country but with an established base in Norway and with a Norwegian-registered fleet, were coded as Norwegian.

It must be borne in mind that we often had to assume that the driver, vehicle or firm was Norwegian because the reports lacked a formal reporting category for nationality. However, this was often clear from the information provided about e.g. place of residence, pictures of the vehicle, names stated, or witness accounts.

2.3.5 Analysis of personal injury accidents from Statistics Norway

Statistics Norway records data from all police-reported traffic injuries. Originally the data was recorded on a physical form filled out by the police, but the reports are now computer registered. We analyse the data by means of the data processing program SPSS.

The data file is predominantly organised around the unit of "people involved", who are people injured in accidents and uninjured drivers. This means that we have used filters in our analyses in order to find HGVs involved in accidents, based on the registration country of the vehicles.

The data file includes all kinds of road users, both drivers, passengers and vehicles. First, we therefore select the value driver on the variable "vehicle road-user", so we exclude passenger, pedestrian, etc. Second, we focus only on the drivers of HGVs. We therefore filter out units on the "vehicle code" variable. This variable has more than 70 values.

Our analyses of accidents and risks focus on the drivers that have been involved in police-reported accidents with injury to people from 2007 to 2014. The accident data from Statistics Norway contain a number of variables. In the current study, we primarily focus on accident types and the risk of different accident types.

The exposure data for Norwegian and foreign HGVs in Norway are based on the lorry surveys of Statistics Norway and Eurostat and the border crossing statistics of Statistics Norway to estimate the vehicle kilometres of Norwegian and foreign HGVs on Norwegian roads (cf. Nævestad et al 2014). We also examine the number of injured people in the HGV accidents, speed limits on the roads with accidents, use of protective equipment and accidents in the winter versus the summer.

2.3.6 Data on vehicle kilometres

We use the lorry surveys of Statistics Norway and Eurostat and the border crossing statistics of Statistics Norway to estimate the vehicle kilometres of Norwegian and foreign HGVs on Norwegian roads. This is matched with accident data from Statistics Norway's data on police reported injury accidents to calculate and compare the accident risk of Norwegian and foreign HGVs in Norway.

We use two data sources in order to analyse the development with regard to foreign HGVs' traffic to, from and within Norway, and to examine the share that the transport of foreign actors makes up of the total goods transport on Norwegian roads. The first data source is Statistics Norway's Lorry surveys' data on the vehicle kilometres of Norwegian HGVs in Norway. This is a quarterly survey of domestic and foreign traffic with Norwegian-registered HGVs. The purpose of the lorry

survey is to describe the Norwegian registered goods transport, commodity types and –utilization, and help to identify transport patterns for Norwegian registered HGVs in Norway and abroad.

The second data source is traffic to/from Norway and cabotage within Norway with foreign HGVs. This is based on European studies similar to the Lorry survey. Eurostat's statistics directive commits each member state to conduct such surveys, which means that Statistics Norway gets information on all trips in and out of Norway from EU-countries.

In order to analyse the scope of, and trends in the transport of goods in Norway, we have developed trip matrices based on the Lorry surveys in Norway and EU-countries. We have not been able to focus on single countries, as the data are based on sample studies in which specific countries have few observations within the network. The following categories have been used in the analyses of personal accident risk: 1) Norwegian HGVs, 2) Swedish HGVs, 3) Danish HGVs, 4) HGVs from other EU15 countries, 5) Baltic and Polish HGVs and 6) HGVs from other EU27 countries.

2.3.7 Uncertainties and challenges related to the estimates of accident risk

In this report, we define HGV risk on Norwegian roads as the number of police reported injury accidents per million vehicle km. We conduct tests of the significance level of the differences in accident risk between the national groups that we compare to examine the probabilities that the differences are due to statistical chance. The calculations take into account uncertainty in both accident- and exposure data.

Our estimates of accident risk is influenced by both the numbers underlying the accident statistics and the numbers underlying the vehicle km's for different groups. If the exposure is underestimated, the accident risk is overestimated and vice versa. If the share of traffic with foreign HGVs in Norway is underestimated, the number of accidents per km will be too high. These numbers may to some extent be influenced by different practices of reporting, registration and so forth.

Our results must be interpreted with some caution, as there are certain uncertainties and challenges associated with the analyses. We have discussed the importance of seven:

1) Vehicles with unknown nationality. There are a total of 429 HGVs with unknown nationality in accidents in the period 2007-2014. The proportion of vehicles with unknown nationality declined dramatically during the period, probably as the focus on accidents with foreign HGVs on Norwegian roads increased in the period. We have indications that significant proportions of the vehicles with unknown nationality are Norwegian, since these groups share several common features. Nævestad et al (2014) did different risk estimates to assess the possibility of a reporting bias meaning that some of the foreign vehicles had substantial shares of vehicles in the group with unknown nationality, and concluded that they primarily are Norwegian.

2) Relatively few foreign vehicles involved in accidents. About 80 % of the heavy vehicles involved in accidents in the period were Norwegian, while about 11 % were foreign and 9 % had an unregistered nationality. Although we have aggregated the nationalities into groups, the numbers of traffic accidents and vehicle km for foreign

HGVs are relatively small. The comparison of accident risk for the foreign groups are therefore subject to uncertainty.

3) Different nationality of vehicles and drivers? Our accident risk calculations are made possible as we have data for HGVs nationality both when it comes to exposure and accident involvement. We know, however, that the nationality of the vehicle and the driver may be different. This is a premise that must be noted when interpreting the results of the present study.

4) Different risks of accidents involving personal injury and material damage? The results show that the other EU15 countries have higher accident risk than Polish and Baltic vehicles and vehicles from other EU27 countries. This may seem unexpected, given the focus on the accident risk of eastern European drivers of HGVs in Norway. However, the risk of accidents or incidents involving only material damage and/or towing assistance may be distributed in a different way than the risk of accidents with personal injuries.

5) The risk of serious accidents is influenced by where you drive, i.e. roads and road environment. We have seen that foreign HGVs primarily are involved long-haul (international transport). If foreign HGVs drive long distances on roads with a good standard, we may underestimate their accident risk. Norwegian HGVs, on the other hand, are involved in more local transport assignments than foreign HGVs. Distribution of goods in a city environment for example, result in few vehicle kilometres in an environment with a relatively high accident risk. This may increases the risk of accidents for the Norwegian HGVs in the sample Future studies should compare the accident risk of Norwegian and foreign HGVs on different road types and in different traffic environments, e.g. city versus motorway. Currently, exposure data lacks on roads and road environment for foreign HGVs.

6) Different types of HGVs have different accident risks. We compare the accident risk of HGVs in general, but traffic safety research indicates that different types of HGVs have different accidents risks (Høye, Elvik, Sørensen & Vaa 2012). We are unfortunately unable to assess the importance of vehicle type for accident risk compared with nationality, as we lack traffic data for the different vehicle types.

Nævestad et al (2014) states that in the accident statistic, the HGVs are distributed on two different types: lorries with and without trailer (N=2599) og tractors with or without semi-trailers (N=1014). This reflects the fact that the Norwegian HGVs in the accident statistics largely are lorries with and without trailer while the foreign HGVs primarily are tractors with and without semitrailers. The latter vehicle type is prevalent among the foreign vehicles, and we have seen that the accident risk vary substantially between them. This indicates that vehicle type not is a more important predictor of accident risk than nationality in our data. This should be examined in future studies.

7) The risk of triggering traffic accidents may be different than the risk of being involved in a traffic accident. Unfortunately, we do not have the data to examine how many of the personal injury accidents in our study that actually were triggered by the HGVs that we focus on, or whether there are differences between the national groups when it comes to the risk of triggering accidents. The shares of drivers triggering traffic accidents are lower for HGV drivers than it is for other drivers (Nævestad and Phillips 2013). However, we cannot rule out that there are differences between the various national groups of HGVs when it comes to triggering accidents. Results from AAG-data (Chapter 3.2) indicate that foreign HGVs are more likely to

trigger accidents, but we have not estimated and compared the risk of triggering accidents.

2.4 Literature review

2.4.1 Search terms and sources

A literature search was conducted in order to acquire an overview of the research literature on safety outcomes of increasing internationalisation of road transport of goods. The results of this literature review is reported in Nævestad, Bjørnskau, Hovi and Phillips (2014): "Safety outcomes of internationalisation of domestic road haulage: a review of the literature". In the current publication, we have updated this literature review and expanded it to also include a third aim: "potential measures that may address these risk factors" (i.e. risk factors identified through the second aim of the literature review).

The first searches for literature relevant to the first and second aim of the literature review were primarily conducted in June and August, 2013, and supplementary searches were conducted in October, 2014. Supplementary searches on measures (third aim) were done in November and December 2015. The searches included four scientific online libraries: Sciencedirect, Ovid, Google Scholar and Trid. General searches in Google were also conducted. The searches in the scientific databases included terms like "cabotage", "deregulation", "liberalization", "competition", "foreign", "out placement" "goods transport", "freight transport", "road freight industry", "foreign hauliers", combined with the terms "traffic safety", "safety" "risk" and "accidents". Some of these key terms were also translated into Norwegian, to search for documents written in Norwegian.

As we know that Germany and France are the European countries with the highest shares of cabotage in Europe (Eurostat 2014), we also used German search terms, e.g. "Risiko", "ausländisch", "Lastkraftwagen". In 2005, 35 % of the HGV transport (in tonnes-km) on the German motorway system was operated by foreign HGVs (Wieland 2005). Unfortunately, we did not find relevant German results comparing the HGV accident risk of German and foreign HGVs in Germany. Neither did the searches using French search terms like "risque", "étranger" and "camions" provide relevant results. The lacking relevant results in German and French may to some extent be a result of language barriers, but we also searched specifically for research literature on France and Germany, using English terms (e.g. "cabotage in Germany" "foreign HGVs in Germany"). Below, we give an example from the Sciencedirect database searches, to how we conducted the searches and the results that they generated.

The Sciencedirect database searches combined the concepts "cabotage", "deregulation", "liberalization" or "competition", combined with one of the terms "traffic safety", "safety" and "accidents". in "title, abstract and key words" in all sources for all years. The first search in Sciencedirect, using the term "cabotage" combined with one of the three safety related terms generated no results. Similar searches using the terms "deregulation", "liberalization" and "competition" combined with one of the terms "traffic safety", "safety" and "accidents" generated 400 results. The titles of these publications were read, and when titles were considered relevant the abstracts of the publications were also read. As a result, we found five seemingly

relevant publications in the Sciencedirect searches: two on air transport, two on freight transport and one on bus transport.

The scarcity of the peer reviewed journal results indicate that few peer reviewed studies focus on the safety outcomes of cabotage liberalization and internationalisation of domestic road haulage. Searches in other search engines (e.g. www.google.com) revealed, however, that this is an important traffic safety and policy issue in European countries. Apart from generating several relevant EU funded research reports, these searches generated relevant studies from countries like Great Britain, the Netherlands, Greece, Finland and Norway, and three additional peer-reviewed articles, two of them comparing accident risk.

Finally, the literature search was also supplemented by research literature that we already knew about, and which we perceived as relevant to the aims of the study. These were not uncovered by the searches. All in all the literature search generated 25 studies that were relevant to at least one of the aims of the study.

Appendix 1 provides an overview of key information on the 25 most relevant and recent publications focusing on safety outcomes of increasing internationalisation of domestic road haulage, potential accident risk factors of foreign hauliers and potential measures to address these risk factors.

2.5 Interviews focusing on risk factors and measures

We have conducted 11 qualitative interviews with 12 sector experts representing employers, employees and authorities in order to gain knowledge on safety outcomes of increasing internationalisation, potential risk factors and relevant measures to increase safety in road transport of goods further. Three interviews were conducted face-to-face, and 8 were telephone interviews. The interviews generally lasted for about one and a half hours.

We have used a semi structured interview guide (cf. Appendix 2), and the themes and questions in the guide focused on the three aims of the study (safety outcomes of internationalisation, risk factors and potential measures), but primarily on the two latter aims.

The interview guide is also influenced by results from our previous study (Nævestad et al 2014), results from the accident database analyse and the results from the literature study. First, the interview guide contains questions on risk factors: 1) winter driving, 2) drivers' transport safety behaviours, 3) company regulation of drivers' transport safety behaviours, 4) safety culture, 5) organization of transport assignments, 6) safety management system, 7) competence, training and experience, 8) technology and equipment, 9) economy, competition and pay, 10) rules and enforcement, and 11) working hours and fatigue,

Second, the interview guide also contains questions on potential measures to address these risk factors: 1) Increase the number of heavy vehicles inspections, 2) Establish a national electronic register, 3) Enforce payment of fines, 4) Increased cooperation with EU/EEA countries, 5) Clarification of rules, 6) Organization of and cooperation between domestic authorities, 7) Increase the authority of some authorities, 8) Clarify (and increase) the responsibilities of transport buyers, 9) Information campaigns 10) Introduce certification/approval systems, 11) Course in winter driving, 12) Technical requirements for driving in Norway.

The purpose of the interviews was to give us a deeper understanding of the context of relevant risk factors and safety problems, to give us insight into potential mechanisms that could shed light on different safety outcomes and the pros and cons of potential measures. It is important to note that interviewees were encouraged to "think out loud" and they were assured that the purpose of the interview was to supplement the other data in our study. Thus, many of the suggestions in the interview data represent hypotheses and point to questions and issues that should be examined in future research. Although the themes in the interviews were fairly similar to those in the small-scale survey, the qualitative interviews involved open ended questions which allowed the interviewees to elaborate freely when answering.

We present the results from the interviews together with some of the results of a project reference group meeting which was held at The Institute of Transport Economics (TØI) March 12. 2014. The reference group meeting was held after an open TØI-seminar where we presented preliminary results from the report comparing accident risks of Norwegian and foreign HGVs in Norway (Nævestad et al 2014). The open seminar lasted from 10-12 and had about 50 participants. From 12-13.30, we arranged a lunch meeting for the reference group, where we discussed possible mechanisms that could explain our findings. We got important feedback, learned more about nuances within our research field, and got suggestions to further research. As we got many important view points and comments in the reference group meeting, we choose to also include some relevant highlights from this meeting together with the presentation of the interview results.

2.6 Field work

2.6.1 Heavy vehicle inspection in June, 2014

Three researchers from the Institute of Transport Economics participated in a heavy vehicle inspection in June 2014 at a Norwegian Public Roads Administration (NPRA) inspection site in the east of Norway. Two of the researchers (Merethe Dotterud Leiren and Tor-Olav Nævestad) spent the whole day at the inspection site. Ross Phillips spent half the day at the inspection site. Merethe Dotterud Leiren had been invited by the NPRA and the Labour Inspection Authority (LIA) who were having a joint inspection of both Norwegian and foreign heavy vehicles. She was at the time conducting field work for a research project on working conditions in goods and tour bus transport. The results of this project is reported in Steen Jensen, Bråten, Dotterud Leiren, Nævestad, Skollerud, Sternberg & Tranvik (2014). (See page 124-131 in Steen Jensen et al (2014) for a presentation of the results from Dotterud Leiren's field work)

The inspection site was a permanent NPRA inspection station. The researchers followed the inspection personnel from the NPRA and LIA in their inspections, and talked to both the inspectors and the drivers throughout the day. The researchers wore yellow vests with the "TØI" (Institute of Transport Economics) logo on and presented themselves as researchers. They also stated that the results of the field work would be reported in ways that ensured their anonymity.

The inspection was mainly organized by the NPRA, but LIA inspectors were also participating. Four NPRA inspectors were present and two LIA inspectors. In addition, a LIA superior was also overseeing the inspections. The day started with a

meeting with the inspectors, where we presented ourselves, discussed our research projects and the themes that we were interested in. Detailed field notes were written at the end of the day. The researchers read and commented on each other's field notes.

2.7 Small-scale survey

Based on the results from the literature study, accident data analysis, field works and qualitative interviews on relevant risk factors, we conducted a small-scale survey to examine the prevalence and perceived importance of the identified risk factors among Norwegian and foreign HGV drivers.

2.7.1 Recruitment of respondents

Survey interviews with foreign drivers, May 2014

The respondents were recruited in two different ways. The foreign drivers were recruited by research assistant and student Gunhild Meyer Levlin at rest stops, terminals and parking lots in the South Eastern region of Norway in May 2014.[2] The drivers were interviewed by means of a tablet device connected to our online survey. The survey was available in four languages, and Levlin also had paper versions of the survey with her, in case there were more drivers present who wanted to answer the survey.

In practice it took minimum thirty minutes for the respondents just to answer the survey. Including introduction and closure of the interviews, most of the interviews with the foreign drivers lasted for about one hour.

Levlin spent a total of 105 hours looking for foreign drivers over a period of 15 days in May 2014, and she drove a total of 1327 kilometres. As each interview lasted for about one hour, she spent approximately 74 hours talking to 69 foreign drivers and five Norwegian drivers in or outside their vehicles.

Drivers were asked to answer the survey themselves by means of the tablet, or Levlin would interview them using the tablet. In both cases, the tablet was used to access survey links with the survey in different languages. The survey and the introductions were distributed in Norwegian, English, Polish, Lithuanian (cf. Appendix 3). There were introductory texts in the beginning of each web survey, explaining the purposes of the surveys and stressing that the surveys were confidential.

Each time Levlin approached a supposedly resting foreign driver, she said:

> «Hi! I am a student writing a thesis on foreign drivers in Norway. I would like to ask you some questions on safety and working conditions. The survey is anonymous, and neither you, your vehicle or your company will be identified. I cooperate with The institute of Transport Economics in Norway, which also will use the data from the survey. It will take about fifteen minutes to complete the survey».

[2] Meyer Levlin used the data on the foreign drivers in her bachelor thesis on Emergency and Risk Management at the Metropolitan University College in Copenhagen (Levlin 2014).

The purpose of this introduction was to introduce herself as a student, and not a representative of Norwegian authorities. Each time she also answered drivers' questions about the survey and explaining more about its context before the survey interviews.

The drivers who were unwilling to answer either could not answer because of their language, or because they did not have time or because they did not want to. According to her estimates, a total of 33 % of the drivers that she approached were unwilling to answer the survey, giving her a response rate of 67 %. Most of the drivers who were unwilling to answer were unwilling because she did not have the survey available in their language (19 %). Only 14 % of the drivers that she asked were unwilling to answer for other reasons.

Thus, Levlin's sample is shaped by the survey languages available. Drivers who did not talk a Scandinavian language, English, Polish, Lithuanian or Finnish3 were excluded from answering. The sample is also shaped by the fact that the drivers by and large were recruited in resting areas in South East Norway, and near the E6-road, which is the main north-south road in Norway. Levlin tried not to visit the same place each time, in order to try to recruit a heterogeneous sample.

This method is more time consuming than sending e-mails through a company, for instance, since the interviewer must find drivers who will answer the survey and either interview them personally, or be nearby as they answer the survey, as they normally answered by means of a tablet device.

Another challenge with this approach to recruiting foreign drivers is that it requires a person who is able to quickly establish trust with the foreign drivers. It was important that the respondents understood that the interviewer was not a representative of Norwegian authorities, that the survey was anonymous, and not least that the survey was a serious project that was worth spending time on. Given the small share of drivers who declined to participate in the survey, it seems that Levlin was successful when it comes to communicating this to the drivers.

One of the main strengths of our chosen way of recruiting foreign drivers in resting areas, and without going through their "superiors" is that we hoped to avoid "strategic answers" from the respondents, fearing that negative results could reflect negatively back on themselves and their contracts (We return to this in chapter 16).

The Norwegian I sample

The Norwegian drivers in the sample were primarily recruited through a web link to the survey on the website of the Institute of Transport Economics. The web link was introduced on the website of the project "Work related transport accidents", which was a sub site on the Institute of Transport Economics website. A link to this site was also presented on the Facebook website to members of the "Norwegian cabotage study", which is a group for fans of a study attempting to map cabotage driving in Norway. We used this Facebook site, as we assumed that most of the members would be Norwegian HGV drivers.

The introduction text did not tell the respondents that the data was collected on behalf of the Safe Foreign Transport project (SAFT), or that their results would be compared to those of foreign drivers. The reason is that the issue of foreign HGV

[3] Levlin also speaks Finnish, and could therefore translate questions to Finnish if Finnish drivers were unable to answer or had problems with the English survey.

drivers in Norway is a politically debated issue, generating considerable incitement among the involved parties. The Norwegian drivers answering the survey are to some extent competing in the same market as the foreign drivers in the survey. As the Norwegian drivers (especially those accessing the survey link from the Facebook site) would have an interest in giving strategic answers in order to score better in the survey than foreign drivers, they were not informed that their results would be compared with those of foreign drivers.

Instead the website with the survey link was titled "Study of safety culture, winter driving and working conditions". Moreover on this website, respondents were informed that:

> "If you are a HGV driver, we hope that you will participate in a study! The Institute of Transport Economics is conducting a survey aimed at HGV drivers in Norway. It will take you about fifteen minutes to answer the survey. The Institute of Transport Economics conducts the survey in conjunction with a research project financed by the Norwegian Research Council, *LINK*. Questions or comments can be directed to Tor-Olav Nævestad. Thank you very much in advance!

The project link on the website was to an actual research project financed by the Norwegian Research Council, focusing on work related accidents in road, sea and air transport. We placed the link to the survey on this website, as we also intended to use the small-scale survey data in this research project, focusing on work related transport accidents. The fact that the Norwegian drivers in the Norwegian I sample generally did not "score better" than the foreign drivers, except when it comes to winter driving, seem to indicate that they did not give strategic answers.

2.7.2 Survey themes and questions

The surveys included questions on the following themes:

1) Background variables related to age, nationality of driver, vehicle and company, employment status, company size and whether the drivers own the trucks themselves.

2) Winter driving: 11 self-developed questions related to e.g. exposure to Norwegian winter roads, need for towing assistance, drivers' perception of risk and feeling of mastery, winter tyres and snow chains, loading of the trailer on winter roads and winter driving training. These questions were developed by Tor-Olav Nævestad and Gunhild Levlin.

3) Five of 25 questions on safety culture from the GAIN-scale on safety culture that we have used in previous research (Bjørnskau & Longva 2009; Nævestad & Bjørnskau 2014). The GAIN-scale is presented in the "Operator's Safety Handbook" (GAIN 2001).[4] The questions focus on safety commitment, safety training and reporting routines.

4) Six of 20 questions on work related factors known to influence the traffic safety of professional drivers (Nævestad & Phillips 2013; Nævestad & Bjørnskau 2014). The

4 Global Aviation Information Network (GAIN) is a voluntary association of airlines, manufacturers, trade unions, governments and other organizations in aviation. The purpose of GAIN is to produce and distribute relevant information to increase safety in aviation. GAIN was established in 1996 based on an idea that dissemination of experiences and knowledge of safety-related factors could improve aviation safety. The purpose of the GAIN manual is to help operators to start, improve and expand their internal safety programs.

questions focus on for instance vehicle safety, and different transport safety behaviours.

5) Questions on exposure (1000 kilometres driven) and accident involvement in the last two years, which also have been used in studies of professional drivers (Nævestad & Bjørnskau 2014).

6) Questions on driving and working hours, fatigued driving and falling asleep behind wheel, which also have been used in studies of professional drivers (Nævestad & Bjørnskau 2014).

7) Questions on responsibility for (un)loading, fixed salary, origin and destination of trips and how the respondents got their cargo. These questions were developed through a cooperation between the research institute FAFO and the Institute of Transport Economics (cf. Steen Jensen et al. 2014).

8) Questions related to measures: knowledge of the Donna Diesel campaign and whether the respondents have smart phones and if they would like to register their phone numbers in order to receive vital driving information on their phones, or whether they would download an app providing this information. These questions were developed by Gunhild Levlin.

2.7.3 Description of the samples

In Table 2.2 we present shares for driver nationality, their vehicle registration countries and their employment countries, distributed according to three geographical regions and one category for unknown.

Table 2.2 Nationality of drivers, vehicle registration country and driver employment country

Region	Driver nationality		Vehicle reg. country		Driver employ. Country	
Norwegian I:	47 %	61	49 %	64	49 %	63
Western European Countries (WE):	13 %	17	15 %	20	15 %	19
Central/Eastern European countries (CEE):	40 %	52	28 %	37	31 %	40
Unknown:	0 %	0	7 %	9	6 %	8
Total:	100 %	130	100 %	130	100 %	130

In order to be able to compare the groups statistically, with an N of 130, we divided respondents into three groups. We see that nearly half of the drivers and vehicles in the sample are Norwegian, and that half of the drivers are employed in Norway. The other groups of drivers were from Central/Eastern European countries (CEE).

The group of drivers from "Western European countries" (WE) is unfortunately small. This group actually consists of 8 drivers from Nordic countries and 9 drivers from other European countries (mostly from The Netherlands). This group is generally too small to make any solid conclusions about this group in our analyses.

The small size of the WE group reflects the limited kilometres driven of these foreign drivers on Norwegian roads. The kilometres driven of Other EU15 countries made up 1 % of the kilometres driven with HGVs in Norway in the period 2007-2012 and 18 % of the kilometres driven with foreign HGVs in Norway. Moreover,

only 2 % of the inspected HGVs in the NPRA's winter inspections in 2015 were from Western Europe, while 20 % were from Central and Eastern Europe. Thus, it may seem that the low share of Western European drivers in our sample to some extent reflects the fact that this group also has a relatively low share of drivers on Norwegian roads.

Nævestad et al (2014: 17) indicate that transport with HGVs from CEE countries is increasing in Norway, at the expense of Nordic and Western European HGVs. The group of drivers from CEE countries was established because of a small sample of foreign drivers. Other publications (e.g. Nævestad et al 2014) discern between "older" (Poland, Baltics) and "newer" (Romania, Bulgaria) EU members from Central Eastern Europe. In this sample, however, we group all these countries together. Nævestad et al (2014) did not find significant differences in the accident risks of HGVs from "older" and "newer" EU members from Central or Eastern Europe in Norway. The group of 52 drivers from CEE countries are distributed among the following nationalities: 29 Polish, 16 Baltic (mostly Lithuania), and the rest from Romania, Bulgaria, Hungary and Slovakia.

Below, we look at drivers' age groups, company size and their employment status distributed according to their nationality.

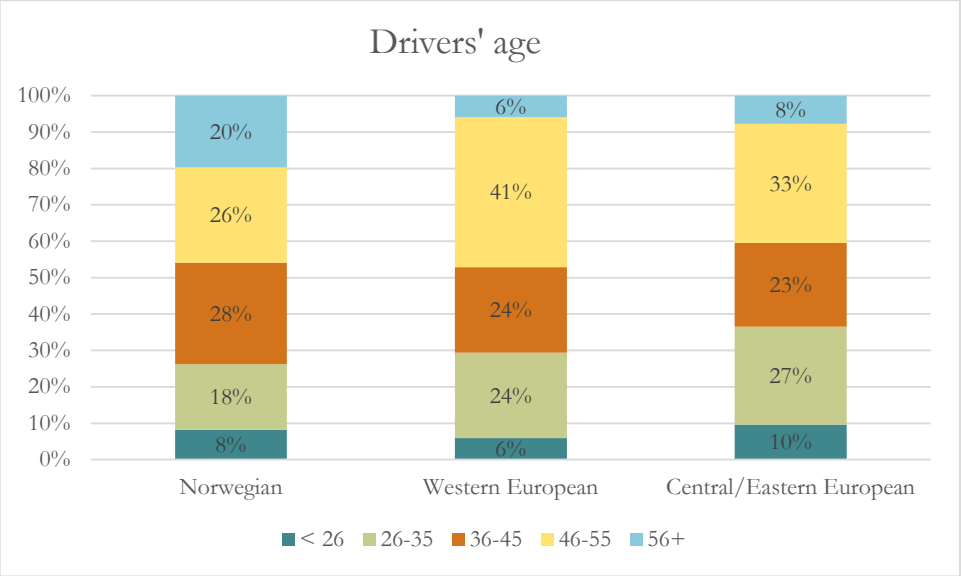


Figure 2.1 Respondents' age groups, distributed according to their nationality.

Figure 2.1 shows that Norwegian drivers have the largest share of drivers over 56 years old, while 60 % of the drivers from CEE countries are 45 years old or younger. The latter group has the largest share of younger drivers. A Chi-square test shows that the differences are not statistically significant (P=0.599).

2.7.4 Nationality of respondents, vehicles and companies

Figures 2.2 and 2.3 indicate vehicle registration countries and driver employment countries distributed according to driver nationality.

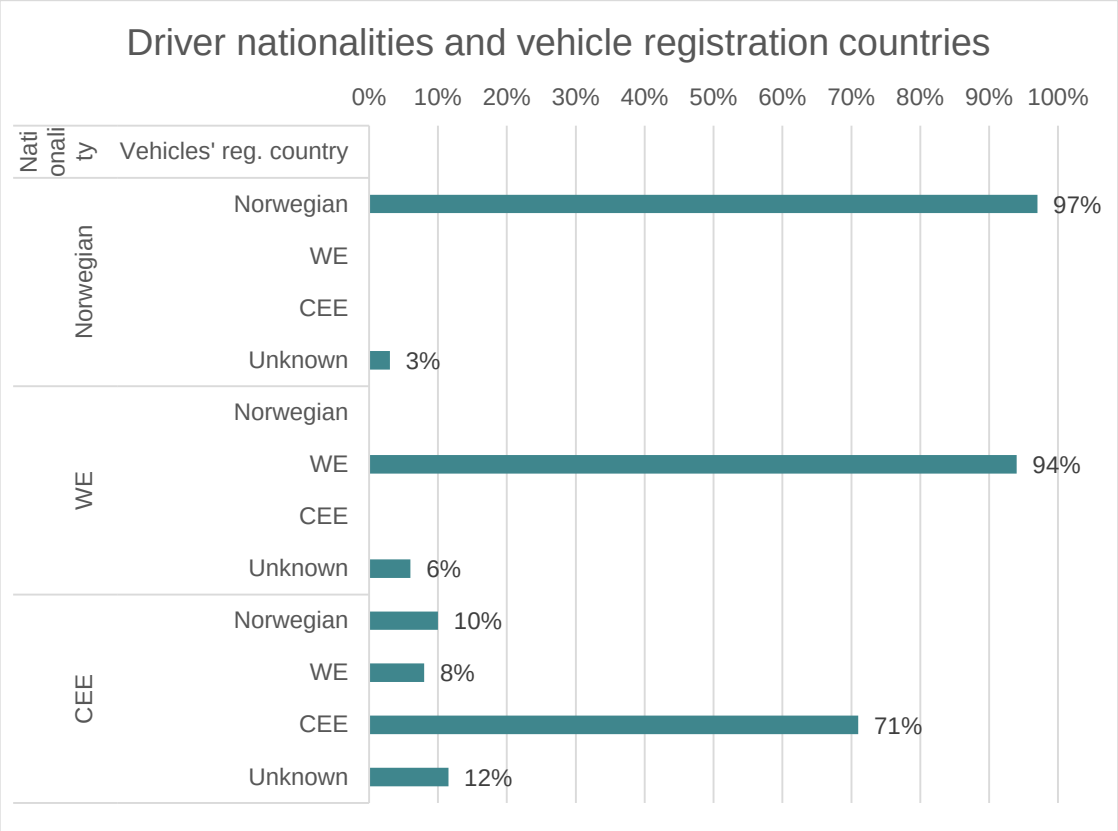


Figure 2.2 Vehicle registration countries, distributed according to driver nationality: Norwegian (N= 61), Western European country (N=17) and Central/Eastern European country (N= 52).

Figure 2.2 shows that the vehicles of the Norwegian drivers are registered in Norway. Looking at the two other groups, we see that the majority of their vehicles are registered in their respective regions, although the share is considerably higher for the drivers from WE countries than it is for drivers from CEE countries. The latter has a considerable share of vehicles registered in Norway and in WE countries. Thus, in contrast to the other groups, drivers from CEE countries are more likely to drive vehicles from another region than their own.

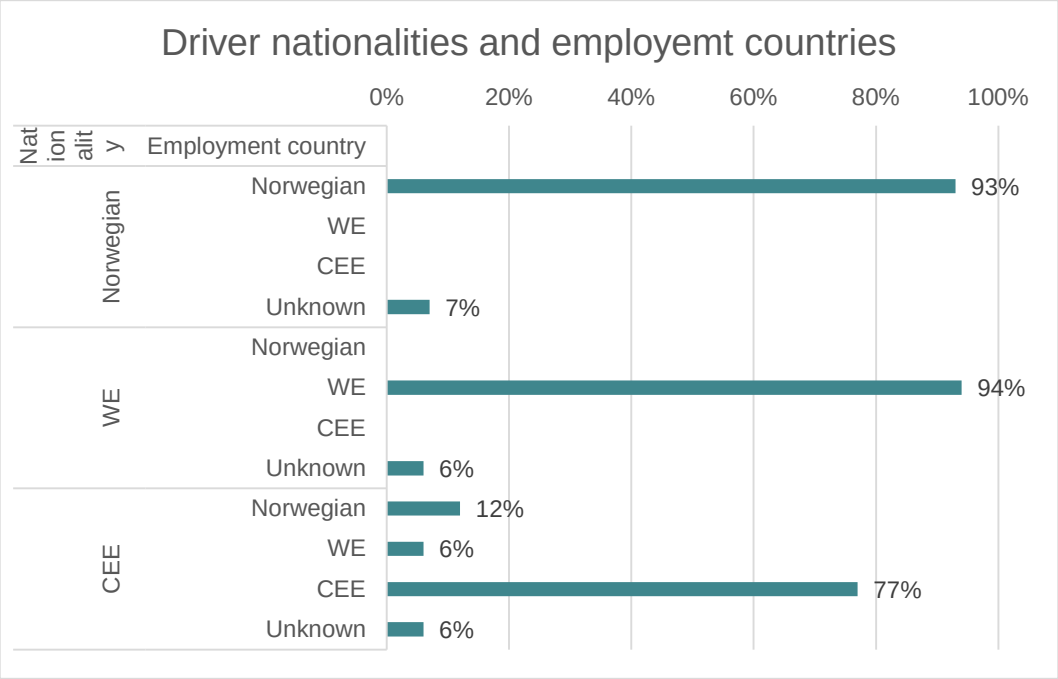


Figure 2.3 Driver employment countries, distributed according to driver nationality.

Figure 2.3 shows that the Norwegian drivers are employed in Norway, and that nearly all of the drivers from WE countries are employed in countries from their own region. Drivers from CEE are, in contrast to the other two groups, also employed in Norway and in WE countries.

2.7.5 Company size and employment status

Figure 2.4 presents company sizes of the drivers in the study, and the share of self-employed drivers in each group.

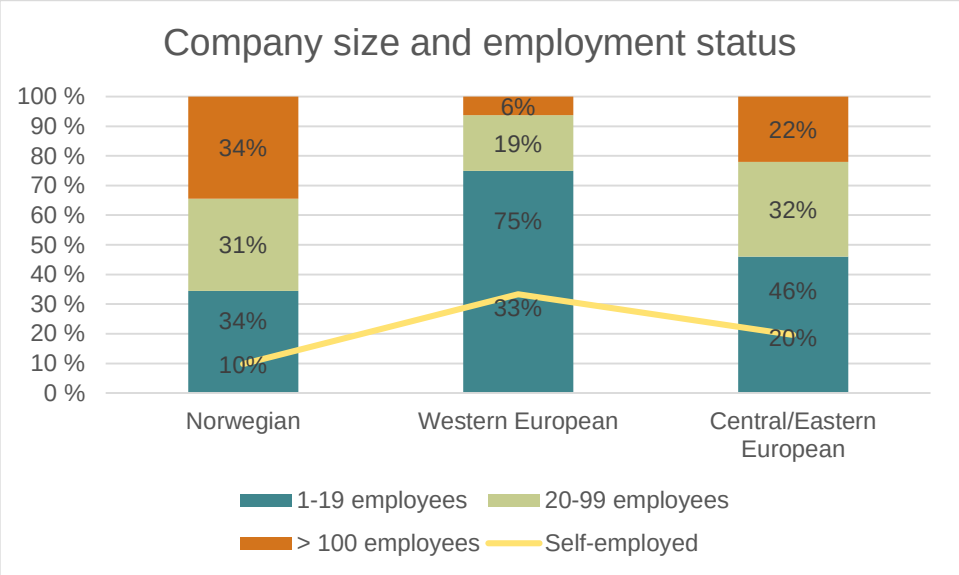


Figure 2.4 Size of drivers' companies, and share of self-employed drivers, distributed according to their nationality. (N=127)

The figure shows that the majority of drivers from WE work in companies with less than 20 employees, while nearly half of the drivers from CEE do. A Chi-square test shows that the differences are statistically significant (P=0.041).

The result that larger shares of the drivers from WE (75 %) and CEE (46 %) work in small companies, compared with Norwegian drivers, is probably caused by the fact that there are higher shares of self-employed drivers from these two regions.

We also asked the drivers whether they own the trucks themselves.

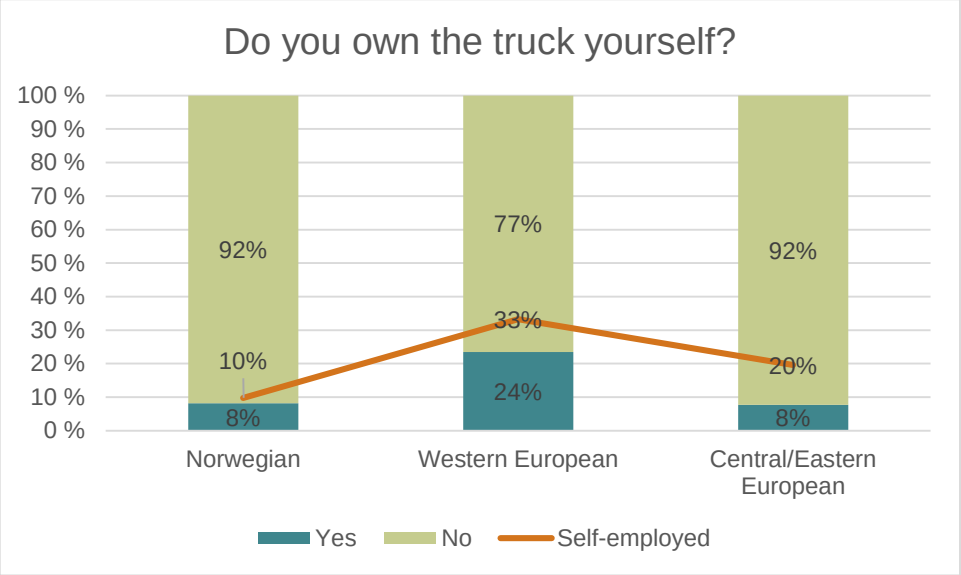


Figure 2.5 Distribution of whether respondents own the truck themselves, based om their nationality.

In accordance with the results shown above, indicating that drivers from WE have the highest share of self-employed drivers, we see drivers from WE is the group with the largest share of drivers who own the truck themselves.

The Norwegian II sample

We compare the results of the survey involving the three above mentioned national groups with those of a previous study of safety culture among drivers (N=224) in three Norwegian haulage companies (Nævestad & Bjørnskau 2014). Several of the survey questions mentioned above were used in this study. The study was financed by the employer organization NHO Transport, and Johannes Straume was our contact person. NHO Transport selected the three companies based on an assumption that they had good safety cultures. The results of the study supported that assumption. We refer to the sample including the 224 drivers from three haulage companies as "Norwegian II".

The Norwegian II sample is included to supplement our interpretations of the differences between the three groups. Based on our previous qualitative research in the companies of the Norwegian II sample, we have seen that these companies work extensively with safety culture and safety management of work related factors with safety implications. Moreover, we have also seen that these efforts were reflected in the quantitative surveys that we carried out in these companies (Nævestad & Bjørnskau 2014). Many of the questions used in the Norwegian II sample are similar

to those used in the current sample of Norwegian and foreign drivers. Thus, we may compare the groups.

Given the presumably random recruitment of respondents to the Norwegian I sample, and the fact that the Norwegian II sample companies were recruited based on their positive work on safety culture and safety management, we would expect the Norwegian II sample to score somewhat higher than the sample of 61 Norwegian drivers in the Norwegian I sample on questions related to safety culture and work related factors with safety implications.

Company A in the Norwegian II sample transports dangerous goods in Norway and neighboring countries, for well-established customers under long term contracts. The company has about 450-500 employees and 200 vehicles. The company has a HSE and quality manager and a safety advisor, both employed in full time positions. Company A has four departments in Norway, transporting different types of dangerous goods

Company B employs about 85 drivers, and transports goods in Norway for well-established customers under long term contracts. The company was part of a motor coach company until it was established as a separate company in 2003. The company has three departments, and the department managers have the daily contact with the drivers in addition to the customers' goods delivery managers.

Company C employs 190 drivers and transports goods in Norway for well-established customers under long term contracts. The company has 250 employees and about 190 drivers, and was part of a motor coach company until it was established as a separate company. Eighteen traffic managers organize the goods delivery and have the daily contact with the drivers. During long distance transport the drivers also communicate with the customers by means of telephone. Company C hires a safety advisor.

Questionnaires were distributed to all drivers in the companies by means of e-mails or letters.

Table 2.3 Submitted e-mails and letters with questionnaires, response rate.

Companies	Submitted questionnaires	Number of answer	Response rate
Company A	212	122	57.5
Company B	72	26	36.1
Company C	190	76	40.0

2.7.6 Field work with foreign drivers, May 2014

As noted, Levlin spent approximately 74 hours talking to 69 foreign drivers and five Norwegian drivers in or outside their vehicles. Through this personal contact with the drivers in their vehicles, Levlin also gathered qualitative data that was recorded in her field notes in the period. These qualitative data are valuable and worthy of reporting in the current project, as they may give indications on the daily work life, working conditions and to some extent safety aspects of the foreign drivers that Levlin interviewed.

Below we present her main experiences while approaching foreign drivers in the study period, and her notes on the lives of foreign drivers staying in resting areas alongside Norwegian roads. These notes also provide an important backdrop for the

quantitative data presented in the present report, as they describe Levlin's process of collecting the data on the foreign drivers. The notes represent an edited version of her field notes, and thus some days are excluded from the presentation below, as merely technical notes were recorded.

First day. I learned about how long the drivers actually have to hang around and wait in the middle of nowhere because of the imposed resting periods. This is however positive for me, as it is easier to come into contact with someone who has to stay at the same place for the next 46 hours or so with nothing to do. I used a lot of time with each driver trying to explain that the survey was anonymous, and that I was a student, and not a representative of Norwegian authorities.

Second day. After a visit to TØI to get a charger, company cell phone and papers, I drove to XX, where I was confident I would locate many foreign drivers. I found a couple of Polish drivers, but they were "busy" and seemed very sceptical of me. On the third day I experienced for the first time that a Polish driver called his employer (my assumption) before he started answering the survey.

The second day I started deviating from my principle of not entering the drivers' cabs. I understood from their body language and facial expression that they were sceptical and/or surprised if I insisted on standing outside the truck. I experience that I get better contact with the drivers if I go into the drivers' cab. After entering we sometimes shake hands and present ourselves. I have started to learn some Polish and Lithuanian words, so it will be easier to get into contact with the drivers. Polska/Ljetova/djenkoje/atsjo/tak/nje.

Third day. When the weather is nice, the drivers (grouped according to nationality) often stand in clusters outside the trucks. It is then easy to get contact with them, because you should not "force yourself" on them when they sit inside the truck. I am confused about the pecking order among the drivers. It seems that the Lithuanians think the Polish drivers are criminals. Polish and Rumanian drivers think the Russians are thieves. The Latvians I have met think the Russians are the best people there is. It is probably as many opinions about this as there are individuals, but what is certain is that the drivers most often stand in clusters with other drivers from the same nationality.

Fifth day. I have become more effective in the way I approach the drivers when it is raining. When they open the door/window, I ask "Ljetova/Polska"/whatever-I-think-they-are. Then they say yes or no, or where they come from, and I click open the right survey so they can read the introduction. I make it very clear to them that they are allowed to say no to participation, not just yes, and that it is okay if they do not want to participate. Young drivers often speak English reasonably well. I got English survey answers from a Romanian driver and a Bulgarian driver.

I have interviewed my first Danish and Swedish drivers today. You get an incredibly nice contact with the drivers, when you can interview them orally, and not just hand them the tablet. This also provides a lot of extra information about attitudes and reactions, and then interesting discussions arise. However, it takes much more time. It is probably realistic to say that I use more than 1 hour on each interview.

Russian, Latvian and Rumanian are mainly the languages I feel that I am missing, judging from how many people from these nationalities I have met that I cannot interview. That is a tip for possible further investigations. I met my first Dutch drivers today, and they spoke English very well.

Sixth day. The time the respondents use when they answer the survey varies a lot, and small talk takes up some time if the atmosphere is good. Sometimes I use some time explaining thoroughly what the survey is about, and sometimes I have to specify that neither their name, company, or registration number are written down. I interviewed a driver couple who used over an hour to answer the survey, since they had a great number of stories and jokes to tell. I did not have conscience to interrupt them, as they after all had taken time to answer the survey.

I was allowed to take a picture of their false "seat belt". They had bought a metal piece at a gas station in Germany, which you put in the seat belt-lock so that the alarm/reminder does not go off. I have seen several original solutions to this, for instance staplers and screwdrivers.

It seems like the drivers think it is annoying/embarrassing/ stupid to be asked questions about things they know is required by law in Norway. For example winter-tires and snow chains. Some drivers seem to think that I am trying to trick them in some way; that it is some kind of test.

From my interview with the driver couple I heard that eastern European companies have started to employ drivers from the Philippines because they are cheaper. Two interviews later, I met my first driver from the Philippines in a Latvian truck.

On the ninth day, there was a tense atmosphere at one of the terminals. The Polish drivers were not sure if they got any goods, as a Lithuanian company outperformed them on the price.

On the seventh day I heard for the second time that the company of the driver I interviewed does not have routines for reporting safety violations, or safety issues. This is because he works in a small company, where the threshold to call the boss is low, and therefore they do not need official routines and procedures for this.

Tenth day. I interviewed a Lithuanian who has lived in Norway for 12 years and spoke very well Norwegian. I asked him to evaluate the Lithuanian survey translation. He said that the questions are understandable; even though it bears traces of Google translate. The funny thing was that the Lithuanian translation in the introduction presents me as a man. This may explain several smiles and laughter that has occurred when the drivers have read the introduction.

I was approached by a Norwegian mechanic on one of the terminals. He was very curt and sceptical to what I wanted with the Rumanians. I explained that I am a student, that I cooperate with TØI, that I would be very nice to the drivers, and that the survey is voluntarily. He told me that the drivers were often harassed, so he had to watch out, when strangers came around. I wish I had asked more about what kind of episodes they have had; if it was violence or verbally, and who is responsible. It was nice to see that the company takes care of their employees. It was also a reminder of why some drivers are sceptical of me, since they obviously have good reasons to be.

Eleventh day. My first interview today was conducted orally in English with a Polish driver. He told me that "most drivers in his company does absolutely "nie" to avoid accidents" (They do nothing). I almost could not keep my poker face intact. It was a very honest man who also admitted that he often fell asleep behind the wheel, when he travelled shorter distances. I think it is uplifting to experience honest answers, because it indicates that the drivers trust the anonymity in the survey.

By the Esso gas station, I was offered Piva (polish beer) by two drivers who had a long break. Later on one of the terminals, I was invited to barbecue with two polish drivers. It smelled fantastic. They do not seem to have a lot of things to do when they have to take a 46 hour break in a peripheral industrial area, but barbecuing and beer do not seem bad at all.

Twelfth day. I got four survey answers this day, and wanted to also try interviewing in the evening for the first time. I interviewed a foreign driver who worked for a Norwegian company. I do not think he was paid Norwegian wages though. He informed me that he got 1500 NOK per day for 15 hours work, and the pay had not risen since the year he was employed. At the end of the interview, he got pretty clinging and intense, and a bit uncomfortable. I ended up with giving him a false phone number just to end the interview.

I think that late at night perhaps is not the best time to interview drivers, even though I should not base this assumption on only one incident. This is also the only incident of this kind that I have experienced. Anyway, at this time there are few parked trucks with the curtains drawn up, most of the drivers have gone to bed and drawn their curtains. So, doing interviews after 9 pm is not recommended if you look for wake drivers.

During the interviews it has happened several times that polish drivers think that I speak polish. I am not certain why. Perhaps they suspect that I just pretend that I cannot speak their language, to listen in on their conversations? I could also be because I sometimes help them during the survey. I have seen the questions so many times that I know which question it is even though I cannot read polish.

Fifteenth day. (last day) Today was the last day with interviews. I can conclude that the best time to meet truck drivers are between 4 and 7 pm, at least around the terminals. It is not so late that everyone has gone to bed, and not so early that the drivers are going out on the road again.

The paper-questionnaire was not very popular among drivers; it is funnier with a tablet. It would have been convenient with 2 or 3 tablets.

I have learned/followed/decided upon some main rules:

- I do not knock on a vehicle that has the curtains down, since the driver probably is asleep.
- I do not knock on the door when the driver is on the phone, or sits with his eyes closed relaxing. My wish is not to disturb anyone, I just want to interview those who have the time to and want to answer the survey.
- I always try to explain to them that they can choose not to participate, if they do not want to, or do not have time for it. I make sure that they understand that.

- I have chosen not to come into the drivers kitchen/lunch-room (I was only offered this at one terminal), since I did not want to intrude on their common private areas.
- I always end the interview with a handshake and say thank you in their language. The driver decides if they want to exchange names. I never initiate it myself, in order to respect the anonymity. Most drivers have actually introduced themselves in the end, and it is very nice.
- It is common courtesy to ask the driver if you should remove your shoes if you are invited into the car. Many drivers have carpets/blankets on the floor, and almost everyone takes their shoes off before entering the car.

2.7.7 Analysis of quantitative data

Cronbach's Alpha. We constructed several indexes of different concepts (e.g. safety commitment, transport safety behaviours), in order to compare how different groups scored on these concepts. An index represents a measure of a concept (e.g. reporting culture, management commitment to safety) which consist of several items (variables) measuring different aspects of this concept.

We assume that respondents' answers to these questions correlate, meaning that it is likely that a person who agrees with one question in an index also agrees with the other questions, for instance related to safety attitudes or behaviours. We assume this when we make indexes, and Cronbach's Alpha provides a way of testing this assumption, as it measures the correlation among responses on the index. The value varies between 0 and 1. A Cronbach's Alpha over 0,9 is very high, a score between 0,7 and 0,9 is good, a score between 0,5 and 0,6 is acceptable and a score below 0,5 is unacceptable.

Significance tests of means. When comparing group scores on different variables and indexes, we examine the probability that the differences we observe are due to statistical chance. We do this by calculating the confidence intervals of the mean scores. The confidence intervals indicate the error margins of the mean scores, i.e. the interval in which a given probability indicates that the "true mean score" lies within. We conduct a sample study, and the "true mean score" is that of the population from which the sample is drawn (e.g. the population of CEE drivers, Norwegian drivers). When comparing mean scores, we may state that the difference between two mean scores is statistically significant if the means do not lie within each-others' confidence intervals.

The probability that the true mean score lies within a confidence interval is given in per cent, and we may also refer to this as a p-value. When choosing a confidence interval, you also choose the level of uncertainty that you will accept. A confidence interval of 90% means that you can be 90 % sure that the true value for the population which the sample represents lies within the 90 % confidence interval. In other words, you will on average reach the wrong conclusion in one of ten cases. A probability level of 95 % means that it is 95 % likely that the true number lies within this interval. We use confidence intervals of 90 %, 95 % and 99 %, and we state that the differences are statistically significant at 10 %, 5 % and 1 % level.

Anova. When comparing the mean scores of different groups, we use one-way Anova tests, which compare whether the mean scores are equal (the null hypothesis) or (significantly) different.

Pearson's R. When examining bivariate relationships or the possible correlation between two variables, we use the Pearsons R or the " Pearson product-moment correlation coefficient". Pearsons R provides a measure of the linear correlation between two variables. It provides a value between +1 and −1 inclusive, where 1 involves a total positive correlation, 0 is no correlation, and −1 is a total negative correlation.

Chi Square. We also use Chi square tests to compare groups' scores on particular variables, if we for instance cannot compare means due to the variables' level of measurement. The chi square test tests whether the actual distribution of groups on a variable is statistically significant different from a coincidental distribution, or an independent normally distributed sample.

Significance tests of differences in accident risk. We also test whether differences in accident risks between the groups that we compare in the study are statistically significant, in order to examine whether the differences that we observe are caused by statistical chance (cf. Appendix 4). As both accident and exposure numbers are subject to statistical uncertainties, we calculate their confidence intervals, i.e. the interval in which a given probability indicates that the "true risk".

2.8 Quality assuranse

The report has been submitted to quality assurance both internally and externally. To ensure that the results of our analyses and our interpretations of the results are as correct and plausible as possible, we have sent the report to relevant sector experts for quality assurance before publication; i.e. to relevant authorities, employer organisations, employee organisations and other user groups. These sector experts were mainly recruited from the project's reference group, but experts from outside the reference group was also used for quality assurance. The experts conducting the quality assurance were invited to comment on the results, our analyses and our interpretations. We are very grateful for their help. The reference group members are from the Norwegian Public Roads Administration, the Norwegian Labour Inspection Authority, the Norwegian Ministry for Transport and Communications, the police, the Transport Accident Investigation Board Norway and representatives from employer organizations and unions. Our documentation of the interview results was sent to the interviewees, who were encouraged to send further comments, and correct mistakes they might find. We received many valuable comments in this process. Field work notes from the heavy vehicle inspection were read and commented by other researchers participating in the field work, and one of the inspectors.

3 Safety outcomes

In this chapter, we discuss the possible safety outcomes of internationalisation of transport of goods in light of four data sources: literature review, accident analyses, interviews and small-scale survey.

3.1 Results from the literature review[5]

Although the accident risk of heavy vehicles is low, they carry a high risk of injuring other road users, because of their mass (Assum & Sørensen 2012). About one in three traffic fatalities in Norway are caused by a collision with heavy vehicles (Haldorsen, 2010).

3.1.1 Accident risk of foreign HGVs in Norway.

1) Approach/methodology. Nævestad et al (2014) survey the exposure of Norwegian and foreign HGVs in Norway, and analyses these results in light of data on personal injury accidents to calculate and compare the accident risk of Norwegian and foreign HGVs in Norway. Nævestad et al's (2014) study is based on a combination of the national Lorry Survey in Norway, Eurostat data from similar surveys in European countries and the border crossing statistics of Statistics Norway to estimate the vehicle kilometres of Norwegian and foreign HGVs on Norwegian roads. Together the Norwegian Lorry survey and the Eurostat data cover all foreign and domestic lorry trips between municipalities and counties that are conducted within, to and from Norway. According to the Eurostat statistics directive, all European countries are obliged to carry out annual representative Lorry surveys on HGV transport in their own country and their domestic HGV's assignments abroad. These data sources give a basis for establishing OD (origin-destination) matrices for domestic and foreign trips. However, as the destinations of international transport assignments done by foreign HGVs are only given at county level in the Eurostat data, the route choices and vehicle km of foreign HGVs in Norway have been estimated by means of the network module in the national freight transport model for Norway. Route choice was based on minimising generalised costs.

The exposure data is matched with accident data from Statistics Norway's data on police reported injury accidents to calculate and compare the accident risk of Norwegian and foreign HGVs in Norway. The risk estimates are based on data from 3531 police reported road accidents with personal injuries in Norway in the period 2007-2012. The accidents involved 3716 HGVs distributed among different groupings of vehicle registration countries.

[5] The results of this literature review is reported in Nævestad, Bjørnskau, Hovi and Phillips (2014): "Safety outcomes of internationalisation of domestic road haulage: a review of the literature". In the current publication, we have updated this literature review and expanded it to also include a third aim: "potential measures that may address these risk factors".

2) Results. Accident risk is defined as the number of injury accidents per million vehicle km. The average accident risk of all HGVs in Norway is 0,34 accidents per million vehicle km. The authors conclude that HGVs registered in foreign countries have higher accident risk than Norwegian HGVs on Norwegian roads. Norwegian (0.32) and Danish (0.35) HGVs have the lowest accident risk. The accident risk of HGVs from the rest of the EU15 (0.91) is over 2,5 times higher than the accident risk of Norwegian vehicles. Polish and Baltic vehicles (0.68) have the second highest accident risk, followed by Swedish vehicles and vehicles from other EU-27 countries. The accident risk for all national groups are statistically significantly different from that of Norway, except in case of Denmark and other EU27 countries.

3) Limitations. The authors stress that the results must be interpreted with some caution, due to the following factors: 1) About ten percent of the HGVs in the accident statistics had unknown nationality. These were added to the Norwegian HGVs in the risk estimations. 2) All in all, there were relatively few foreign vehicles involved in accidents, 3) The risk estimation is based on vehicles' nationality, and there is a possible differences between vehicles' and drivers' nationality, 4) The report focuses on the risk of personal injury accidents, which probably is different from the risk of material damage accidents, 5) The risk of serious accidents is influenced by the roads chosen, and foreign HGVs drive longer distances on roads with good standard compared with Norwegian HGVs 6) Different types of HGVs probably have different accident risks, but the study lacks exposure data for HGV types, 7) The risk of triggering accidents may be different from the risk of being involved in accidents, and the study only focuses on HGVs involved in accidents 8) The authors know little about the actual causes of the accidents and the differences between the national groups.

3.1.2 Fatalities per billion HGV km in European countries

1) Approach/methodology. Traffic safety is one of several issues that AECOM (2014) discusses in a comprehensive report analysing data on the structure of the road haulage sector in the European Union. The focus is on the risk of international driving and causal factors of incidents. AECOM calculates the number of fatalities involved in a HGV incident per billion HGV km in European countries, based on accident statistics from the European Road Safety Observatory and exposure data from Eurostat. Norway is not included in this study.

2) Results. Comparing the number of fatalities involved in HGV incidents per billion HGV km driven in each of the European countries, AECOM concludes that the HGV fatality risk in general is higher in Eastern European countries than it is in western European countries. The average risk of all EU member states is 31.5 fatalities involved in a HGV incident per billion HGV km. Romania has by far the highest HGV fatality risk, with 177.3 fatalities per billion HGV km driven. Poland had the second highest fatality risk (59.9), followed by Belgium, Greece, Finland, Austria, Denmark, Portugal and the Czech Republic. The risk in these countries was above the EU average. Luxembourg has the lowest risk, with 3,8 fatalities per billion HGV km, followed by Slovenia, United Kingdom, Germany (21.3), Italy (24.9), Spain, Ireland, France (31.4). The risk in these countries was below the EU average. Examining the road users who were killed in these accidents, AECOM concludes that in 50 % of the accidents, car occupants were killed, followed by pedestrians (15 %), HGV occupants (15 %), motorcycle riders (7 %), pedal cyclists (6 %), LGV occupants (4 %), moped riders (2 %) and other (1 %). Finally, based on SafetyNet

research, it is concluded that the driver generally is to blame in these accidents, and that information and communication failure are central causes.

3) Limitations: The main strength of this publication is that it estimates accident based on vehicle km. It is essential to control for HGV km, as a country may have a high number of HGV accidents without having a high HGV accident risk. However, this study suffers from the same limitation as the DaCoTa study discussed below, as it compares HGV accident risk across countries instead of examining the risk of national groups of HGV drivers within countries.

As noted, it is not given that foreign HGV drivers from high risk countries have the same risk as in their home country when they drive in lower risk countries. HGV accident risk is influenced by e.g. other road users' behaviours, transport companies' safety measures, economic competition, authorities' regulation, the physical road environment, police enforcement, standard of the vehicles and so forth. In accordance with this argument, we see for instance that Germany has a relatively low HGV-related fatality risk, despite having a high share of foreign HGV transport (Wiesman 2005). We do however not know which countries the foreign drivers in Germany come from. However, Nævestad et al (2014) find considerable risk differences among domestic and foreign HGVs in Norway, and Leviäkangas (1998) found that the accident risk of Russian drivers in Finland corresponded to the risk in their home country.

3.1.3 Foreign HGV drivers in the Netherlands

1) Approach/methodology: In November 2011 the Dutch parliament passed a resolution stating that the number of registered crashes in The Netherlands involving drivers from middle- and eastern European countries was increasing. The resolution also stated that it should examined whether this was due to a lower quality of the driving courses in middle- and eastern European countries. In their study of this issue, Vlakveld, Stipdonk & Bos (2012) compare driver training curriculums from different European countries. To examine and compare accident risk, the authors undertook a crash analysis and an analysis of Dutch traffic offense data.

2) Results: Vlakveld, Stipdonk & Bos (2012) conclude first, that international research has not proved a relationship between the quality of driver training and accident risk, and that the third EU Directive on driving licences (Directive 2006/126/EC), establishes common minimum requirements for all European countries (Vlakveld, Stipdonk & Bos 2012).

Second, the authors studied accidents and traffic offenses involving foreign HGV drivers on Dutch roads. They stress that the accident data were poor for the recent years, and that the offense data were biased, as the Dutch police focus especially on foreign HGV drivers. Moreover, as they lacked exposure data on the actual distances travelled by HGV drivers with different nationalities, they were unable to assess whether the increase in accidents involving drivers from middle- and eastern European countries was due to their increased participation in Dutch traffic, higher accident risk, or both.

3) Limitations: The study of Vlakveld, Stipdonk & Bos (2012) illustrates the importance of data quality for analysing and developing measures against important traffic safety challenges. In the English summary, they conclude that "No data is available on the distance travelled on Dutch roads per nationality". Thus, their primary recommendation is that the registration of road crashes must be improved

substantially and that exposure data must be developed. As Nævestad et al (2014) do, Vlakveld, Stipdonk & Bos could probably have used Eurostat data as a basis of estimating kilometres driven by foreign HGVs in the Netherlands. However, as the Netherlands is a transit country, estimates for vehicle km's of foreign HGVs would probably be uncertain. They would therefore need information on HGV driving to and from several other countries.

3.1.4 Fatalities per million population in European countries

1) Approach/methodology: The DaCoTa project provides thorough descriptions and analyses of road safety and accidents in 27 European countries in the period 1999-2008. These data are collected in the Community Road Accident Database (CARE), which is based on the national accident databases maintained by all EU member states, taking the differences between national systems for recording accidents into account (DaCoTa 2010). The statistics include descriptions of accidents related to different modes of travel, not just HGVs. Because of different levels of injury underreporting in European countries, fatal accidents are one of the few comparable data among EU Member States. The DaCoTa study uses fatal accidents per million population as a measure of exposure. Norway is not included in this study.

2) Results: The number of people killed in accidents involving HGVs in the EU-23 countries decreased by 36,1 %, from 7.559 fatalities in 1999 to 4.832 in 2008. The project also shows that the risk of a fatal accident involving HGVs differs substantially across different European countries. The risk of a fatal accident involving HGVs is for instance ten times higher in Slovakia (36,3) than in Slovenia (3,5). Countries with low risk of fatal accidents with HGVs are for instance UK (6,2), Sweden (7,8), Denmark (11,3), Germany (7,6), Netherlands (6,5). Countries with high risk of fatal accidents with HGVs are apart from Slovakia, Poland (30,3) Latvia (23,9), Estonia (24,6). Comparing for instance eastern European countries with Scandinavia, we see that the risk of fatal HGV accidents is three times higher. The risk in Poland and Slovakia is over 30 per million population, while it is substantially less than 10 per million in Denmark and Sweden (DaCoTa 2010).

3) Limitations: The substantial differences in the risk of fatal accidents involving HGVs per million population suggest that an increased exposure of e.g. Polish and Slovakian HGVs could lead to an increased accident risk. However, two criticisms could be raised against this conclusion. First, we may ask how suitable population is as a measure of exposure. Ideally, accident risk estimates should use HGV activity (e.g. vehicle km's) as a measure of exposure,. Other measures of HGV activitiy that can be used are million hours used or million tonne kilometres transported. The number of million inhabitants in a country does not necessarily reflect HGV actitivity, as some countries may transport larger shares of their goods by rail, sea and air, and so forth.

Second, as we have said, although some countries have high HGV accident risks, it is not given that HGV drivers from these countries are more likely to be involved in accidents in lower risk countries. HGV accident risk is not just a consequence of driver characteristics, although research indicates that risk factors related to the driver are important in HGV accidents (Nævestad & Phillips 2013). We return to this discussion below.

3.1.5 Foreign HGVs in Great Britain

1) Approach/methodology. The number of foreign HGVs in Great Britain increased with 150 % between 1992 and 2003 (Danton, Kirk, Rackliff, Hill, Gisby, Pearce & Dodson 2009). Unlike the rest of Europe, British and Irish road users keep to the left side of the road. Foreign HGVs are therefore likely to present a safety challenge on British roads, as these vehicles are designed for driving on the right side of the road, and as their foreign drivers are accustomed to driving on the right side of the road.

In order to study the accident risk of foreign HGV drivers, the authors analyse HGV accidents involving foreign HGVs on British roads. The latter is done as part of the On the Spot Project (OTS) which is a project involved in investigating and analysing about 500 real world collisions in Britain each year. The project involves all collision types including all road users.

2) Results. Reviewing the national data for Great Britain, the authors found that of the 10.466 injury accidents involving a HGV, 9 % (952) involved a foreign registered HGV. In the on the spot (OTS) dataset, 9,6 % of all the 3.504 accidents were with HGVs and 19 % of these HGVs were foreign. Most of the reviewed accidents with foreign HGVs were on the main arterial routes with higher speed limits, and the majority of the HGVs in accidents were performing an overtaking or lane change manoeuvre when they collided. The most important contributory factors were that the HGV-drivers "failed to look properly", which is closely related to the considerable "vehicle blind spots" of the foreign HGVs on British roads. The latter was a contributory factor in 76 % of the collisions involving the foreign HGVs.

3) Limitations: An obvious limitation of this study is that it does not estimate and compare the accident risk of foreign and domestic HGVs on British roads, although the study concludes that about one in ten HGVs involved in accidents are registered in a foreign country. Unfortunately, the authors do not provide an estimate of the kilometres driven by foreign HGVs on British roads.

3.1.6 Foreign drivers in Greece

1) Approach/methodology: Yannis et al (2007) estimate and compare the accident risk of foreign and domestic passenger cars drivers in various road environments in Greece. The studied road environments are: area type (inside/outside urban area), junction (yes/no) and lighting conditions (day/night). The authors use hierarchical log-linear analysis to analyse police reported injury accidents from the period 1985-2001 from the national accident database of Greece. Lacking exposure data, the authors use the induced exposure method, comparing drivers who were "at fault" and "innocent".

2) Results: Generally, the study shows that the accident risk of the foreign drivers were nearly twice that of Greek drivers. The drivers compared are Greek, Albanian, EU-15, and other nationalities. The analysis shows that Greek drivers (1.08) have a lower accident risk than the foreign drivers under all conditions, followed by Albanians (1.41), EU15 (1,5) and drivers from "other nationalities" (1.93). Drivers with "other nationalities" had the highest accident risk under all conditions. All foreign drivers had an increased risk inside urban areas. Although the study did not find a significant interaction between more than one roadway parameter, accident fault risk and driver nationality, different road environments influenced the risks of the national groups differently, especially inhabited areas and junctions. Lighting conditions and uninhabited areas did not. The study concludes that because the risk

factors of different groups of foreign drivers were different, reducing the risk of different national groups of foreign drivers requires different safety interventions.

3) Limitations: The main strength of this study is that it compares accident risk in various road environments. Few other studies do that, except for Nævestad et al (2014), comparing accident risk in Norwegian regions. The main limitation of the study is that it focuses on passenger car drivers in general, and not HGV drivers. However, as Leviäkangas (1999) study indicates, the accident risk of foreign HGV drivers and foreign car drivers in a country seems to be fairly similar.

3.1.7 A meta study of deregulation and transport safety

During the last three decades commercial transport has been economically deregulated in many countries, meaning that formal regulations limiting entry to the business have been removed (Elvik 2006). The main purpose of economically deregulating a business area is to stimulate competition. Even a deregulated transport sector will, however, normally be subject to a number of regulations such as anti-trust laws, safety standards for vehicles, safety regulations for traffic operators and regulations of working conditions for employees (Elvik 2006). In general, safety regulations of a business remain in force even though the business is deregulated.

1) Approach/methodology. The main purpose of Elvik's (2006) literature review and meta-study is to quantify the safety outcomes of deregulation of transport in the road, rail, aviation and sea sector. Elvik identified 41 studies in the literature search, and 25 of these were included in a meta-analysis of evidence from evaluation studies on the safety effects of deregulation of transport. 16 studies were not included in the meta-analysis, primarily as they did not report the statistical precision of their estimates of effect. The study included 30 estimates of effect related to road transport.

2) Results: Elvik (2006) concludes that economic deregulation does not seem to hamper safety. The meta-study's summary estimate of effect indicates that no statistical changes in road safety occurred because of deregulation. However, the study states that the impact of deregulation on transport safety should be monitored closely in the future, as the process of deregulation is fairly new in many countries.

3) Limitations: This is a high quality meta-analysis of several empirical studies. The conclusion is based on the estimation of the reported individual effects into general summary estimates of effect, and for all modes of transport, the individual estimates of effect were highly heterogeneous. Thus, perhaps the safety outcomes of deregulation are contingent on different contexts. Moreover, the meta-analysis is of the safety outcomes of economic deregulation in general, and not specifically increasing internationalisation, although this may be a consequence of deregulation in transport. Thus, perhaps the studies on the accident risk of foreign HGVs and cars in Norway, Finland and Greece are more relevant to the aims of the current study.

3.1.8 Russian drivers in Finland

1) Approach/methodology: Leviäkangas (1998) examines the accident risk for foreign car and HGV drivers, mostly Russian, in southeast Finland in the period 1992-1995. The study estimates accident risk based on police reported traffic accidents and origin-destination studies carried out on Finnish-Russian border stations, focusing on three main roads. The study focuses on vehicle nationality, assuming that this corresponds to driver nationality.

2) Results: The study shows that the accident risk for Russian drivers in Finland are substantially higher than the accident risk for domestic drivers. The risk for Russian drivers is about two to three times higher than the risk for Finnish drivers. Taking into account the number of automobiles and the number of people killed relative to the population, the study concludes that the car accident risk in Russia is six times higher than in Finland. All in all, Leviäkangas concludes that the accident risk of Russian drivers in Finland is comparable to their accident risk in their home country. He suggests that differences in traffic culture may explain these national differences.

The study also compares heavy vehicle risk (including buses), although there are few heavy vehicles in the sample. This risk estimation shows that the accident risk for Russian HGVs on one of the roads in the study is double the risk of Finnish HGV drivers. This difference is in line with the results reported by Nævestad et al (2014) for Norway. Leviäkangas also concludes that the winter season is especially risky for foreign drivers. He suggest that this is due to insufficient winter driving skills and winter equipment. In contrast to Finland, neither winter tyres or winter training during license obtainment are mandatory in Russia.

3) Limitations: Leviäkangas primarily focuses on passenger car drivers, and it is not given that the risk differences between foreign and domestic car drivers are transferable to HGV drivers. However, although the sample is small, Leviäkangas also estimates and compares the accident risk of HGV drivers, and finds that the risk of foreign drivers is two times that of domestic drivers. This is approximately the same as for passenger car drivers. Another limitation of the study is that the risk estimation does not discern between different road environments, like Yannis et al (2007).

To sum up, we have discussed eight studies indicating that the HGV accident risk varies with a factor of up to ten in European countries, and that the accident risk of foreign HGVs are approximately two times higher than that of domestic HGVs in the studied European countries. In the following, we will look at results from the accident analyses of AAG data on fatal accidents and data from Statistics Norway on personal injury accidents.

3.2 Analysis of fatal accidents

3.2.1 How many professional drivers are involved in fatal road accidents?

Out of 1028 drivers involved in fatal accidents in the period from 2010–2013, 230 (22 %) were coded as professional drivers (Table 3.1). The rest of the analysis focuses on these drivers.

Table 3.1 Coding of drivers involved in fatal accidents on Norwegian roads (2010-2013) as professional drivers. Number of cases.

Professional driver?	Number of cases
Yes	230
Likely	0
Insufficient information	8
Unlikely	10
No	759
No information	21
Total	**1028**

3.2.2 How many foreign professional drivers are involved in fatal road accidents?

Table 3.2 shows the number of professional drivers coded as foreign, and the number driving foreign vehicles or working for a foreign firm. Of these professional foreign drivers, 35 drove HGVs, while 5 drove buses.

Table 3.2 Coding of 230 professional drivers involved in fatal accidents on Norwegian roads (2010-2013) as foreign; driver of vehicle registered in another country; or employed or owner of foreign firm. Number of cases.

Code	Foreign driver?	Foreign vehicle?	Foreign firm?
Yes	40	19	21
Likely	1	0	0
Insufficient information	7	4	10
Unlikely	22	21	14
No	160	186	185
Total	230	230	230

We assume from Table 3.2 that of all the drivers involved in fatal accidents on Norwegian roads between 2010–2013, 40 had a foreign nationality and/or license. Seventeen professional drivers had both foreign nationality, drove a vehicle registered in another country *and* worked for a foreign firm. We assume that these drivers drove from outside of Norway in the days before the accident.

Table 3.3 shows other data collected for foreign professional drivers.

Table 3.3 Shares of drivers involved in fatal accidents on Norwegian roads between 2010 and 2013.

For those involved in fatal accidents on Norwegian roads 2010- 2013…	%
Share of all drivers (n=1028) who are foreign professionals (n=40)	3.9
Share of professional drivers (n=230) who are foreign (n=40)	17.3
Share of professional drivers driving a foreign registered vehicle (n=19)	8.3
Share professional drivers employed in / owners of foreign firm (n=21)	9.1

The foreign professional drivers (n=40) were also coded according to whether they had driven regularly within Norway within the last 10 years (referred to as "Foreign based in Norway"), or whether they had driven into Norway in the days before the

accident (Figure 3.1). Here we assumed that those with a foreign nationality, drove a foreign-registered vehicle and worked for a foreign firm, had driven into Norway from another country.

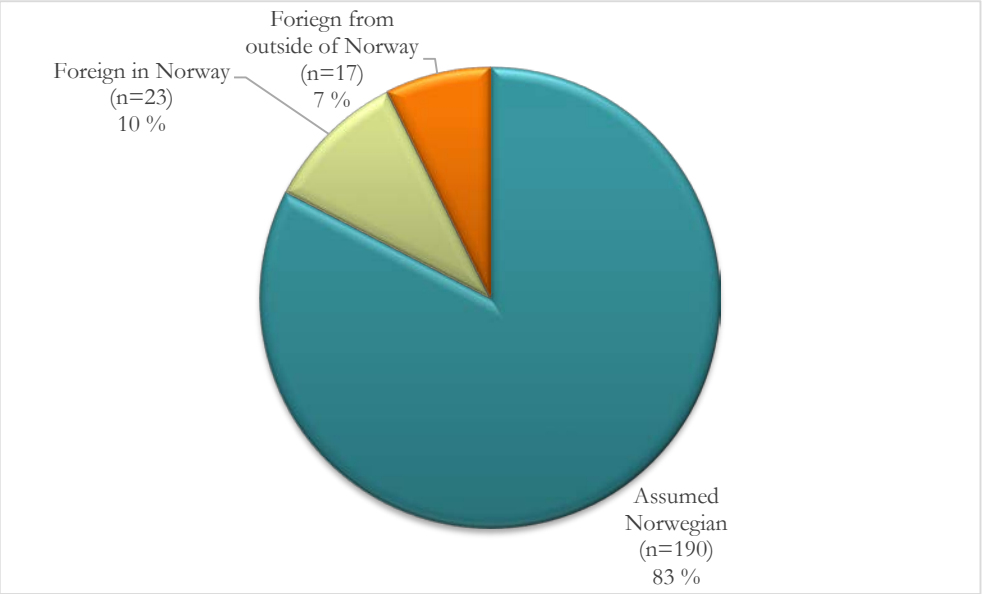


Figure 3.1. Share of professional drivers involved in fatal accidents on Norwegian roads in the period 2010-2013, who were foreign and based in Norway, and share who were foreign and drove from outside of Norway.

Most of the professional drivers who drove into Norway drove a tractor with semi-trailer (11 out of 17, Table 3.4). Four drove a HGV with axle trailer and two drove a bus.

Table 3.4 Types of vehicle driven by Norwegian and foreign professional drivers involved in fatal accidents on Norwegian roads between 2010 and 2013.

Type of vehicle	Assumed Norwegian driver	Foreign driver	
		In Norway	From outside of Norway
Vehicle over 3,5 t / lorry	56	6	-
Vehicle over 3,5 t / lorry with trailer	50	5	4
Tractor-and-semitrailer	39	9	11
Bus	23	3	2
Tram	3	-	-
Light car or van	10	-	-
Farm tractor or other utility vehicle	7	-	-
No information	2		
Total	190	23	17

3.2.3 Which nationality did the foreign professional drivers have?

The 40 foreign professional drivers involved in fatal accidents between 2010–2013 came from 14 different countries (Table 3.5). Almost half came from Poland and Sweden. Some of the professional drivers driving from outside of and into Norway, were on assignments for a firm registered in a third country.

Table 3.5 The nationality of foreign professional drivers involved in fatal accidents on Norwegian roads between 2010 and 2013, according to whether they drove regularly in Norway within the ten years leading up to the accident ("Based in Norway"), or drove from outside of Norway in the day(s) before the accident. Number of cases.

Nationality or driving licence	Based in Norway	Drove from outside of Norway	Total
Poland	5	6	11
Sweden	6	2	7
Latvia	5	0	5
Denmark	1	3	4
Finland	0	2	2
Lithuania	1	1	1
Argentina	1	0	1
Estonia	0	1	1
Philippines	1	0	1
Netherlands	0	1	1
Romania	1	0	1
Russia	0	1	1
Turkey	1	0	1
Germany	1	0	1
Total	23	17	40

3.2.4 How many foreign professional drivers drove "triggering" vehicles?

The different types of foreign professional drivers were analysed according to whether they drove vehicles classified by AAG as triggering the accident. Less than a third of the Norwegian professional drivers (29 %) drove triggering vehicles but more than half of the foreign drivers (57,5 %) did so (Figure 3.2). 29 % of the triggering vehicles driven by professional drivers were driven by foreigners (foreign professional drivers drove 23 out of 78 such vehicles).

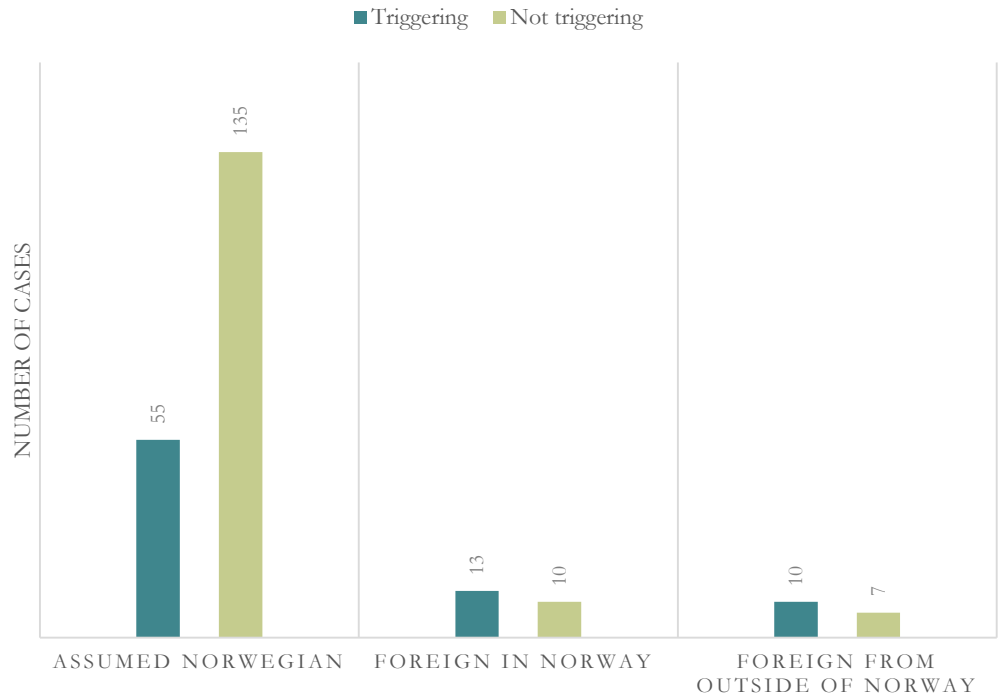


Figure 3.2 Number of Norwegian and foreign drivers involved in fatal accidents on Norwegian roads between 2010 and 2013 who drove a vehicle classified by AAG as triggering the accident.

3.2.5 Driver injury

Even though the numbers are low, there is reason to believe that foreign professional drivers are more likely to become seriously injured as a result of the accident. Table 3.6 shows that 28 % of foreign drivers (11 out of 40 in total) were killed or seriously injured versus 13 % of Norwegian professional drivers (24 out of 190 in total).

Table 3.6 Number of professional drivers of different types involved in fatal accidents on Norwegian roads between 2010 and 2013, according to injury severity.

Injury severity	Assumed Norwegian	Foreign	
		Based in Norway	Based outside Norway
Fatal / serious injury	24	4	7
Light injury / uninjured	166	19	10
Total	190	23	17

3.2.6 Description of 8 fatal accidents triggered by foreign professional drivers who were driving into Norway from another country

Collecting information on accident and injury factors tells how often certain factors contribute to accidents and injuries, but it tells us little about the set of circumstance surrounding the accidents that foreign professional drivers tend to trigger. To get a better idea about this, we describe below each accident triggered by a foreign professional driver having driven into Norway from another country in 2010-2013.

Table 3.7 Description of 8 fatal accidents triggered by foreign professional drivers who were driving into Norway from another country

Accident number	Description of accident in which foreign professional driver drove a vehicle classified by AAG as precipitating the accident
1	Road departure. The driver drives well over the speed limit on a slippery road, and skids when a wheel enters a ditch. The driver does not use a seatbelt.
2	Road departure. Has carried out domestic deliveries within Norway (cabotage). The driver can have been tired, possibly sick, and does not use seatbelt. Drives at high speed for the conditions, and drives out of the road onto dangerous roadside terrain, possibly due to lack of information gathering.
3	Head-on collision. Involves a foreign driver. High speed for the conditions, on slippery road. Driver loses control of the truck. Lack of information gathering likely. The load is poorly secured, the vehicle has poor structural soundness, and some of the tyres are over worn.
4	Junction accident. Driver turns left and collides with a car coming in the opposite direction. Lack of information gathering. Professional driver does not use seatbelt.
5	Road departure. Foreign driver hired out to a firm based in a third Nordic country. High speed for the conditions and wrong / unfortunate placement of the vehicle in the road, means that the driver enters a ditch with severe inclination.
6	Head-on collision. Wrong /unfortunate placement of the vehicle in the road and lack of information gathering leads to a collision with an oncoming vehicle. The driver did not use a seatbelt.
7	Road departure. The driver lacks driving experience. S/he drives too fast for the prevailing conditions, and ends up driving off the road. Lack of information gathering is probably a factor. No use of seatbelt. The vehicle has a high centre of gravity and poor structural soundness.
8	Road departure. The driver may have been tired since s/he has driven for a long time to meet a delivery deadline the following morning. Drives at high speed for the conditions on a slippery road, loses control and drives off the road. There are also problems with the road (poor lighting, signage and barriers).

3.3 Analysis of personal injury accidents

We also look at all police reported traffic accidents with personal injuries involving HGVs in the period 2007-2014.

3.3.1 Number of vehicles in accidents and related injuries

Table 3.8 shows the number of HGVs involved in police reported traffic accidents with personal injury in Norway 2007-2014, distributed according to vehicle registration country.

Table 3.8 Number of HGVs involved in police reported traffic accidents with personal injury in Norway 2007-2014, distributed according to vehicle registration country, and number of accidents per nationality per year.

Nationality	2007	2008	2009	2010	2011	2012	2013	2014	HGVs	Accidents	Injuries
Norwegian	602	501	463	484	443	464	355	318	3 630	1819	2301
Swedish	22	20	13	27	19	16	12	13	142	80	103
Danish	10	9	7	7	8	8	9	6	64	40	47
Other EU15	22	19	11	19	15	13	12	8	119	69	84
Polish & Baltic	6	10	17	19	14	27	27	12	132	69	86
Other EU27	6	2	1	0	6	2	2	3	22	14	16
Unreg.	115	112	64	43	13	16	42	24	429	2198	3353
Other	3	2	5	3	3	5	0	0	21	9	10
Total	786	675	581	602	521	551	459	384	4559	4298	6000

Table 3.8 shows that we have data from 4298 police reported traffic accidents with personal injury in Norway 2007-2014. The accidents involved 4559 HGVs distributed among different groupings of vehicle registration countries. 3630 vehicles were Norwegian, 142 Swedish, 64 Danish, 119 from other EU15 countries, 132 Polish or Baltic, 22 HGVs from other EU27 countries, 21 were from other countries, and 429 HGVs had unknown nationality.

About 80 % of the heavy vehicles involved in accidents in the period were Norwegian, while about 11 % were foreign and 9 % had an unregistered nationality.

We also see that the total number of HGVs in accidents has decreased for all groups of nations in the period 2007-2014. The exception is Polish and Baltic HGVs, but these had, however, only 12 HGVs in accidents in 2014, compared to 27 in 2013 and 2012. The fact that this group of HGVs has not had the same steady decline in HGVs in accidents as the other national groups can be explained by the increased transport of this group in Norway in the period. We also see that the number of HGV with unknown nationality has decreased substantially in the period, probably as a consequence of increased focus on the accident risk of foreign HGVs in the period.

The database also includes information on the number of injured people in the accidents with HGVs involved. A total of 6000 people were injured in these accidents. In 2007, 1097 people were injured in HGV related accidents, while 473 people were injured in HGV accidents in 2014. There has been a steady decline in injured people throughout the study period.

When looking at injury severity of the HGV drivers involved in the accidents, we see that the drivers of 70 % of the vehicles were unharmed in the accidents that they were involved in. In 53 cases, the accidents were fatal for the HGV drivers, 8 cases are registered with very serious driver injury, and serious injury in 107 cases. 950 HGV drivers are registered with light injury and 2799 drivers were unharmed. Severity of injury was lacking for 246 involved HGV drivers.

3.3.2 Accident types

The data base of Statistics Norway on police reported traffic accidents with personal injury includes a variable on accident types. This variable has about 90 values. We have, however, categorized these into six main categories or accident types below: 1) accidents with vehicles driving in the same direction, 2) head-on accidents, 3)

intersection collisions, 4) accidents with pedestrians involved, 5) single vehicle accidents and 6) other accidents.

We only include accidents from the period 2007-2012 in our analyses of accident types. The reason is that we also compare the different national groups' accident risk for these accidents types, and we only have exposure data from 2007-2012.

Table 3.9 Accident types with Norwegian and foreign HGVs on Norwegian roads 2007-2012

Accident type	Norway	Sweden	Denmark	Balt/Pol.	Oth.EU15	Oth.EU27	Other	Total
Vehicles same dir.	32 %	30 %	24 %	26 %	31 %	41 %	19 %	31 %
Head-on	29 %	36 %	22 %	39 %	27 %	24 %	38 %	30 %
Intersection coll.	14 %	9 %	6 %	6 %	4 %	0 %	0 %	13 %
Pedestrian involved	4 %	1 %	6 %	5 %	2 %	0 %	0 %	4 %
Single vehicle	15 %	23 %	35 %	19 %	28 %	35 %	33 %	16 %
Other	6 %	2 %	6 %	4 %	7 %	0 %	10 %	6 %
Total	3320	117	49	93	99	17	21	3716

The table indicates that accidents with vehicles driving in the same direction, head on collisions and single vehicle accidents are the most prevalent accident types in HGV accidents. We also see that the foreign HGVs generally have substantially higher shares of vehicles in single vehicle accidents, compared with Norwegian HGV, and that Norwegian HGVs have substantially more vehicles in intersection collisions than the foreign HGVs.

Figure 3.3 shows the proportion of accident types for Norwegian and Foreign HGVs involved in police reported traffic accidents with personal injury in Norway 2007-2012.

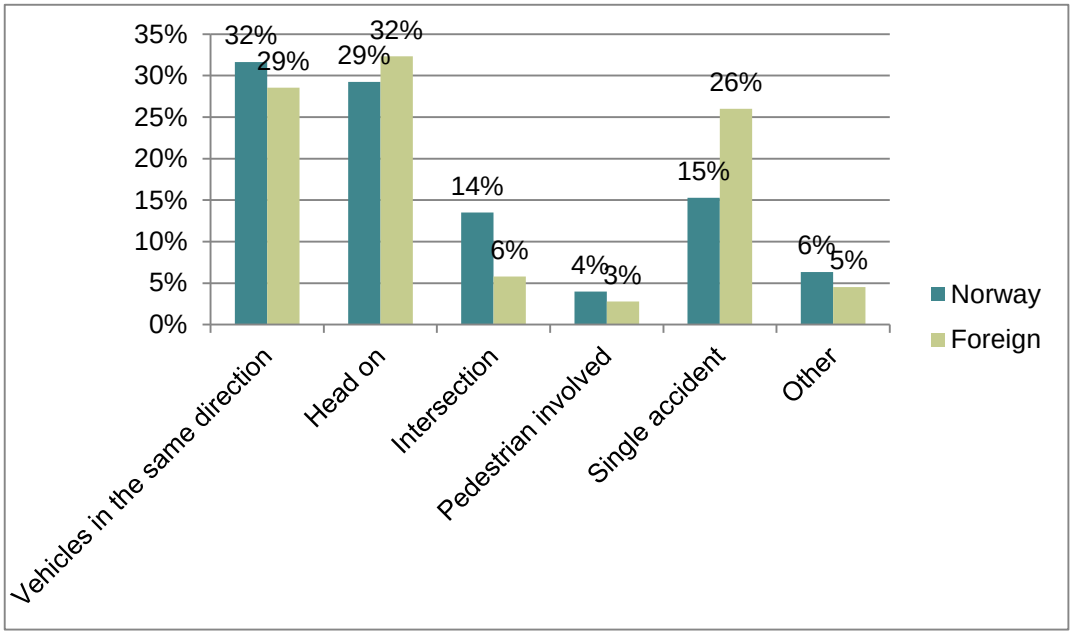


Figure 3.3 The proportion of accident types for Norwegian (N=3320) and Foreign HGVs (396) involved in police reported traffic accidents with personal injury in Norway 2007-2012.

The figure indicates two interesting differences. The first is that the share of single vehicle accidents in the group of foreign HGVs is nearly twice as high in the group

of foreign HGV as in the group of Norwegian HGVs. The second is that the proportion of intersection accidents is over twice as high among the Norwegian HGVs than it is among the foreign HGVs. These differences are probably due to differences in driving patterns. We may assume the Norwegian HGVs have a larger share of their driving in distribution transport in densely populated areas and that they therefore pass through more intersections. It is likely that foreign HGVs, on the other hand have most of their driving on long distance transport on main roads and high ways. This may increase the risk of fatigue and decreased attention, and perhaps lead to a higher share of single vehicle accidents in this group.

Figure 3.4 shows the proportion of single vehicle accidents in each of the national groups of HGVs involved in police reported traffic accidents with personal injury in Norway 2007-2012.

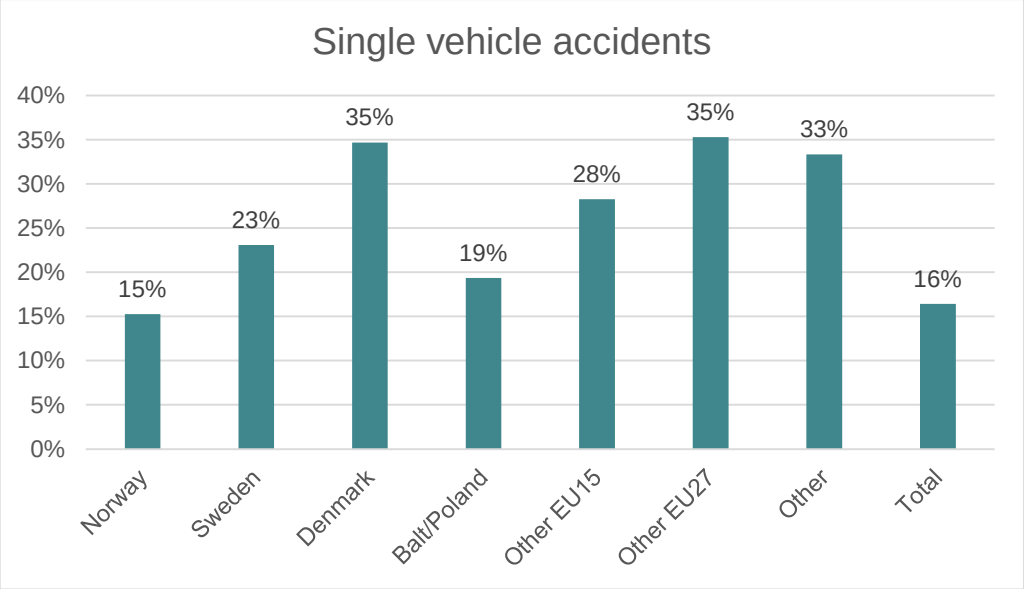


Figure 3.4 The proportion of HGVs involved in single vehicle accidents in each of the national groups of HGVs involved in police reported traffic accidents with personal injury in Norway 2007-2012. (The total number of HGVs in accidents in each group is given in table 3.12).

In figure 3.3 above, we saw that 26 % of the accidents that the foreign HGVs were involved in were single vehicle accidents. When we look at the distribution of each of the national groups among the foreign vehicles on this particular accident type, we see Baltic and Polish HGVs have the second lowest share of single vehicle accidents, and that Denmark and Other EU 27 have the highest shares. The numbers are however small for the foreign national groups on this accident type, and results should be interpreted with caution.

Single vehicle accidents is a special accident type, which often is related to a known set of causes. These accidents may typically be related to fatigue, falling asleep, distraction, too high speed for conditions, illness, intoxication and so forth. We analyse risk factors related to such accidents in chapter 12, examining time of day of these accidents and light conditions. The purpose is to examine whether fatigue is a likely risk factor in these accidents.

3.3.3 The risk of different accident types

Above we have compared the shares of different accident types between different national groups of HGVs. In the following, we will compare the frequency of different accident types that the groups are involved in based on their kilometres driven. We thereby compare the different national groups' risk for different types of accidents. It is important to note that these estimates do not take into account where the kilometres driven by the national groups has been done. We may for instance assume that Norwegian HGVs have a higher risk of intersection collisions than foreign HGVs because they drive more in intersections, but the risk estimates do not control for that, as they not are sensitive to where the different groups drive.

Figure 3.5 shows the risks that HGVs from different countries have of becoming involved in single vehicle accidents in Norway.

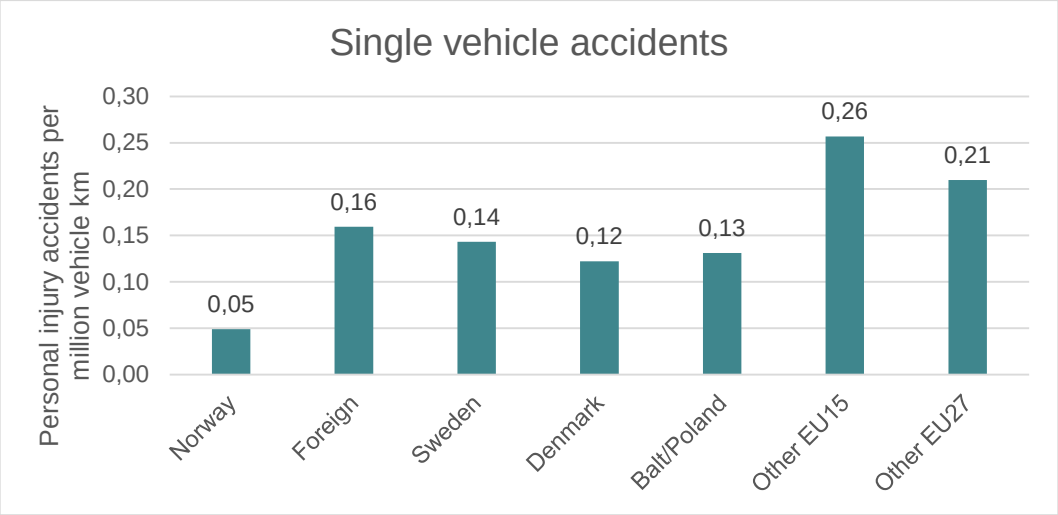


Figure 3.5 Risk of single vehicle accidents for Norwegian and foreign HGVs (involved in police reported traffic accidents with personal injury in Norway 2007-2012.

As the numbers are small for the foreign groups when we look at specific accident types, we have calculated the risk for all foreign HGVs. We see that foreign HGVs in general have a three times higher accident risk of being involved in single vehicle accident than do Norwegian HGVs. In the national groups of foreign HGVs, the accident numbers on which the risk estimates are based on are small, and differences between these are probably not statistically significant.

Figure 3.6 shows the risks that HGVs from different countries have of becoming involved in head on collisions in Norway, indicating that foreign HGVs have twice as high risk of head-on collisions as Norwegian HGVs.

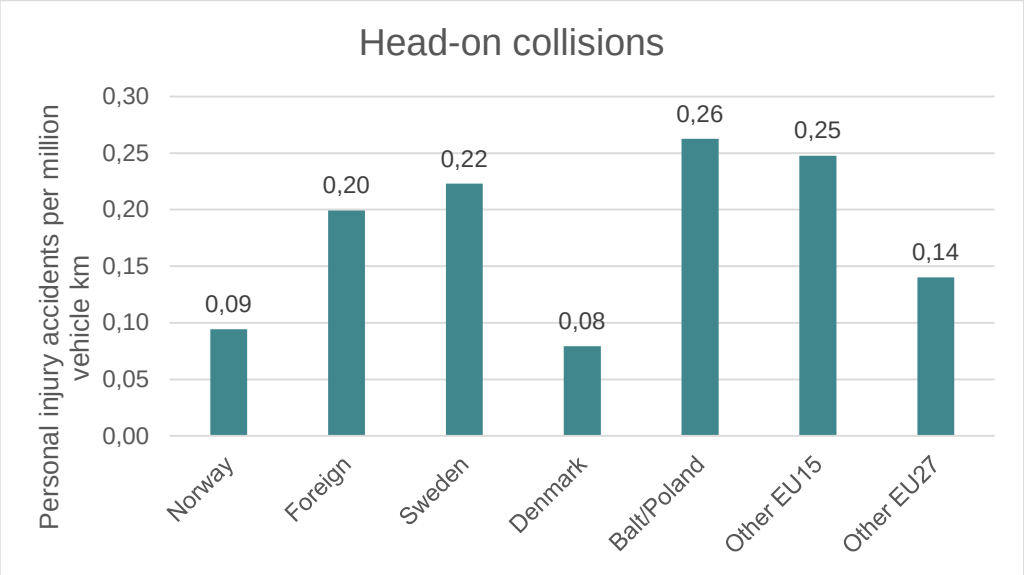


Figure 3.6 Risk of being involved in head-on collisions for Norwegian and foreign HGVs (involved in police reported traffic accidents with personal injury in Norway 2007-2012.

Figure 3.7 shows the different national groups of HGVs' risks of being involved in collisions with vehicles driving in the same direction.

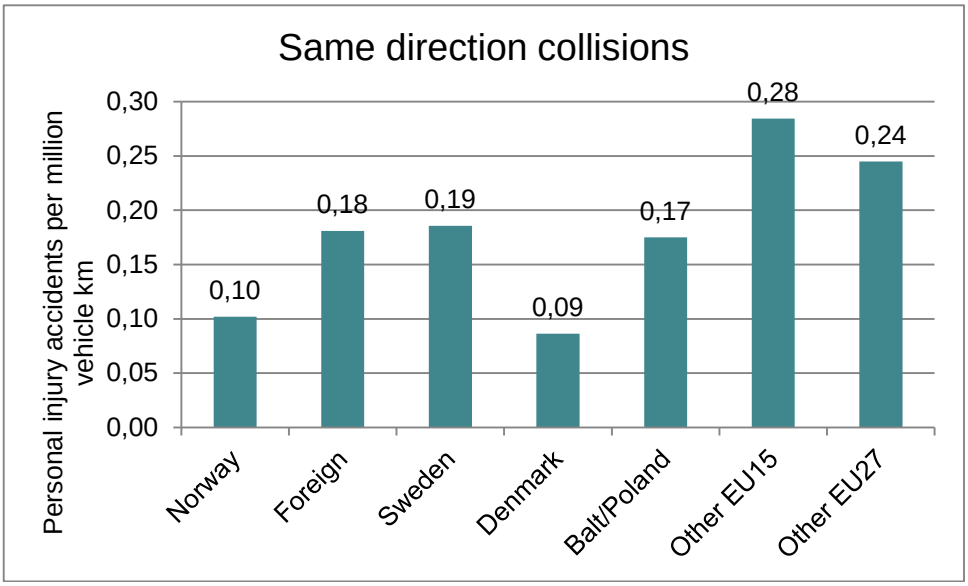


Figure 3.7 Risk of being involved in collisions with vehicles driving in the same direction for Norwegian and foreign HGVs (involved in police reported traffic accidents with personal injury in Norway 2007-2012.

We see that foreign HGVs have nearly has twice as high risk of collisions with vehicles driving in the same direction.

Figure 3.8 shows the risk of Norwegian and foreign HGVs of being involved in accidents with pedestrians involved, intersection accidents and other accidents. We only show the risk of foreign and Norwegian HGVs, as the number of accidents with foreign HGVs are small for these accident types.

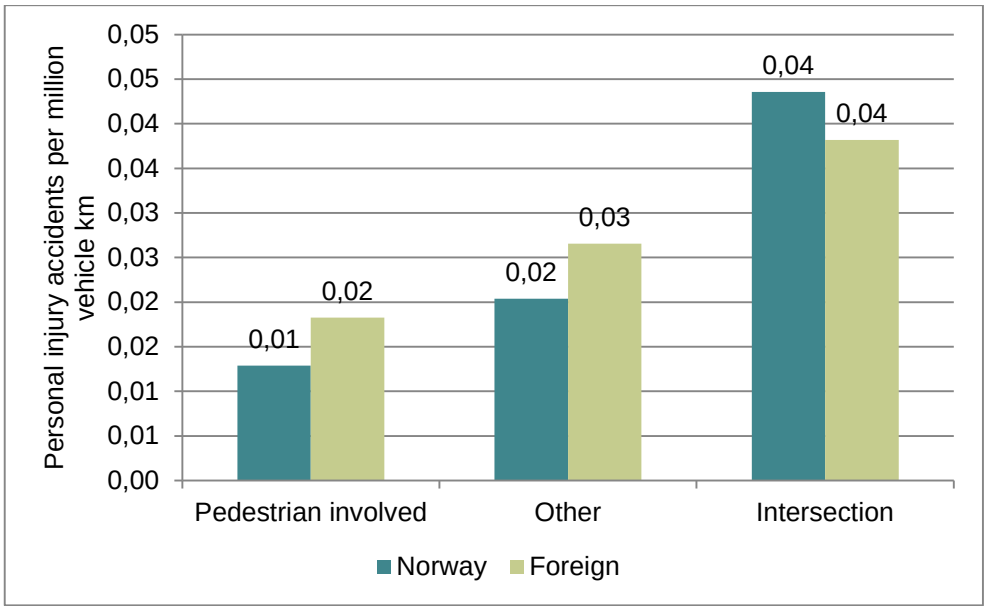


Figure 3.8 The risk of Norwegian and foreign HGVs of being involved in accidents with pedestrians involved, intersection collisions and other accidents. (HGVs involved in police reported traffic accidents with personal injury in Norway 2007-2012.)

Figure 3.8 indicates that the risk of being involved in intersection collisions is similar for Norwegian and foreign HGVs. As noted above, this is probably due to the fact that Norwegian HGVs have a higher share of their driving in densely populated areas with more intersections. Foreign HGVs are probably less involved in distribution transport than Norwegian HGVs and more involved in long distance transport on roads with fewer intersections. This argument is probably also valid for accidents with pedestrians involved, as HGVs in densely populated areas are more exposed to pedestrians than HGVs on main roads in rural areas.

Finally, tests of whether the differences in the risks of the different accident types are statistically significant indicates that only the differences between Norwegian and foreign HGVs' risk of single vehicle accidents, head-on accidents and accidents with vehicles driving in the same direction are statistically significant at the 5 % level (cf. Appendix 4).

3.4 Results from the interviews

The interviewees gave different answers when asked about the safety consequences of internationalisation of goods transport in Norway. Some stated that it seems that foreign HGV drivers have a higher risk of personal injury accidents, as the report of Nævestad et al (2014) indicates. These interviewees stated that the safety standard of foreign drivers in average is a bit lower than that of Norwegian drivers, although they stressed that there of course are several exceptions to this on both sides. One interviewee stressed the importance of research in this area, to avoid stigmatizing foreign drivers.

The interviewees seemed to agree that foreign drivers have a higher risk of accidents with material damages only, especially in the winter. Interviewees also agreed that foreign HGV drivers have a higher risk than Norwegian drivers of "getting stuck" while driving under winter conditions.

Several participants in the reference group meeting (March 12. 2014) suggested that in the winter, the foreign HGVs generally seem to get stuck on the road while driving uphill, while Norwegian goods vehicles run out of the road. Based on this, it was suggested that the foreign vehicles requiring towing assistance along Norwegian roads in the winter, is more of a traffic flow problem than a traffic safety problem. It was however also pointed out that such situations can easily become a traffic safety problem, as other road users have to circumvent foreign HGVs that are stuck on icy roads.

3.5 Results from the small-scale survey

We asked respondents questions on how many thousand kilometres they have driven with a heavy vehicle in the last two years, whether they have been involved in traffic accidents in the last two years and how often they have been in Norway to work as a driver in the last two years.

Table 3.10 Thousand kilometres driven with a heavy vehicle in the last two years, traffic accident involvement in the last two years, and visits to Norway to work as a driver in the last two years. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52)

Drivers' nationality	Norwegian	WE	CEE	Norwegian II
Approximately how many thousand kilometres have you driven with a heavy vehicle in the last two years?	167	259	232	96
During the last two years, have you been involved in a traffic accident while at work?	11.5 %	11.8 %	7.7 %	11,9 %
How often have you been in Norway to work as a driver in the last two years?				
Every week		63 %	48 %	
Every month	13 %	27 %		
Every six months		13 %	2 %	
Very rarely		13 %	10 %	
This is the first time		0 %	14 %	
Total	61	17	52	224

The table indicates that the of the three groups that we primarily focus on in the study, the Norwegian drivers have the lowest number of driven kilometres in the last two years. However, when we also include the Norwegian II sample, we see that these have a low exposure. The reason is that this sample included many drivers with low (<10 000 km) HGV mileage in the last two years.

Nevertheless, we see that the Norwegian II sample has the highest share of drivers who have been involved in accidents. It is however, important to note that the shares who have been involved in accidents in the Norwegian and the WE group is fairly similar to those of the Norwegian II sample. The CEE drivers are exceptional here, with the lowest share of drivers who report to have been involved in accidents. We will return to this below. As we do not define traffic accidents in the survey, we assume that respondents report all sorts of traffic accidents (both damage and injury)

here, and that the figure indicate the share who have been involved in accidents with material damage.

Finally, looking at how often the drivers report that they are in Norway to work as drivers, we see that the WE drivers are more frequently visiting Norway. Fourteen per cent of the CEE drivers were visiting Norway for the first time at the time of the interviews.

3.5.1 Accident risk

A number of studies show that professional drivers are about half as likely to be involved in accidents as other drivers, and that professional drivers are even less likely to trigger accidents (Høye 2014). Being a professional driver is, however, a hazardous occupation compared to other occupations. This is evident when we compare occupational drivers' risk per million person hours in the profession, with similar risks in other occupations. Data from 1988-1993 shows that professional drivers' risk corresponded to 9.5 deaths per 100 million person hours, compared with 3 for other occupations. Other road users had a risk of 21.8 deaths per 100 million person hours (Fosser & Elvik 1996 Elvik 2005). Previous studies show that the risk of HGV accidents involving material damage correspond to 9.69 accidents involving material damage per million kilometers driven, and 0.21 personal injury accidents per million vehicle km (Høye 2014).

We may use data from our survey to assess the risk of accidents in the three groups. There are, however, six important reservations:

1) This is a sample survey based on fairly small numbers of respondents, and we therefore have few accidents and small numbers, which to some extent will be affected by coincidence.

2) The numbers of accidents and the exposure measure are based on drivers' self-reports, with the sources of error this involves, e.g. related to memory and subjective definitions of what is counted as an accident.

3) Different types of transport activity affect accident situations and accident risk. It is reasonable to expect that the Norwegian drivers drive relatively more distribution transport than the foreign drivers, who are more likely to drive relatively longer distances in and out of Norway. This generates a higher mileage, conducted on safer roads (i.e. motor ways), and probably lower risk.

4) We do not define traffic accident for the survey. Traffic accidents are probably interpreted by respondents to include everything from scratches and broken mirrors to collisions. It is also important to remember that the drivers reporting the accidents in the survey have not necessarily have been attributed blame for the accidents they report. Since we do not define traffic accidents, we assume that respondents report all sorts of traffic accidents (damage and personal injury) and that our risk estimates refer to the risk of material damage accidents.

5) We do not discern between whether the drivers reporting accidents actually triggered the accident or merely were involved in it. Thus, the risk of triggering accidents may be different from being involved in accidents as a passive party. We saw in Chapter 3, that foreign HGV drivers in Norway seem to be more likely to trigger fatal accidents than Norwegian drivers.

6) We do not count the number of accidents that each driver has been involved in. Thus, the risk estimates may be termed conservative. This is however similar for all the groups in the study.

When we look at the traffic volume in the groups involved in the study, we see that the Norwegian drivers had driven about 10 million km (10.122970) in total. Drivers from WE had driven 4.4 million km (4.395010), while CEE drivers had driven about twelve million km (11.975080) in total in the last two years. In comparison, the drivers in the Norwegian II sample had driven about 21.5 million km (21.544320) in the last two years.

This gives a risk of accident with material damage of 0.69 accidents per million kilometres per respondent among the Norwegian drivers (7/10.1), 0.46 accidents per million kilometres among the WE drivers (2/4.4) and 0.33 accidents with material damage per one million kilometres per respondent in among the CEE drivers (4/12). Finally, the risk of Norwegian II is 1.21 accidents per one million km per respondent (26/21.5). It is important to remember that these figures are subject to uncertainty, as they are based on self-reports.

Figure 3.9 shows the absolute number of drivers involved in accidents in the last two years, million km driven with HGV in the last two years per driver in each group, and estimated accident risk based on these numbers.

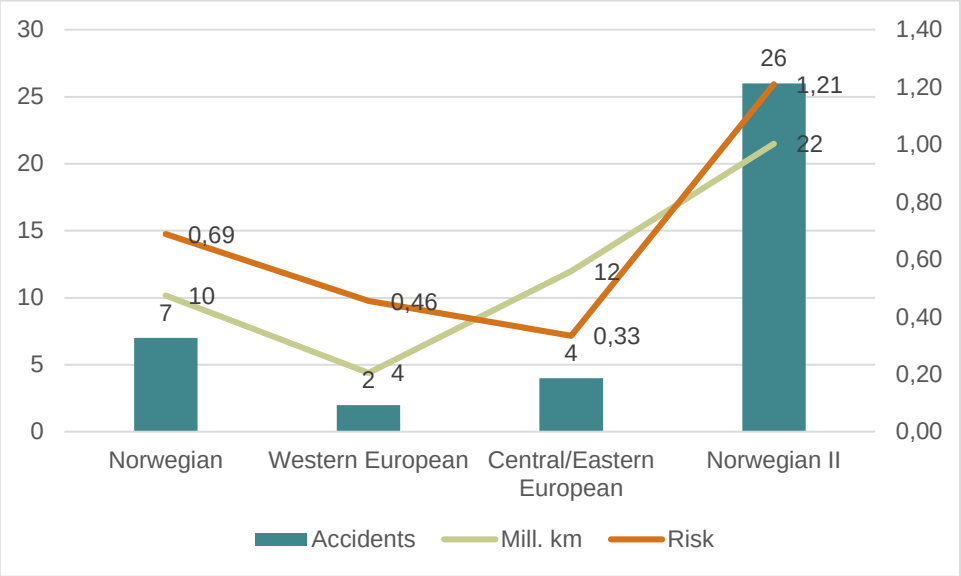


Figure 3.9 Absolute number of drivers involved in accidents in the last two years, million km driven with HGV in the last two years per driver in each group, and estimated accident risk based on these numbers. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52).

We see that the Norwegian II sample has the highest accident risk, followed by the Norwegian drivers, Other/West drivers and CEE drivers. We have tested whether these differences in accident risk are statistically significant, taking into account uncertainties related to both the accidents and exposure numbers. These estimates show that only the accident risk of CEE drivers and the Norwegian II sample is statistically significant at the 5 %-level (cf. appendix 4 for the calculations). The accident risk of the Norwegian II sample is 3.5 times higher than that of the CEE drivers. This is unexpected for several reasons.

First, these risk numbers are the opposite of those found in above mentioned research comparing accident risk between national groups of HGVs in Norway (Nævestad et al 2014). Although this research applies to personal injury accidents, we saw that Norwegian HGVs had the lowest accident risk, and that HGVs from Other EU15 had 2.5 higher accident risk than the Norwegian HGVs, while the risk of Polish/Baltic HGVs was the twice that of the Norwegian HGVs. According to the small-scale survey, however, it is the other way around.

Second, it is unexpected that the Norwegian II group has the highest accident risk among the groups, as the companies in this group was selected because of their exceptional efforts on safety and their positive safety performance. Thus, we suggest that differences in accident risk could be caused by reporting effects in the small-scale survey. We return to this in chapter 16, where we discuss six potential explanations to what seems to be reporting effects.

Finally, given that we assume that the risk numbers correspond to the risk of material damage accidents, it should be noted that the risk estimates are considerably lower than the risk of 9.69 accidents involving material damage per million kilometers driven, which has been found in previous research (Høye 2014).

We compare the accident risks of the different groups with their scores on the indexes for safety commitment and transport safety behaviour (Figure 3.10).

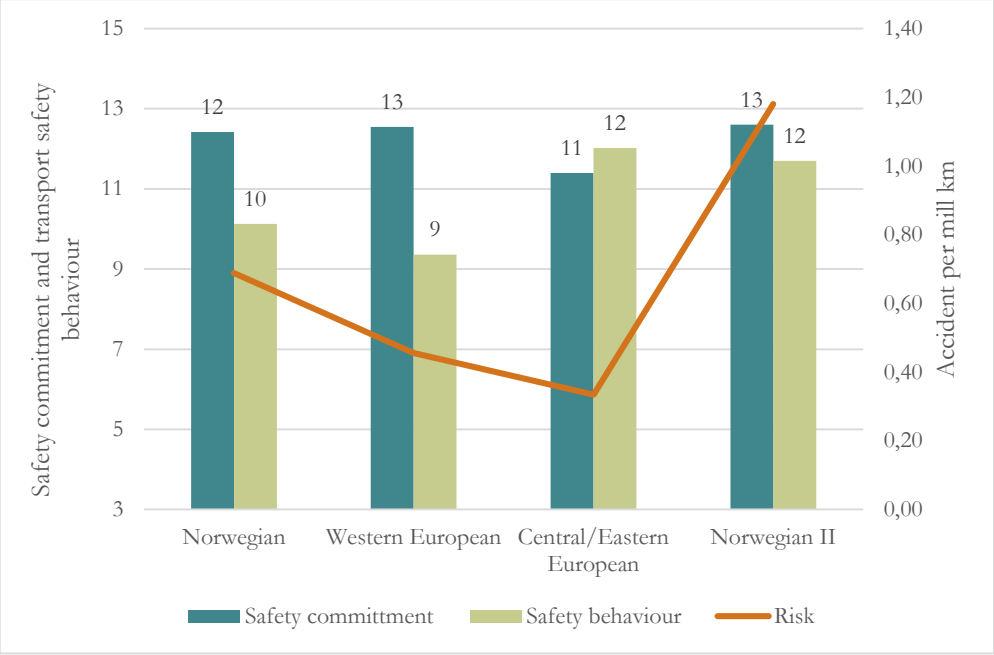


Figure 3.10 Safety commitment, transport safety behaviour and accident risk in the three groups. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52) Norwegian II (N=242).

The differences in safety commitment (cf. chapter 7.3) and safety behaviour (cf. chapter 6.4) are fairly small when we take into account that the accident risk of the Norwegian II group was 3,5 times higher than that of the CEE drivers. This is in contrast to a previous study of safety culture in goods transport, where we saw a correspondence between safety culture level and accident risk (Nævestad & Bjørnskau 2014).

Thus, unless the items that we have used to measure safety commitment and behaviour in the current study are ineffective, it seems that some of the results are influenced by reporting effects.

Finally, it could have been interesting to conduct a multivariate logistic regression analysis in order to compare the effect of the independent variables age group, safety commitment, safety behaviour, working hours and fatigued driving on accident involvement among the respondents. However, as we argue that the differences between the groups seem to partly be influenced by reporting effects, and because the samples are relatively small we refrain from conducting such analyses (cf. chapter 16).

3.6 Summing up

In the literature review, we discussed eight studies indicating that the HGV accident risk varies by a factor of up to ten in European countries, and that the accident risk for foreign HGVs is approximately two times higher than it is for domestic HGVs in those European countries studied. Thus, it seems that increased internationalisation of road transport of goods in Norway has the potential to increase the number of HGV accidents. That said, Germany has a relatively low HGV related fatality risk (AECOM 2014), despite having probably the highest share of transport with foreign HGVs in Europe (Wiesman 2005).

A previous Norwegian study (Nævestad et al 2014), examines the number of HGVs in police reported traffic accidents with personal injuries per million kilometres for HGVs in Norway from 2007 to 2012. The study concludes that HGVs registered in foreign countries have higher accident risk than Norwegian HGVs on Norwegian roads. Norwegian and Danish HGVs have the lowest accident risk. The accident risk of HGVs from the rest of the EU15 is over 2.5 times higher than the accident risk of Norwegian vehicles. Polish and Baltic vehicles have the second highest accident risk, followed by Sweden and vehicles from other EU27 countries.

Results from analysis of police reported traffic accidents with personal injuries (2007-2012) in the present report indicate that foreign HGVs have a three times higher accident risk of single vehicle accidents than Norwegian HGVs, twice the risk of head-on collisions, and nearly twice the risk of collisions with vehicles driving in the same direction.

Analysis of AAG data from 2010-2013 indicates that 17 % of the professional drivers involved in fatal accidents in Norway (N=230), 2010-2013 had a foreign nationality. Results also indicate that foreign professional drivers in Norway seem to be more likely to trigger fatal accidents than Norwegian drivers.

The interviewees agreed that foreign drivers have a higher risk of material damage accidents, especially in the winter. Interviewees also agreed that foreign HGV drivers have a higher risk than Norwegian drivers of "getting stuck" while driving under winter conditions.

In the small-scale survey, we asked respondents questions on how many thousand kilometres they have driven with a heavy vehicle in the last two years, and whether they have been involved in traffic accidents in the last two years. Based on this, we estimated the accident risks of the three groups in the study and compared these numbers with an additional sample of Norwegian drivers (N=224) with good safety

culture and good safety record (the Norwegian II sample). Surprisingly, we saw the accident risk of the Norwegian II sample was 3.5 times higher than that of the CEE drivers, a result which is the opposite of what we have found in previous research with higher quality data. We argue that the accident risk results from the small-scale survey are due to reporting effects.

4 Winter driving

In the following 11 chapters (chapter 4-14), we discuss twelve possible risk factors that may explain why the accident risk for foreign HGVs is higher than it is for domestic HGVs. In the current chapter, we discuss the importance of winter driving as a risk factor that may explain why foreign HGVs have a higher accident risk than domestic HGVs in light of five data sources: literature review, accident analysis, interviews, small-scale survey and NPRA results on winter equipment from HGV inspections.

4.1 Results from literature review

Foreign lorry drivers' lack of competence on Norwegian roads has been identified as a significant safety problem, especially when it comes to winter driving (Bergene & Underthun 2012). Both Nævestad et al (2014) and Leviäkangas (1998) find that foreign drivers in Norway and Finland respectively have a higher share of their accidents in the winter. Norwegian professional drivers must undergo a mandatory course in driving on slippery roads to get their professional drivers licence. Such courses are not required in other European countries further south.

Winter driving is one of the risk factors that the Norwegian Public Roads Administration's (NPRA) information campaign "Trucker's guide to driving in Norway" focuses on, stating that:

> "Be prepared! On Norwegian winter roads you cannot trust luck alone. The only things you can trust are appropriate equipment, responsible driving and being your own best friend behind the wheel. Norway is a difficult country to drive in, with many winding roads and a lot of snow during winter. These are normal conditions since most of the country consists of mountainous terrain." (Truckers guide 2012: 6).

It is important to note that several of the challenges met by foreign HGV drivers in Norway also can be found in other European countries. Roads and tunnels with steep inclination are found in both Nordic countries and alpine countries. Winter driving is also a common challenge in Nordic and alpine countries. As a consequence, the Norwegian minister for transport took an initiative to make winter training mandatory for HGV drivers in certain EU/EEA countries, together with his colleagues in Sweden, Switzerland and Austria.

4.2 Results from accident analysis

We lack data on foreign vehicle kilometres for different months of the year, so to get an idea of the accident risk in the winter and in the summer, we examined the distribution of HGVs involved in police reported road accidents with injuries in Norway 2007-2012 distributed according to nationality and season (October-March

versus April-September). In figure 4.1 we have simplified this, showing the distribution of vehicles from Scandinavia and other countries.

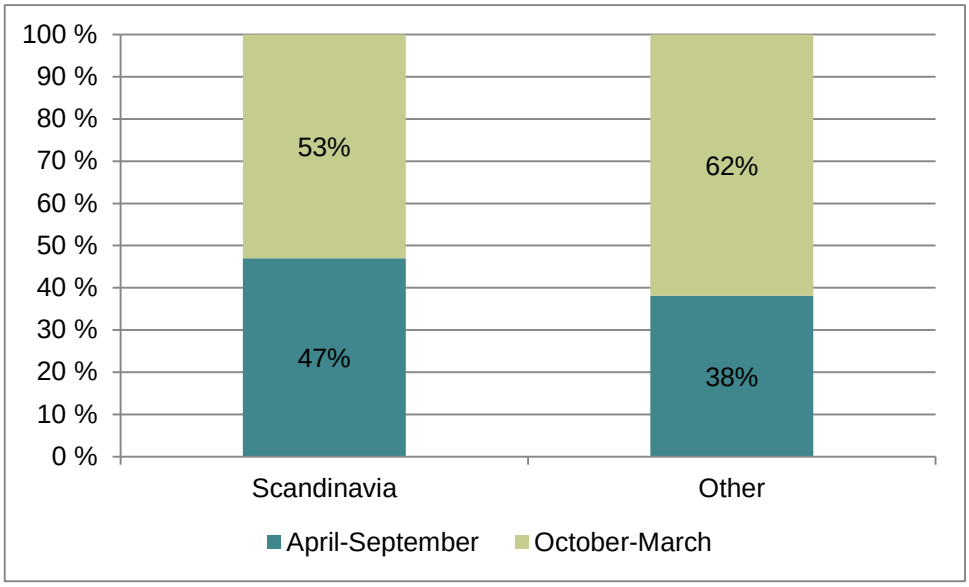


Figure 4.1 Shares of heavy goods vehicles involved in police reported road accidents with personal injuries in Norway from 2007 to 2014, for Scandinavia and non-Scandinavian countries, in the winter (October-March) and the summer (April-September).

The figure shows that HGVs from non-Scandinavian countries have a greater proportion of the accidents in the winter than the Scandinavian vehicles have. This may indicate that foreign HGVs have a higher accident risk in the winter.

We cannot rule out that this finding also may reflect differences in vehicle kilometres in the winter versus the summer, since our exposure data for foreign heavy goods vehicles not are detailed enough to investigate the amount of traffic in the months of the year. We know, however, that Norwegian heavy goods vehicles had 49.4 % of their vehicle kilometres in the winter (October - March) (average of 2007-2012). Thus, perhaps this also applies for foreign HGVs. Future studies should look into that issue, in order to compare winter accident risk of Norwegian and foreign HGVs. The national group which had the highest share of accidents in the winter was other EU15 (66 %).

Figure 4.2 shows the distribution of HGVs involved in police reported road accidents with personal injuries in Norway from 2007 to 2014, distributed according to road surface and HGV nationality. We lack information for 196 vehicles.

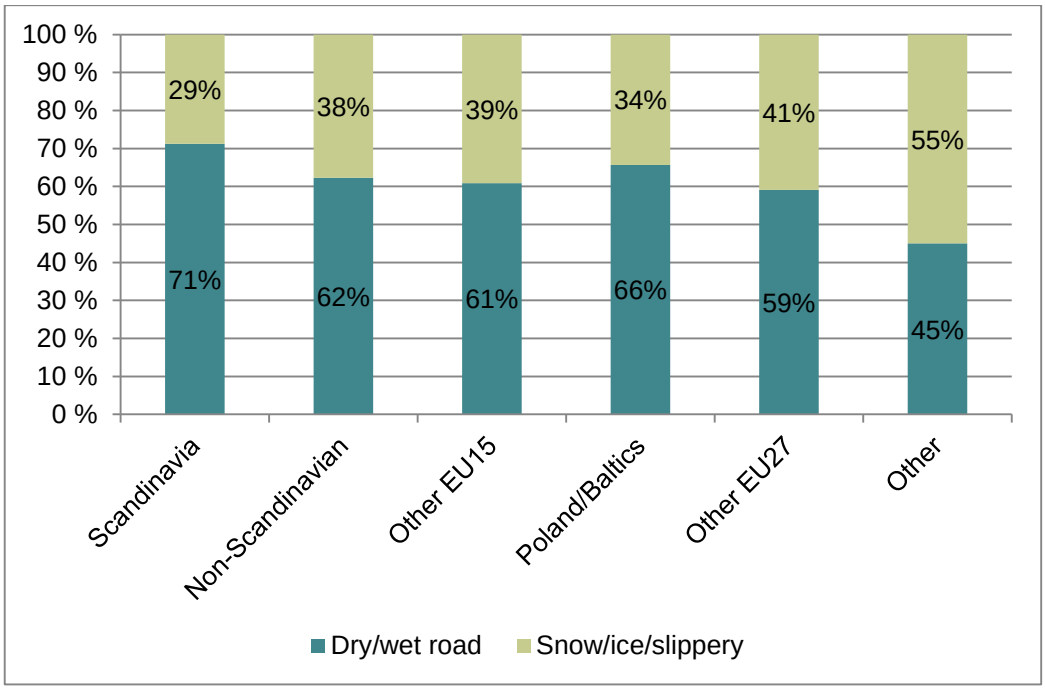


Figure 4.2 Shares of heavy goods vehicles involved in police reported road accidents with personal injuries in Norway from 2007 to 2014, distributed according to road surface and HGV nationality (N=4363).

The figure shows that non-Scandinavian HGVs have a higher share of their HGVs in accidents on road surfaces with ice/snow/slippery conditions compared with Scandinavian HGVs. This finding and the fact that Scandinavian vehicles have a lower percentage of accidents during winter than other countries indicates that HGVs from Scandinavia may be better equipped for winter driving and have drivers with more experience and expertise in winter driving than vehicles from other countries have. Numbers in the Other EU27 group (N=22) and the group "Other" (N=20) are too small to be used to draw solid conclusions on these groups, and results for these groups should therefore be interpreted with caution.

4.3 Results from interviews

Interviewees agreed that winter driving is the main safety challenge related to foreign drivers in Norway. This challenge is multi-faceted. Foreign HGVs are less suited to Norwegian winter conditions as they often have two axles, providing them with a poorer grip than three axle HGVs. Winter equipment (tyres, snow chains) has previously been a challenge, but it seems that this situation has improved. January 1. 2015, special Norwegian rules on mandatory winter tyres for the truck and the trailer were introduced.

Moreover, the competence of HGV drivers is a key factor when it comes to winter driving. Interviewees agreed that winter driving is the main safety challenge related to foreign drivers in Norway, and that foreign drivers' training, competence and experience is a key risk factor in this respect. Driving safely under winter conditions is strongly dependent on drivers' experience, which allows them to judge situations correctly, evaluate risks and adapt their speed to conditions. Also driving uphill on winter roads without getting stuck and putting on snow chains requires competence and experience. Loading for winter conditions also requires competence.

4.3.1 Trygg Trailer

The "Safe Trailer" ("Trygg Trailer") campaign was mentioned by interviewees as a very successful example of a campaign that may contribute to safer winter roads. "Trygg Trailer" (safe trailer) started in the winter 2010 as a collaboration between the NPRA region north and the Fishing and Aquaculture Industry Association (FHL). The campaign started as a response to traffic accidents and closed roads in the communities where the companies were located. Moreover, the companies exporting fish and seafood wanted to ensure that their goods were brought safely to their destination. FHL therefore wished that the employees of the member organizations should be trained to perform simple controls of tyres and snow chains on HGVs coming to load fish and seafood. The experiences from this campaign were very good, and in January 2014 it was decided that this measure should be implemented nationally. It was also decided that the campaign also should target other industries than sea food.

Trygg trailer is based on a common understanding between private companies, organizations and the NPRA, that poor winter equipment is a main challenge for road transport of goods in the winter. In the winter 2014/2015, the NPRA offered companies training in conducting simple checks of tires and snow chains of HGVs. This would enable employees to perform such checks on vehicles coming to load or unload cargo. The campaign has also been expanded to includes simple checks of how the cargo is secured.

The NPRA training of transport hub employees last for about two hours, and focus on tread depth, labelling of winter tyres and snow chain requirements. Additionally, company management emphasizes for employees that Trygg Trailer is a priority in the company. The companies will decide upon and inform their employees about how to follow up violations when it comes to winter equipment. The NPRA offers, however, advice on how to establish routines for dealing with this. Additionally, the NPRA offers information on winter driving to transport buyers, drivers and transport companies though information material that is available both as paper pamphlets and as web documents (i.e. the above mentioned Trucker's Guide). In the period 2014-2017, the NPRA will develop Trygg Trailer further to include mobility and safety in HGV transport, in addition to winter driving. By April 2016, 127 companies were participating in Trygg Trailer.

The main purpose of Trygg Trailer is to direct focus to the simple measures that are assumed to have the greatest effect. Moreover, the campaign is also important because it directs attention to what transport buyers can do to contribute to transport safety. The companies participating in the campaign have in some cases found repeated violations among drivers in some of transport companies. As a consequence, these transport companies have been asked to improve their winter equipment. An advantage with this approach is that it focuses on the transport companies, and not the driver. Although the regulations focus on the drivers, the drivers do not have as much influence as the regulations imply.

4.3.2 Behavioural adaptation

In the reference group meeting, it was suggested that the foreign drivers seem to do well given the negative coverage they receive in the media. When we take into account the poor technical equipment that foreign drivers seem to have, these drivers may well drive safer than expected. A possible explanation that was introduced is

"behavioural adaptation". It means that foreign drivers feel less safe on Norwegian winter roads with the kind of tyres they have, and adapt by driving slower and more carefully. This is a well-known mechanism that is supported in other areas of traffic safety research. More research is needed on this issue.

The interviewees mentioned several anecdotes from people in the field supporting this hypothesis, for instance: "if you want to know whether a HGV that has driven out of the road in the winter is Norwegian or foreign, you may look at its position: if it is located far off the road, it is probably Norwegian, if it is placed close to the road it is foreign." The purpose of this story is to illustrate an assumption that foreign HGV drivers drive slower (adapting their behaviour) in the winter than Norwegian drivers.

It was mentioned that indications from data on towing assistance support the hypothesis of behavioural adaptation (cf. Figure 4.3 below). This further implies that there are differences in in the types of accidents that are dominated by Norwegian and by foreign goods transporters on winter roads.

Several participants in the reference group meeting suggested that the foreign HGVs often get stuck while driving uphill, while the Norwegian HGVs tend to run off the road. The explanation for this was that Norwegian drivers drive faster on winter roads because they have good tyres and a lot of experience with driving under these conditions. The Norwegian drivers therefore feel safer and more confident. The foreign HGV drivers on the other hand, drive slower because they have poorer tyres, older vehicles, possibly less experience and thereby feel less safe. A hypothesis is that bad tyres also contribute to the tendency for foreign drivers to more often get stuck uphill, and more often need towing help.

4.4 Data from a towing company (Falck Redning AS)

In 2011, the NPRA, an insurance company ("If Forsikring") and two towing companies ("Falck Redning AS" and "Viking") started a cooperation project in order to map where accidents occur on Norwegian roads.[6] The goal of the project ("FOU Bilberging") was to establish a continuous identification of accident spots and roads with accidents. Certain towing company branches were given personal digital assistants (PDA's) from the NPRA to register information about towing assistance given to light and heavy vehicles, including the exact GPS coordinates of the incidents requiring towing assistance. The data collected focus only on towing assistance related to accidents, "stuck" vehicles, and other traffic safety events (i.e. not assistance related to e.g. engine failure).

The data were initially collected from some parts of central Norway ("Midt Norge"). As of Medio 2013, Falck Redning AS started to deliver data to the project from all over the country. It is likely that some towing assistance data for foreign HGVs are unrecorded in the project. Falck Redning AS is organized according to a franchise model. It is therefore possible for road users to pay local towing company branches directly for their services. This solution is often preferred by foreign HGV drivers,

[6] We are very thankful to Fredrik Bergmann at Falck Redning AS for providing us with statistics on towing assistance given to Norwegian and foreign HGVs. The statistics and data on the project "FOU Bilberging" is based on a presentation held by Bergmann in Karlstad November, 12. 2015. Confer: http://www.nvfnorden.org/hemsida/utvalg/ts-risker-med-eu-trailer-pa-hala-vagar/

and when a local branch is paid directly, the incident is not reported to Falck Redning AS centrally. Moreover, some data is also unrecorded in the project, as the other participating towing company "Viking" encountered technical problems in their registration of incidents.

A total of 54,843 cases were reported in the project from January 1st 2013 to November 2015. Of these cases, 3,410 incidents involved heavy vehicles. Table 4.1 shows the share of Norwegian and foreign HGVs towed by cause of damage.

Table 4.1 Cause of damage for HGVs that were given towing assistance and registered in the "FOU-Bilberging" project from January 1st 2013 to November 2015. Source: Falck Redning AS.

Cause of damage	Share (%)	N
Stuck HGV	52	1781
Collision damage	5	161
HGV run off the road	37	1251
HGV overturned	6	217
Total	100	3410

Figure 4.3 shows the distribution of Norwegian and foreign HGVs towed by cause of damage.

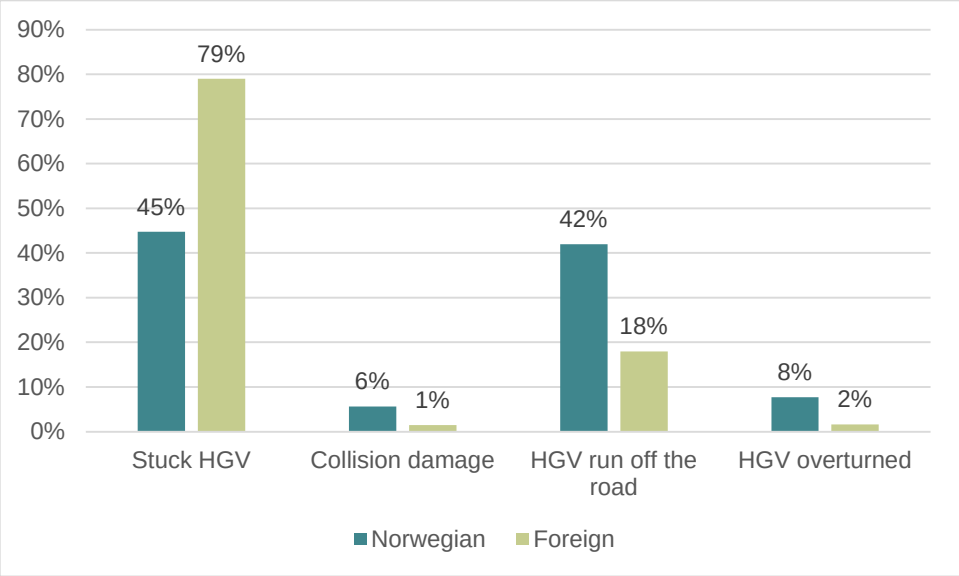


Figure 4.3 Cause of damage for foreign (N=747) and Norwegian (N=2663) HGVs that were given towing assistance and registered in the "FOU-Bilberging" project from January 1st 2013 to November 2015. Source: Falck Redning AS.

Figure 4.3 indicates that foreign HGVs are more likely to "get stuck", while Norwegian HGVs are more likely to run off the road. This is in line with the hypothesis about behavioural adaptation that was presented in the interview data above. According to this hypothesis, Norwegian HGV drivers feel safer and more confident while driving on winter roads (cf. Figure 4.7 below), because of their equipment and their experience. They therefore drive faster. When they encounter problems on winter roads, they therefore tend to run off the road. The foreign HGV

drivers on the other hand, drive slower because they have poorer tyres, older vehicles, possibly less experience and thereby feel less safe. As a consequence, they are more likely to get stuck while driving uphill on winter roads. It is important to note that this is merely a hypothesis, although it is in line with our data (cf. Figure 4.7)

It seems that foreign heavy vehicles are overrepresented among the vehicles that got "stuck" while driving on winter roads, as 33 % (N=590) the 1781 HGVs which were "stuck" on winter roads were foreign. In comparison, 11 % of the HGVs involved in personal injury accidents in Norway were foreign. Foreign HGVs accounted for six per cent of the average domestic transport in Norway in 2009-2012.

4.5 Results from the small-scale survey

We asked the drivers 11 questions on winter driving. The first question we asked was how many days they had driven about Norwegian winter roads in total. The purpose of this question was to estimate the respondents' "exposure" to Norwegian winter roads.

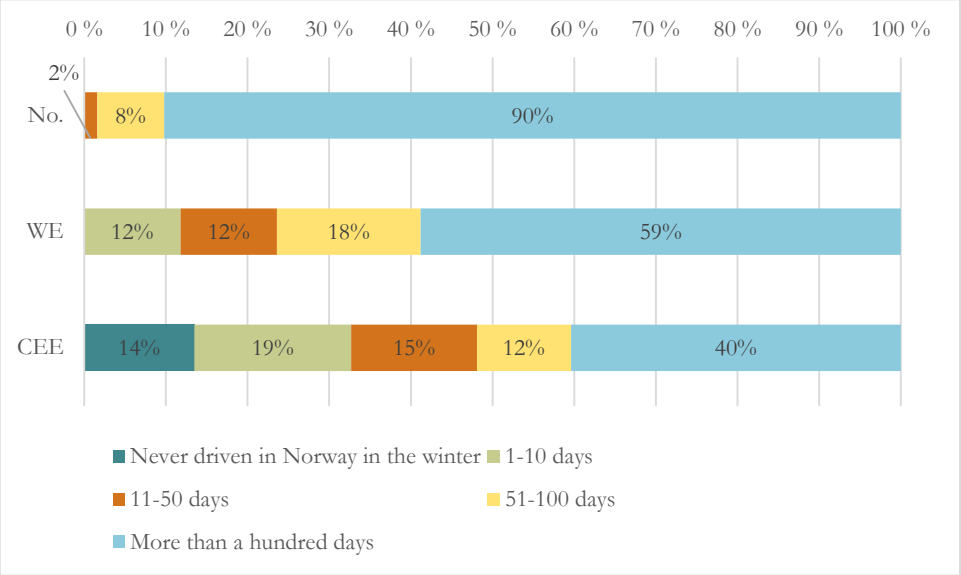


Figure 4.4 National groups' distributions on the question «Approximately how many days have you been driving on Norwegian winter roads in total?» Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52).

As expected, nearly all of the Norwegian drivers had driven more than a hundred days on Norwegian winter roads. The drivers in the two other groups have larger shares of drivers with less Norwegian winter road experience. This especially applies to drivers from CEE countries. In fact, seven of the CEE drivers in the sample had never driven in Norway in the winter before. These drivers were therefore not asked the rest of the questions below on their experiences with winter driving.

In figure 4.5 we show results for drivers' answers as to whether they have ever been in need of towing assistance due to winter conditions.

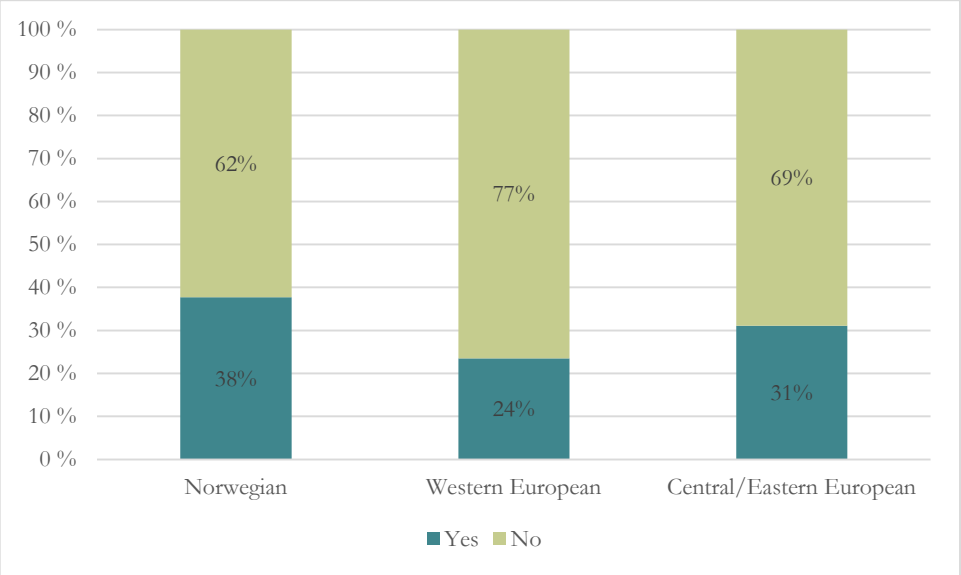


Figure 4.5 National groups' distributions on the question «Have you ever been in need of towing assistance due to winter conditions?». Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=45).

The question states "have you ever been in need of towing assistance", and given this wording and our limited exposure measures, a comparison of Norwegian drivers and foreign drivers is slightly misleading. Many of the Norwegian drivers probably have several years of experience driving on Norwegian winter roads (20 % of them were over 56 years old), and as the questions states "have you ever", their towing assistance incident(s) could have been several years back in time.[7]

It is not unlikely that a fifth of the Norwegians in the sample have been HGV drivers for several decades (20 % >56 years), they therefore have a vast experience with driving under winter conditions (90 % >100 days).[8] Given their age and winter driving experience, the Norwegian drivers in the sample have been far more exposed to winter conditions than the foreign drivers in the sample.

Despite this, the shares for drivers who report to have ever been in need of towing assistance due to winter conditions are not very different when we compare the three groups of HGV drivers. A Chi-square test shows that the differences not are statistically significant (P=0.507). It should be noted that the actual numbers are small.

Figure 4.6 compares winter road exposure (> 100 days) and towing assistance.

[7] We considered asking whether respondents had been in need of towing assistance in the last "two years", but assuming that this occurs rarely, like accidents, we expanded the period to "ever".

[8] The winter driving experience measure should perhaps have included much higher values, in order to take into account the winter driving experience of the Norwegian drivers who have been working as drivers for several decades. These drivers have been driving several hundred winter days. Nevertheless, this exposure measure works fairly well in accordance with its purpose, as it shows the relatively scarce winter driving experience of the foreign drivers.

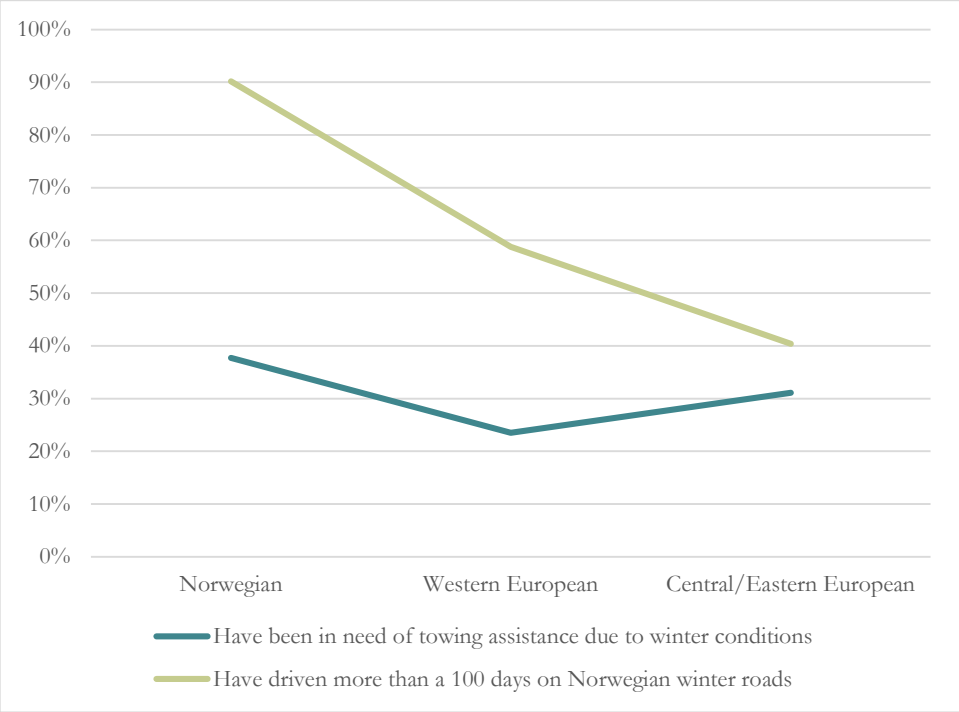


Figure 4.6 National groups answering "Yes" on the question « Have you ever been in need of towing assistance due to winter conditions?» and national groups' shares that have driven more than a 100 winter days Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=45).

As indicated above, we see that although the exposure to winter days is very different (and probably far more different than figure 4.4 indicates, as > 100 days is the maximum value), the reported need for towing assistance is fairly similar in the groups. (As noted, the difference is not statistically significant.) Thus, it seems that foreign drivers and especially drivers from CEE countries have a far higher risk of being in need of towing assistance when driving on Norwegian winter roads than Norwegian drivers.

This requires an explanation. Below we will examine different factors that may shed more light on this interesting result. We will look at drivers' perception of risk and feeling of mastery of winter conditions, use of winter tyres and snow chains, competence on trailer loading under winter conditions and training for winter driving.

4.5.1 Drivers' perception of risk and feeling of mastery

We asked three questions on drivers' perception of risk while driving on Norwegian winter roads and their feeling of mastery related to winter driving:

- I feel that I cope well with the driving conditions of Norwegian winter roads
- I feel equally safe when driving in the winter in Norway as I do in summer
- I'm worried about "getting stuck" when driving under winter conditions

The distribution of answers are given in figure 4.7

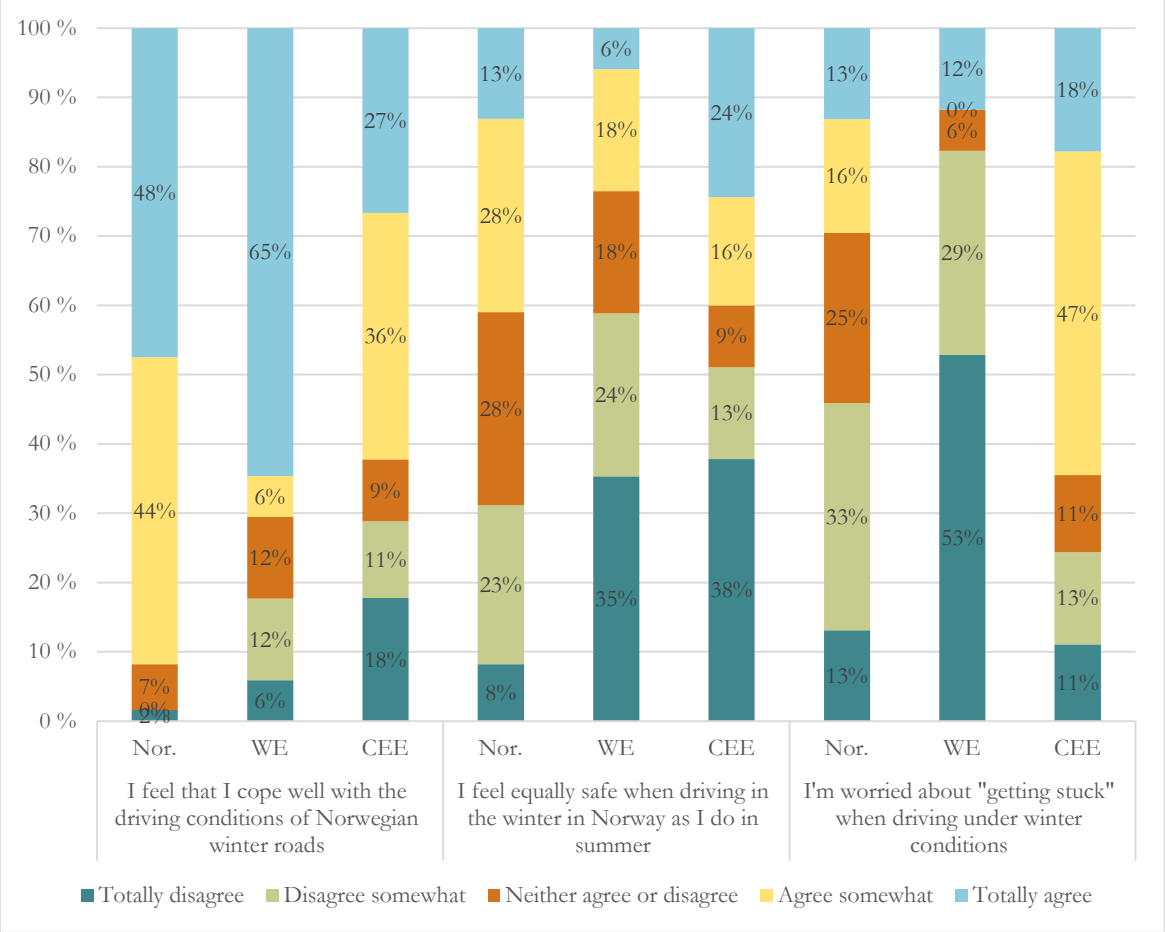


Figure 4.7 National groups' distributions on three questions on perception of risk and feeling of mastery related to winter driving Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=45).

We see that 92 % of the Norwegian drivers agree (totally/somewhat) that they cope well with the driving conditions of Norwegian winter roads, while 71 % of the WE drivers do and 63 % of the CEE report that they do. In the latter group, 29 % actually disagree with the statement. A Chi-square test shows that the differences are statistically significant (P=0.001). Thus, it seems that the Norwegian drivers have a stronger feeling of mastery of Norwegian winter conditions than foreign drivers (especially drivers from CEE).

We also asked the drivers whether they "Feel equally safe when driving in the winter in Norway as they do in summer". This is not a very good question, as it is ambiguous: we should not assume or expect that any drivers feel equally safe while driving in the winter as they do in the summer, as the winter offer more demanding driving conditions. Nevertheless, it could be argued that drivers therefore should adapt their driving behaviour (i.e. drive more carefully) in order to feel equally safe as they do in the summer. Although such speculations make this question vulnerable to interpretations and therefore ambiguous, we see that a higher share of the Norwegian drivers agree with the statement than the foreign drivers. The ambiguous character of the statement is also indicated by the fact that 28 % of the Norwegian drivers answered that they neither agreed or disagreed with it. A Chi-square test shows that the differences are statistically significant (P=0.004). Thus, we may assume that the

Norwegian drivers are more inclined to feel as safe in the winter as in the summer than the foreign drivers.

Looking at the statement "I'm worried about "getting stuck" when driving under winter conditions", we see that 29 % of the Norwegian drivers agreed, while only 12 % of the WE drivers agreed. However, we see that as many as 65 % of the drivers from CEE agreed with the statement, indicating that these drivers are far more worried about "getting stuck" while driving under winter conditions than the other groups in the sample. A Chi-square test shows that the differences are statistically significant (P=0.000).

4.5.2 Winter tyres and snow chains

We also asked the drivers questions about the snow chains and winter tyres of their vehicles (Figure 4.8).

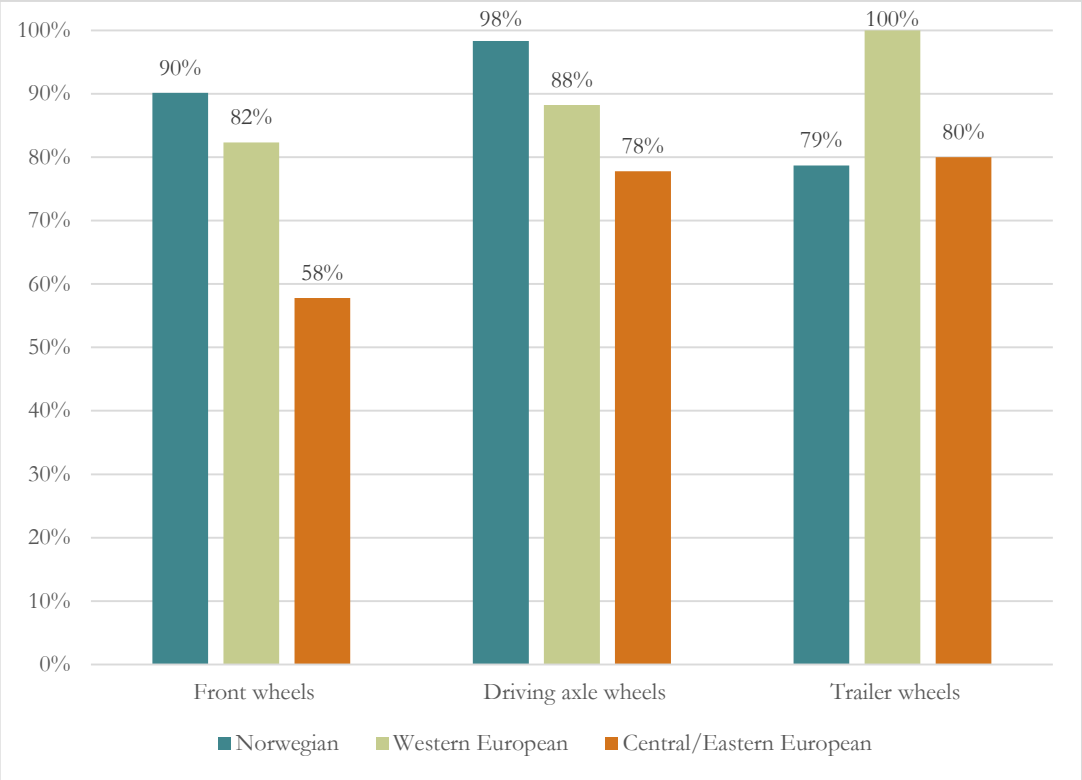


Figure 4.8 National groups' distributions of answers regarding the wheels for which they have snow chains when driving on winter roads. Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=45).

The figure indicates that the Norwegian drivers to a greater extent than the other drivers have snow chains for their front wheels and driving axle wheels, while all drivers from WE report that they have snow chains for their trailer wheels. Drivers from CEE generally reported of a lower number of snow chains at their disposal.

We also asked respondents about their use of snow chains.

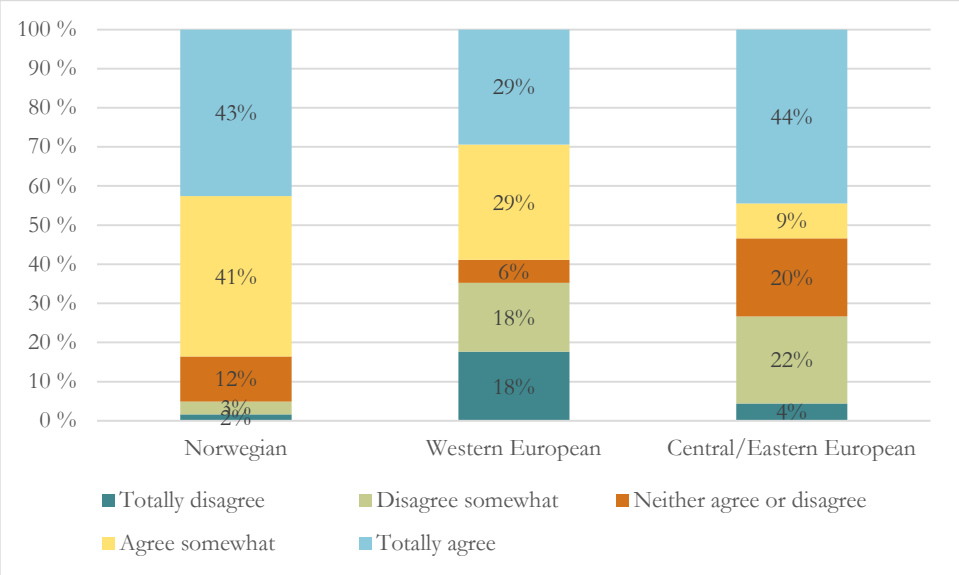


Figure 4.9 National groups' distributions of answers to the statement: "When driving in the winter I often use snow chains when I need to". Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=45).

The figure indicates that the Norwegian drivers are considerably more inclined than the two other groups to use snow chains when they need to. A Chi-square test shows that the differences are statistically significant (P=0.001).

We also asked respondents about winter tyres (Figure 4.10).

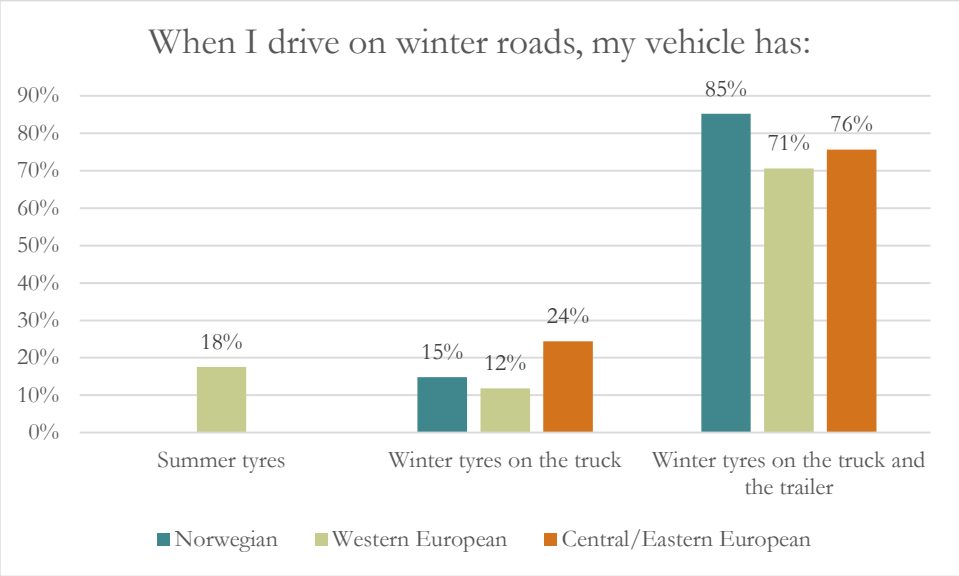


Figure 4.10 National groups' distributions of answers to the statement: "When I drive on winter roads, my vehicle has". Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=45).

We see that the Norwegian drivers generally report a higher incidence of winter tyres on their vehicles when driving on winter roads. A Chi-square test shows that the differences are statistically significant (P=0.001).

4.5.3 Winter driving training

Based on the results of the questions concerning competence and equipment above, it seems that we may conclude that the Norwegian drivers (and to some extent the WE) drivers have better equipment for and competence on winter driving. Additionally, the Norwegian drivers have a greater feeling of mastery and a lower perception of risks related to winter driving than foreign drivers.

This is probably related to both their experience with winter driving and their training. The survey includes two questions on winter driving training:

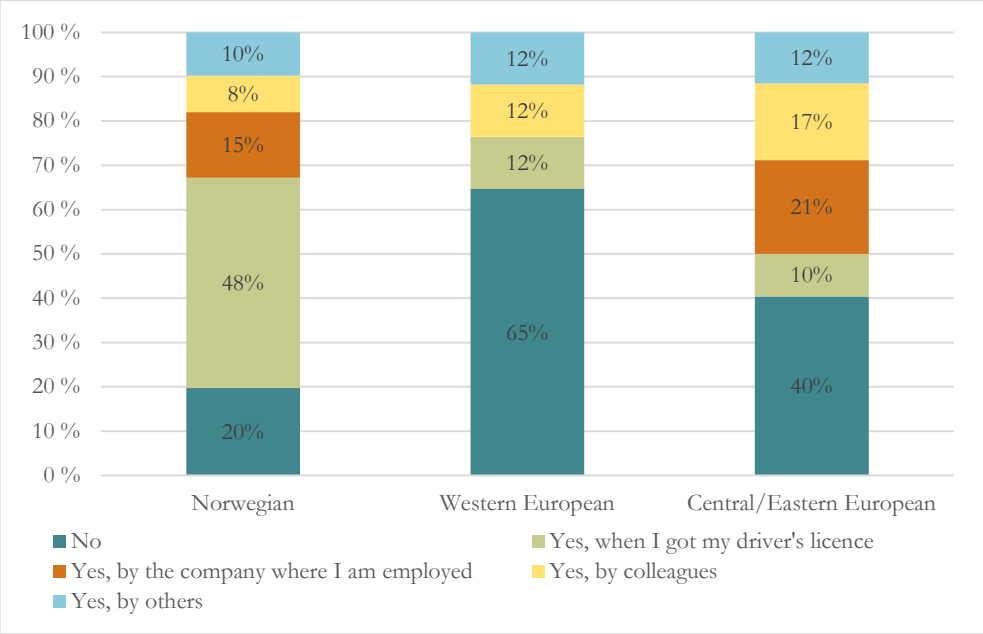


Figure 4.11 National groups' distributions of answers to the statement: "I have been trained in driving on winter roads". Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52).

Figure 4.11 shows that the two foreign groups of drivers have considerable shares answering no to the question "I have been trained in driving on winter roads", especially drivers from WE. (However, the latter group's competence on winter loading equalled that of the Norwegian drivers.) We see that half of the Norwegian drivers got their training when they got their driver's license. This can be explained by age of these drivers. The course in driving on slippery roads became mandatory for people who wanted to obtain a drivers' license for heavy vehicles in the east, south and west of Norway in 1993 and 1994 (Christensen & Glad 1996).

Moreover we see that 21 % of the drivers from CEE (and 15 % of the Norwegian) received their winter training from the company in which they are employed. About 20 % in all groups got their training from their colleagues or others. This "training" is probably not as comprehensive and structured as the training they underwent when they got their driver's license or from their employer.

We also asked the respondents whether they want more training in winter driving. This can give indications on the quantity and quality of the training that they already have, and it may also give indication of their experiences with or lacking experiences with winter driving.

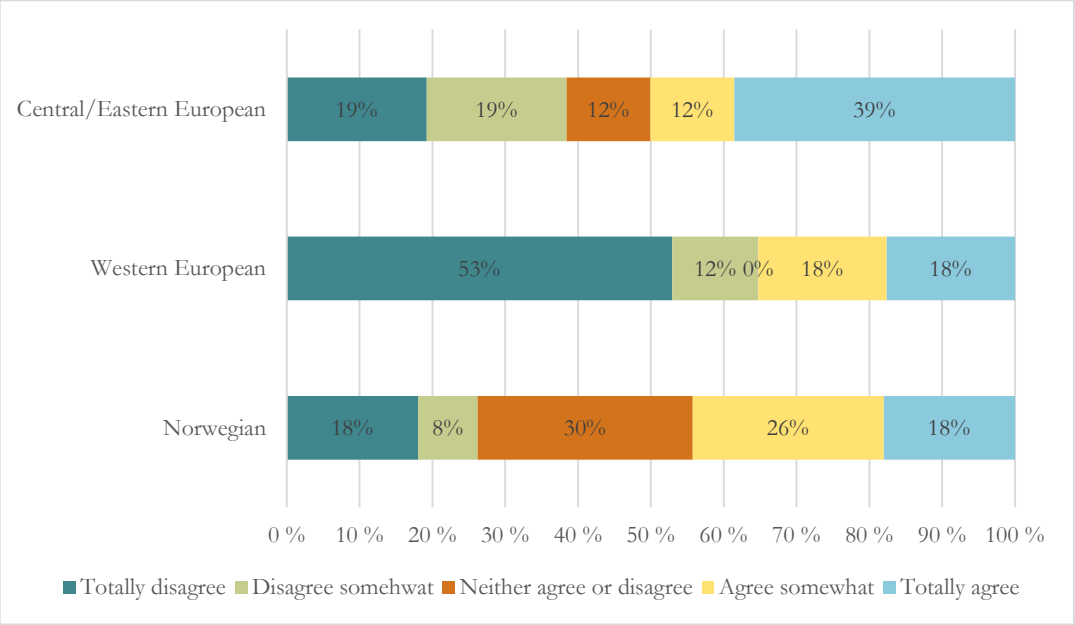


Figure 4.12 National groups' distributions of answers to the statement: "I would like to have more training in winter driving in Norway". Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52).

Above we concluded that the foreign drivers, especially those from CEE, have poorer competence and equipment for winter driving than the Norwegian drivers. This is also reflected in their wish for more training on winter driving in Norway. We see that nearly 40 % of the drivers from CEE totally agree with the statement that they would like more training in winter driving. This is more than the double of the other groups. However, the differences become smaller when we look at both "agree somewhat" and "totally agree" Finally, more than half of the WE drivers totally disagree. This is interesting, given that ¾ of these lack winter training. However, this group is small, and as noted their competence on winter loading equalled that of the Norwegian drivers. A Chi-square test shows that the differences are statistically significant (P=0.001).

4.6 NPRA results of winter equipment inspections

In the following, we present results from the annual winter equipment inspections (Oct. 16- Dec 31.) of the NPRA. We have data from 2012 to 2015.[9] It is important to note that in a European context, Norway has a unique legislation on winter tyres and snow chains for HGVs. Winter tyres for the trailer were required in 2015 and winter tyres for the truck were required in 2013.

[9] We are very grateful to Arnfinn Eriksen at the Norwegian Public Roads Administration (NPRA), who have given us data presenting the results from all heavy vehicle inspections in Norway for the last four years.

In figure 4.13 we show the following inspection results related to the truck: winter tyres, snow chains and temporary prohibition of use ("midlertitidig bruksforbud", "suspension")[10] related to these deficiencies.

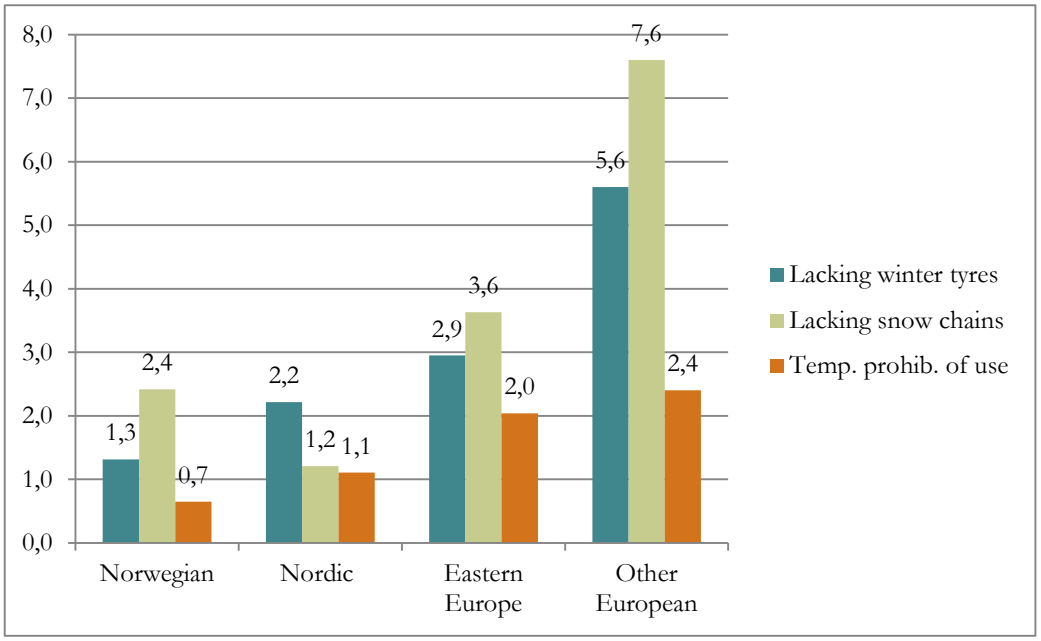


Figure 4.13 Results from the NPRA's heavy vehicle inspection of winter equipment, 2012-2015. Control results related to the truck: winter tyres, snow chains and temporary prohibition of use. Per cent. Norwegian (N=7368), Nordic (N=992), Eastern Europe (N=2204) and Other European (N=250). Data source: NPRA.

We see that the group Other European trucks have the highest shares of deficiencies related to winter equipment. The Norwegian trucks generally have the least deficiencies, although Nordic trucks have fewer deficiencies related to snow chains.

In figure 4.14, we look at the annual percentages with lacking snow chains for the truck within each national group.

[10] Cf. Directive 2014/46/EU of the European Parliament and of the Council of 3 April 2014 amending Council Directive 1999/37/EC on the registration documents for vehicles: "Suspension means a limited period of time in which a vehicle is not authorized by a Member State to be used in road traffic following which – provided the reasons for suspension have ceased to apply – it may be authorized to be used again without involving a new process of registration." Suspension can be used for instance if the vehicle has deficiencies which constitute an immediate traffic safety hazard (e.g if it lacks required winter tyres in the winter).

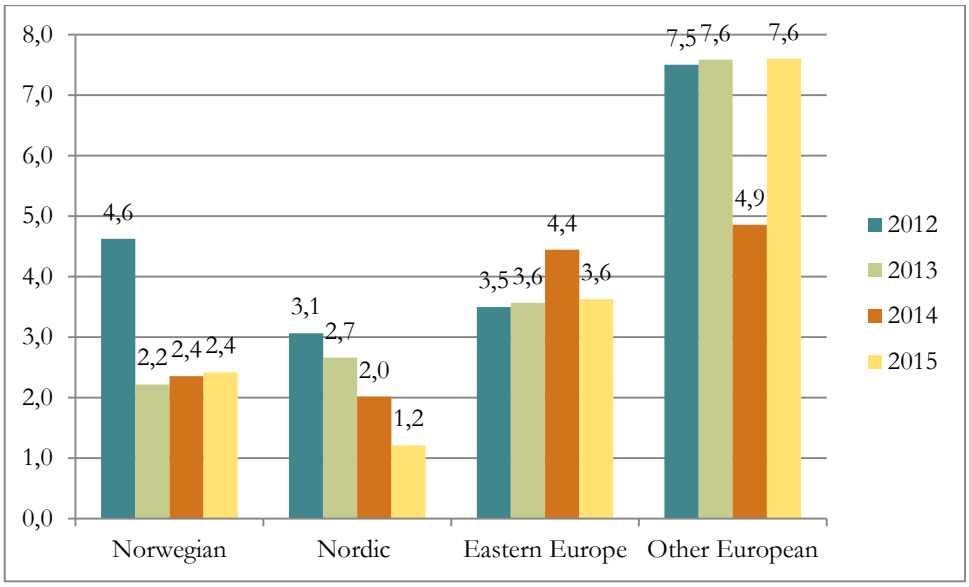


Figure 4.14 Results from the NPRA's heavy vehicle inspection of winter equipment, 2012-2015. Annual percentages with lacking snow chains for the truck within each national group. Data source: NPRA.

The figure indicates a steady decline in lacking snow chains for Nordic trucks and a fairly stable developments for Eastern European trucks. With the exception of 2014, the other European trucks have also been on a stable level. The Norwegian trucks started with the second highest level of lacking snow chains in 2012, but this percentage was reduced with 52 % in 2013, and was then stabilized on this level.

In figure 4.15 we show the following inspection results related to the trailers in 2015: winter tyres, snow chains and temporary prohibition of use related to these deficiencies.

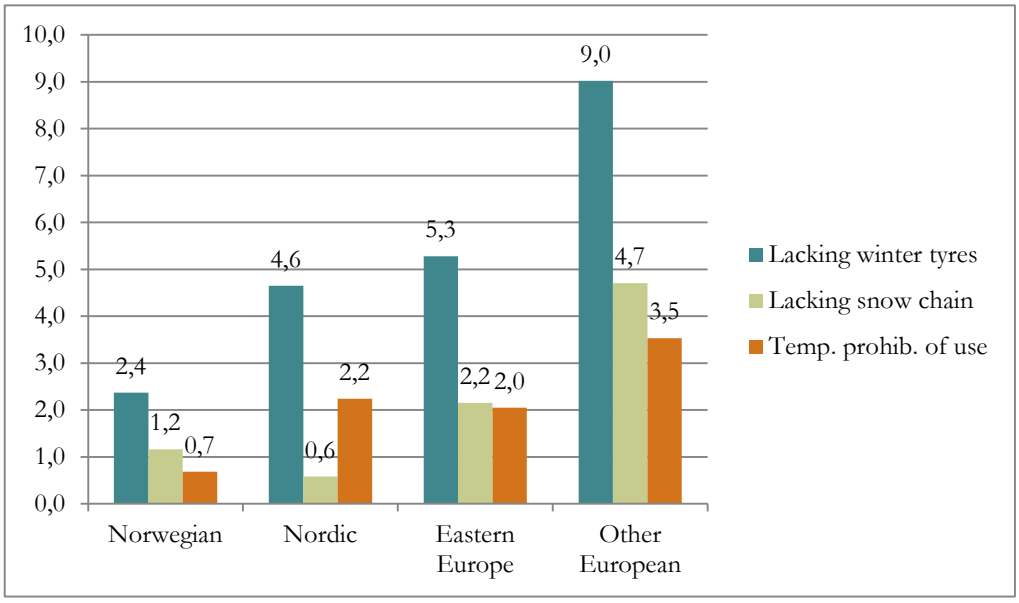


Figure 4.15 Results from the NPRA's heavy vehicle inspection of winter equipment, 2012-2015. Control results related to the trailer: winter tyres, snow chains and temporary prohibition of use. Per cent. Norwegian (N=4982), Nordic (N=1205), Eastern Europe (N=1856) and Other European (N=255). Data source: NPRA.

We see that the group Other European trailers have the highest shares of deficiencies related to winter equipment. The Norwegian trailers generally have fewer deficiencies, but Nordic trailers have fewer deficiencies related to snow chains.

In figure 4.16 we look at the annual percentages with lacking snow chains for the trailer within each national group.

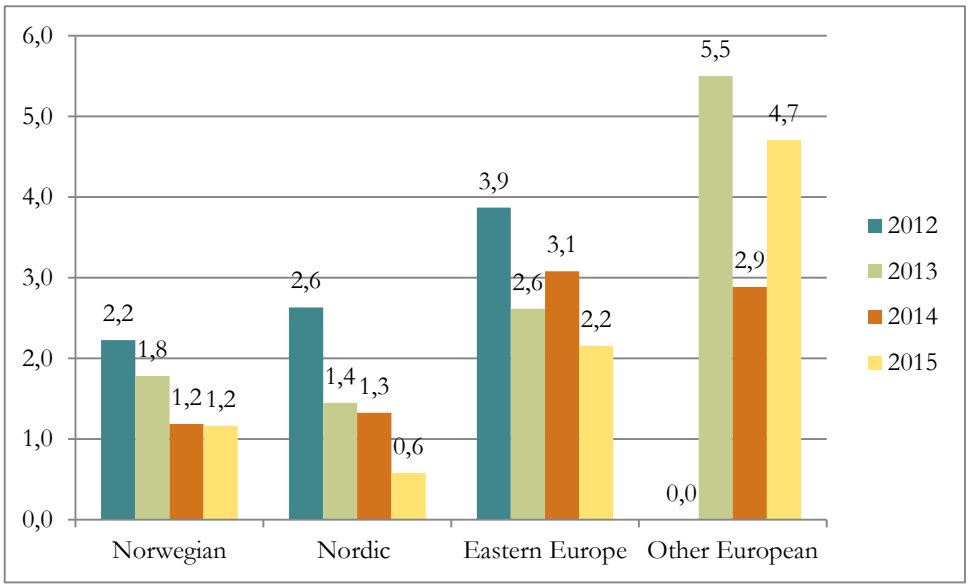


Figure 4.16 Results from the NPRA's heavy vehicle inspection of winter equipment, 2012-2015. Annual percentages with lacking snow chains for the trailer. within each national group. Data source: NPRA.

The figure indicates a decline in lacking trailer snow chains for Norwegian, Nordic and Eastern European trailers.

Figure 4.17 presents the annual percentages lacking winter tyres for the truck within each national group.

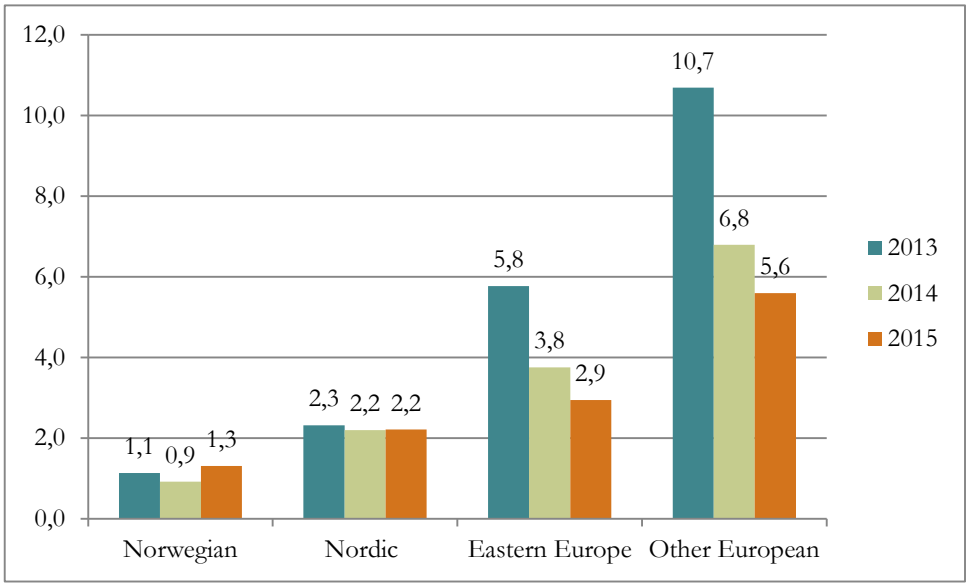


Figure 4.17 Results from the NPRA's heavy vehicle inspection of winter equipment, 2013-2015. Annual percentages with lacking winter tyres for the truck within each national group. Data source: NPRA.

The figure indicates stable low shares of lacking winter tyres for Norwegian and Nordic trucks. Eastern European and Other European trailers had relatively high shares of lacking winter tyres in 2013, but these shares were reduced to about the half in 2015, probably indicating the efficiency of the NPRA inspections, and the new rules prescribing winter tyres for the truck in 2013.

4.7 Summing up

The literature review indicates that, in spite of common training and education standards across Europe, European countries offer different national and local challenges with repercussions for HGV safety. In Norway and Finland this is especially related to winter driving.

The analysis of personal injury accident data indicates that HGVs from non-Scandinavian countries (62 %) have a greater proportion of their accidents in the winter than the Scandinavian (53 %) vehicles have. In addition, HGVs from non-Scandinavian countries (38 %) have a greater proportion of the accidents on road surfaces with ice/snow/slippery conditions than the Scandinavian (29 %) vehicles have. This may indicate that HGVs from Scandinavia have lower risk of winter accidents, that they are better equipped for winter driving and have drivers with more experience and expertise in winter driving than vehicles from other countries have.

Interviewees agreed that winter driving is the main safety challenge related to foreign drivers in Norway. This challenge is multi-faceted. As noted, foreign HGVs are less suited to Norwegian winter conditions as they often have two axles, providing them with a poorer grip than three axle HGVs. Winter equipment (tyres, snow chains) has previously been a challenge, but it seems that this situation has improved.

In the small-scale survey, we examined several aspects of winter driving, comparing the Norwegian and the foreign drivers. As expected, nearly all the Norwegian drivers had driven more than a hundred days on Norwegian winter roads. The drivers in the two other groups have considerably less Norwegian winter road experience, especially drivers from CEE (40 % > 100 winter days).

Although the exposure to winter days was very different, the reported need for towing assistance ("ever") was fairly similar in the groups, and the difference was not statistically significant. Given their different exposure to winter roads, it seems that foreign drivers and especially drivers from CEE have a far higher risk of being in need of towing assistance when driving on Norwegian winter roads than Norwegian drivers.

This was discussed in light of drivers' perception of risk and feeling of mastery of winter conditions, use of winter tyres and snow chains, and training for winter driving.

We concluded that Norwegian drivers have a stronger feeling of mastery of winter conditions than foreign drivers, especially drivers from CEE. They also have a lower perception of risks related to winter driving than foreign drivers.

We also found that CEE drivers are more worried about "getting stuck" when driving under winter conditions than Norwegian drivers.

We also found that drivers from CEE reported of a lower number of snow chains than Norwegian drivers, and that the Norwegian drivers are considerably more

inclined than the two other groups to use snow chains when they need to. Also, the Norwegian drivers report of a higher incidence of winter tyres on their vehicles when driving on winter roads.

NPRA inspection data shows that HGVs from Other European countries have the highest shares of reported deficiencies related to winter equipment, followed by Eastern European HGVs, Nordic HGVs and Norwegian HGVs. The situation has improved in recent years.

5 Competence, training and experience

5.1 Results from literature review

The third Directive on driving licences - (Directive 2006/126/EC), establishes common minimum requirements for driver training in all European countries. The training of lorry and bus drivers is also regulated by EU-directive 2003/59/EC on the initial qualification and periodic training of trucks and bus' drivers, which entered into force on 10. September 2003. The goal of the Directive is to:

> "(...)enhance road safety in Europe by ensuring a common level of training, and the achievement of the necessary skills and competences for professional drivers to drive their vehicles. It establishes mandatory level of initial qualification and periodic training for professional drivers in the European Union. The training is organised by training centres approved by the Member States."[11]

In November 2011 the Dutch parliament expressed concern about the increase in registered accidents with drivers from Central and Eastern Europe. The Parliament also decided to investigate if the increase in accidents was caused by a lower quality of driver training in central- and Eastern Europe. In their examination of this issue, Vlakveld, Stipdonk og Bos (2012) first conclude that they lack exposure data, so they cannot decide whether the increase in accidents among these drivers is caused by higher accident risk, increased exposure of these drivers, or if both mechanisms are involved. In addition, they conclude that international research has not proved a relationship between the quality of driver training and traffic safety, and that the third licence directive from EU (Directive 2006/126/EC), establishes a minimum standard for driver training in all European countries (Vlakveld, Stipdonk & Bos 2012).

Research has, however, shown a relationship between experience and traffic safety (Elvik et al 2009), and it may be argued that lack of experience of HGV drivers from certain countries may be an important risk factor. In spite of common training standards across Europe, European countries offer different national and local challenges with repercussions for traffic safety. Norway offers three central challenges to foreign drivers: hilly terrain, winter driving, and generally demanding driving conditions (e.g. many turns, narrow roads) in some regions of Norway (west, central and north).

The investigation report following the near-catastrophic Oslofjordtunnel-fire 23.06.2011 suggests that foreign lorry drivers often do not know how to drive safely in the hilly Norwegian terrain, increasing the risk of overheated engines or brakes (Safetec 2011, cf. Nævestad & Meyer 2014). This investigation report concludes that foreign lorry drivers tend to drive too fast down the steep Oslofjord tunnel, as they are not accustomed to such steep tunnels. They are thereby more prone to

[11] http://ec.europa.eu/transport/road_safety/users/professional-drivers/report_12_07_2012_en.htm

overheating the brakes of their vehicles, which may lead to tunnel fires. Norway is the country in the world with most subsea road tunnels (>30) and over 1000 road tunnels (Nævestad & Meyer 2014).

Research also seems to indicate that it is more demanding to drive HGVs in some regions of Norway than others (Nævestad et al 2014). HGVs from non-Scandinavian countries have a three times higher accident risk than Scandinavian HGVs in the western, central and northern regions of Norway. HGVs from non-Scandinavian countries have twice the risk of accidents in western/central/northern Norway than they have in the southern/eastern region. In comparison there is little difference between accident risks for Scandinavian HGVs in these two parts of the country (Nævestad et al 2014). Thus, we may assume that it is more difficult for foreign drivers to drive in some parts of Norway, perhaps because they lack the experience and competence of Norwegian drivers.

While winter driving and steep gradient provide challenges for foreign HGV-drivers in Norway, large shares of bicyclists may challenge foreign HGV-drivers in countries like Denmark and the Netherlands. A review of bicycle-lorry interaction in European cities has, for instance, pointed to the fact that foreign lorry drivers in Denmark may have a lower awareness of bicycles in the city transport system, and that this may lead to accidents (Sørensen 2009). Several solutions to this challenge is discussed, including allowing only drivers with local knowledge to drive on these roads (Sørensen 2009).

5.2 Results from interviews

The interviewees' mentioned two main challenges related to foreign drivers' training, competence and experience. The first is related to winter driving, and the second is related to the poor road standard in many parts of Norway.

Interviewees agreed that winter driving is the main safety challenge related to foreign drivers in Norway, and that foreign drivers' training, competence and experience is a key risk factor in this respect. Driving safely under winter conditions is strongly dependent on driver experience, which allows them to judge situations correctly, evaluate risks and adapt their speed to conditions. Because of their experience, Norwegian HGV drivers are able to recognize dangerous situations and judge risks.

Also driving uphill on winter roads without getting stuck requires competence and experience. Putting on and using snow chains correctly is also dependent on competence and experience. If you are in doubt, you should always put on snow chains. Drivers must be prepared for this, and keep equipment for putting on snow chains in their back packs in the winter: e.g. warm clothes, boots, gloves, head lamps, in addition to having shovels in their trucks. As winter driving requires experience, foreign HGV drivers may have a considerable disadvantage if they come from countries without winter conditions.

Some interviewees stressed that experience with Norwegian winter conditions is the key factor, and that winter driving will be a less significant safety challenge, once foreign drivers gain more experience with driving in Norway in the winter.

In the reference group meeting, it was suggested that competence on winter driving also involves loading the truck right for winter roads. Equipment and loading influence how the HGV behaves on the road and this is in turn dependent on how

suited drivers are for driving on Norwegian roads. This concerns for example loading in relation to the configuration of the axles, and also how the containers are loaded. Loading the trailers to put extra weight on the driving axle gives the truck a better grip while driving under winter conditions, but foreign drivers seem to have less knowledge on this than Norwegian drivers. They tend to put less than 10 tonnes on the driving axle, fearing to be fined for overweight. Thus, they load the trailers so they have the majority of the weight further back (on the triple-axles of the trailer), and under winter conditions this is unfavourable.

The second challenges related to foreign drivers' training, competence and experience is the hilly Norwegian roads. The Norwegian terrain is challenging to drive in, because it is hilly, and have many roads with poorer standards than on the European continent. As one interviewee put it: you do not have to go further than to Sweden, to see totally different roads: the landscape is flatter and the roads are less curved. Thus, the Norwegian roads may come as a surprise to foreign drivers. Driving in hilly terrain requires a lot of driver competence and experience, for instance related to using motor brakes, retarder and adaptation of speed.

5.3 Results from the small-scale survey

5.3.1 Loading of the trailer on winter roads

Below we show the distribution of answers to the statement: «In the winter, I load the trailer so that I get maximum weight on the driving axle".

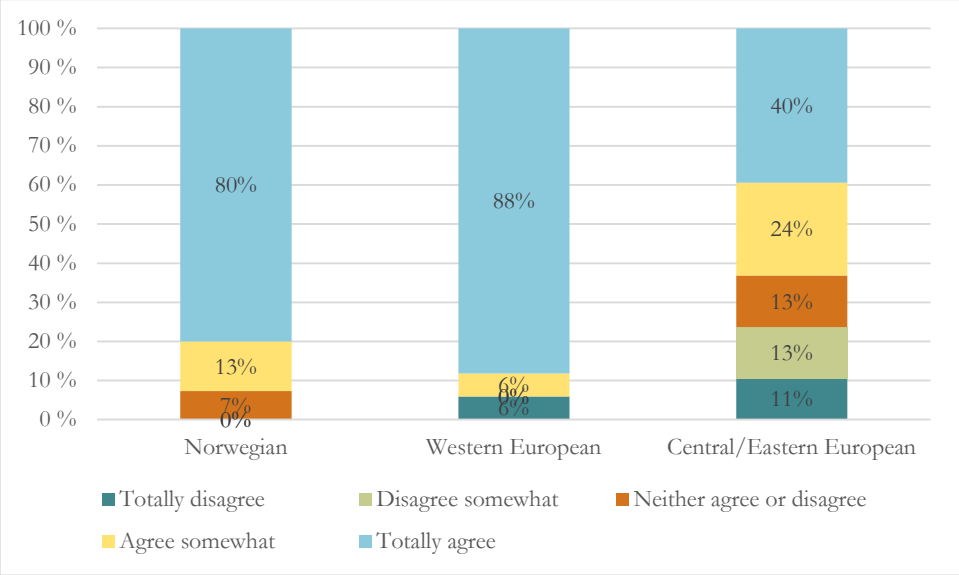


Figure 5.1 National groups' distributions of answers to the statement: «In the winter, I load the trailer so that I get maximum weight on the driving axle" Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=45).

In figure 5.1 we removed the 10 % of the Norwegian drivers and the 16 % of the CEE drivers who reported that they did not load the trailer themselves from the distribution. We see that 80 % of the Norwegian and 88 % of the WE drivers (correctly) agree with the statement, while only 40 % of the CEE drivers do. This

indicates that the former groups have a better competence on winter driving, specified as how to load the trailer while driving on winter roads. A Chi-square test shows that the differences are statistically significant (P=0.001).

When interpreting the answers in figure 5.1, it is important to note that what we interpret as different loading competence between the groups must be seen in light of the different vehicles that the national groups tend to drive. While the "typical" foreign (non-Nordic) HGVs are two-axle tractors, the typical Norwegian or Nordic tractors have three axles. The latter may lift the rear ("boggi") axle to increase the weight on the driving axle, for instance while starting on a slippery road, or while driving uphill on a slippery road.

Non-Nordic drivers may also have three-axle tractors, but it is likely that the technical specifications of these are different. The reason is a EU-directive which is not enforced in Norway. Because of this directive, European three-axle tractors are designed in a way which allows the driver to put maximum 30 % more weight on the driving axle by lifting the rear axle (while driving maximum 30 km/h). The rationale behind this rule is to avoid heavy loads and wear and tear on the road, and local pollution. The Nordic three-axle tractors, on the other hand, are equipped with a "Nordic solution", which means that they are not limited in the same way as the European, when it comes to the weight they can put on the driving axle by lifting the rear axle (i.e. presumably more than 30 % more weight).[12]

According to regulations[13], HGVs doing international transports in Norway should be loaded in a manner that puts at least 25 % of the weight of the load on the driving axle.[14] Fully loaded tractors should have 10 tonnes weight on the driving axle, and maximum 11.5 tonnes. However, given the "Nordic solution" of the Norwegian three-axle tractors, they put considerably more weight than the maximum 11,5 tonnes on the driving axle by lifting the rear axle of the tractor.

Despite the different types of HGVs used by Norwegian (or Nordic) and foreign HGV drivers, the principle remains the same, i.e. that maximum weight on the driving axle on winter roads will reduce the chance of tyre slip and "getting stuck". This is also underlined in the NPRA's "Trucker's Guide to Norway":

> "When operating vehicle combinations on slippery roads, you should load most of the cargo on the tractor unit and not on the trailer, because this will help reduce the risk of jack-knifing." (Trucker's Guide: 13).

[12] There was debate about this in Norway in 2012, as the NPRA considered to enforce the EU directive regulation this (30 % more weight and max 30 km/h). The Norwegian minister for transport decided, however, that regulation should not be enforced, provided that lifting the "boggi axle" not became an alternative to snow chain use.

[13] Directive No 96/53/EC - dimensions and weights of commercial vehicles, cf. : "Forskrift om bruk av kjøretøy", FOR-1990-01-25-92; Directive 2002/7/EC.

[14] The prescribed maximum weight of the two-axle tractors with trailers is 40 tonnes, while the prescribed maximum weight of the three-axle tractors with trailers is 50 tonnes. Foreign HGV drivers are however not required to drive according to the 96/53 directive to/from Norway. They may demand to drive according to this directive, but they seldom do, as they often get a higher total weight when they drive according to the Norwegian rules (43 tonnes), than the 96/53 directive (40 tonnes). The foreign tractors with trailers often load the extra 3 tonnes that Norwegian rules permit them to on their trailers. Therefore, they often end up with less than 25 % of the total weight on the driving axle.

It is also important to remember to maintain steering capabilities on winter roads, and that lifting the "boggi-axle" may make it more difficult to steer on slippery roads.[15]

5.4 Summing up

According to the results of the literature review, Norwegian roads offer conditions that may be challenging for foreign drivers, with winter conditions, regions with roads with poorer standard than roads on the European continent and hilly terrain (steep inclination and ascent). In accordance with the assumption that the Norwegian road network is demanding for foreign drivers, previous research (Nævestad et al 2014) indicates that HGVs from non-Scandinavian countries have a three times higher accident risk than Scandinavian vehicles in the western, central and northern regions of Norway. Results from the interviews indicate that foreign drivers' training, competence and experience is a key risk factor related to winter driving, poor road standard in some Norwegian regions and hilly terrain. We have also seen that Norwegian and WE drivers have a better competence on winter driving, specified as how to load the trailer while driving on winter roads.

[15] Additionally, regulations state that 20 % of the total tractor weight should be on the steering axle, in order to maintain steering capabilities.

6 Transport safety behaviours

6.1 Results from literature review

6.1.1 Drivers' transport safety behaviours

Nævestad, Phillips and Elvebakk (2015) study severe road traffic accidents in Norway, triggered by drivers at work. The aim of the study was to examine whether and to what extent accident risk factors associated with these triggering drivers and their vehicles could be traced back to work-related factors. The study is based on information available in the Norwegian Public Roads Administration's (NPRA) Accident Analysis Groups (AAG) database on fatal accidents in the period 2005-2011, 10 reports from the Accident Investigation Board Norway (AIBN), and information from nine research interviews conducted with experts from government bodies engaged in accident investigations, worksite inspections and roadside inspections.

The analysis of AAG data shows that the following transport safety behaviours were the most important risk factors in fatal accidents triggered by drivers at work:[16]

- Speed too high for the circumstances,
- Lack of seat belt use
- Insufficient information gathering

Although these risk factors have not been examined in previous studies comparing domestic and foreign HGV drivers, we suggest that they should be examined in future research, as they have been found to be important for safety in studies of Norwegian HGV drivers.

6.1.2 Company follow up of drivers' transport safety behaviour

Research indicates that follow up of drivers' speed, driving style and seat belt use is important for transport safety in haulier companies (Nævestad & Phillips 2013; Nævestad, Phillips & Elvebakk 2015; Nævestad & Bjørnskau 2014). This may involve technically limiting the speed of vehicles to a lower speed than the legally prescribed 90 km/h limit; implementing policies regulating the speed, seat belt use and driving style of drivers, automatic records of drivers' speed; safety talks with the drivers; and declarations to be signed by the drivers regulating their speed and seat belt use (Nævestad & Bjørnskau 2014). Research indicates a correspondence between driver behavior and management focus on these issues (Nævestad & Bjørnskau 2014). These risk factors have not been examined in previous studies comparing domestic and foreign HGV drivers. Nevertheless, we suggest that they should be examined in future research, as they have been found to be important for safety in studies of

[16] The AAG database included little information on work related factors, and the authors therefore conducted analyses of reports from AIBN and expert interviews in order to obtain information on this.

Norwegian HGV drivers. As we will see below, too high speed and lacking seat belt use were just as important or more important among foreign HGV drivers triggering fatal accidents than among Norwegian triggering drivers.

6.2 Results from accident analysis

6.2.1 Risk factors associated with "triggering" foreign professional drivers

In the foregoing, we have seen that results may indicate that foreign HGV drivers are more likely to trigger fatal accidents than Norwegian drivers. In this section we present risk factors linked to triggering vehicles and their drivers, judged by AAG as playing an important or decisive role in precipitating the accident. We have excluded all factors playing an important or decisive role in less than two cases. When considering risk factors contributing to the occurrence of the accident, we have excluded all factors that are exclusively injury factors (i.e. if they are not also assigned as risk factors for the accident). Likewise, when considering factors contributing to the scale of injuries resulting from the accident, we exclude those risk factors that are exclusively accident factors.

Figure 6.1 shows accidents factors linked to Norwegian and foreign professional drivers who drive a vehicle classified by AAG as triggering a fatal accident. Lack of information gathering and too high speed are clearly the most frequent factors contributing to accidents triggered by foreign professional drivers, as is the case for Norwegian professional drivers. However, these two factors are associated relatively more often with accidents triggered by foreign than by Norwegian professional drivers. Lack of information gathering is named 10 times for 23 of the accidents triggered by foreign professional drivers, but only 12 times for 55 accidents triggered by Norwegian professional drivers. Factors that do not appear in Figure 6.1, because they did not contribute to accidents triggered by either foreign or Norwegian professional drivers, include violations of driving time regulations, lack of driving experience and poor securing of load.

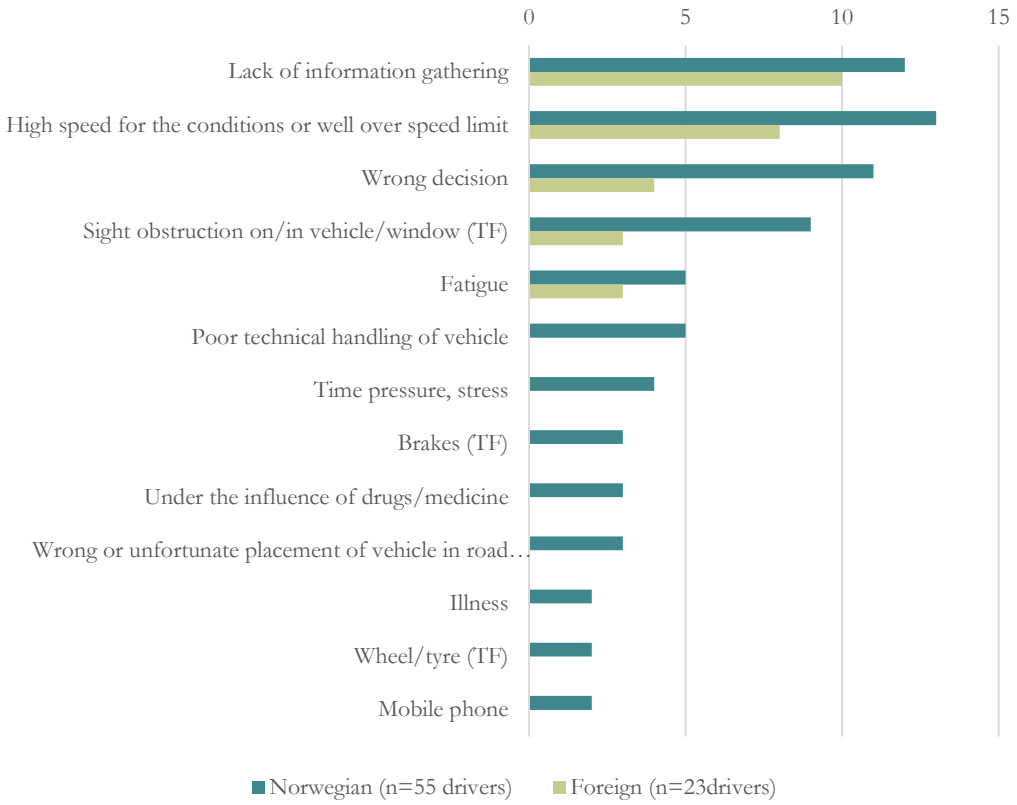


Figure 6.1 Factors which according to AAG contributed to ***triggering the accident****. TF = technical factor. Other factors are human factors. The figure shows the number of cases a factor is named as an accident factor in the AAG reports with great or decisive significance. Only those factors named twice or more are shown. Absolute numbers.*

Figure 6.2 shows injury factors associated with Norwegian and foreign drivers driving a vehicle classified by AAG as triggering the accident.

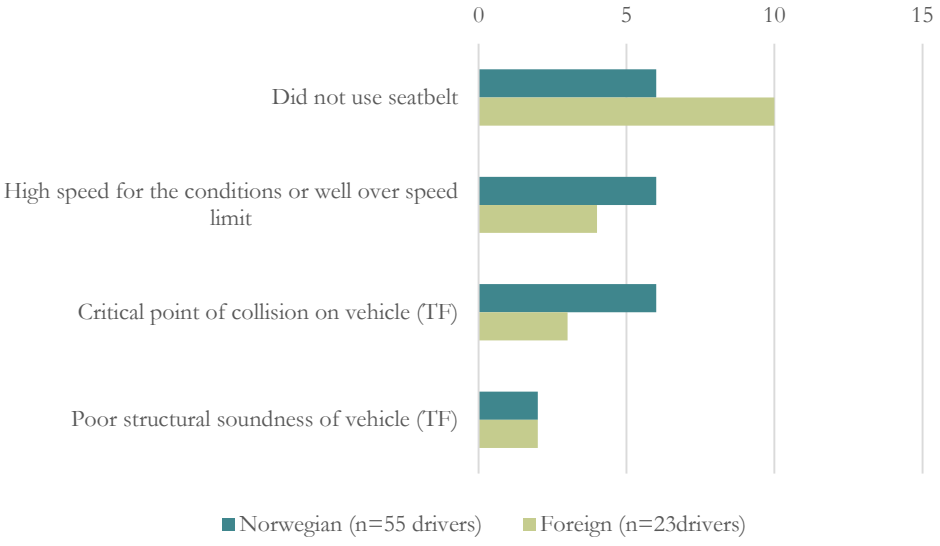


Figure 6.2. Factors which according to AAG played a large or decisive role in the ***degree of injury*** *resulting from the accident. Only factors named at least twice are shown. TF = technical factor. Other factors are human factors. Figure shows the number of times a factor is named.*

The data suggest that failure to wear a seatbelt by foreign professional drivers increases injury severity to a greater degree than failure to wear a seatbelt by Norwegian professional drivers. This was identified as a risk factor of 6 of 55 triggering drivers for Norwegian drivers (11 %), and 10 of 23 triggering foreign drivers (43 %). Thus, although numbers are small, this risk factor seems to be more important for the foreign drivers. We cannot conclude, however, based on these small numbers.

6.2.2 Speed limits and use of protective equipment in personal injury accidents involving HGVs

Figure 6.3 shows the distribution of Norwegian HGVs and foreign HGVs involved in police reported traffic accidents with personal injury on roads with a speed limit of 60 km/h and lower and 70 km/h and higher. We unfortunately lack speed limit information for 999 HGVs.

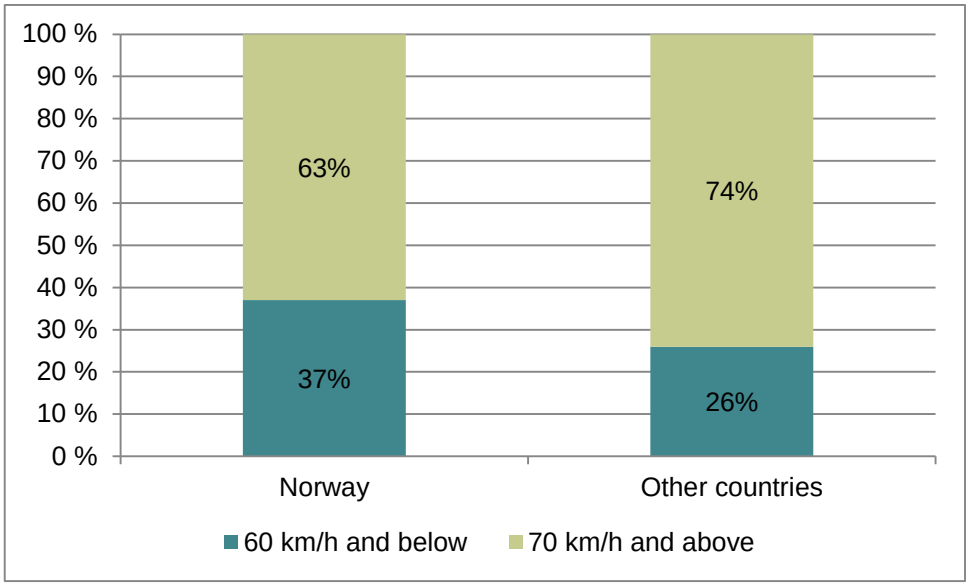


Figure 6.3 Distribution of Norwegian HGVs (N=3147) and foreign HGVs (N=413) involved in police reported traffic accidents with personal injury on roads with a speed limit of 60 km/h and lower and 70 km/h and higher, 2007-2014 (N=3560).

The figure indicates that the Norwegian HGVs have a higher share of their accidents on roads with speed limits of 60 km/h and lower than foreign HGVs have. This indicates that the foreign registered HGVs have a higher share of their driving on main roads with higher speed limits.

Figure 6.4 shows the distribution of safety equipment in use for Norwegian HGVs and foreign HGVs involved in police reported traffic accidents with personal injury. We unfortunately lack information on safety equipment for as many as 2656 HGVs. Bearing in mind this serious limitation, it may nevertheless be interesting to compare the different national groups on equipment use, as we saw in the analysis of AAG data that this is a key variable.

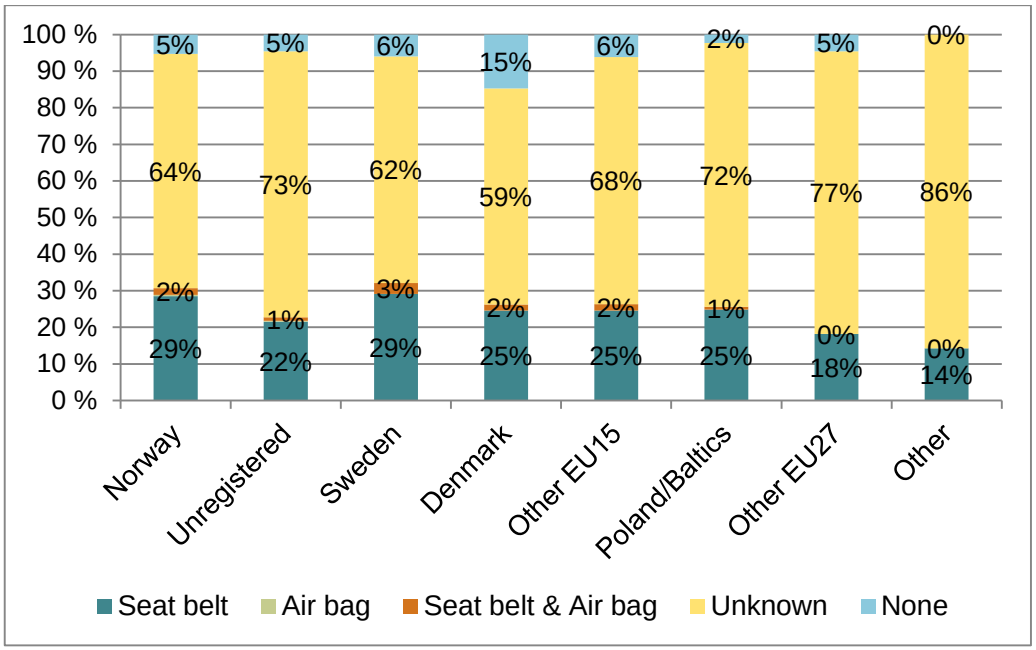


Figure 6.4 Distribution of safety equipment in use for Norwegian HGVs and foreign HGVs involved in police reported traffic accidents with personal injury, 2007-2014 (N=4469).

The different shares of «unknown" may be due to systematic differences. Bearing this reservation in mind, we see that Sweden and Norway have the highest shares of safety equipment in use, while EU27 and other have the lowest shares. But as noted, the data on this are poor, given the amount of lacking information. Thus, given the importance of this indicated in the AAG data, future research should look more into this issue.

6.3 Results from interviews

The interviewees gave different answers when asked about the importance of speeding and lacking seat belt use as risk factors in accidents with foreign HGVs. Some interviewees stated that these risk factors perhaps were less important for foreign drivers, as they drive more carefully in a foreign environment. In the reference group meeting, it was suggested that the foreign drivers adapt their transport safety behaviour to their (supposedly poor) equipment, i.e. that they feel less safe on Norwegian winter roads with the kind of tyres they got, and adapt by driving slower and more carefully.

Other interviewees stated that they believed over speeding to be a more prevalent risk factor among foreign drivers, as they seem to have a strong focus on getting the load to its destination in time regardless of the circumstances. Moreover, it was also suggested that managers in foreign companies may exert pressure on their drivers to reach their destination in time. One of the interviewees also suggested that foreign HGV drivers often drive too fast for the circumstances because they are foreign to the road and the road environment. Because of this, their perception of the situation and their risk judgments are slower. This requires a slower pace to compensate, and when the foreign drivers do not compensate, they drive too fast for circumstances. Thus being foreign requires behavioural adaption.

Some interviewees also stated that they believed the status of this risk factor to be the same for Norwegian and foreign drivers. Finally, it was also suggested that driving under the influence of for instance alcohol could be a more prevalent safety challenge among foreign drivers, for instance because of different transport safety attitudes and behaviours in their home countries and because they are far away from home for longer periods with few recreational opportunities

6.4 Results from the small-scale survey

Figure 6.5 shows respondents answers to three statements on transport safety behaviour:

- The drivers in my company adhere to the speed permitted by speed limits and driving conditions
- All drivers in my company wear seat belts
- Sometimes I break the traffic rules to get quicker to my destination

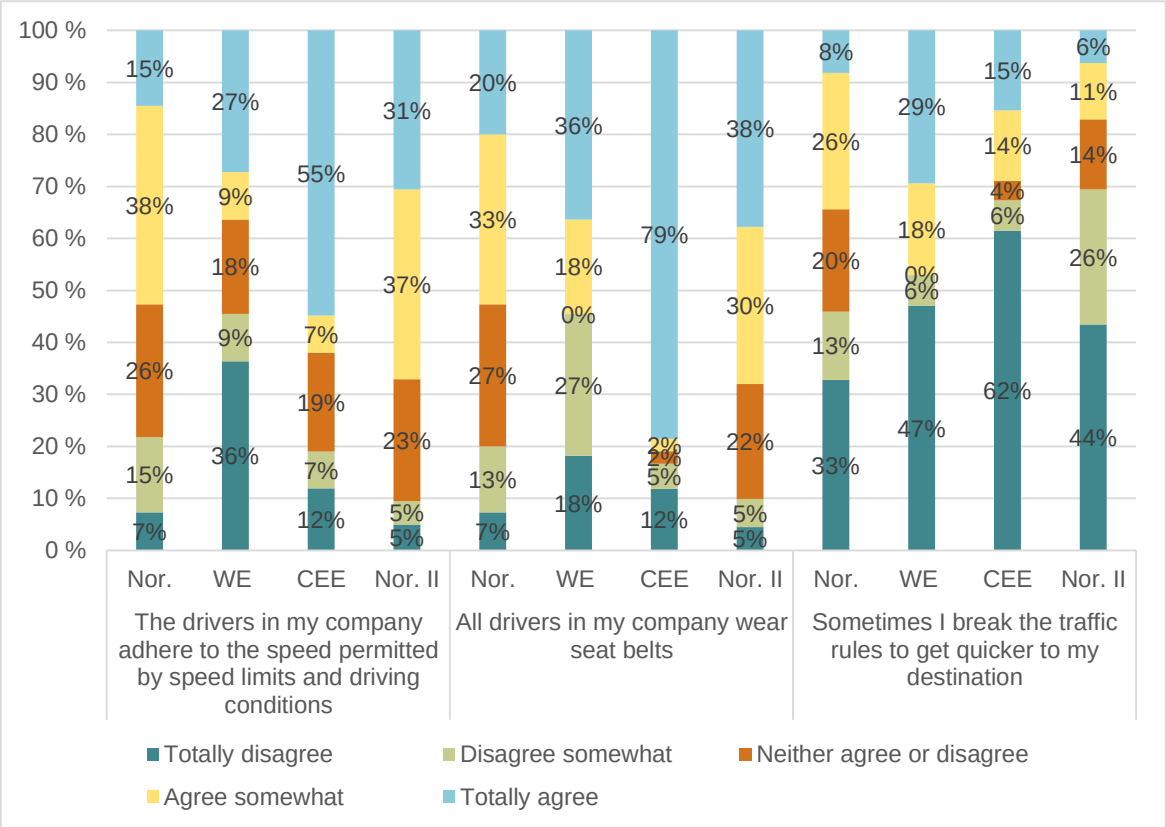


Figure 6.5 National groups' shares on three statements on transport safety behaviour Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52).

The figure indicates that, when comparing the three groups that we primarily focuses on, the drivers from CEE to a considerably higher extent than the other groups totally agree that drivers in their companies adhere to speed limits. A comparison of means shows that Norwegian drivers score 3.4, WE drivers score 2.8, while CEE drivers score 3.9 on average. An ANOVA analysis of variances shows that the differences are statistically significant at the 5 %-level (P=0.046). Thus, we may

conclude that the CEE drivers are more inclined to agree that drivers in their companies adhere to speed limits than the other drivers.

When we also look at the Norwegian II sample, the shares agreeing with the statement (mean score 3.8 points) were slightly higher in the Norwegian II sample than the other groups. Nevertheless, drivers from CEE had the highest share of drivers who totally agreed with the statement. This is surprising, given the organizational measures implemented on this in the three companies in the Norwegian II sample. We will return to this in Chapter 16.

We see that drivers from CEE to a considerably higher extent than the other groups totally agree that drivers in their companies wear seat belts. A comparison of means shows that Norwegian drivers score 3.5, WE drivers score 3.3, while CEE drivers score 4.3 in average. An ANOVA analysis of variances shows that the differences are statistically significant at the 1 %-level (P=0.004). Thus, we may conclude that the CEE drivers are more inclined to agree that drivers in their companies wear seat belts than the other drivers in the sample.

When we also look at the Norwegian II sample, we see that the shares agreeing with the statement (mean score 3.9 points) were somewhat lower in the Norwegian II sample compared with CEE drivers. The latter drivers had the highest share who totally agreed with the statement: 79 %, which is more than the double of the share of the Norwegian II sample. This is surprising, given the organizational measures implemented on this in the three companies in the Norwegian II sample. We will return to this below.

We also asked the drivers whether they sometimes break the traffic rules to reach their destination sooner. The figure shows that 47 % of the drivers from WE agree with the statement, followed by Norwegian drivers (34 %) and CEE drivers (29 %). A comparison of means shows that Norwegian drivers score 2.6, WE drivers score 2.8, while CEE drivers score 2.2 in average. An ANOVA analysis of variances shows that the differences are not statistically significant (P=0.177). Thus, we cannot conclude that the drivers' self-reported tendencies to violate traffic rules while in a hurry are different. Finally, the shares disagreeing with the statement (mean score 2.1 points) were slightly higher in the Norwegian II sample than the other groups, and about the same as in the CEE group, although a higher share disagreed totally among the CEE drivers.

We also made a transport safety behaviour index based on the three questions, with a minimum value of 3 points (1*3) and a maximum value of 15 points (5*3). The values of the question on violations were coded in reverse when this question was included in the index, as the higher values indicated negative safety behaviour. Comparing how the three groups that we primarily study score on the index, we see that the Norwegian drivers score 10.1, WE drivers score 9.4 points, while CEE drivers score 12 points in average. An ANOVA analysis of variances shows that the differences are statistically significant at the 1 %-level (P=0.005).

In comparison, the score of the Norwegian II sample on the transport safety behaviour index was 11.7 points, and thus slightly lower than the score of the CEE drivers. This is surprising, given the fact that the three companies in the Norwegian II sample are considered to be among the best when it comes to regulation of drivers' transport behaviour (cf. Nævestad & Bjørnskau 2014). The companies in the Norwegian II sample have speed limiters in the HGVs, technically limiting the speed of their vehicles at a lower speed than the legally prescribed 90 km/h limit. They also

have policies for drivers' speed and driving style and seat belt use. They also have safety talks with drivers about speed and driving style and sanction unsafe driving. In the safety talks the drivers must sign declarations that they will drive in accordance with conditions, use seat belt and so forth. Additionally they follow up drivers' speed and driving style in the sense that they automatically record (through fleet management systems), regularly check and therefore know each driver's driving style.

Moreover, analyses of objective AAG-data indicate that lacking seat belt use, too high speed and lacking information gathering are more prevalent risk factors among foreign drivers. It is important to remember, however, that numbers are small and that the drivers in the AAG are not necessarily representative of foreign drivers in general, although foreign drivers who are merely involved in accidents and not triggering accidents not necessarily are different from foreign drivers in general. This might indicate that the differences between the foreign and Norwegian drivers' transport safety behaviours that we observed in the small-scale survey seem to be influenced by reporting effects. More research is needed on this issue, because we have not compared the policies of the foreign and Norwegian companies when it comes to this.

6.5 Summing up

The literature review indicates that speed too high for the circumstances, failure to use seat belt and insufficient information gathering are the most important risk factors in fatal accidents triggered by drivers at work. Our analysis of fatal accident data indicates that these factors are associated relatively more often with accidents triggered by foreign than by Norwegian professional drivers. Lack of information gathering was identified more often among the foreign drivers triggering fatal accidents, the same was too high speed and lacking seatbelt use. Although numbers too small to reach trustworthy conclusions on this, the latter risk factor seems to be four times more important for the foreign drivers. This may explain why twice as many foreign drivers are seriously injured in the accidents that they are involved in compared with the Norwegian drivers (28 % vs. 13 %).

The interviewees gave different answers when asked about the importance of speeding and lacking seat belt use as risk factors in accidents with foreign HGVs. Some stated that these risk factors perhaps were less important for foreign drivers, because of behavioural adaption to poor equipment, others believed speeding to be a more prevalent because of a strong focus on getting the load to its destination in time.

The small-scale survey includes three statements on transport safety behaviour. We made a transport safety behaviour index based on these three questions, and found that the CEE drivers had the highest score on the index, followed by the drivers in the Norwegian II sample. This is surprising, given the fact that the three companies in the Norwegian II sample are considered to be among the best when it comes to regulation of drivers' transport behaviour (cf. Nævestad & Bjørnskau 2014). We concluded that the differences between the foreign and Norwegian drivers' transport safety behaviours that we observed in the small-scale survey seem to be influenced by reporting effects (cf. chapter 16).

7 Safety culture

7.1 Results from literature review

In the last few years, traffic safety scholars have started studying the role that traffic safety culture may play in explaining and reducing risks in road transport (Nævestad & Bjørnskau 2012). It is widely recognized that safety culture is important for safety in organizational settings in hazardous industries (Nævestad, 2010), and the concept is applied to an ever increasing range of sectors and industries. Early results suggest that the safety culture concept may have great potential for improving traffic safety (AAA, 2007; Ward et al., 2010). Summing up ten years' experience of the AIBN, Mellum (2015) argues that a future improvement in traffic safety requires an increased focus on safety culture, and learning from other sectors' (e.g. aviation) work on organizational learning and establishing a "just culture".

In spite of a notable diversity in specifications of safety culture, studies of safety culture often seem to treat it as shared and safety relevant ways of thinking or acting that are (re)created through the joint negotiation of people in social settings (Nævestad 2010). Safety culture provides a frame of reference that guide individuals' interpretation of actions, hazards and their identities, and which motivate and legitimize behaviours that have an impact on safety (Antonsen 2009, Nævestad 2010). Such shared frames of reference are created through interaction in groups (Nævestad 2010).

7.1.1 Organizational safety culture and climate

Although the concepts of organizational safety culture and climate only recently have been applied in studies of professional drivers in road transport, research indicates that safety culture influences transport safety behaviour and safety outcomes in transport organisations (cf. DfT, 2004, Wills et al., 2005 and Davey et al., 2006).

The concept of organizational safety culture is usually traced to the 1986 Chernobyl disaster, which made the International Nuclear Safety Advisory Group (INSAG) conclude that an inadequate safety culture at the plant was an important cause of the accident (INSAG, 1991). In the years following the disaster, several major accident investigations have identified safety culture as a major contributing factor. Additionally, organizational safety management strategies usually involve a strong focus on safety culture.

It may be useful to think of organizational safety culture as the informal aspects of safety in organizations (e.g. informal, shared ways of (inter) acting and thinking), in order to distinguish it from the formal aspects of safety in organizations, specified as rules, procedures and so forth (the formal ways of (inter) acting and thinking) (cf. Antonsen 2009b). Management commitment for safety is the most crucial aspect of safety culture (Flin et al 2000), as this tends to influence all other safety related aspects of organizations (Reason 1998).

Safety culture is generally measured by means of safety climate questionnaires, measuring a handful of key themes, e.g. management commitment to safety, employee commitment to safety and reporting culture (Guldenmund 2000; Cox & Flin 1998; Flin et al. 2000; Pidgeon & O'Leary 2000). Safety climate questionnaires only grasp the superficial and transient expressions of safety culture, and it can be conceived of as "snapshots", or manifestations of safety culture (Cox & Flin 1998: 192).

Measures of organizational safety culture and climate are important tools that can be used to assess the safety level of organizations. While traditional measures of organizational safety levels use retrospective data on accidents and incidents ("lagging indicators"), it is hoped that safety culture data may provide predictive assessments that enable safety improvements without having to wait for accidents or incidents to happen ("leading indicators") (Antonsen 2009a).

7.1.2 National safety culture

Even though the concept traditionally has been applied to organizations, research indicates that safety culture can be applied to other social units than organizations. It can for instance be applied to studying the (traffic) safety culture of members of social units like nations, communities and peer groups (Nævestad & Bjørnskau 2012; Nævestad, Elvebakk & Bjørnskau 2014). Studying safety culture within other social units than organizations requires the same focus on how shared and safety relevant ways of thinking or acting are created and recreated by members of these units.

When we apply the safety culture perspective to road transport of goods, units like region, sector, subsector and nation may constitute relevant sources of culture, in addition to organizations. We may perhaps assume that all of these different socio-cultural units may be relevant when it comes to explaining patterns of thinking and acting, and thus that their importance should be examined empirically.

Differences in national safety culture could be a possible explanation to the above mentioned differences in HGV accident risk in different European countries (DaCoTa 2010). In addition to being influenced by professional safety culture learned through professional driver training, it is likely that foreign drivers carry with them influences from the traffic safety cultures of their home country. Factors influencing national traffic safety culture include traffic rules, the police enforcing the rules, road user interaction, driver licensing and driver education (Nævestad & Bjørnskau 2012). However, it is not given that HGV drivers from countries with high HGV accident risk are more likely to be involved in accidents in lower risk countries.

Leviäkangas (1998) suggests that the risk difference between foreign and domestic drivers in Finland may be explained by differences in traffic culture, which he defines as the sum of all factors that affect the skills, attitudes and behaviours of drivers as well as the equipment (i.e. vehicles):

> Firstly, the author wishes to avoid pointing an accusive finger at foreign drivers. Driving habits and skills as well as driving behavior are largely the products of culture and the social environment: patterns of behavior and attitudes are learned and thus they do not necessarily mean consciously directed aggression towards other drivers. The Russians, the Finns, and all nationalities differ from each other as far as traffic culture is concerned and it

> would be intellectually dishonest to say that some culture is better than another (it may be safer, though). (Leviäkangas 1998: 252).

Page (2001) (in Ward, 2010) studies national traffic safety cultures by comparing predicted accident rates, based on variables known to influence accident rates, with actual accident rates in different countries. The difference was partly inferred to be an effect of national traffic safety culture. Comparisons of national traffic safety culture have also been made in the large EU-funded research project "SARTRE", which reported national differences among European car drivers' attitudes towards road safety (SARTRE, 1994). A recent study also found significant differences in driver behaviour between Finnish, Swedish, Greek and Turkish drivers (Warner, Özkan, Lajunen and Tzamalouka, 2011). This and other findings suggest it is important to account for differences in national traffic safety culture, and ultimately safety behaviour, in accounting for differences in accident risk.

The research literature on national culture shows that it influences values, communication styles, methods of conflict resolution, decision making and organizational behaviour (Håvold 2005). In 1980, Hofstede published "Culture's consequences", a seminal study which showed that national culture varies substantially from country to country according to four main dimensions (Hofstede 1980). Hofstede's study used a databank of 116 000 IBM employees from 64 different countries. Hofstede's scale is the most widely used measure of national cultures (Håvold 2005: 452).

The first dimension of national culture highlighted by Hofstede is "power distance", which concerns how inequality is viewed, and the degree to which less powerful members of a society accept and take for granted that power is distributed unequally. People in cultures with a high degree of power distance (e.g. China) accept and take for granted a hierarchical social order. People in cultures with low degree of power distance (e.g. Norway), on the other hand, expect equal social distribution. In these latter cultures, hierarchies and power distance requires justification. People from cultures with low power distance will expect to be included in decisions and will expect to be able to freely criticise authority (Hofstede 2001).

The second dimension is "individualism/collectivism". People living in individualistic cultures (e.g. the U.S.) will expect and value that people only should take care of themselves and their closest relatives. People in collectivistic societies (e.g. Latin American countries), on the other hand, will focus on the loyalty to the group instead of the individual ("we" instead of "I"). They will expect to receive help from the group if needed, and their own contribution to the group will not need justification.

The third dimension is "uncertainty avoidance", which concerns the degree to which people are comfortable with uncertainty and ambiguity, and the degree to which one should take measures to try to control the future. Cultures with strong degree of uncertainty avoidance (e.g. Japan) usually uphold rather strict codes for ways of thinking and acting, sanctioning exceptional behaviour, while cultures with low degree of uncertainty avoidance are more tolerant of new ideas, new ways of acting and so on (Hofstede 2001).

The fourth dimension is "masculinity/feminity". Cultures which are "masculine" value achievement, heroism, competition, and material rewards for success (e.g. Japan), while "feminine" cultures value cooperation, consensus and care (e.g. Sweden).

A fifth dimension was later added to the theory: "short-term normative orientation vs. long term orientation". Cultures upholding a short term normative orientation exhibit great respect for traditions (how it has been done in the past), and focuses on "(…)respect for tradition, preservation of 'face' and fulfilling social obligations." (Hofstede 2001: 359). Long term orientation on the other hand, fosters virtues oriented towards future rewards, e.g. perseverance and thrift, encourages savings and education. Moreover, given its low focus on traditions, long term orientation is not as focused on absolute truth (given from tradition) as the short term orientation; assuming that truth depends on situation, context and times.

Hofstede's research on cultural dimensions has been criticized for being static (Lamvik & Ravn 2004) and deterministic (McSweeney 2002). It is important to note, however, that the dimensions should be interpreted as ideal types, i.e. analytical tools that do not exist in reality. Rather the dimensions represent extremes on a continuum, and by conducting empirical studies, we may measure approximately how members on societies score on the continuums offered by Hofstede's dimensions.

Given that safety culture is defined as cultural traits that are relevant to safety, it is interesting to ask whether and how Hofstede's cultural dimensions are relevant for safety. This has been done in a few studies, for instance in aviation (Merrit 2000) and shipping (e.g. Håvold 2005; 2010a). It is for example easy to imagine that the power distance dimension may be relevant to safety, as strong hierarchies and unquestioned authority may be negative to safety. Reluctance to question decisions is an indicator of poor safety culture, and can be expected to vary along the national culture dimension of value of hierarchy (Hetherington et al., 2006). Håvold (2005) suggests that people living in societies with high power distance and high degree of collectivism are more likely to answer what they believe that "the management wants to hear".

According to Helmreich & Merrit (1998) two of Hofstede's national culture dimensions influence safety: power distance and colletivism/individualism. They found, as indicated above, that pilots from different national cultures disagreed substantially when asked whether "Crew members should not question the decisions or actions of the captain except when they threaten the safety of the flight" (15 %-93 %). How respondents answered when confronted when this statement seemed to be influenced by the degree of power distance in their culture. Hemlreich and Merrit (1998) stress that in situations where the values of the national and the organizational cultures are in conflict, stress might arise and safety may be negatively influenced.

Merrit (2000) demonstrates that Hofstede's dimensions exert an important influence over cockpit culture and the professional culture of aviation pilots (Merrit 2000). Her study of 9,400 male airline pilots in 19 countries reports of a successful replication of Hofstede's indexes of national culture. Merrit especially found the dimensions of power distance and uncertainty avoidance to be of relevance to safety, concluding that national culture influences the working styles and preferences of the commercial airline pilots. Thus, in spite of the internationalisation, the comprehensive regulation and extensive training involved in commercial aviation, Merrit (2000) found that national culture exerts an influence over the professional culture and safety behaviour of pilots.

7.2 Results from interviews

Interviewees were careful about making generalizations about differences between national safety cultures, but it was noted that it seems that the general culture of and focus on safety in a society also has consequences for transport safety culture. Most of the interviewees suggested that some countries, for instance in the Eastern Europe do not seem to have the same strong focus on transport safety that we have in Norway. Moreover, safety attitudes and behaviours related to for instance speeding and seat belt use are probably not as positive in Eastern European countries as in Norway and Scandinavia. It is likely that HGV drivers are influenced by the general national cultures and the way safety is viewed in this culture, although this of course must be examined empirically.

Interviewees stated that labour relations in these countries are also different from those in Norway, with lower trust in the governments and unions. It also seems that employees generally have more respect for their managers in Eastern European countries, compared with employees in Norway. It was suggested that some foreign drivers actually respect their managers more than they respect Norwegian authorities and traffic safety, and that if a manager has given them an instruction, "it must be followed". One interviewee suggested for instance that drivers who are stopped because of errors and omissions often continue to drive, despite poor equipment, because the boss in their home country demands it. It was also noted by the interviewees that there are several examples of situations where drivers are left to themselves for several days if they are stopped by the police or the NPRA, and they are unable to pay their fines.

7.3 Results from the small-scale survey

7.3.1 Safety commitment

The survey included six questions measuring organizational safety culture, and six additional questions on work related factors with relevance for transport safety. These questions were also used in a previous study of safety culture among drivers (N=224) in three Norwegian haulage companies (Nævestad & Bjørnskau 2014). The three haulier companies were selected based on an assumption that they had good safety cultures, and the results of the study supported that assumption. Below we compare the frequencies and scores of the three national groups with those of the 224 drivers from the previous study (Norwegian II).

Figure 7.1 shows the three national groups' and Norwegian II's shares on three statements measuring safety commitment:

- The management of the company focuses on safety[17]
- The drivers in my company do everything they can to avoid unwanted incidents and accidents
- In my company, it is more important to drive safely than to deliver on time

[17] The wording of this statement was different in the Norwegian II survey: "Management regards safety to be a very important part of all work activities"

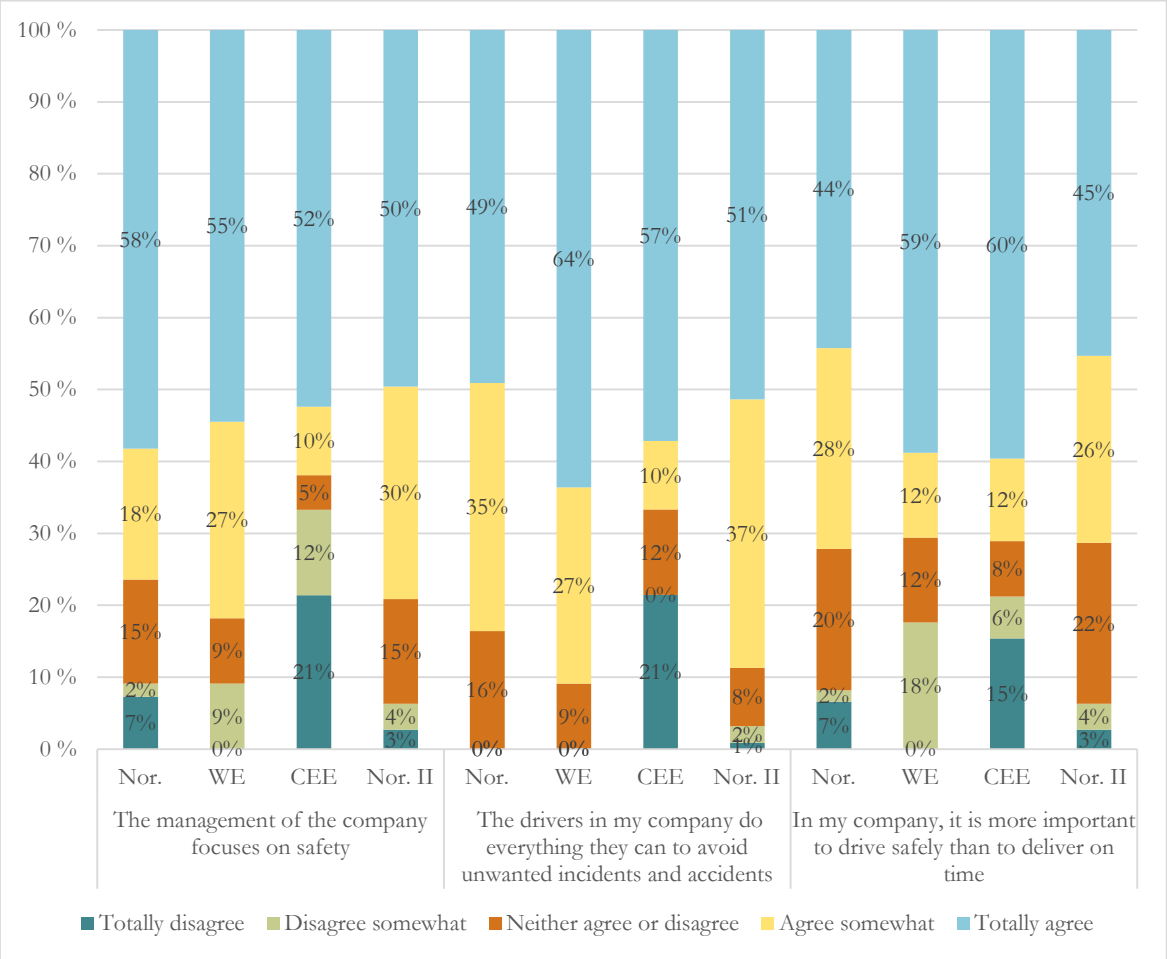


Figure 7.1 National groups' shares on three statements measuring safety culture. Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52), Norwegian II (224).

The figure indicates that, of the three national groups we primarily compare in the study, WE region has the largest share of drivers agreeing with the statement "The management of the company focuses on safety", followed by Norwegian drivers and drivers from CEE. A comparison of means shows that Norwegian drivers score 4.2, WE drivers score 4.3, while CEE drivers score 3.6 in average. An ANOVA analysis of variances shows that the differences are statistically significant at the 10 %-level (P=0.097). Thus, it seems that there are differences between the groups when it comes to respondents' self-reports of their managers' commitment to safety. Finally, the shares agreeing with the statement (mean score 4.2 points) in the Norwegian II sample were fairly similar to those of the Norwegian drivers and the drivers from WE, although we would expect the Norwegian II sample to score higher than the other groups on this question.

The same pattern is evident for the drivers' response to the statement: "The drivers in my company do everything they can to avoid unwanted incidents and accidents". Although on this question, the differences between the groups are bigger (up to 24 percentage points). A comparison of means shows that Norwegian drivers score 4.3, WE drivers score 4.6, while CEE score 3.8 in average. An ANOVA analysis of variances shows that the differences are statistically significant at the 10 %-level (P=0.052). Thus, it seems that there are differences between the groups when it

comes to respondents' self-reports of colleagues' commitment to safety. Finally, the shares agreeing with the statement (mean score 4.4 points) in the Norwegian II sample were fairly similar to those of the Norwegian drivers and the drivers from WE , although we would expect the Norwegian II sample to score higher than the other groups on this question.

The shares agreeing with the statement "In my company, it is more important to drive safely than to deliver on time" is fairly similar for the three groups that we primarily compare in this study, although the share agreeing totally is lower among drivers from Norway. A comparison of means shows that Norwegian drivers score 4, WE drivers score 4.1, while CEE drivers score 3.9 in average. An ANOVA analysis of variances shows that the differences not are statistically significant (P=0.885). Thus, we cannot conclude that there are differences between the groups when it comes to self-reported company focus on safety versus efficiency. Finally, the shares agreeing with the statement (mean score 4.1 points) in the Norwegian II sample were fairly similar to those of the Norwegian drivers. This is unexpected, as it indicates that fewer respondents "totally agreed" with the statement in the Norwegian II sample (of Norwegian companies with good safety culture) than in the groups of foreign drivers.

We also made a safety commitment index based on the three questions, with a minimum value of 3 points (1*3) and a maximum value of 15 points (5*3). Norwegian drivers score 12.4, WE drivers score 12.6, while CEE drivers score 11.4 in average. An ANOVA analysis of variances shows that the differences are not statistically significant (P=0.251). The score of the Norwegian II sample on the safety commitment index was 12.6 points. As expected, Norwegian II scores slightly higher than the Norwegian group, and equal to the group of WE drivers. This is unexpected, given the comprehensive work on safety in the Norwegian II sample.

7.3.2 Safety training and reporting routines

Figure 7.2 shows two additional statements measuring safety culture:

- Drivers in my company receive adequate training to drive in a safe way
- In my company, there are routines for reporting safety problems and safety violations

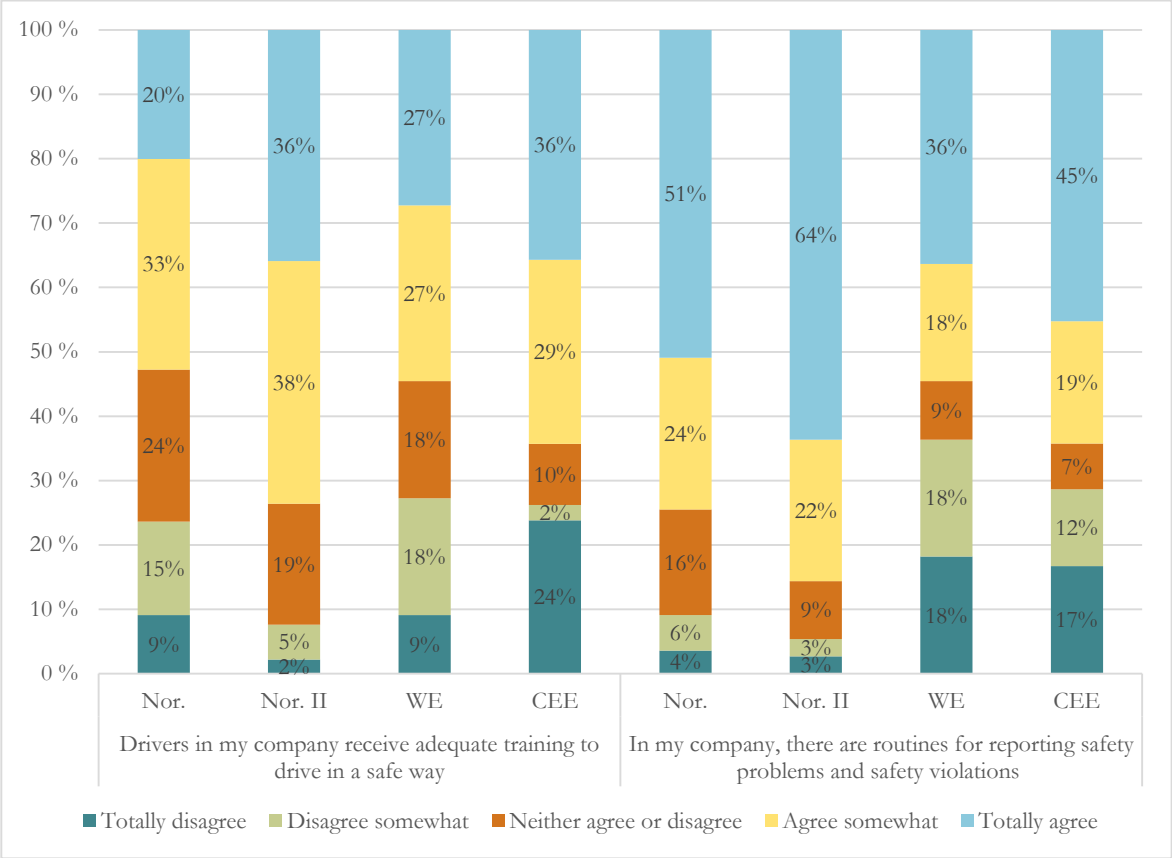


Figure 7.2 National groups' shares on two statements measuring safety culture. Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52).

The figure indicates that, of the three national groups we primarily compare in the study, CEE has the largest share of drivers agreeing with the statement "Drivers in my company receive adequate training to drive in a safe way", while the shares in the two other groups are fairly similar. A comparison of means shows that Norwegian drivers score 3.4, WE drivers score 3.5, while CEE drivers score 3.5 in average. An ANOVA analysis of variances shows that the differences are not statistically significant (P=0.940). Thus, we cannot conclude that there are differences between the groups when it comes to self-reported training. Finally, the shares agreeing with the statement and the mean score (4 points) in the Norwegian II sample were considerably higher in the Norwegian II group, indicating that this group is notably better when it comes to driver safety training.

The figure indicates that, of the three national groups we primarily compare in the study, the Norwegian drivers to a higher extent than the other groups report that they have "routines for reporting safety problems and safety violations". In this case, the difference between Norwegian drivers and the two other groups is about 10 (EEC) and 20 (WE) percentage points. A comparison of means shows that Norwegian drivers score 4.1, WE drivers score 3.4, while CEE drivers score 3.6 in average. An ANOVA analysis of variances shows that the differences are not statistically significant (P=0.1). Thus, we cannot conclude that the Norwegian drivers' companies have better routines and systems for incident reporting. Finally, the shares agreeing with the statement and the mean score (4.4 points) in the Norwegian II sample were considerably higher in the Norwegian II group, indicating that this group is notably better when it comes to reporting systems.

In sum, the two questions in figure 7.2 could indicate a higher quality of safety management systems (training, reporting) among the companies employing the Norwegian drivers in the sample than the companies employing the foreign drivers. (We discuss this in chapter 8 below).

7.4 Summing up

According to the results of the literature review, it is likely that foreign drivers carry with them influences from the national traffic safety cultures of their home country, influenced by traffic rules, the police enforcing the rules, road user interaction, driver licensing and driver education. We have unfortunately not been able to measure this adequately in our survey, although our measures of for instance transport safety behaviours, incident reporting and working hours could be used as indicators of different national transport safety cultures.

Interviewees were careful about making generalizations about differences between national safety cultures, but it was noted that Eastern European countries may have less focus on safety, and labour relations in these countries are also different from those in Norway, with lower trust in the governments and unions and more deference to authority.

The literature review indicates that although the concept of organizational safety culture only recently has been applied in studies of professional drivers in road transport, it influences transport safety behaviour and safety outcomes. The small-scale survey includes five questions measuring organizational safety culture, i.e. the safety cultures of the companies that the respondents work for. We made a safety commitment index based on the first three safety culture items, and found that the differences were only minor and not statistically significant. This is unexpected, given the comprehensive work on safety and the supposedly stronger commitment to safety in the Norwegian II sample.

8 Safety management

8.1 Results from literature review

Research indicates that safety management systems influence safety in transport organizations, in road, sea and air transport (Nævestad et al 2015). This is also highlighted in Nævestad & Bjørnskau's (2014) study of three haulier companies with good safety culture and safety performance. Analyses of AIBN-reports shows that the most frequently mentioned risk factor in organizations which have been involved in accidents in road, sea and air transport is lack of complete, written risk assessment. Risk assessment is the cornerstone of what AIBN road refers to as safety management systems (SMS), consisting of three elements. Taken together, these three processes summarize an ideal of how transport operators should relate to risk and how they should work with safety management. We formulate these normatively in the following:

1) Transport companies must perform (and document) risk assessments of critical operations.
2) These risk assessments must be used as the basis for job descriptions/procedures that transport operators can consult prior to operations.
3) The risk assessments and job descriptions/procedures must be used as the basis for a training programme for transport operators to prepare them for the risks related to their work.

In the accidents described in the AIBN-reports, it is often concluded that one or several of these processes have failed. This ideal of HSE requirements is in accordance with the Working Environment Act and the Internal Control provision.

8.2 Results from interviews

Interviewees had little knowledge about the safety management systems of foreign transport companies, but suggested that it is unlikely that foreign transport companies are in a position to manage the safety of drivers that they seldom see. Another interviewee stated that lacking safety management systems also is a general challenge in the Norwegian transport business. Several managers started up as drivers 30 years ago, became car owners and then managers. These managers do not put a great emphasis on administrative tasks, and establishing safety management systems. It was suggested that the transport business therefore is less developed in this aspect than other lines of business in Norway, and that competition with foreign actors on costs is not likely to improve the situation. The compliance with the Internal control provision of the Norwegian Labour Environment Act is for instance too low within the Norwegian goods transport sector.

8.3 Results from small-scale survey

We cannot draw conclusions on safety management systems, as we have not compared foreign and Norwegian drivers on this issue in the small scale survey. The small-scale survey includes, however, two questions that may be used as indicators of the status of safety management systems in the companies employing the different groups of drivers. The first statement is: "Drivers in my company receive adequate training to drive in a safe way", and the second is: "In my company, there are routines for reporting safety problems and safety violations".

A comparison of means did not reveal statistically significant differences between Norwegian drivers, WE drivers or drivers from CEE on these two items. We found however, that the drivers in the companies in the Norwegian II sample, as expected, scored somewhat higher than these three groups on these items on training (15 % higher) and reporting routines (19 %). More research is needed on this issue.

8.4 Issues for future research

The literature review indicates that safety management systems (risk analyses, procedures and training) may be an important precondition for transport safety in transport organizations. We do, however, need research to evaluate the safety consequences of safety management systems before we draw any conclusions on the importance of safety management systems. Neither can we draw conclusions on safety management systems in the current study, as the small-scale survey do not compare foreign and Norwegian drivers' when it comes to employers' risk assessment routines and work descriptions/procedures. Interviewees had little knowledge about the safety management systems of foreign transport companies compared to Norwegian companies, and more research is needed on this issue.

Although accident investigations stress the importance of documented risk assessments, we do not know the prevalence of these risk factors in organizations that have not been involved in accidents, and future research should therefore examine this in order to assess the importance of these risk factors (Nævestad et al 2015). Induced exposure methods could for instance be applied to examine this issue. It is not given that the accident-struck organizations would have been able to conduct a proper risk assessment that would have identified the risks. More research is needed on this issue, for instance examining the existence and use of formal risk assessments in organizations with a good safety level. Are formal documented risk assessments as crucial as the accident investigations suggest? Moreover, are formalized risk assessments likely to be used by small companies and one-man companies?

9 Organization of the transport

9.1 Results from literature review

Research indicates that organization of transport assignments is an important work related risk factor that may influence drivers' level of perceived stress and pressure, and thus perhaps also their speed and transport safety (Nævestad & Bjørnskau 2014). study. According to Steen Jensen et al. (2015), one in three drivers reports that their work situation causes stress, and time pressure is the main cause of stress for those drivers that report it.

Nævestad & Bjørnskau (2014) found statistically significant differences between driver in three companies on the statement "In my job, I experience that customers press/stress drivers". In Company A, 73,7 % of the respondents disagreed, while 26,9 % in Company B and 45,3 % in Company C disagreed. The low share in Company B probably reflects differences in the customer relationship and different organization of transport assignments. While Company A and C have region managers or transport managers organizing the transport, almost all of the transport assignments are given directly from customers to the drivers in company B, and the customers have nearly daily contact with the drivers in this company. It seems that the organization of transport in Company A and C puts less pressure on the drivers. Organization of transport assignment is important, as we have seen that stress is an important risk factor among professional drivers triggering fatal accidents. We have not examined this risk factor in foreign hauliers, and more research is needed to examine this.

9.2 Results from accident investigations

Analysing the AAG data, we have looked at the condition of the drivers triggering fatal accidents. It is difficult to say whether the condition of the drivers at the time of the accident varies according to whether they are Norwegian or foreign, because of the low numbers we have for this variable (Table 9.1). However, as is the case for the Norwegian drivers, time pressure, stress and fatigue, seem to be the most usual "abnormal" conditions for foreign professional drivers involved in fatal accidents.

Table 9.1. Number of professional drivers of different types involved in fatal accidents on Norwegian road between 2010 and 2013, according to their condition at the time of the accident.

Condition at time of accident	Assumed Norwegian	Foreign	
		Based in Norway	Based outside Norway
Normal	155	19	12
Time pressure / stress	5	2	2
Fatigue	7	1	3
Under the influence of alcohol or drugs	3	0	0
Illness	2	0	0
No information	18	0	0
Total	190	23	17

9.3 Results from interviews

Interviewees had little knowledge about the organization of transport in foreign transport companies, but it was mentioned that stress and time pressure is a likely risk factor, both for foreign drivers and Norwegian drivers. It was suggested that if a Norwegian driver wants to discuss something with his manager, he is likely to have a better access to his manager than a foreign driver who perhaps only sees his manager a few times each year. It was also mentioned that it seems that the supposedly higher respect that Eastern European employees have for their manager also makes it more difficult for them to take up pressing issues.

In the reference group meeting it was put forward that transport-buyers in many cases may have too much power over the drivers, and put them under strain. If you look at the chain of transportation, the drivers often perceive the terminal manager as the real boss. It was also mentioned that it is problematic that the people organizing the transport often have a considerable distance to the drivers' situations. This can make them evaluate things differently when it comes to for example how realistic various timetables are. Such "optimistic considerations" become the driver's problem when he or she is supposed to arrive with the goods in time.

Interviewees generally stated that future measures should aim to increase the responsibilities of the transport buyers and also the other parties involved in the transport. Transport companies must set the premises for safe transport, and this also applies to forwarding companies, those who send the goods and those who receive it.

9.4 Results from the small-scale survey

We also asked the drivers how they got their transport assignments and the origin and destinations of their trips.

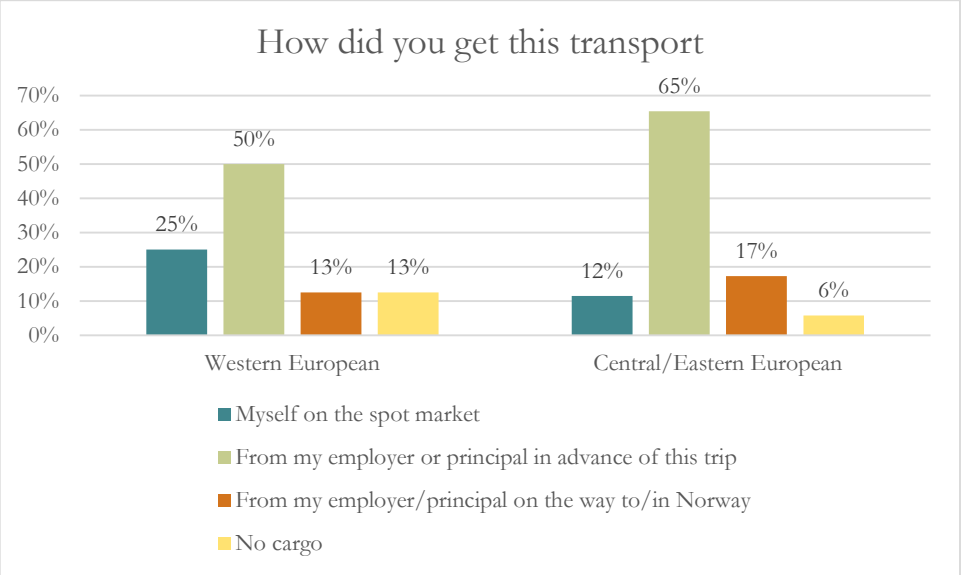


Figure 9.1 How drivers got their transport assignments, based om their nationality.

In accordance with results above, indicating that a third of the drivers in the WE group are self-employed, we see that a fourth of the WE drivers got their transport themselves on the spot-market. Interestingly, we also see that notable shares got their transport assignments on their way to, or in Norway, and that some drivers had no cargo. We look more closely at the latter in figure 9.2 below.

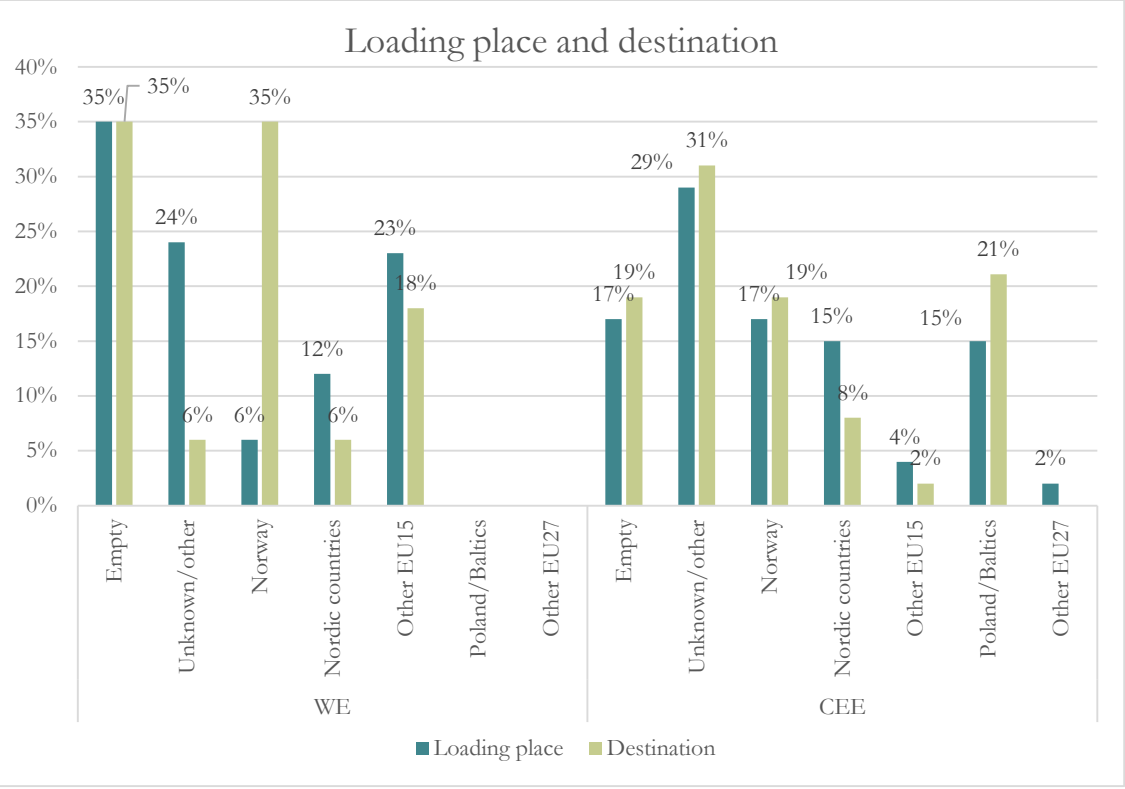


Figure 9.2 Drivers' reported loading places and destinations, distributed according to their nationalities.

The data on loading place and destination of trips, show higher shares of drivers with no cargo at the time they were interviewed than figure 9.1 above. A total of 35 % of the drivers from WE had no cargo when they were interviewed, while 19 % of the drivers from CEE had no cargo when they were interviewed. Thus, we may assume that the drivers answering the question reported in figure 9.1 either referred to the cargo that they had before they were interviewed, or the cargo that they were going to pick up after the interview.

Interestingly, we see that nearly a fifth of the CEE drivers have Norway as both their loading place and destination. This could indicate cabotage transport. However, the figure only presents data on group level, and not individual level, i.e. we do not know whether the 19 % of Central drivers who have Norway as their origin are the same as the 17 % who loaded in Norway. A more detailed look at the individual level, shows that 8 %, (i.e,. four drivers) of the Central drivers who loaded in Norway also have a place in Norway as their destination. This could indicate cabotage, unless these drivers are employed in Norway and use a vehicle registered in Norway. A closer look at the data at the individual level, shows that 4 % (i.e. two drivers) of the Central drivers with origin and destination within Norway were employed outside Norway and drove foreign registered vehicles.

9.5 Summing up

The literature review indicates that organization of transport assignments and drivers' relationship and contact with customers may influence transport safety. A previous study found that drivers in a company who had nearly daily contact with customers reported to be more stressed by their customers than drivers in two other companies who had transport managers to take care of the customer contact. It seems that the latter organization of transport puts less pressure on the drivers. This is important, as our analysis of fatal accident data indicates that time pressure and stress is an important cause of fatal traffic accidents, triggered by both foreign and Norwegian HGV drivers.

Unfortunately, we have not measured drivers' perception of stress and pressure in the small-scale surveys, or examined organization of transport. Thus, we are unable to compare this between Norwegian and foreign drivers. However, given the importance of this risk factor when it comes to triggering fatal accidents, future research should focus on this issue. Foreign drivers in Norway drive in a foreign environment, are probably less familiar with the geography of the country, are alone for longer periods and must rely on telephone contact with their superiors and shipping agents. These working conditions may increase their perception of stress.

Interviewees had little knowledge about the organization of transport in foreign transport companies compared to Norwegian companies, and more research is needed on this issue.

10 Technology and equipment

10.1 Results from literature review

It has been suggested that foreign HGVs in Norway suffer from several shortcomings compared with Norwegian lorries, and that these shortcomings increase the accident risk of foreign HGVs on Norwegian roads. Safetec (2011) concludes, in a risk analysis of the subsea Oslofjord tunnel, that:

> "The analysis has identified a category of the heavy vehicle traffic which stands out when it comes to risk. Many foreign tractors are only equipped with two axles, with reduced engine effect and a low total permitted weight. When these vehicles are heavily loaded in hilly terrain, the pressure on the vehicle increases. Scandinavian vehicles are often equipped with three axles, and a more powerful engine, making it less likely that they are over loaded in hilly terrain. Age and wear and tear on the vehicle is also a factor, as older vehicles are more prone to fuel leakages than newer vehicles are." (Safetec 2011: 17).

It has also been claimed that foreign transport companies often have more relaxed standards when it comes to the technical state of their vehicle fleet, compared with Norwegian transport companies, and that they may lack mandatory equipment (Safetec 2011: 18; Bergene & Underthun 2012). It has also been suggested that foreign HGVs have poorer braking systems than Norwegian HGVs, e.g. that they may lack retarder braking systems (Safetec 2011; Buvik, Amundsen og Fransplass 2013). This may increase the risk of overheating the brakes while driving long distances with steep inclination (e.g. > 7 %), for instance in subsea road tunnels.

However, the Norwegian Public Roads Administration (NPRA) concluded in August 2013 that they did not find substantial differences between the technical state of Norwegian and foreign HGVs after inspecting 17 000 HGVs from January to August 2013 (NPRA 2013). Sixty percent of the inspected HGVs were Norwegian, while forty percent were foreign.

The NPRA also states that tyres with hard rubber are popular among foreign transport companies, as they are cheap and hard-wearing. However, NPRA tests show that these tyres also require far longer braking distances on winter roads.[18]

10.2 Results from the accident analysis

Analysis of AAG-data of HGVs involved in fatal accidents in Norway 2010-13 indicate that there is no difference between foreign- and Norwegian-registered vehicles driven by professional drivers, according to whether they had ABS or ESC fitted.

[18] http://bil.aftenposten.no/bil/Derfor-kjorer-vogntogene-av-veien-15286.html

Only 6 out of 19 vehicles registered in another country, which were involved in fatal accidents and driven by a professional driver) were classified as "solid" for structural soundness, compared with 92 out of 183 vehicles registered in Norway. Again, these numbers are low, so we cannot draw solid conclusions about this difference.

Table 10.1 shows triggering vehicles of different types, according to whether they were driven by a Norwegian or foreign driver at the time of the accident. Here it can be seen that 11 triggering tractor-and-semitrailers were driven by foreign professional drivers, but only 10 were driven by Norwegian professional drivers (in the period 2010-2013). Thus, it seems that tractor and semitrailer is more prevalent among foreign HGV drivers in Norway. Nævestad et al (2014) also found this.

Table 10.1 Types of «triggering» vehicles driven by Norwegian and foreign professional drivers involved in fatal accidents on Norwegian roads between 2010 and 2013. Number of cases.

Triggering vehicle	Assumed Norwegian	Foreign	
		Based in Norway	Based outside of Norway
Vehicle over 3,5 t / lorry	14	2	-
Vehicle over 3,5 t / lorry with trailer	6	2	3
Tractor-and-semitrailer	10	6	5
Bus	11	3	2
Tram / van / farm tractor	14	-	-
Total	**55**	**13**	**10**

10.3 Results from interviews

The interviewees suggested that foreign HGVs are generally less suited to Norwegian roads, especially in the winter, as the majority of them are semi tractors with only two axles compares to Norwegian tractors with three axles. Three axles is a huge advantage when driving under winter conditions, because it allows the driver to lift the rear "boggi" axle of the tractor, for instance when driving uphill in order to put more weight on the drive axle and thereby get better grip (cf. Chapter 5.3.1). It was for instance mentioned that under winter conditions on some mountain passes, only HGVs with three axles are allowed, as they are less likely to "get stuck".

When it comes to the technical state of foreign HGVs versus Norwegian HGVs, interviewees' opinions diverged. Some stated NPRA inspections show that it is a myth that foreign HGVs are in a poor technical state compared to the Norwegian. Other interviewees suggested that it seems that foreign HGVs in average have a poorer standard than Norwegian HGVs. These stated that foreign HGVs are generally older, and it seems that there is less focus on maintenance of the vehicles in foreign transport companies, especially those located in the Eastern Europe. Norwegian HGVs are generally newer, with service deals. Moreover, it seems that the Norwegian HGVs are better equipped when it comes to driver assistance systems.

Some interviewees also stated that foreign drivers may seem to care less about warnings (e.g. warning lights in the truck dashboard) and technical errors with various systems. In heavy vehicle inspections, for instance, it is not unusual that inspectors first step into the truck to look for technical warning lights.

It was also suggested that the foreign HGVs generally have smaller engines than Norwegian. The Norwegian terrain is hillier than in other parts of Europe. With smaller engines, the foreign HGVs must use more motor power while driving uphill, perhaps going slower than other heavy vehicles would. The smaller engines also negatively influence the efficiency of the HGV's motor breaks. Because of smaller engines, it is more likely that the engines of these vehicles over heat while driving uphill, while the less efficient motor brakes may lead to overheating of brakes while driving downhill. This could increase the risk of vehicle fires, especially in sub-sea tunnels which Norway has more than thirty of.

In the reference group meeting it was suggested that the foreign drivers seem to do well given the negative descriptions often provided in the media. Considering the poor technical equipment that foreign drivers seem to have, these drivers may drive safer than assumed, participants suggested (cf. Chapter 4.3).

10.4 Results from the small-scale survey

Figure 10.1 shows the results of two statements on vehicle safety:

- There are regular safety check for vehicles in my company
- I am often stressed due to technical problems with my vehicle or other equipment

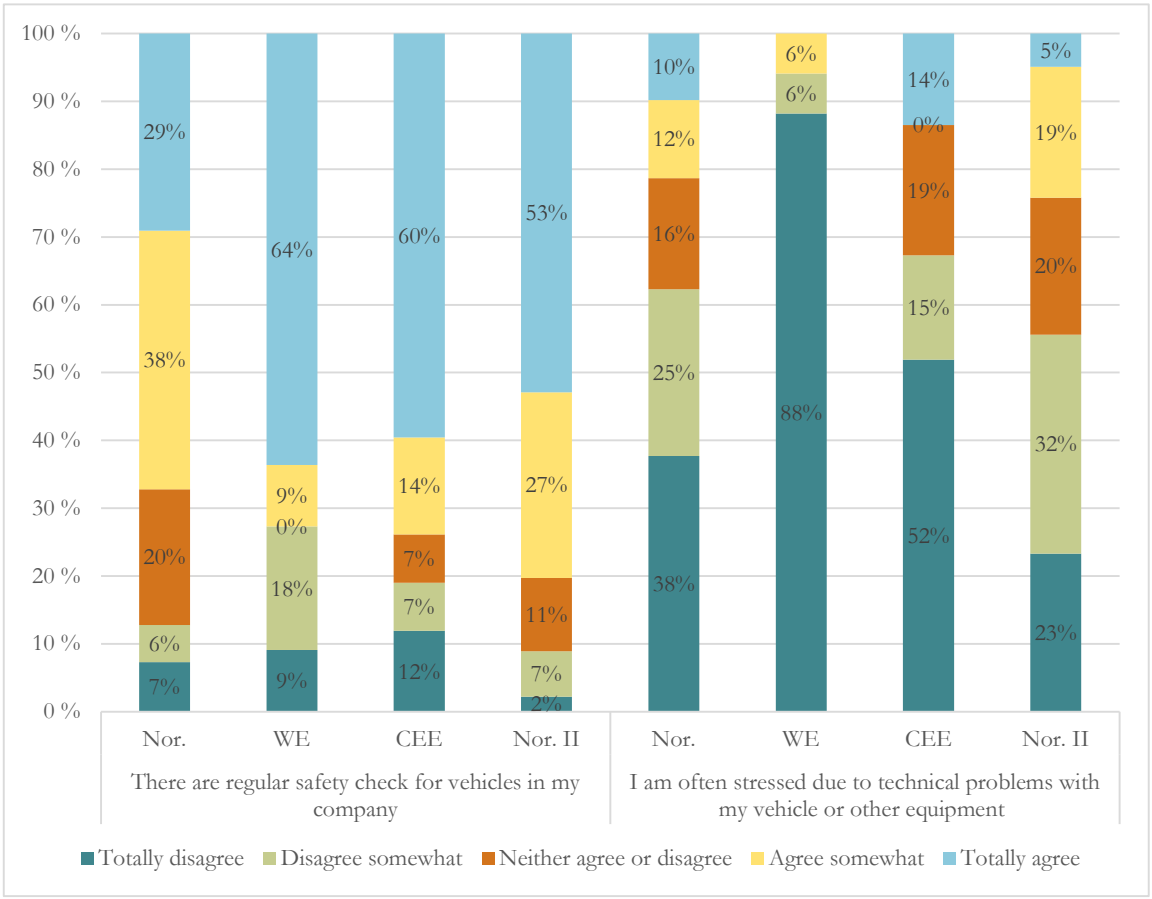


Figure 10.1 National groups' shares on two statements on vehicle safety. Per cent. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52).

The shares agreeing with the statement "There are regular safety checks for vehicles in my company" are fairly similar in the three groups that we primarily compare in this study, but the share of Norwegian drivers totally agreeing with the statement is only half the shares of the other two groups. A comparison of means shows that Norwegian drivers score 3.8, WE drivers score 4, while CEE drivers score 4 in average. An ANOVA analysis of variances shows that the differences are not statistically significant (P=0.601). Thus, we cannot conclude that there are differences between the groups when it comes to self-reported safety checks of vehicles. Finally, the shares agreeing with the statement and the mean score (4.2 points) in the Norwegian II sample were higher than those of the other groups.

Norwegian drivers have the highest share agreeing with the statement "I am often stressed due to technical problems with my vehicle or other equipment". A comparison of means shows that Norwegian drivers score 2.3, WE drivers score 1.2, while CEE drivers score 2 on average. An ANOVA analysis of variances shows that the differences are statistically significant at the 5 %-level (P=0.013). Thus, we may conclude that the Norwegian drivers' report more stress related to technical problems with their vehicles or equipment.

Finally, the share disagreeing with the statement (mean score 2.5 points) was lower in the Norwegian II sample than in the other groups, indicating that they are more stressed about technical problems with vehicle or other equipment than drivers in the other groups. This is surprising, as it is in spite of the above mentioned result that there were more safety checks of vehicles in the Norwegian II sample. This supports the conclusion that the Norwegian drivers' seem to be more stressed about technical problems with their vehicles or equipment than foreign drivers. It is difficult to explain why, as their vehicles seem to undergo the same number of, or slightly more vehicle safety checks. More research is needed. It must be noted that "regular safety checks" is a vague formulation that is open to interpretation, and that different national groups may interpret this in different manners. The same applies to "often stressed due to technical problems".

10.5 Results from the NPRA's HGV inspections

Below we present results from NPRA technical heavy vehicle inspections according to directive 2000/30EF in Norway for 2014 and 2015. The technical inspections according to directive 2000/30EF focus on vehicle identification, brake system, steering, vision, lights and el. system, axles, wheels, tyres, suspension, underbody and equipment, other equipment, and injury effects.

Figure 10.2 shows the per cent of reported deficiencies per inspections of 10 inspection points for national HGVs, HGVs registered in the EU and HGVs registered in a third country in 2014. It is important to note that the figure focuses on deficiencies per inspection point (e.g. brakes, steering) and not inspected vehicles. A vehicle inspection will include a given number of different inspection points.

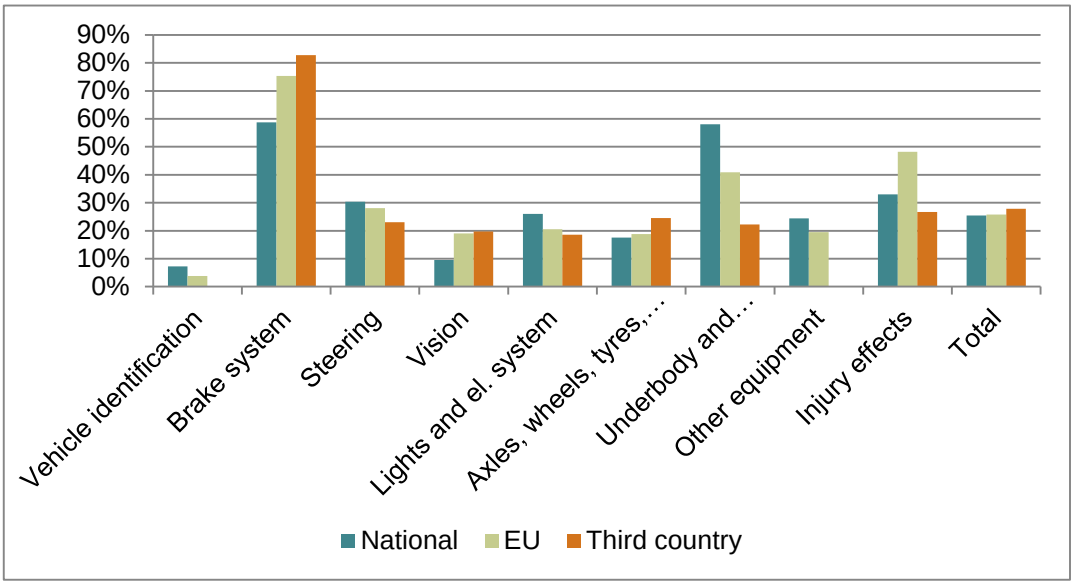


Figure 10.2 Results from the NPRA's technical heavy vehicle inspections according to directive 2000/30EF 2014. Per cent of reported deficiencies per inspections of 10 inspection points for national HGVs (N=61333 inspections of 10 inspection points), HGVs registered in the EU (N=47640 inspections of 10 inspection points) and HGVs registered in a third country (N=896 inspections of 10 inspection points) in 2014.

When we look at the total shares of reported deficiencies per inspected vehicles for the ten inspection points, the figure shows fairly similar shares for national HGVs, EU HGVs and HGVs from a third country, although the share for the latter group is slightly higher. National HGVs have fewer reported deficiencies per inspected vehicles than the other groups, but more reported deficiencies related to steering, lights and el. system and underbody and equipment.

Figure 10.3 shows the per cent of inspected vehicles with deficiencies in technical inspections according to directive 2000/30EF for the period 22.01-31.12.2015 for national HGVs, HGVs registered in the EU and HGVs registered in a third country.

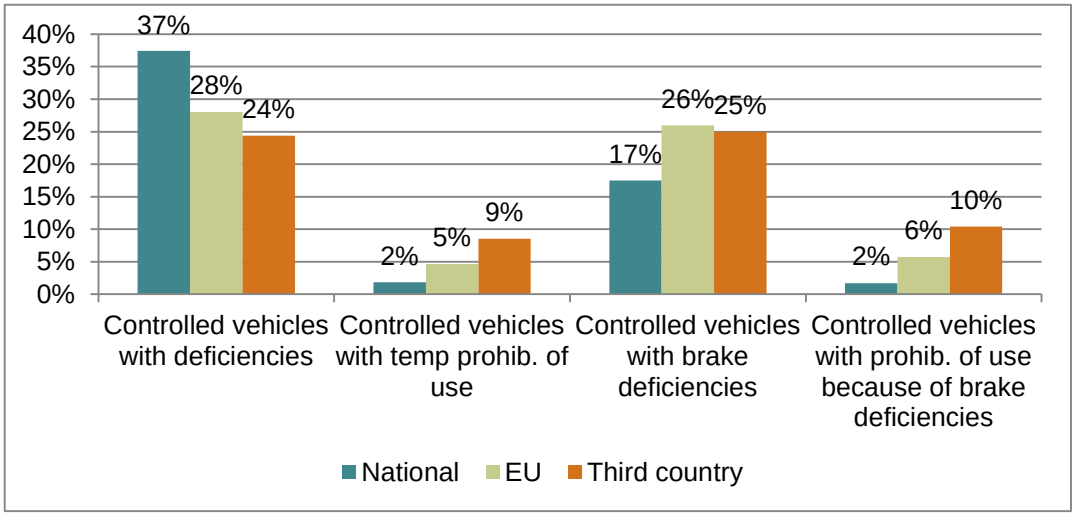


Figure 10.3 Per cent of inspected vehicles with deficiencies in technical inspections according to directive 2000/30EF for the period 22.01-31.12.2015 for national HGVs (N=14471), HGVs registered in the EU (N=9636) and HGVs registered in a third country (N=164). Per cent of inspected vehicles with brake deficiencies in technical inspections of brakes according to directive 2000/30EF for the period 22.01-31.12.2015 for national HGVs (N=3886), HGVs registered in the EU (N=2545) and HGVs registered in a third country (N=48).

The figure shows a higher share of inspected vehicles with deficiencies for Norwegian HGVs, but we see that the foreign HGVs have higher shares of inspected vehicles with temporary prohibition. This indicates a higher share of serious deficiencies in the foreign groups. We also see higher shares of vehicles with brake deficiencies in the two foreign groups and higher shares of inspected vehicles with prohibition of use because of brake deficiencies in the two foreign groups.

10.6 Summing up

According to the results of the literature review, interviews and the inspection results, it does not seem that lower technical standard of foreign HGVs constitutes an important risk factor related to internationalisation of road transport of goods. Nevertheless, interviewees suggested that foreign HGVs are generally less suited to Norwegian roads, especially in the winter, as the majority of them are semi tractors with only two axles compares to Norwegian tractors with three axles.

The analysis of fatal accident data indicates that only 6 out of 19 vehicles (1/3) registered in another country, which were driven by a professional driver and involved in a fatal accident were classified as "solid" for structural soundness, compared with 92 out of 183 vehicles (1/2) registered in Norway. Again, these numbers are low, so we cannot draw solid conclusions about this difference.

The NPRA inspection data for 2015 shows a higher share of inspected heavy vehicles with deficiencies for Norwegian heavy vehicles, but we see that the foreign heavy vehicles have higher shares of inspected vehicles with temporary prohibition of use.

The small-scale survey indicates that Norwegian drivers report to be more stressed because of technical problems with their vehicles or equipment than foreign drivers. It is difficult to explain why, as their vehicles seem to undergo the same number of or slightly more vehicle safety checks. Perhaps the groups' expectations of their vehicles are different. More research is needed.

11 Economy, competition and pay

11.1 Results from literature review

During the last three decades commercial transport has been economically deregulated in many countries, meaning that formal regulations limiting entry to the business have been removed (Elvik 2006). The main purpose of economically deregulating a business area is to stimulate competition. Even a deregulated transport sector will, however, normally be subject to a number of regulations concerning anti-trust laws, safety standards for vehicles, safety regulations for traffic operators and regulations of working conditions for employees (Elvik 2006). In general, safety regulations of a business remain in force even though the business is deregulated.

The European Union is founded on the principle of a European Single Market. The introduction of the new central and eastern European EU members states in the preceding decade put, however, pressure on this principle, as their labour costs on average are very low compared with the western European countries. The average hourly labour costs in Norway is for instance thirteen times that of Bulgaria (Eurostat 2013).

Competition is an important framework condition for HGV safety, although researchers may disagree on whether the consequences are positive, negative or neutral. In his meta-analysis, Elvik (2006) concludes that economic deregulation does not seem to influence transport safety negatively. The report of Alvarez-Tikkakoski et al concludes that economic downturn and harder competition in the Baltic Sea region has led to an improvement in the safety level of the haulage sector in the period 2007-2011. It is suggested that this is a result of economic and financial difficulties forcing the poorly performing operators to completely exit the market rather than just bend the safety rules and regulations of the industry. On the other hand, Johnsen, Lindstad and Nicolaisen (2002) argue that their literature review shows that hardened competition in the road sector has increased driver fatigue and stress.

The main limitation of Alvarez-Tikkakoski's study is that it primarily is based on 32 interviews, and the authors look at accident risk for HGVs in general, and do not discern between domestic and foreign hauliers. Thus, they are unable to conclude whether the improvements in the safety level of the Baltic Sea haulage sector in the period 2007-2011 is due to a larger or smaller share of foreign HGVs.

Pay systems is one of the safety relevant organizational features highlighted in both Nævestad & Phillips study of work related factors related to professional drivers triggering fatal accidents and Nævestad & Bjørnskau's (2014) study of three haulier companies with goods safety culture and safety performance. According to Steen Jensen et al. (2015), one in four HGV drivers do not have a fixed wage, and different forms of fixed wage combined with some form of bonus is more common among long-distance than among local delivery drivers. Interviewees in the former study argue that performance pay systems in the road transport sector for instance may increase drivers' stress, motivate them to speed, drive while fatigued, and thus be

negative to transport safety (Nævestad & Phillips 2013). More research is needed, however, to estimate the existence of performance pay and the consequences of this for safety.

11.2 Results from interviews

Some participants in the reference group suggested that a large proportion of foreign drivers are involved in pure commission driving, meaning that they do not get paid when they for various reasons have to stop, for example because of technical failure or incidents.

Interviewees also pointed to this, but underlined, however, that they do not know the prevalence of different pay systems among foreign drivers. Nevertheless, incidents for instance related to technical errors were mentioned, where foreign drivers are left to themselves, living in their trucks in Norwegian parking lots for several days. This seems to indicate that they are not paid unless they are driving on an assignment. It was also stated that foreign transport companies put more of the risk on their drivers, who are left to wait in their vehicles for several days if they do not have any assignments. In this manner, the employer will have the vehicles available whenever it is needed.

It was pointed out that commission salary can affect the driving behaviour in ways that do not favour traffic safety. If you are paid according to performance, you may be motivated to keep a high speed in order to get as much work done as possible and earn more money.

One of the interviewees suggested that flat wages without over-time pay is common in Norwegian goods transport, although the provision on working hours for drivers state that over-time work requires over-time pay, which is 40 % higher than the regular pay. The collective agreement coverage is low in goods transport, where only 15-20 % are members of unions, compared to 80 % in bus transport.

A generally applicable collective agreement for road goods transport was implemented in July, 2015. Such agreements ("allmenngjorte tariffavtaler") regulate pay and working conditions, and they apply to everyone who works in the specific sector, regardless of whether they are party to the agreement. The purpose of such agreements is to prevent foreign workers from being given poorer pay and working conditions than are usual in Norway.[19] According to the generally applicable collective agreement, all employees carrying out road goods transport (HGVs exceeding 3.5 tonnes), shall have a minimum hourly wage of NOK 158.32 (as of July 2015). For foreign drivers, this collective agreement only applies to those who perform cabotage or combined transports in Norway.

One of the interviewees stated that it will be interesting to see the consequence of this agreement, and whether transport buyers will use less foreign drivers when the prices for transport assignments are more similar. The pay of drivers may be difficult to control and enforce, but it is likely to have an impact.

[19] http://www.arbeidstilsynet.no/fakta.html?tid=240096

11.3 Results from the small-scale survey

11.3.1 Payment

We asked respondents two questions regarding their salary. The first was whether their payment is fixed, the other was «How many Euros do you earn in a month (included expenses for food and lodging)?"

Table 11.1 National groups' distributions on the question whether their payment is fixed. Per cent, and national groups responses to the question: «How many Euros do you earn in a month (included expenses for food and lodging)?" Mean number for each group, standard deviation and minimum and maximum.

Nationality	Has fixed payment	N	Euros per month	Std. dev.	Min	Max	N
Norwegian	42 %	61					
Western European country	55 %	17	3217	512	2500	4000	6
Central/Eastern European country	74 %	52	1654	643	1000	3000	37

We see that three quarters of the CEE drivers have a fixed payment. Fixed payment is more prevalent in both foreign groups of drivers compared with the Norwegian drivers in the sample. Previous research indicates that fixed payment is positive for safety, as performance pay systems may motivate drivers to drive faster in order to get more work done to increase their wages (cf. Nævestad & Phillips 2013). However, fixed payment may also mean "flat wage", as over-time pay does not seem to be prevalent in the haulier industry (Steen Jensen et al 2014). Research also indicates that HGV drivers work long hours (Phillips et al 2015). Future research could focus on this to shed light on the working conditions of HGV drivers.

Although answering the question on how many Euros they earn in a month was optional, a total of 43 foreign drivers answered this question. We see that the wages of WE drivers in average is the double of the salary of the drivers from CEE. It is also important to note the considerable difference between the minimum payments of the two groups.

11.4 Results from a survey of HGV drivers' wages

In 2014 (June 1.-3.) the Norwegian union for occupational drivers «Yrkestrafikkforbundet» (YTF) and the NPRA conducted a survey on HGV drivers' wages. A total of 500 long distance drivers answered the survey at Svinesund inspection station, which is located on the Norwegian border. The drivers were asked about their monthly wages and their working time. Both driver nationality and truck nationality were registered. The Institute of Transport Economics was granted access to the survey data and cooperated with YTF on analysing the results of the survey. Figure 11.2 shows how the average monthly wages of the drivers in the survey are distributed according to the nationality of the drivers and the trucks.

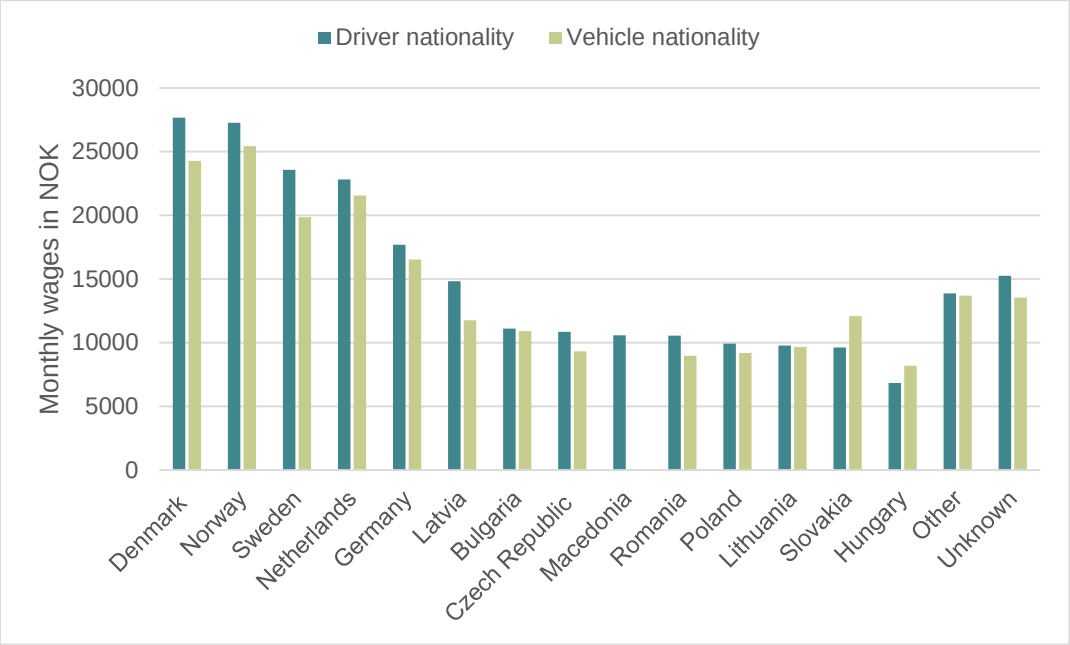


Figure 11.1. Average monthly wages in NOK, distributed according to driver and vehicle nationality. Source: YTF.

The figure indicates that the wage differences between the national groups are smaller than indicated by Eurostat (2013) numbers. Secondly, the figure shows that monthly wages based on vehicle nationality is lower than monthly wages based on driver nationality for all countries except for Slovakia and Hungary. This means that transport companies in nearly all countries hire drivers from countries with lower costs, and that these are paid less than drivers in the countries where they are hired.

11.5 Summing up

The literature review results diverge when it comes to the issue of whether and how competition may influence the safety level in HGV transport. Competition is an important framework condition for HGV safety, although researchers may disagree when it comes whether the consequences are positive, negative or neutral. Some researchers suggest that tight competition may drive the less safe actors out of business; while others conclude that it is the other way around. The most important framework condition influencing the competitive abilities of road transport companies is the level of wages. Previous research also indicates that performance pay for HGV drivers may be negative for transport safety.

Interviewees pointed to commission pay among foreign drivers and that this may be negative for transport safety, but underlined however that they do not know the prevalence of different pay systems among foreign drivers. It was also mentioned that foreign drivers do not seem to be paid for "down time", as they sometimes are left to themselves in Norwegian parking lots for longer periods. Results from the small-scale survey indicated that fixed payment is more prevalent in both foreign groups of drivers compared with the Norwegian drivers in the sample. The wages of WE drivers (3217 Euro) on average was the double the salary of the drivers from CEE (1654 Euro).

12 Working hours and fatigue

12.1 Results from literature review

A recent study of fatigue among transport operators shows that HGV drivers have long working days (Phillips, Sagberg & Bjørnskau 2015). In this study, HGV drivers reported an average work day lasting 10.6 hours. Many HGV drivers spend considerable time on physical tasks (e.g. loading/unloading) in addition to driving.

According to Steen Jensen et al. (2015) more than 40 % of Norwegian goods transport companies adjust working time of their employees depending on the contracts that they are working on. Moreover, widespread use of overtime establishes an impression of a business controlled by external actors/contract providers.

International research shows that between 36 and 64 % of professional drivers report having fallen asleep behind the wheel one time or another (Sagberg & Bjørnskau 2004: 2). The share is higher among professional drivers than among private drivers (23-52 %), as the former drive longer distances.

When asked if they have fallen asleep in the last 12 months, the share of private drivers answering "yes" varies internationally from between 8 and 29 %, while the shares of professional drivers are often higher (Sagberg & Bjørnskau 2004; Phillips & Sagberg, 2013). A Finnish survey (n=317 male drivers) showed that 40 % of long distance drivers reported dozing while driving at work in the past three months (DaCoTa, 2012).

Nordbakke (2004) found that 36 per cent of Norwegian professional drivers reported to have fallen asleep behind the wheel while driving at one time or another, while 16 % of the HGV drivers in the sample reported to have dozed off behind the wheel at least once during the preceding 12 months. This study included 1169 professional drivers (72 % bus and 28 % truck drivers).

Research seems to indicate that checks of driver compliance with rules on driver's hours influence drivers' compliance and thus their safety (Nævestad & Bjørnskau 2014). The companies in Nævestad & Bjørnskau's study oversee drivers' compliance with regulations relating to driving time and rest on a monthly or quarterly basis. Drivers must sign the output from their tachographs. Few of the drivers reported that they often violate regulations relating to driving time and rest. This could indicate that the companies' control of drivers' compliance with the rules is a purposeful way of controlling driving patterns and preventing violations. We do, however, not know if they have few violations because they are controller, or for other reasons. More research is needed on this issues, as we have not compared Norwegian and foreign companies' control of drivers' compliance with driver's hours.

12.2 Results from the accident analysis

12.2.1 Condition of the drivers triggering fatal accidents

In the analysis of AAG data of fatal road accidents, we compared the conditions of the drivers triggering the fatal accidents.

It is difficult to say whether the condition of the drivers at the time of the accident varies according to whether they are Norwegian or foreign, because of the low numbers that the shares in this variable are based on (Figure 12.1). However, as is the case for the Norwegian drivers, time pressure, stress and fatigue, seem to be the most usual "abnormal" conditions for foreign professional drivers involved in fatal accidents.

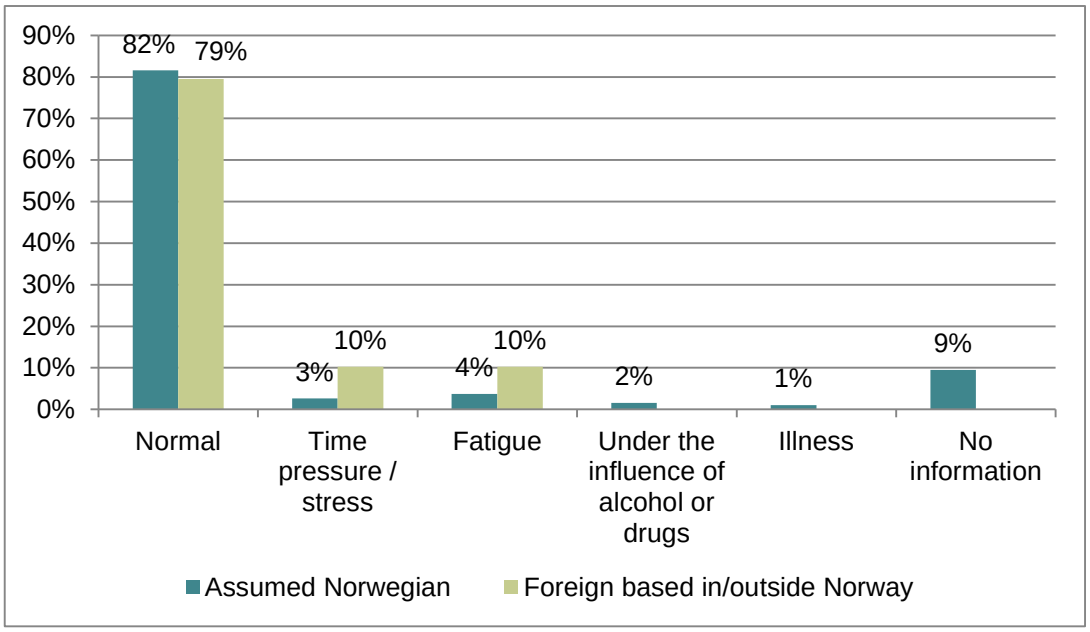


Figure 12.1 Share of professional drivers of different types involved in fatal accidents on Norwegian road between 2010 and 2013, according to their condition at the time of the accident.

Figure 12.1, indicates that fatigue and time pressure/stress is just as important, or more important in accidents triggered by foreign HGV drivers, as it is in accidents triggered by Norwegian drivers. Numbers are small, though.

12.2.2 Single vehicle accidents with personal injury

We have seen that foreign HGVs in general have a three times higher accident risk of single vehicle accidents than Norwegian HGVs. Single vehicle accidents is a special accident type, which often is related to a known set of causes. These accidents may typically be related to fatigue, falling asleep, distraction, too high speed for conditions, illness, intoxication and so forth. Figure 12.2 shows the light conditions (daylight or darkness with or without road lights) for single vehicle accidents with Norwegian and foreign HGVs involved in police reported traffic accidents with personal injury in Norway 2007-2012.

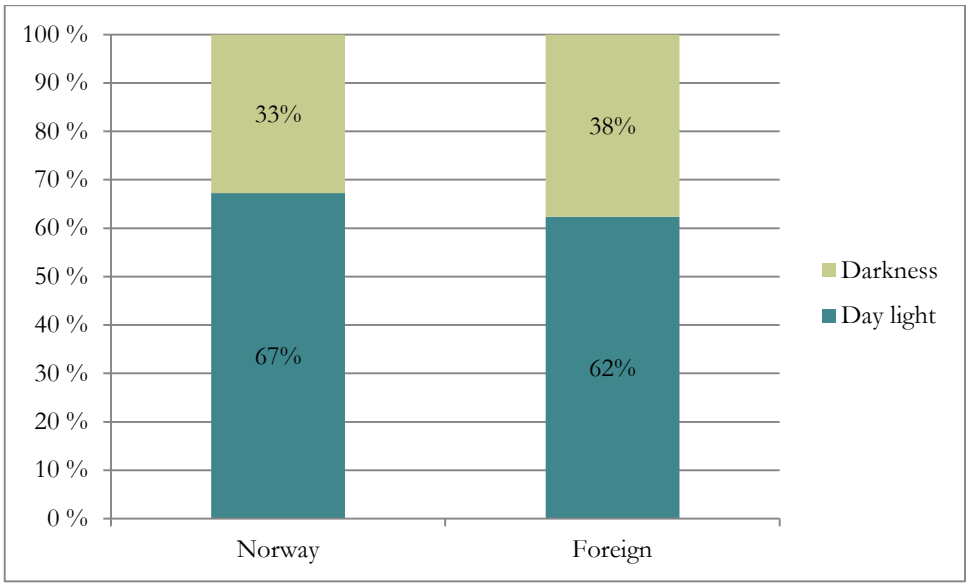


Figure 12.2 Light conditions for single vehicle accidents with Norwegian (N= 494) and foreign HGVs (N= 101) involved in police reported traffic accidents with personal injury in Norway 2007-2012.

The figure indicates that a somewhat larger proportion of the foreign HGVs in single vehicle accidents are involved in accidents when it is dark. This could indicate a higher share of fatigue related accidents in this group, or poor lights or that more foreign drivers have accidents in the winter when there is less hours of day light.

Figure 12.3 shows the time of day the accidents happened for single vehicle accidents with Norwegian and foreign HGVs involved in police reported traffic accidents with personal injury in Norway 2007-2012.

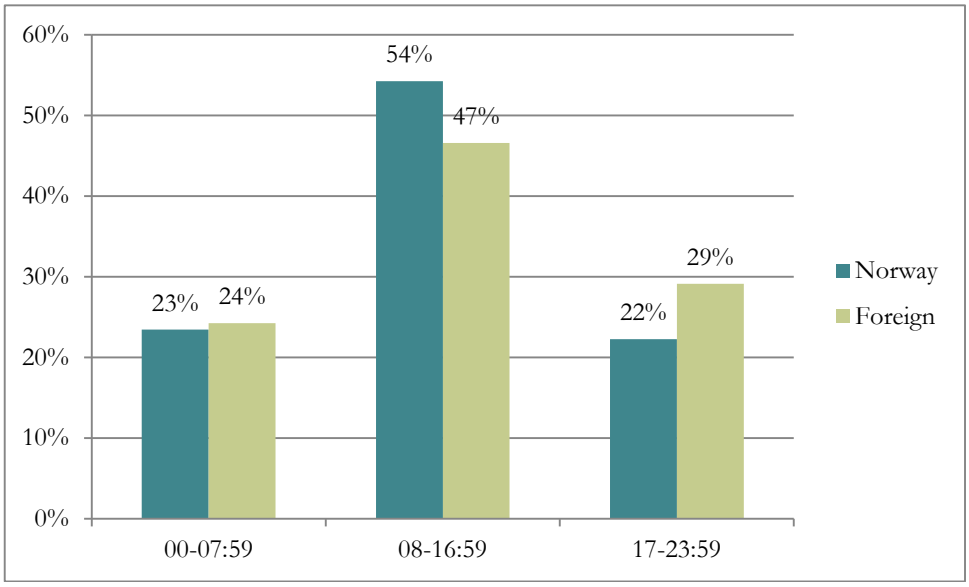


Figure 12.3 Time of day the accidents happened for single vehicle accidents with Norwegian (N= 507) and foreign HGVs (N= 103) involved in police reported traffic accidents with personal injury in Norway 2007-2012.

The figure indicates that the foreign HGVs involved in single vehicle accidents to a larger extent than the Norwegian HGVs in single vehicle accidents occur in between 17:00 and midnight.

12.3 Results from interviews

Compliance with rules on driving time and rest hours is regulated effectively and is relatively easy to control. Interviewees by and large agreed that they did not believe that there are notable difference between Norwegian and foreign compliance with these rules. One interviewee stated, however, that it seems that foreign drivers seem to be somewhat more inclined to violate rules on driving time and rest hours.

Foreign drivers are mainly engaged in long distance transport, and a possible risk factor that could lead to higher prevalence of fatigue among drivers involved in long distance transport is that if you follow slavishly the rules on driving time and rest hours while driving on an international transport over several days, you will drive through physiologically unfavourable times of day in order to maximize time spent driving.

This is provided that you take your required rests and maximize your opportunities to drive when the rules allow you to. Driving time and rest rules only require a certain number of rest hours and do not state when the rests should be taken. Thus, you may risk having to take your daily rest period in the middle of the day and drive in the night. Little is however known when it comes to how the foreign drivers solve this issue. One interviewee suggested that some foreign drivers may have a culture for driving in the day time while sleeping in the night.

12.4 Results from the small-scale survey

12.4.1 Working hours

We asked respondents three questions regarding their working hours:

- How many hours do you drive on a typical working day?
- How many hours do you work in total on a typical working day?
- How many hours do you expect to drive in total today?

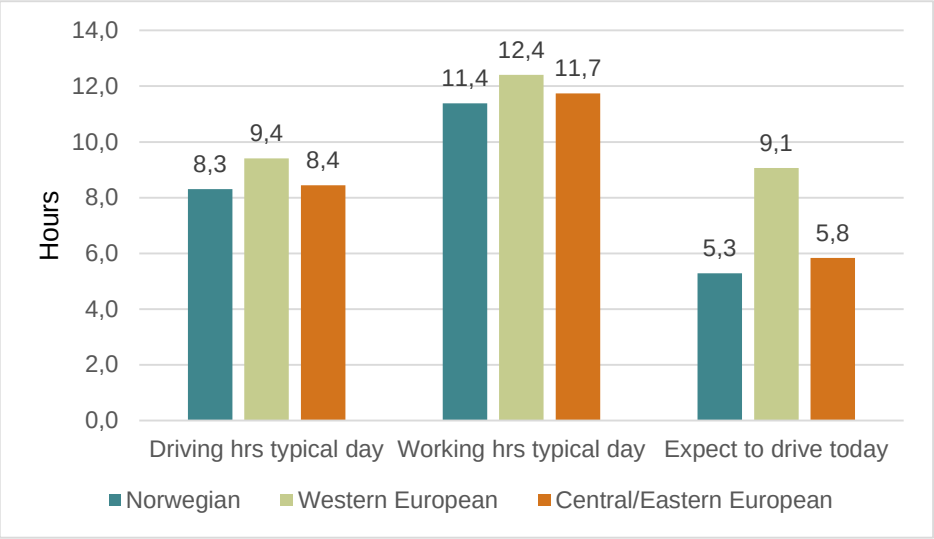


Figure 12.4 Average driving hours, working hours and expected driving hours on a typical day and «today». Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52).

The figure indicates the drivers from WE on average have longer driving and working hours than the other drivers, followed by drivers from CEE and Norway. The differences between the latter groups are, however, minor. An ANOVA analysis of variances shows that the differences between driving hours on a typical day are statistically significant at the 5 %-level (P=0.013).

The differences between working hours on a typical day are not statistically significant (P=0.737), nor are the differences between expected driving time "today" statistically significant (P=0.108). Thus, we may conclude that the figure shows that the HGV drivers in the sample typically work long days (11-12 hours) and that they typically drive 8-9 hours of these.

12.4.2 Falling asleep behind the wheel

Respondents were asked two questions on falling asleep and fatigued driving. The first question was: Have you ever fallen asleep (or dozed off for a short moment) driving a heavy vehicle? Figure 12.5 shows the share answering yes on this question and their average self-reported 1000 km's driven in the last two years.

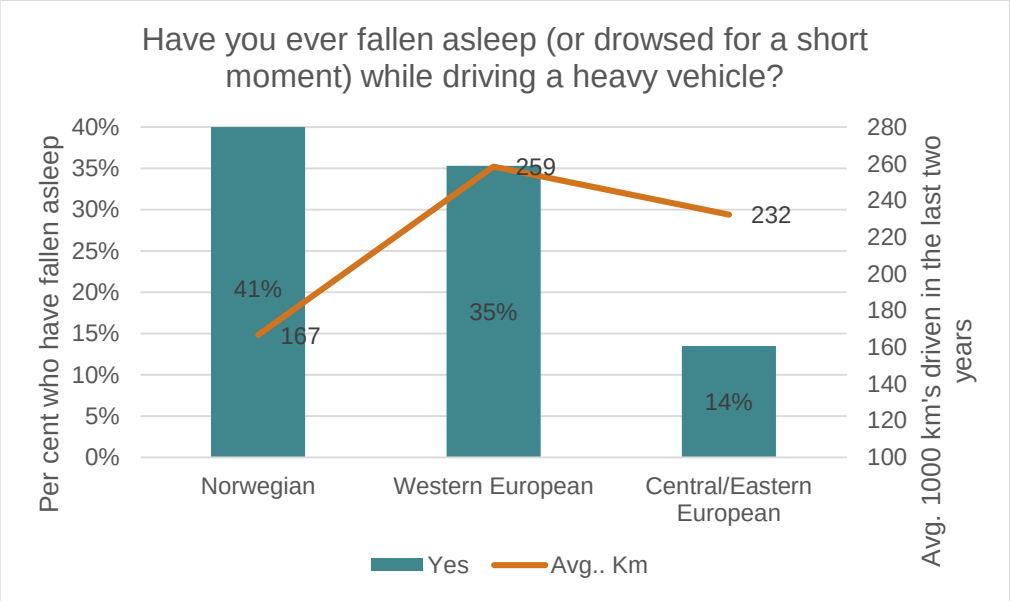


Figure 12.5 Shares answering that they have ever fallen asleep (or drowsed for a short moment) driving a heavy vehicle and average 1000 km's in the last two years. Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52).

The figure indicates that far less drivers from CEE have fallen asleep while driving a HGV in the last two years, although we have seen above that they work and drive as many hours as the two other groups. Although the Norwegian drivers drive far less per year than the CEE drivers (33 000 km's less on average per year), the Norwegian drivers report that they are nearly three times more likely to fall asleep while driving a heavy vehicle than the CEE drivers.

The results of the AAG-data, indicate that fatigue is just as important, or more important in accidents triggered by foreign HGV drivers, as it is in accidents triggered by Norwegian drivers. Moreover, the literature review indicated that 36 % of professional drivers report having ever fallen asleep (Nordbakke 2004). The shares

of the Norwegian drivers and the WE drivers are not far from 36 %, while the CEE share is one third of this.

This result is surprising, and hard to explain (cf. the discussion of reporting effects in chapter 16). We have also seen that the drivers in the three groups typically work long days (11-12 hours) and that they typically drive 8-9 hours of these. On this basis, it is difficult to understand why Norwegian drivers are 2.8 times more inclined to fall asleep. It must, however, be noted that the question states "have you ever", and that the Norwegian group have the highest share of drivers who are over 56 years old. It may also be that older drivers are more likely to nod off while driving, but probably not to the extent that the difference between the groups indicate.

12.4.3 Fatigued driving

Respondents were also asked whether they ever drive a heavy vehicle, even though they actually are too tired or unfit to drive. Figure 12.6 shows the share answering "No, never" on this question and their average working hours on a typical day.

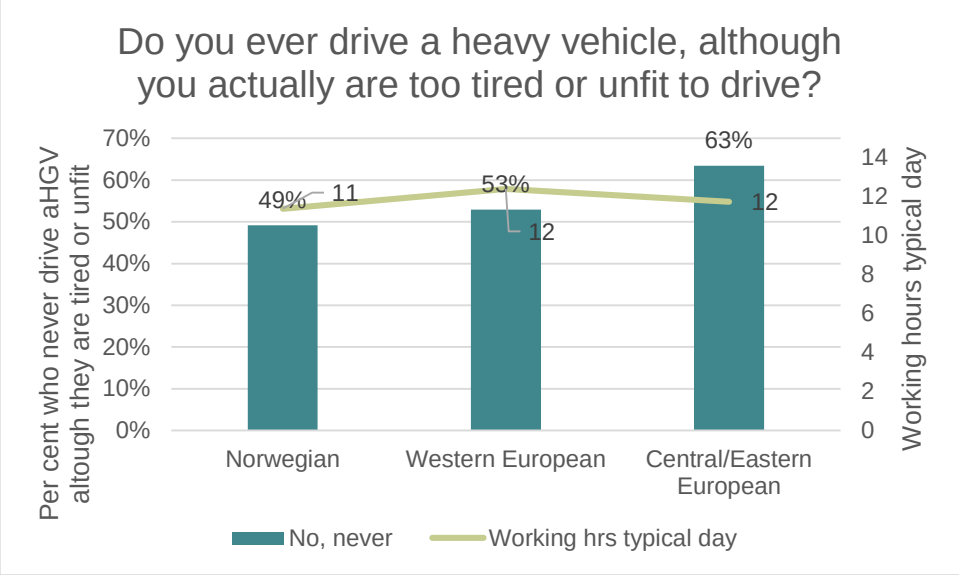


Figure 12.6 Shares answering "No, never", when asked "Do you ever drive a heavy vehicle, although you actually are too tired or unfit to drive". Norwegian (N=61), Western European country (N=17), Central/Eastern European country (N=52).

The figure shows that quite high shares of drivers in all groups report that they never drive a heavy vehicle if they are too tired or unfit. The definition of "tired or unfit" is however subjective, and open to interpretation. Nevertheless, the shares answering "no, never" are notable. We see that the Norwegian drivers have the lowest share answering "no, never", while the share of the CEE drivers answering "no never" is 14 percentage points higher than it is for the Norwegian drivers.

Thus, although the Norwegian drivers on average work one hour less than the CEE drivers, they are more likely to drive while fatigued. This result is unexpected and hard to explain. We return to this in chapter 16, where we discuss six potential explanations to what seems to be reporting effects in the small-scale survey. Moreover, perhaps "too tired" and "unfit to drive" are subjective definitions that may vary systematically between national groups and thus be vulnerable to such reporting effects.

We also asked why drivers choose to drive although they may be too tired or unfit. The answers were not mutually exclusive, so the shares were calculated on the basis of the total number of reasons given by respondents in each group.

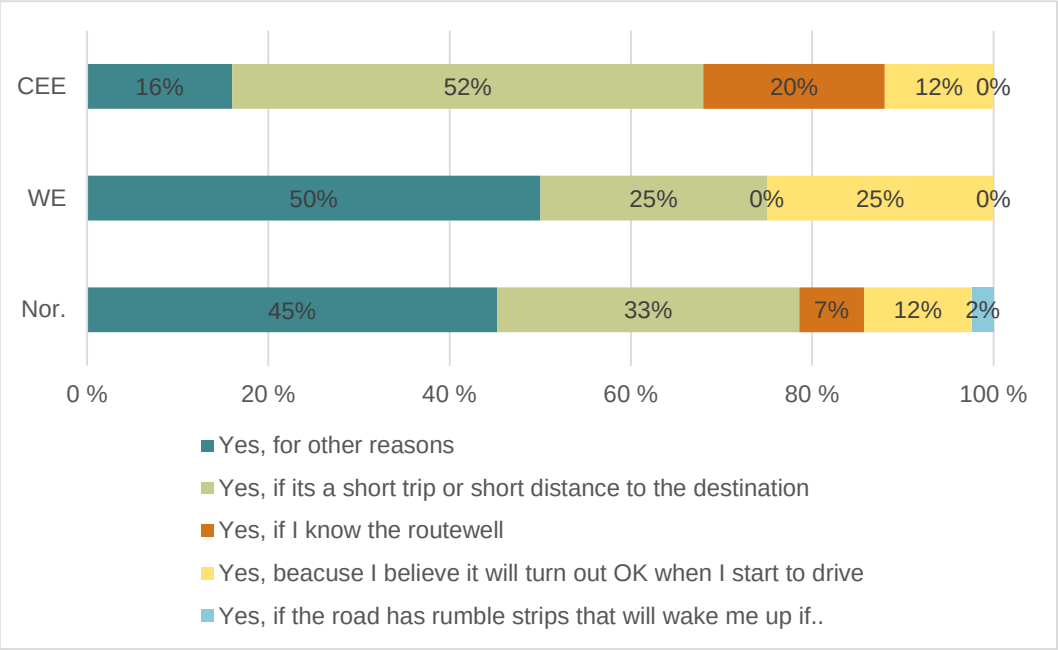


Figure 12.7 Shares of reasons why drivers choose to drive although they may be too tired or unfit. Shares are based on the numbers of reasons given in each group. Reasons were not mutually exclusive. Norwegian (N=42), Western European country (N=8), Central/Eastern European country (N=25).

The main reason given, both for Norwegian drivers and drivers from WE is "other reasons". The second most prevalent reason given in these two groups is "If it's a short trip, or short distance to the destination". The latter is the most prevalent reason given by drivers from CEE. Delivery deadlines and time pressure was unfortunately not included as an answer alternative.

Sleep and fatigued driving is closely related to the quantity and quality of rest stops in Norway. We therefore asked the respondents what they think about rest stops in Norway.

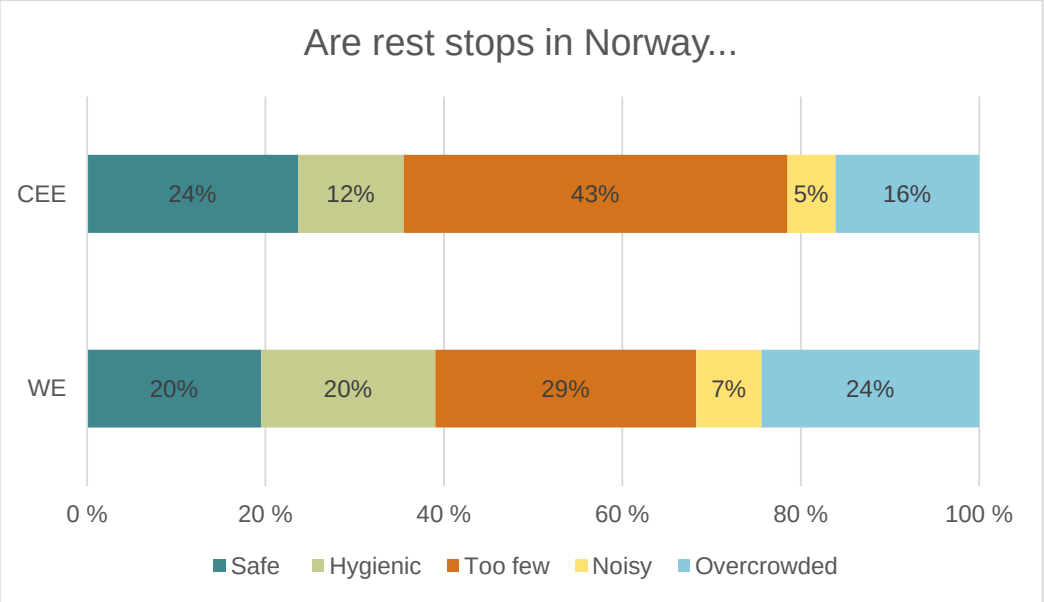


Figure 12.8 Shares of respondents key words when describing rest stops in Norway. Shares are based on the numbers descriptions used in each group. Reasons were not mutually exclusive. Western European country (N=41), Central/Eastern European country (N=93).

The most prevalent description is "too few". Several respondents also used the key word "overcrowded". Thus, the results indicate that the quantity of rest stops is too low. When it comes to the quality of rest stops, we see that a about forty per cent of the respondents describe them as safe and hygienic. A few describe them as noisy.

12.4.4 NPRA driver hour inspections

Figure 12.9 presents the results of inspections of driver's hours for Norwegian drivers, EU/EEA drivers and other drivers.

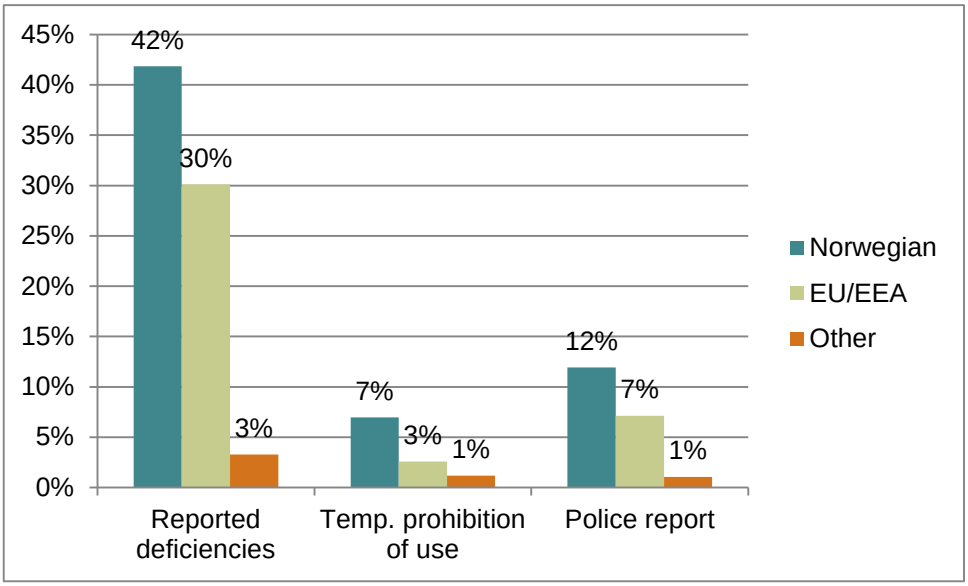


Figure 12.9 Results from the NPRA's heavy vehicle inspections, 2015 (Jan. 22.-Dec. 31.) Controls of driver's hours for Norwegian drivers (N=5823), EU/EEA drivers (N=3944) and other drivers (N=673).

The figure indicates a higher share of violations on driver's hour legislation among Norwegian drivers than among EU/EEA drivers and other drivers. Thus, these results seem to support the self-reported data (from 2014) presented above. It is important to note that the three first weeks of 2015 are missing in the data presented in this figure. It has also been noted that in the cases where severe violations have been detected, the foreign drivers' violations seem to be more severe, although they have fewer violations overall.

12.5 Summing up

The literature review shows that HGV drivers have long working days (average of 10.6 hours), and that many HGV drivers spend considerable time on physical tasks (e.g. loading/unloading) in addition to driving. International research shows that between 36 % and 64 % of professional drivers report to have fallen asleep behind the wheel at one time or another. A previous Norwegian study found that 36 per cent of professional drivers reported to have fallen asleep behind the wheel while driving at one time or another, while 16 % reported to have dozed off behind the wheel at least once during the preceding 12 months.

The analysis of fatal accident data indicates that when it comes to condition of the drivers at the time of the accident, time pressure, stress and fatigue, seem to be the most usual "abnormal" conditions for foreign professional drivers involved in fatal accidents, just as is the case for the Norwegian drivers. Fatigue and time pressure/stress is just as important, or more important in accidents triggered by foreign HGV drivers, as it is in accidents triggered by Norwegian drivers.

The results of the small-scale survey indicate that the HGV drivers in the sample typically work long days (11-12 hours) and that they typically drive 8-9 hours of these. It is therefore surprising that the Norwegian drivers are 2.8 times more likely to fall asleep while driving a heavy vehicle than the CEE drivers, although they work and drive as many hours as the two other groups. Moreover, the shares of the Norwegian drivers and the WE drivers who report to have fallen asleep behind the wheel are fairly similar to those reported in previous research. The share of CEE drivers who report to have fallen asleep is, however, only one third of this (14 %).

Although the NPRA inspection data indicates a higher share of violations on driver's hour legislation among Norwegian drivers than among EU/EEA drivers and other drivers in 2015, this result is surprising (the survey was conducted in 2014). This might indicate that CEE drivers under-report how often they have fallen asleep behind the wheel. Additionally, when we ask respondents whether they ever drive a heavy vehicle, although they actually are too tired or unfit to drive, results indicate that Norwegian drivers are more likely to drive while fatigued than CEE drivers, although they on average work one hour less per day than the CEE drivers and drive several hours less per day.

13 Road and road environment

13.1 Results from literature review

Yannis et al (2007) estimates and compares the accident risk of foreign and domestic passenger car drivers in various road environments in Greece. This study reports that different road environments influence the risks of the national groups differently. Because the risk factors of different groups of foreign drivers were diverse, different national groups of foreign drivers require different safety interventions. One of the interventions (directed to EU nationals who are tourists and visitors in Greece) that Yannis et al suggest is to improve the road infrastructure, signing, and signalization, especially in and around the most popular tourist destinations, as well as in the entire main interurban road network.

Foreign drivers are more vulnerable than domestic drivers, as they are unfamiliar with the existing road environment. Thus, by providing a more self-explanatory as well as forgiving road environment, this risk factor can be reduced. This suggestion is also relevant to Danton et al's (2009) study of foreign drivers in Britain, as it is likely that these drivers face a left-hand driving road environment that is very different from what they are accustomed to and what their HGVs are designed for.

In Chapter 5.1 we suggested that it seems that parts of the Norwegian road network is especially demanding for foreign drivers. The reason is that previous research (Nævestad et al 2014) indicates that HGVs from non-Scandinavian countries have a three times higher accident risk than Scandinavian vehicles in the western, central and northern regions of Norway. We have not conducted a systematic analysis to examine why roads in these regions are more demanding for foreign drivers. However, compared with roads on the European continent, the roads in these regions generally have less traffic and a poorer standard. It is likely that these roads are more demanding for foreign HGV drivers because they are narrower, have more (tight) curves and because they are more hilly than roads that foreign HGV drivers are accustomed to. Under winter conditions, it is even more demanding for foreign HGV drivers to drive on these roads.

These road conditions may help explaining why foreign drivers have a three times higher risk of single vehicle accidents than Norwegian HGV drivers (cf. Chapter 3.3). As noted in Chapter 5, driving safely with HGVs on roads that are narrow, hilly, have many curves and which perhaps also are slippery requires a certain competence and experience. Our accident analyses indicate that Norwegian HGV drivers to a greater extent than foreign drivers have this experience and competence. Perhaps foreign HGV drivers who drive in Norway for several years also will acquire this experience and competence, and that the difference in risk between the groups will be smaller in the future? As long as new foreign HGV drivers come to Norway, however, it is likely that the Norwegian road conditions will constitute a risk factors, as these conditions seem to be more demanding for foreign drivers. More research is needed on these issues.

Summing up ten years' experience of the Norwegian Accident Investigation Board for road transport (AIBN), Mellum (2015) shows that 42 % of the 118 safety recommendations issued in the AIBN reports concern road characteristics. Some of these recommendations concern winter maintenance of roads, and measures that could make roads more predictable and self-explanatory for foreign drivers of heavy vehicles.

13.2 Results from interviews

The road and road environment was also mentioned as a risk factor related to foreign drivers in the interviews. Foreign drivers are more vulnerable than domestic drivers, as they are unfamiliar with the existing road environment. By providing a more self-explanatory as well as forgiving road environment, this risk factor can be reduced.

Interviewees stated that the Norwegian terrain is challenging to drive in, because it is hilly, and have many roads with poorer standards than on the European continent. Thus, Norwegian roads may come as a surprise to foreign drivers. Driving in hilly terrain requires a lot of driver competence and experience, for instance related to using motor brakes, retarder, and adaptation of speed.

Being foreign to the Norwegian road conditions, with varying standards and sometimes poor roads, is a disadvantage in itself, because you do not know what to expect, and how to adapt your driving to the conditions. One interviewee stated that Norwegian drivers have more experience with varying road conditions on Norwegian roads, for instance related to curves, and other aspects of road standard. Norwegian drivers may predict variations more easily, adapt their speed and there is therefore less chance that they are surprised by the road characteristics. Some interviewees also suggested that a lot has been done to improve vehicle safety, and that it is time to start looking more at the road maintenance in order to improve HGV safety.

In the reference group meeting, it was mentioned that Norwegian and foreign registered HGVs probably drive on different roads and road-environments, and that this probably influence their accident risk. The foreign registered HGVs mostly drive long distance transports (international assignments), while the Norwegian drivers have a higher share of the HGV kilometres in urban areas with risk of accidents involving material damages. The accident risk of HGVs varies dependent on vehicle type and road type, and if foreign HGVs drive longer distances on high quality roads, we may underestimate their accident risk when we compare them with Norwegian HGVs that have more kilometres in urban areas.

There were unfortunately no questions in the small-scale survey about road conditions.

14 Rules and enforcement

14.1 Results from literature review

The 2009 regulation of road cabotage was introduced as the previous EU Council regulations of cabotage were considered too vague and ambiguous. The preceding Council Regulation from 1993 states for instance that foreign hauliers may operate national road haulage services in another member state, on a "temporary basis" (Council Regulation 3118/93). However, distinguishing between temporary and permanent transport services was not easy in practice, as precise definitions were missing (ECORYS 2006). Moreover, because of its vague formulation, the preceding cabotage regulation was very difficult to enforce in the member countries (ECORYS 2006). Although the new cabotage regulation is clearer than the former, the EU-member states choose somewhat different approaches when it comes to the implementation and enforcement of the regulation (European Parliament 2013). Moreover, Sternberg (2013) concludes that the new directive 1072/2009 has created a considerable grey zone concerning cabotage, which are exploited by foreign hauliers.

Rules and regulations are a crucial framework condition for transport safety, as they set minimum safety standards. The enforcement of these rules is just as important. EU-Regulation (EC) 1072/2009 is interpreted and enforced differently in different EU countries (European Parliament 2013, Policy Research 2013, Sternberg 2013, Steen Jensen 2014).

Moreover, discussing enforcement directed against foreign lorry drivers in Norway, Safetec (2011) states that it is problematic to enforce payment from foreign drivers and foreign transport companies. Thus, this important risk group face few consequences when they fail to adhere to safety rules. This challenge has also been mentioned by interviewees in a study of fatal accidents triggered by professional drivers in Norway (Nævestad & Phillips 2013), and in foreign studies of foreign drivers involved in cabotage transport (Policy Research 2013).

Research also indicates that there seems to be a potential for improvement when it comes to following up work related risk factors in authority inspections. The majority of the interviewees in Nævestad & Phillips's (2013) study held that work related factors with potential implications for traffic safety are insufficiently monitored in inspections. We expand further on these issues below, in our discussion of measures.

14.2 Results from interviews

All interviewees agreed that Norwegian authorities' enforcement of compliance by foreign drivers seem to be effective and that it seems that the inspections are equally effective for Norwegian and foreign drivers. The situation has improved in recent years, as this has become a politically prioritized issue for the minister of transport and communications. Toll tags have become mandatory, the NPRA may use wheel locks and has been given an increased authority to impound vehicles violating traffic rules. Interviewees also had the impression that foreign companies receive large fines for severe violations. They stated however that the quality of the cooperation between the NPRA and the police seems to vary between Norwegian regions.

NPRA inspection results seem to indicate that the inspections are effective, as the number of reported deficiencies have been reduced. The most severe violations are found among the foreign drivers, for instance manipulating the tachograph with magnets (which also puts the motor brakes out of function) and using the driver's licenses of other people. But apart from this, the number of reported deficiencies among foreign drivers is fairly similar among Norwegian and foreign drivers.

14.3 Results from field-work at a heavy vehicle inspection station

14.3.1 Norwegian Public Roads Administration

Three researchers from the Institute of Transport Economics participated in a heavy vehicle inspection in June, 2014 at a Norwegian Public Roads Administration (NPRA) inspection site in the east of Norway. Merethe Dotterud Leiren had been invited by the NPRA and the Labour Inspection Authority (LIA) who were having a joint inspection of both Norwegian and foreign heavy vehicles. The inspection site was a permanent inspection station. Two of the researchers spent the whole day at the inspection site. The researchers followed the inspection personnel in their inspections, and talked to both the inspectors and the drivers throughout the day. The current description of the field work is primarily based on Tor-Olav Nævestad's interpretations. It has been read and commented by the other researchers who were present.

The inspection was mainly organized by the NPRA, but LIA inspectors were also participating. Four NPRA inspectors were present and two LIA inspectors. The day started with a meeting with the inspectors, where we presented ourselves, discussed our research projects and the themes that we were interested in. Detailed field notes were written at the end of the day, and researchers checked and commented on each-others notes.

The NPRA inspection personnel focused on inspecting transport documents and potential illegal cabotage of foreign drivers, the weight of the heavy vehicles (over load), the technical state of vehicles, driver's licenses, and compliance with driving and rest rules. It was interesting to see how easy it was to check compliance with driving and rest rules compared to the inspection of illegal cabotage. Checking compliance with driving and rest rules first required the inspector to press a button on the digital tachograph and read the printout for the current day. Based on this sample, the inspector chose whether he should download all the data from the digital

tachograph or not. Downloading and analysing the data by means of a special software would take about fifteen minutes. The inspection of illegal cabotage, on the other hand, required the inspector to gather several documents, interpret them and perhaps make phone calls to managers, forwarders, transport owners and so forth. The latter process could last throughout the day.

When the NPRA inspectors start their controls, they activate a "heavy vehicle control sign" which is placed alongside the nearby motor road. The sign tells the drivers to drive onto a ramp in order to approach the inspection station. They cannot have the inspection signs on all of the time, because this will create very long queues. The signs are therefore only activated for limited periods. The inspectors see the vehicles approaching the signs through a camera, and they may also turn on the sign if they want to inspect a particular vehicle. Sometimes drivers may ignore the signs, and this may lead to a pursuit of the heavy vehicle drivers. This was observed in a previous visit to the inspection station. In this case a HGV driver ignored a stop sign and was followed and stopped by the inspection leader.

When we sat and watched the camera of the activated inspection sign and the vehicles approaching it, it was remarkable to see that after a while, no heavy vehicles approached the sign. We were told that this was not uncommon, that the heavy vehicle drivers sometimes were alerted by other drivers (e.g. in Facebook groups). We were also told that sometimes, the NPRA identify the place where the heavy vehicle drivers have stopped to avoid the inspection, and then carry out their inspections there instead. Another strategy sometimes used by the inspection personnel is to activate the inspection sign and to let all the vehicles who enter the inspection site pass, and just inspection the vehicles trying to avoid the control by ignoring the sign. This is done by establishing the "real inspection site" some place after the inspection sign. In this manner, the inspection will only include the drivers who miss or pretend to miss the inspection sign. This is an interesting inspection strategy that is likely to be effective, as it is directed to those who for some reason seek to avoid being inspected.

14.3.2 Labour Inspection Authority

We were told beforehand that the Labour Inspection Authority mainly performs two types of inspections aimed at the transport sector, and that these usually are conducted in cooperation with the NPRA. The first type of inspection, which is conducted on traffic inspection stations, is a fairly simple inspection focusing on the technical equipment of the vehicle and extended constructions on the vehicles (e.g. lifting equipment like cranes). The inspection focuses on verifying that the equipment has the documentation required by the law, that the equipment is certified, has been subject to periodic inspections and that it is documented that drivers have been trained in maintenance and use of the equipment.

Additionally, in such inspections, LIA inspectors also ask the driver whether he has a written work contract, a safety representative in their company, company health service, work schedules, recording of working hours, overtime pay and so forth. Often the driver is unable to answer many of these questions, and when LIA inspectors meet drivers who are self-employed, they are not asked these work related questions, as the questions are aimed at employees.

The other types of LIA inspections are company visits, which usually are reported in advance. This inspection, which is done together with the NPRA, usually involves

one or two people from LIA and two or three from the NPRA. In these inspections the LIA asks that relevant documentation of work conditions are submitted, e.g. internal control documentation, work contracts, safety representatives, company health service. They also ask about performance pay, pressure from customers, documentation of adherence to driving and rest rules, documentation of working hours and lists of pay checks. In these inspections, the inspectors go through the documentation together with the company representatives. These inspections usually last for one and a half day.

14.3.3 Some of the drivers who were inspected that day

In the following, we will give a few examples of some of the drivers who were inspected on the day of the field work. The examples are chosen randomly, based on the inspections that we observed. We only observed a few of the inspections that were conducted that day. We cannot use the examples to draw conclusions about differences between Norwegian and foreign drivers. Moreover, the description is primarily based on Tor-Olav Nævestad's interpretation of what went on that day, and it may therefore be incomplete.

When we got to the inspection station, we saw a lot of heavy vehicles with drivers who were using the inspection station as a resting area. We were told that the area could be crowded, especially on Sundays. We also saw two foreign drivers who had been there for two days, waiting in their vehicles for their managers to transfer money to pay their fines and send documents to the inspection station. We return to these below, but first we will mention some of the drivers who were inspected on the day of our field work.

Foreign driver sanctioned for illegal cabotage

One of the first foreign drivers that we met during the inspection was a young Macedonian driver who was sanctioned for illegal cabotage. According to procedures, the inspector first checked his compliance with driving and rest rules by pressing a button on his tachograph and reading the printout for the current day. This check was easily done, and as the sample indicated that the driver had not violated these rules.

In contrast the inspection of whether the driver had been involved in illegal cabotage lasted most of the day. The driver did not speak much English, and when he was asked to show the papers on his transport assignments in Norway, he first showed one CMR document.[20] Then, half an hour later, he showed more documents. He looked sad and walked nervously around his car. It seemed very difficult to get in contact with this driver.

Typically, when the drivers' vehicles were held up like this, the first thing they did was to go and fill their bottles of fresh water. Then it seemed that they often waited in their vehicles to see what happened next.

After a few of hours, the driver suddenly showed a quite complete list of all the trips and assignments that he had carried out in Norway. This was surprising for the

[20] "CMR" is an abbreviation of the French title of the 1956 UN convention: "Convention on the Contract for the International Carriage of Goods by Road". (In French: "**C**onvention relative au contrat de transport international de **m**archandises par **r**oute.")

inspectors, as he first seemed to have few or no transport documents, and as he seemed to be unable to understand what the inspectors wanted from him.

At the end of the day, the driver was sanctioned for illegal cabotage, because he could not verify when he had entered Norway with his truck. I did unfortunately not register how he was sanctioned. Nevertheless, it was very interesting to see the inspector's process of determining whether the driver had been involved in illegal cabotage. This process lasted most of the day. First, the inspector waited for the driver to show him the documents. When he did, the inspector spent several hours reading and interpreting the documents, and making phone calls in order to make sense of the number of trips the driver had undertaken in Norway and for how long he had been here. (It was for instance obviously difficult to determine when a trip starts and ends.) This driver had picked up cargo several different places throughout his stay in Norway, and with all his stops along the road, it was difficult to determine when the distribution of his load and his transport assignment actually ended.

The crucial point was however that the inspector was unable to determine exactly when he had entered Norway, and thus whether he had been taking more than three assignments within Norway for more than seven calendar days. Moreover, communicating with the driver was difficult, because of language barriers. Thus, given the fact that he was unable or unwilling to say when he had entered the country, although he was able to give good documentation of other trips within Norway, this seemed for the inspectors to be illegal cabotage. The inspectors stated that the driver had a CMR document for his first transport into Norway. This was issued in Denmark, with a date for the loading time, but the document lacked a date for delivery in Norway. Although this driver seemed to comply with the cabotage rules when it comes to the number of trips after his international transport, he was sanctioned for illegal cabotage because his CMR document lacked a date for the delivery in Norway.

In conclusion, it was interesting to see how difficult and time consuming it was to define illegal cabotage, especially compared with the inspection of compliance with driving and rest rules. The latter only required pressing a button and looking at the sample printout for the current day. If the inspector chose to download and analyse all the data on the digital tachograph, it would take him about fifteen minutes. Defining illegal cabotage, on the other hand, was more time consuming. It was interesting to see how the driver gradually showed more and more documents. It is hard to tell whether this was done strategically, or just because the driver lacked control over his documents. The inspectors stated that both these scenarios happened in their work. Sometimes drivers could use crucial transport documents to write notes on for instance, and thus perhaps by chance the inspectors would see them.

Nevertheless, the difference between the tachograph inspection and the illegal cabotage inspection suggests that it would be very effective to introduce an electronic registration of all foreign drivers' assignments in Norway, documenting when they enter, for how long they stay, the assignments they undertake and when they leave. This would save a lot of time for the inspectors, and make them better suited to also conduct other tasks in their work.

Foreign HGV with a crashed front

Later a Bulgarian driver with half the front of the truck crashed and a cracked front window came. It was evident that the truck recently had been involved in an accident. The Bulgarian driver of the truck transported goods that was supposed to have been delivered nearby, but when he approached the terminal, he was refused entry because of the poor state of his vehicle. The personnel at the terminal were afraid that the vehicle was unsafe for traffic, I was told later. Thus they called the police, and the driver was escorted by the police to the control station. The driver also had a friend or a co-driver with him in the car.

Neither the driver or his friend spoke English at first, and it was difficult for the inspectors to communicate with the driver. When he was asked about the accident, the driver was unable to answer exactly when it had happened. The accident had happened somewhere close to Gothenburg, either the day before or the same day, he said. And he said that he had driven into a machine that was used in road construction work.

After a while, when the driver realized that he was unable to proceed unless he communicated with the inspectors, his English communication skills suddenly improved, and he was able to communicate better with the inspectors. The inspectors stated that this was not unusual.

The driver was clearly stressed, and he said that as he was refused to enter the terminal, he was on his way to get his truck fixed at a HGV garage nearby. In the course of the day, the inspector called his boss and the company who owned his cargo. This was also common procedure among the inspectors. Additionally, the inspector took a picture of the truck and e-mailed it to the driver's boss. At first, the boss had told the driver to carry on, but when the boss saw the picture of the truck, he got angry. This could perhaps indicate that the driver had under communicated the extent of the damage when he first spoke to him about the accident and the vehicle damage. I do not know what happened to this driver, but he stayed there most of the day, and it is unlikely that he was allowed to continue.

Foreign HGV with a crashed trailer

Later that day, I observed a inspection of a Swedish driver who drove a trailer that was severely crashed on the right side. Sharp parts were sticking out and the side of the trailer, which had traces of dirt and moss, indicating that it had been sliding on the ground. He was held back by the inspector, as the trailer was too wide because of the damages, and because sharp objects stuck out from the side of the trailer. The inspectors said that he could injure for instance pedestrians in case of an accident. The driver was angry, and said that he was not going to drive on any road with pedestrians. It seems that this trailer had been involved in a capsize somewhere on a mountain road, and that the driver had picked it up to transport it to a work shop where it would be repaired. There was quite a bit of moss in the trailer door, indicating the capsize. I do not know whether he removed the sharp objects and was allowed to continue.

Norwegian driver with poorly secured cargo

The inspectors also stopped a Norwegian driver with a long trailer with a big rock weighing several tonnes. The rock was secured with a few chains, and the inspectors were quite confident that the rock was inadequately secured. It was however time consuming to calculate how many, and what kind of chains that would be needed to secure forward movement of such a heavy rock. The driver merely stated that the people who had loaded the rock on his trailer said that everybody loaded it the way that they did, and that it would be safe. The inspectors said that in cases like this, they often suggested for the drivers that they should test the securing of the cargo by driving the truck on the inspection site in 50-60 km/hour, and suddenly stop. The drivers usually refused to do this, stating for instance "No, are you crazy?".

Three Norwegian drivers

We were also participating in inspections of Norwegian drivers in between the foreign drivers. By and large, the inspectors found few critical violations when inspecting the Norwegian drivers in the period when I participated in the inspections. The inspectors stopped one Norwegian driver involved in long distance transport of food, and two other Norwegian drivers with smaller crane trucks. As noted, we only observed a few of the inspections that were conducted that day and we cannot use the examples to draw conclusions about differences between Norwegian and foreign drivers.

The inspections of the Norwegian drivers indicate that the organizational apparatus surrounding the Norwegian drivers were less comprehensive than we would expect from employees in other businesses outside the transport sector. It seems that recording of working hours, and thus over-time, often was lacking, companies lacked safety representatives (when their size required it), and so forth. The inspectors confirmed this impression, and stated that transport companies often lack some of the organizational features (e.g. recording of working hours) and functions (e.g. safety representative) that are common in other sectors. These issues should be followed up in future research.

14.3.4 Sanctioning possibilities

At the time of the field work in June 2014, the NPRA inspectors could only impound vehicles with excess weight. Moreover, they could hold back vehicles with summer tyres in the winter using a wheel lock, but this is not unproblematic, as it is impossible to change all tyres when the wheels are locked, and NPRA personnel must therefore also unlock vehicles when that is needed. The sanctioning possibilities of the NPRA has been increased since the field work in 2014 (cf. Chapter 15).

It was also stated that it is problematic that the NPRA has few possibilities to sanction drivers and companies. Some types of violations must be sanctioned by means of police reports, and cases against foreign drivers and companies may often be dismissed. The development in these cases is often dependent on the police lawyer who has the case, it was suggested. Some police lawyers follow up such cases rapidly, others do not. As a consequence that possibilities to sanction foreign drivers and companies not always are good, the NPRA inspection personnel stated that they sometimes choose a "naming and shaming" strategy in newspapers and magazines.

This strategy may involve taking photographs of the vehicle with the company logo on the side of the trailer and to make a case about the violation(s) that the driver has been involved in. This will exert pressure on the company in question (this will often be the company that buys the services of the driver in question). Journalists often call the company which has its logo on the side of the trailer, and ask why their drivers are involved in the violations in question. This strategy has generated several cases in the media, and it was stated that the fact that they have pictures that the journalists can use often is decisive.

14.3.5 The driver is often the last link in a complex chain

The inspections of the foreign drivers indicated how challenging it is for the inspectors to follow up these drivers. Several different nationalities and countries are involved in the chain of actors involved in the transport. The driver's nationality may be a challenge, as he is often unable to communicate satisfactorily in English. As a consequence the inspectors may contact e.g. the driver's manager by phone, and end up in a seemingly difficult communication between the manager and the driver. Often the inspectors also contact the forwarders or the transport owners, who are likely to be situated in another country than that of the driver and his company.

This contact with the driver's manager and the forwarder is often time consuming. These parties are contacted in order for the inspectors to get answers regarding different aspects of the transport that the driver is engaged in. Photographs of vehicles, equipment and goods is also effective in this contact, it was stated.

Finally, the NPRA inspectors stated that the driver's manager and the forwarder do not necessarily care very much for the driver, and that the driver is a very vulnerable party in the chain of actors surrounding the transport. In some cases the drivers are just left to wait on the inspection site for several days. As noted, the two foreign drivers (a Rumanian and a Macedonian) who we saw as we entered the inspection site had been waiting in their vehicles for two days. These drivers had been imposed a driving restriction. They lacked necessary documents, and they were unable to pay their fines. Thus, while the police waited for transfer of money and necessary documents the drivers were waiting in their vehicles. In such cases, drivers could be waiting for several days, probably without pay, the inspectors stated. The drivers have their own food and live in their vehicles while they wait.

14.3.6 Behavioural adaption of foreign drivers

One of the issues that we discussed with the NPRA inspectors was behavioural adaption among foreign drivers. This was first discussed with respect to winter driving, i.e. that foreign drivers drive more carefully in the winter because they are anxious, and therefore adapt their speed and driving style to reduce their risk of serious traffic accidents. A similar argument was used with respect to foreign drivers in general, suggesting that as they generally have a poorer equipment than Norwegian drivers, they learn to drive more carefully. This issue could be followed up in future research, for instance by examining more closely what kind of violations the foreign drivers typically are sanctioned for.

14.4 Summing up

The literature review indicates that rules/enforcement is a crucial framework condition for transport safety, as they set minimum safety standards. The enforcement of these rules is just as important. Moreover, discussing enforcement directed against foreign lorry drivers in Norway, Safetec (2011) states that it is problematic to enforce payment from foreign drivers and foreign transport companies. Thus, this important risk group face few consequences when they fail to adhere to safety rules. Research also indicates that there seems to be a potential for improvement when it comes to following up work related risk factors in authority inspections.

Interviewees agreed that Norwegian authorities' enforcement of foreign drivers seem to be effective and that it seems that the inspections are equally effective for Norwegian and foreign drivers. Some interviewees also suggested that a lot has been done to improve vehicle safety, and that it is time to start looking more at road maintenance in order to improve HGV safety.

15 Measures

15.1 Introduction

Below, we will present and discuss possible measures that can be implemented to address the 12 risk factors related to internationalisation of the haulier industry in Norway: 1) winter driving, 2) drivers' transport safety behaviours, 3) company regulation of drivers' transport safety behaviours, 4) safety culture, 5) organization of transport assignments, 6) safety management system, 7) competence, training and experience, 8) technology and equipment, 9) economy, competition and pay, 10) rules and enforcement, 11) working hours and fatigue and 12) the road and road environment. When discussing measures, we draw on the literature review, interviews and to some extent the small-scale survey. Before discussing measures, we present two of the main publications that we draw on in our description of measures.

15.2 Key publications discussing measures

15.2.1 Norwegian working group on cabotage

In 2013, several actors in the Norwegian transport industry (e.g. employer organizations and trade unions) argued that the number of cabotage transports in Norway, including illegal cabotage, was increasing. These actors also pointed to the negative effects on Norwegian society and that "something had to be done". As a consequence, the Ministry of Transport and Communications established a working group on cabotage, consisting of the relevant organizations and authorities in the road transport area. The purpose of the working group was to establish a common understanding of the main challenges related to cabotage, and to prioritize between them (both within goods and tour bus transport). The working Group should also propose measures to address these challenges, based on existing legislation.

The report, which was published in 2014, suggests a total of 24 different measures (Report on road cabotage in Norway, 2014). Some measures were directed at both bus and goods transport, and some addressed either bus or goods transport. Some of the suggested measures were in line with the current Norwegian laws regulating the transport sector, while some of the measures would require a reformulation or adaption of laws. Each suggested measure was discussed with and submitted to the relevant authorities. For each measure, the authority that is responsible for following up the measure, and perhaps implementing it, is mentioned and notified. Finally, the working group also specifies whether all members or only some members were in favour of the suggested measures. Moreover, specific challenges related to the measures and working group members' objections are presented, when these were raised. The minister of transport and communications immediately started working with a third of the 24 suggested measures in the report on road cabotage in Norway (2014). We expand on this below.

Below we present some of the measures suggested by the working group. It is interesting to note that although the 24 suggested measures primarily address cabotage transport, which officially is estimated to count for only a few per cent of the transport with foreign HGVs in Norway, several of them can also be used to address risk factors related to foreign drivers involved in international transport in and out of Norway. All suggested measures are presented as bullet points.

15.2.2 Report on working conditions in tour bus and goods transport

In the summer of 2013, Fafo and the Institute of Transport Economics (TØI) conducted a preliminary study of working conditions in road sector commissioned by the Ministry of Labour and Social Affairs (Bråten et al. 2013). The background for this pilot project was a concern for the increase of "unserious" actors in the professional transport market. There was also a concern whether some of these actors failed to address basic requirements for working conditions and for the safety for employees.

In the winter of 2014, the pilot project lead to a research project, which also was conducted by Fafo and TØI. The purpose of this project was to contribute with knowledge on the challenges and issues that goods transport and tour bus transport are facing, and which efforts that are needed in the time to come.

The report maps market challenges and working conditions, seen both from the perspectives of employers and from employees/drivers, both in goods transport and in the tour bus sector. The conditions of both Norwegian and foreign actors are studied in the report. Safety and accidents are also discussed, as well as the roles of regulating authorities. Generally the report concludes that drivers, employers, regulatory authorities and other central actors were concerned about the increased foreign transport on Norwegian roads (Steen Jensen et al 2014). Finally, the report suggests several measures, based on results from the study. This report has been cited as the cause of the introduction of a generally applicable collective agreement in road goods transport in Norway in 2015. Such agreements apply to everyone who works in the specific sector, regardless of whether they are party to the agreement, in order to prevent foreign workers from being given poorer pay and working conditions than are usual in Norway.[21] The agreement applies to foreign drivers engaged in cabotage and combined transports.

15.3 Results from literature review and interviews

15.3.1 Increase the number of heavy vehicle inspections

Discussing the relationship between technical inspections of heavy vehicles and personal injury accidents involving heavy vehicles, Elvik (2002) concludes that abolishing inspections may result in an increase of 5–10 % in the number of heavy vehicles involved in injury accidents. Correspondingly, he concludes that increasing the number of inspections by 100% is associated with a similar reduction in the number of accidents (Elvik 2002). He emphasizes, however, that the results are not statistically significant and highly uncertain.

[21] http://www.arbeidstilsynet.no/fakta.html?tid=240096

According to the Report on road cabotage in Norway (2014), the Norwegian Police inspected 4.400 foreign HGV drivers, while the NPRA inspected 4.070 foreign HGV drivers in 2012 in drivers' hours inspections. According to EU directive 2006/22/EF, the Norwegian authorities shall inspect 3 % of the work days of the drivers who are subject to the rules on driver's hours. In 2015 (Jan. 22.-Dec. 31.) the NPRA inspected the driver's hours of 5.823 Norwegian drivers, 3.944 EU/EEA drivers and 673 other drivers. The police inspected the drivers hours' of 3.800 drivers in 2015. These numbers do, however, only include driver's hours inspections. In the winter 2013/2014, nearly 50 000 heavy vehicles were controlled by the NPRA, which according to the Norwegian government involved a fourfold increase compared to the preceding year.[22] The share of foreign drivers in the heavy vehicle inspections is about 40 % for both the police and the NPRA.

In the Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014), Henrik Sternberg argues that the different shares of cabotage transports in Norway, Sweden and Denmark can be explained in light of different inspection regimes. Because of more cabotage inspections in Norway compared to for instance Sweden, the scope of cabotage in Norway is smaller than in Sweden.

One of the measures discussed in the Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014) is:

- Increased inspection from regulatory authorities. The report shows that 90 % of the employers and over 80 % of the drivers are in favour of this measure. When they were allowed to suggest their own measures in a free text field in the survey, both employers and employees stressed the importance of increased inspection of incoming foreign vehicles at the Norwegian border.

The Report on road cabotage in Norway (2014) also suggests to:

- Ensure an increased and permanent inspection of cabotage on Norwegian roads (including implementation of new technical inspection tools). The purpose of this suggestion is to increase heavy vehicle inspections in general in Norway, not just related to cabotage violations. This would require an increased funding (minimum 10 million NOK), more inspectors at work, and better funding of investigations of reported cases. The new technical inspection tool that would facilitate more effective and targeted inspections is the ANPR system (Automatic Number Plate Recognition).

Interview results indicate that interviewees agree that Norwegian authorities' enforcement of foreign drivers seems to be effective and that it seems that the inspections are equally effective when it comes to targeting both Norwegian and foreign drivers. Some improvements were nevertheless suggested, e.g. that it is important that inspections target the actors that we know have a higher risk of accidents, and that these actors perceive that violations are detected.

According to the interviews, the inspection budget of the NPRA was increased after the publication of the report on road cabotage in Norway (2014).

15.3.2 National electronic register

Register focusing on transport safety. Increased inspections could be facilitated by a common register of safety relevant information on (foreign) drivers, foreign

[22] Cf. https://www.regjeringen.no/no/aktuelt/Tungbilkontroll-mer-enn-firedoblet/id759001/

companies and perhaps transport buyers. The register could be connected to the ANPR system during roadside inspections, and thus be used to target specific drivers and companies. The Report on road cabotage in Norway (2014) suggests such a register (although focusing on cabotage regulation):

- Join the common European register described in EU provision 1071/2009 on the "European Register of Road Transport Undertakings" (ERRU). This involves the establishment of a national electronic register of all transport permits and violations, which will be shared with the other EEA states, in order to increase the inspection possibilities.

Norway became a member of the ERRU register January 1. 2015,[23] but the ERRU register does not include information on cabotage trips or cabotage violations, it focuses on violations relevant to road safety. ERRU focuses on information about violations sanctioned by the police in all EU countries, and such violations could lead to the retraction of hauliers transport permits in their respective countries. When a person or a company in EU applies for a transport permit, all ERRU members are consulted electronically to check for registered violations. The NPRA gets several thousand such automatic electronic inquiries each day.

ERRU is an electronic register which involves linking of all national registers on road transporters. The purpose is to create a better exchange of information between Member States, so that the competent authorities can better monitor the compliance of hauliers. Companies that do not respect the rules when operating abroad will face the consequences in the Member State where they are based. This is part of the "Road Package", Reg.(EU) 1071/2009, 1072/2009 and 1073/2009.

Interviewees were positive to the ERRU cooperation and the sanctioning possibilities that such a register provides, for instance: if a company has a certain number of recorded violations across Europe, it may temporarily lose the right to conduct border crossing transports. Interviewees also reminded that Norway is in a unique position when it comes to inspections, as both the NPRA and the police conduct such inspections. In other countries heavy vehicle inspections are only conducted by the police.

Perhaps the ERRU register could also be expanded to include information about transport buyers, and other actors influencing the safety of road goods transport. Moreover, the register could also be used to target roadside inspections. AECOM (2014: 39) suggests that the ERRU and national registers should be used by Member States to better target checks of haulier companies at the premises. This involves targeting checks on companies with higher risk rating, based on previous infringements. In addition to targeting drivers for inspections, using the ANPR technology, the register could also be used to choose companies for in-house inspections.

Register focusing on cabotage violations and regulation of competition. The Report on road cabotage in Norway (2014) suggests as noted to establish a national register and to join the ERRU register. In accordance with its mandate, this report focuses on how such a national register can be used as a tool to regulate competition, as it will focus on detecting and recording cabotage violations.

[23] This cooperation currently includes inquiries about drivers and companies sanctioned by the police, when someone applies for a transport permit in a European country. As far as we know, the ERRU database will be used for inspection purposes in 2017.

The Report on road cabotage in Norway (2014) suggests that authorities:

- Establish an overview of the number of cabotage inspections and violations. According to the cabotage report, the NPRA should have this system up and running by 2014-2015, when they start using their new inspection software Vadis 2. As suggested above, such an overview should also include vehicles and drivers and be connected to the ANPR system.
- Establish a register where the transport buyer shall register all cabotage trips. This means that the transport buyer should register all cabotage trips before they start, and that a lacking registration would lead to fines. The purpose of the suggestion is to give authorities a better opportunity for inspection by establishing an online register where inspection authorities easily can verify whether a cabotage transport is legal or not. The register should also include a specification of when the international load was unloaded, in order to specify when the driver's opportunity to conduct cabotage transport started. Members in the group disagreed on this, and the dissenting member stated that 70-80 % of foreign transport assignments in Norway have a foreign principal. The member stated that such a register therefore would be difficult to enforce, constitute a trade barrier and not be in accordance with current EEA legislation.

It would make it more difficult for drivers to engage in illegal cabotage, if transporters were required to register all their cabotage trips in a common database. With such a system, HGVs which have used up their cabotage opportunities in Norway could be registered in a common database. The register could also include information on the starting point and ending point of a trip, to avoid confusion (see field work presentation of this challenge in chapter 14.3). When establishing the ERRU register, the EU also considered including cabotage information in this register. This was however not done as the purpose of ERRU is to include information that is relevant to transport safety. Information about cabotate violations are relevant to regulation of competition. The EU has, however, currently shown an interest in such a register focusing on cabotage trips and violations.

15.3.3 Enforce payment of fines

As noted, Safetec (2011) states that it is problematic to enforce payment from foreign drivers and foreign transport companies in Norway, and that foreign drivers violating safety regulations face few consequences. The Report on road cabotage in Norway (2014) suggests:

- Considering sanctioning illegal cabotage through on-the-spot-fines ("forenklet forelegg", "gebyr") issued by the police or the NPRA. The purpose of this measure is to avoid going through the judicial process of 1) reporting illegal cabotage to the police, which 2) must investigate and 3) send the case further to the prosecution authorities, which 4) must decide upon a fine. The challenge with this process is that because of limited resources, the police often prioritize other criminal acts instead of illegal cabotage. Thus, cases are dismissed and illegal cabotage is not sanctioned.

- Making toll tags mandatory for all heavy vehicles as soon as possible. The purpose of this is to ensure that foreign heavy vehicles also must pay toll road taxes. Toll tags became mandatory on 1. January 2015 for all commercial vehicles above 3.5 tonnes. These vehicles must have signed a contract with a toll road operator and correctly installed a valid tag on the inside of the

vehicle windscreen. The police, customs authorities and the NPRA monitor compliance with the provision. If the vehicle does not have a valid contract and toll tag, a fine of NOK 8 000 will be the result. Steen Jensen et al 2014 show that over 90 % of the employers and about 85 % of the drivers/employees were in favour of this measure.

- Changing the rules for impounding vehicles until fines are paid. The challenge with doing this under the 2014 legislation was that it required a verdict or an approved fine. A fine imposed on the driver was not sufficient for impounding a vehicle if the driver refuses to approve the fine. Some cabotage working group members suggested that the legislation should be changed on this point, others suggested that this sanction would be too harsh. As a result, of the Report on road cabotage in Norway (2014), the NPRAs authority to impound vehicles was expanded. This change in legislation took effect on May 1. 2015, and involved that the NPRA could hold back HGVs without drivers' approval of fines, and without verdict from the prosecutors.

The Report on road cabotage in Norway (2014) also suggests to:

- Require foreign companies involved in cabotage operations (> NOK 50 000) to also be established in Norway

Interview results do not indicate that interviewees perceived the enforcement of fines from foreign transporters to be a significant problem, although it was said that it may be very time consuming. Several examples were mentioned of large fines issued to foreign hauliers. However, interviewees noted that the NPRA should be given an increased authority to issue "on-the-spot-fines" (gebyr) for a larger spectre of violations than they have the authority to sanction today. This applies for instance to violations of rules on driving time and rest periods. It seems unnecessary to have to contact the police for smaller violations of these rules, and the NPRA are competent at controlling this.

Interviewees mentioned that Norwegian authorities may face some difficulties when attempting to collect fines from foreign transporters. They stated that changes are being made to the provision of the state collection agency ("Håndhevingsdirektivet"), which will give the collection agency authority to collect fines from companies in other countries. It was also noted that it is challenging that different countries operate with different payment arrangements.

15.3.4 Increased cooperation with EU/EEA countries

Some of interviewees in a previous study (Nævestad & Phillips 2013) suggested:

- Cooperation within EU/EEA on streamlining a system of sanctions aimed at drivers violating rules. This could mean to agree on interpretation of current laws, enforcement and sanctions. According to AECOM (2014: 39), the European Commission is advocating the exchange and distribution of information more systematically across enforcement agencies.
- Another possible solution suggested by these interviewees was to do as in the construction industry, where you have bilateral deals with certain countries. It is then possible to cooperate with the government in these countries, in order to follow up relevant transport companies.

A related measure is suggested in the Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014):

- Increased EU cooperation on working conditions and safety in the transport sector. Steen Jensen et al (2014) suggest that this could lead to cooperation agreements with other countries' authorities. Moreover, through this cooperation, other countries' authorities could impose sanctions on the companies in question. Norwegian Custom authorities has an established international network which could be used as inspiration. It must be noted that ERRU is a good start on such a cooperation.

Another measures suggested by AECOM is:

- Standardised EU training of enforcement officers. The European Commission is advocating a standardised approach to the training of enforcement officers across Member States in order to facilitate a standardised application of legislation (AECOM 2014: 39).

In the interviews it was mentioned the EU has put a lot of work into developing a common inspection strategy, and that cabotage is a temporary step on the road to full liberalization of the goods transport market. Developing a common inspection strategy may be seen as a way of developing a level playing field for different national actors competing within the same market. Some interviewees wanted a more formalized cooperation with foreign (EU) agencies within their fields.

15.3.5 Clarification of rules

Clarification of rules regulating transport safety. Rules regulating HGV transport safety is interpreted and enforced differently in different EU countries. Policy research (2013) argues in favour of clarification and harmonization of all regulation which is relevant to road haulage, such as working and driving times, the 48-hour work week, regulation concerning dangerous goods and the Posted Workers Directive. Policy research states that because of the high degree of autonomy which Member States have in their approach towards monitoring and enforcement, it is difficult to develop a consistent approach.

Clarification of rules regulating competition. The Report on road cabotage in Norway (2014) suggest several measures aiming to clarify and specify the cabotage rules in Norway, to make the rules stricter, and easier to interpret. By reducing the "grey zone", interpretations of violations are subjected to less ambiguities. It is important to note that these suggestions primarily are aimed at regulating competition and not increasing transport safety.

- Clarify the requirement on permanent and running activity. A Norwegian Government document ("Rundskriv") states that cabotage in Norway cannot be conducted as a permanent and running activity (i.e. "planned"). Some members of the working group wanted to remove this requirement, as it is stricter than the 1072/2009 directive. Other members wanted to keep it and include it as a provision to the legislation.

- Implement a quarantine after ended cabotage. This suggestion also involve a stricter clarification of the cabotage rules: if an international transport is loaded on a Sunday, the transporter is allowed to undertake three cabotage trips by the coming week. However, if the three cabotage trips are finished earlier and a new international transport is loaded before the next Sunday, the transporter cannot start cabotage transport before Sunday, i.e. before the end

of the first seven day period after the first international load. This will also constrict the possibilities of planned cabotage.

- New definition of an international trip, which makes clear that an international trip, which is a precondition for further cabotage transport, must carry a "real load", and that the value of this load must answer to the costs of transporting it into Norway. This suggestion seeks to avoid transport of e.g. empty pallets into Norway in order to be able to conduct cabotage transport, and will also constrict the possibilities of planned cabotage. Working group members disagreed on this.
- Implement a more constricted definition of "cabotage trip", in accordance with the Finnish interpretation. According to current legislation, cabotage trips may involve several loadings and unloadings, making it difficult for inspectors to judge when the trip starts and when it ends. This suggestion involves to define a cabotage trip as a trip with one loading and one unloading, making it much easier do define the cabotage trip. This solution is probably not realistic, as Finland had to abolish their strict definition of cabotage transport after the EU commission found it to be in conflict with EU regulation.
- Clarify the rules on combined transports. The background is that these in reality present an opportunity to conduct distribution transports in most of Eastern Norway. Combined transports are intermodal transports involving e.g. ship or train and starting or ending with HGVs. These are defined as international transports, but members agreed that they should not be defined as international trips that would give the right to cabotage transports. Neither should such transports be used as an international transport after cabotage transport in Norway.

Interviewees were in favour of clarification of rules, for instance related to combined transport, which is not time limited, like cabotage. An interviewee stressed that combined transports represents a loop-hole, because it is an arrangement that was introduced before cabotage became legal. Thus, after cabotage was legalized, combined transports should have been abolished. The Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014) shows that over 90 % of the employers and about the drivers/employees were in favour of introducing stricter rules on cabotage transports.

15.3.6 Organization of and cooperation between domestic authorities

Today, the NPRA and the Labour Inspection Authority have joint inspections focusing on heavy vehicles, both on inspection sites along the road and within transport companies. Additionally, the NPRA cooperates with the police when they detect violations: the NPRA reports violations to the police who must follow up cases and press charges. Interviewees stated that the quality of the cooperation between different inspection authorities varies today, and that developing a more formalized cooperation with a joint inspection strategy, like the Report on road cabotage in Norway (2014) suggests may increase the quality of the cooperation even further:

- Ensure increased cooperation between regulating authorities: NPRA, Labour Inspection Authority, the police, customs and tax authorities. The

cooperation would involve a more formalized and effective cooperation, and the development of a joint inspection strategy.

- Join road inspection of heavy vehicles and the following investigation in one central organizational unit. The purpose of this suggestion is to ensure that the inspection and investigation of road transport violations is more streamlined across the country. Moreover, it will ensure that violations are investigated by personnel which is specialized within the field.

The Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014) also suggests and discusses the idea of joining road inspection of heavy vehicles and the following investigation in one central organizational unit. Steen Jensen (2014) states that the Norwegian minister of transport and communication followed up this recommendation of the working group on cabotage, and that a formalized cooperation between several authorities is established and coordinated by the NPRA.

In February 2016 the NPRA announced that they are establishing a new organizational unit focusing on transport related crime. The unit is likely to start up by the first half of 2016. The new unit will focus on issues like technical manipulation of vehicles (odometers, trimming, tachographs), counterfeiting of driver's license, driver card, certificate of competence for professional drivers, loop holes in the legislation that is used to obtain financial gain, and transport crimes in general.

The unit will not be involved in road side inspections, but will work on collecting information and conduct thorough analyzes traffic violations, focusing on their organizational. When cabotage violations and violations of drivers' hours are uncovered, this new unit will provide in-depth analyses and examine the history of companies, instead of just sanctioning the driver.24 This is a positive measure, and we hope that it involves a formalized cooperation with other inspection authorities, including the personnel conducting heavy vehicle inspections.

15.3.7 Increase the authority of some authorities

The NPRA has limited power to sanction foreign drivers legally, and is often dependent on the police to impose certain categories of fines (related to e.g. driving time and rest hours violations). Today the NPRA has the authority to impose fines ("gebyr") based on some violations of road traffic rules: vehicle weight, snow chains, worn out tires and lacking driver's license. However, the NPRA also detect other violations that they lack the authority to sanction themselves (e.g. violations of rules on driving time and rest periods).

Interviewees argued that the NPRA should be given an increased authority to issue "on-the-spot-fines" (gebyr) for a larger spectre of violations than they have the authority to sanction today, for instance violations on rules on driving time and rest periods. It seems unnecessary to have to contact the police for smaller violations of these rules, and the NPRA are competent at controlling this. Although the police have competence to press charges, and the NPRA has not, the NPRA has the authority to impose fines on some violations, and this authority could be expanded to also apply to other "less serious violations". All such violations must be reported

[24] Confer: http://vegnett.no/2016/02/vegvesenet-med-ny-enhet-mot-kriminalitet-og-samfunnsskadelig-aktivitet/; http://www.lastebil.no/Aktuelt/Nyhetsarkiv/2016/Ny-enhet-skal-bekjempe-transportkriminalitet

to the police, and giving the NPRA authority to issue fines in case of minor violations would free police resources.

The Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014) suggest to:

- Expand the authority of the NPRA to impose fines related to violations of road traffic legislation, in order to avoid spending police resources. Thus, inspections and sanctions will be issued by the same authority.

Steen Jensen et al (2014) also discusses the possibility of giving the NPRA the authority to impose "forenklet forelegg", which is a fine that only the police has the authority to issue. However, in contrast to "gebyr", "forelegg" involves a penal process, and the NPRA has not the legal competence to take cases to the courts.

The Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014) also suggest to:

- Give the NPRA the right to impound vehicles until fines are paid. As noted above, the NPRA's authority to impound vehicles was increased May, 1. 2015.

15.3.8 Clarify (and increase) the responsibilities of transport buyers

As noted in the field-work results (cf. chapter 14.3), the foreign driver is often the last link in a long and complex chain of actors involved in the transport. According to legislation on driver's hours and working hours (Forskrift om arbeidstid for sjåfører og andre innen vegtransport § 3), all links in the transport chain (e.g. forwarders, principals, the actors sending and receiving the goods) must "contribute" to the adherence to the rules on driver's hours. The Report on road cabotage in Norway (2014) suggests to:

- Clarify the responsibilities of each member of the transport chain. The purpose of this suggestion is to ensure adherence to the current rules on the responsibilities of other actors than just the driver and his company. In this context, other actors refer to the transport buyer, which also has a responsibility to contribute to legal cabotage ("medvirkningsansvar"). Some members also wanted to specify this into an objective responsibility, in order to be able to press charges against the transport buyer in case of illegal cabotage. Although the members disagreed on this issue, they agreed that the responsibilities of different actors involved in the transport should be clarified.

- Establish voluntary business measures making transport buyers responsible that transport assignments are conducted in a legal way (including cabotage). These measures would involve for instance ensuring that the cabotage transport is legal, that the vehicle is in a legal condition, that the driver has a license and proper training, that the assignment is conducted according to rules on driver's hours, and most importantly: that the principal regularly can control that these demands are met.

The Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014) also stresses the need to clarify the responsibility of transport buyers and forwarders. Regulatory authorities can currently conduct inspections to check whether the different parties fulfil their responsibilities when it comes to "contributing" to compliance with driver's hours, but it is uncertain whether this

actually is done (Steen Jensen et al 2014). Thus, a clarification of the responsibility to "contribute" to compliance would be warranted.

The Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014) states that:

- One possibility is to increase the responsibility of large transport centrals or large transport buyers. They stress, however, challenges related to this. First, more responsibility would require technical competence of terminal personnel to control e.g. compliance with driver's hours. Moreover, they also discuss the consequences of such a measure when it is voluntarily: will for instance terminal personnel treat "their own" transporters and other transporters in the same way.

Interviewees strongly emphasized the importance of clarifying and increasing the responsibility of the different parties involved in goods transport, especially the transport buyers. Interviewees argued in favour of focusing on the "responsibility to contribute" to transport safety ("Medvirkeransvaret"). If an accident happens, the driver is held responsible today, although transport safety regulations state that e.g. the forwarders have a responsibility to contribute to transport safety. Interviewees therefore stated that this regulation on responsibility to contribute should be put to use in practice in Norwegian courts. One of the interviewees also stated that it is important that safety is included as a requirement in contracts. It was also stated that the responsibility to "contribute to transport safety" was too vague and mild, and that regulations instead should focus on the actual responsibility of the transport buyer ("bestilleransvar").

Moreover, forwarders should also be held responsible for the safety of the transport, as well as transport companies in which drivers are employed, and the people who load and unload the goods. "Trygg Trailer" was mentioned as a very successful example of a safety measure where the people who load the transport performs basic checks of drivers' winter equipment before they are allowed to load the goods and start transport operations (cf. Chapter 4.3). This was mentioned as an example to take after both when it comes to the transport buyers' opportunity to influence the traffic safety, but also when it comes to the opportunity of foreign transporters to drive safer with better equipment. We expand more on this below.

Moreover, the Norwegian "Three-party business program for goods transport" is currently developing guides for transport buyers, focusing on safety and responsibility.

15.3.9 Introduce certification/approval systems

One of the measures discussed in the Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014) is:

- Standard or approval system for transport companies. The international traffic safety standard ISO 39001 is the example of such a standard. But Steen Jensen et al (2014) also suggest that other standards or approval systems are possible.

The main benefit with such arrangements is that they serve as an indicator that the business in question is serious and fulfils important requirements. Steen Jensen et al (2014) shows that such approval schemes have been introduced in other sectors in Norway, for instance in the staffing industry in Norway and in the cleaning industry. Perceived disadvantages with such a measure is that it may be difficult to reach an

agreement on the indicators that should be included in such a standard, it can be perceived as unnecessary bureaucratic, and include requirements that already are required by law. Nevertheless, such arrangements can improve the image of companies, pay off in the long term and filter out unserious competitors.

Interviewees stated that such certification arrangements and standards are positive, but that it is unrealistic to demand for instance ISO 39001 certification of foreign companies when only four Norwegian companies were certified for this standard by the end of March, 2016. "Trygg Trailer" was mentioned by the interviewees as a good example of a voluntary arrangement which serve to guarantee for third parties that the transport is conducted in accordance with certain requirements or standards (cf. Chapter 4.3).

15.3.10 Course in winter driving

In spite of common training standards across Europe (Directive 2006/126/EC), European countries offer different national and local challenges with repercussions for traffic safety. Foreign lorry drivers' lack of competence and equipment on Norwegian roads has been identified as a significant safety problem, especially when it comes to winter driving (Bergene & Underthun 2012). Norwegian professional drivers must since 1993/1994 undergo a mandatory course in driving on slippery roads to get their professional driver's licence. Such courses are not required in other European countries further south, making it even harder for foreign drivers to cope with Norwegian winter conditions.

Such courses may, however, make drivers overestimate their skills in manners that may increase their accident risk, as indicated in a previous research report studying the effect of courses in slippery driving for HGV drivers (Christensen & Glad 1996). More research is needed on this. Although courses improving technical winter driving skills may make drivers overconfident, competence on how to drive on Norwegian roads is needed. Perhaps courses aimed at improving winter driving skills could be designed not to increase HGV drivers' confidence, while at the same time improving their skills?

One of the measures discussed in the Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014) is:

- Mandatory course in driving on slippery roads. About 90 % of the employers and the drivers in Steen Jensen et al's (2014) survey agreed that this measure should be implemented.

Interviewees were all positive to this measure, also suggesting that such education should include training in for instance how to put on snow chains. The Norwegian minister for transport and communications previously suggested that a winter driver's license should be required for driving in Norway in the winter. He addressed this issue to the EU in Brussels. Some organizations have supported this, requiring winter training and courses in slippery surface driving to be mandatory for all HGV drivers in Norway. Some large companies (e.g.) Bring have started providing their own drivers with courses in winter driving. It was mentioned that it may be problematic to introduce such legislation, given the EU's focus on equal opportunities to compete for European hauliers.

15.3.11 Technical requirements for driving in Norway

In the presentation of the results of the NPRAs technical controls of heavy vehicles, we saw minor differences between Norwegian and foreign HGVs (cf. Chapter 10).

One of the measures discussed in the Report on working conditions in tour bus and goods transport (Steen Jensen et al 2014) is:

- Stricter requirements for vehicles and equipment. Both employers and drivers were asked about this measure, and this measure was not as popular as the other suggested measures. About 70 % of the drivers and employers in Steen Jensen et al's (2014) survey agreed that this measure should be implemented.

Steen Jensen (2014: 135) explain this by suggesting that perhaps the respondents do not perceive that this is the most pressing issue when it comes to foreign drivers.

Interview results indicate that interviewees were in favour of introducing certain requirements for conducting winter transports in Norway. The main issue that the interviewees focused on was two axle tractors vs. three axle tractors. Given the ability of the latter to lift one axle and increase driving axle weight under demanding winter conditions, some interviewees suggested that only three axle tractors should be allowed in the winter in Norway, and that this should apply to both Norwegian and foreign transporters.

Some interviewees suggested that only three axle tractors should be allowed in the winter in Norway, and that this should apply to both Norwegian and foreign transporters. A possible measure that could be tested and evaluated is to only allow three-axle tractors in the western, central and northern parts of Norway, where driving conditions are especially difficult in the winter. A challenge with implementing such a solution is the different technical specifications of Nordic three-axle tractors and European three-axle tractors. The former three-axle tractors have a "Nordic solution", which means that they can put more weight to the driving axle than the European three-axle tractors can. Thus, the number of axles on the tractors is not necessarily a sufficient requirement.

One interviewee also suggested to change the rules on maximum trailer weight in the winter. Now the trailer can carry one and a half time the weight of the truck. If the trailer only is allowed to carry the weight of the truck, we may perhaps expect fewer foreign HGVs to get stuck on Norwegian roads in the winter.

After the report on road cabotage in Norway (2014), the minister of transport and communications started a process which led to the introduction of unique Norwegian rules requiring winter tyres for both the tractors and trailers, in addition to stricter snow chain requirements. As these rules apply to all HGVs in Norway, they are not distortive to competition.

15.3.12 Road design and infrastructure

Yannis et al (2007) estimates and compares the accident risk of foreign and domestic passenger car drivers in various road environments in Greece. This study reports that different road environments influence the risks of the national groups differently. Because the risk factors of different groups of foreign drivers were diverse, different groups of foreign drivers require different safety interventions.

The road and road environment was also mentioned as a risk factor related to foreign drivers in the interviews. In accordance with Yannis et al's (2007) line of argument,

interviewees stated that the Norwegian terrain is challenging to drive in, because it is hilly, and have many roads with poorer standards than on the European continent.

Norwegian drivers may predict variations in road characteristics more easily, adapt their speed and there is therefore less chance that they are surprised by the road. It was suggested that a lot has been done to improve vehicle safety, and that it is time to start looking more at the road maintenance in order to improve HGV safety. One potential measure is to make roads more self-explanatory for foreign drivers.

15.3.13 Campaigns aimed at foreign drivers

Social norms campaigns. SARTRE (1994) suggests a social norms approach to influencing the attitudes and subsequently the traffic safety behaviours of car drivers:

> The acceptance of safe behaviour by drivers will grow when they experience this behaviour as common. Counter measures, no matter if they have a legal basis or make use of other means, must be aimed at installing social norms, involving social influences. (SARTRE 1994: 3).

The social norms approach uses knowledge about normative mechanisms and "social pressure" to construct campaigns aiming at changing behaviour (Berkowitz, 2005). Peer group membership influences individuals' behaviours through both direct social pressures and more subtle social mechanisms (Nævestad, Elvebakk & Bjørnskau 2014). We may refer to such social pressures as normative influences on behaviour (Cialdini et al., 1990). Individuals' perceptions of peers' opinions (i.e. approval/disapproval) about a given behaviour are often defined as injunctive norms, while individuals' perceptions of what peers actually do often are defined as descriptive norms (Ajzen, 1991; Rivis and Sheeran, 2003; Ward et al., 2010). While descriptive norms specify what is actually done, injunctive norms specify what ought to be done; beliefs regarding what constitutes morally approved and disapproved conduct (Cialdini et al., 1990: 1015). It is important not to mistake the mechanisms of injunctive and descriptive norms, preceding behaviour, with the "false consensus" mechanism, following behaviour. This is a cognitive bias meaning that individuals overestimate certain behaviours among others in other to justify their own behaviour (Berkowitz, 2005). The social norms approach may be applied to remove false consensus effects supporting risky behaviour by informing risk groups about the actual prevalence of risky behaviour of their peers (Berkowitz, 2005; Linkenbach and Perkins, 2005).

Information campaigns. Traditional information campaigns may also be effective and useful. Danton et al (2009) suggest information campaigns to increase awareness among foreign HGV drivers both on the specific challenge of left-hand driving in Britain and on British road legislation in general. Little research has been done on the effectiveness of information campaigns aimed at foreign HGV drivers.

Interviewees stated that the Norwegian Public Roads Administration's information campaign "Trucker's guide to driving in Norway" ("Donna Diesel") provides useful information to foreign drivers. The guide presents important information that foreign heavy-vehicle operators need to know in order to drive safely in Norway, e.g. required tyre equipment and wheel chains and a number of relevant laws and regulations. In the guide, the relevant information is presented by a cartoon character "Donna Diesel". The guide is translated into English, Finnish, Lithuanian, Polish, Russian and German.

The Trucker's Guide consists of 36 pages, and includes the following: Tips from Donna Diesel, Facts, Driving in Norway, Information about road and traffic conditions, Choose the right route, Driving on icy roads, Tyre equipment requirements, How to attach universal tyre chains, 10 rules for heavy-vehicle operators driving in tunnels, Safe driving in tunnels, Driving and resting time regulations – summary, 24-hour rest areas, Paying at Norwegian toll plazas, Donna's food tips, Laws, regulations and rules of the road, Trygg trailer, Distances in km along E6 or closest road and emergency telephone numbers.

15.4 Results from the small-scale survey

15.4.1 Drivers who have obtained and read the Trucker's guide

In the small-scale survey, drivers were asked whether they had obtained and read the "Trucker's Guide".

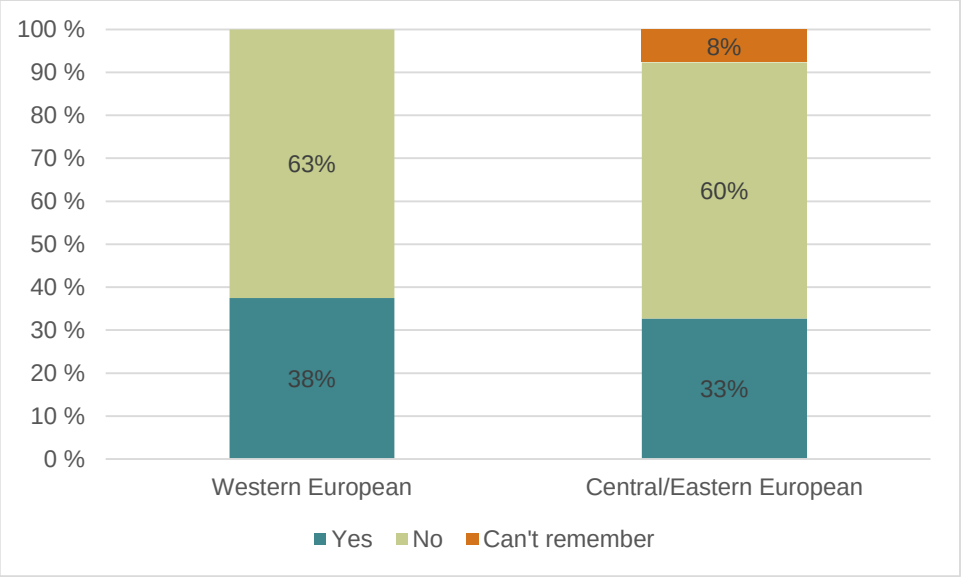


Figure 15.1 Have you obtained "A trucker's guide to driving in Norway"? Western European country (N=17), Central/Eastern European country (N=52).

The figure indicates that at least a third of the drivers in each group has acquired a Trucker's guide to driving in Norway. We also asked the drivers who had obtained the guide, whether they actually had read the guide.

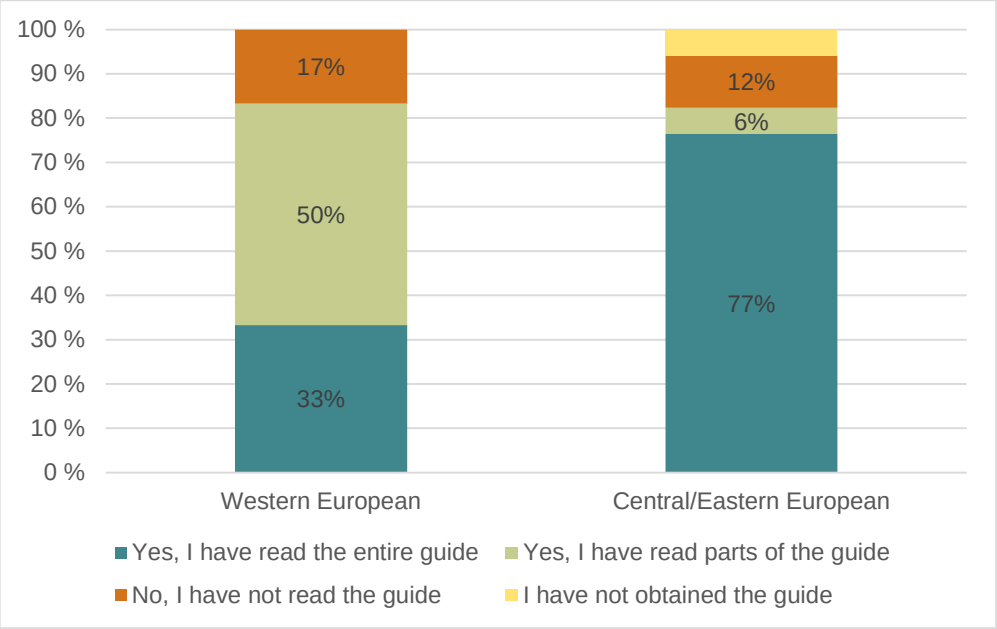


Figure 15.2 Have you read the Driver's guide?" Western European country (N=6), Central/Eastern European country (N=17).

The figure indicates that more than the double of the CEE drivers have read the entire guide compared with drivers from WE.

15.4.2 Potential for communicating by phone and applications

We also considered alternative ways of communicating with foreign drivers in Norway, in addition to documents like the "Trucker's Guide". The drivers were asked three questions. The results of the first question is shown below: "Do you have a phone that works in Norway?"

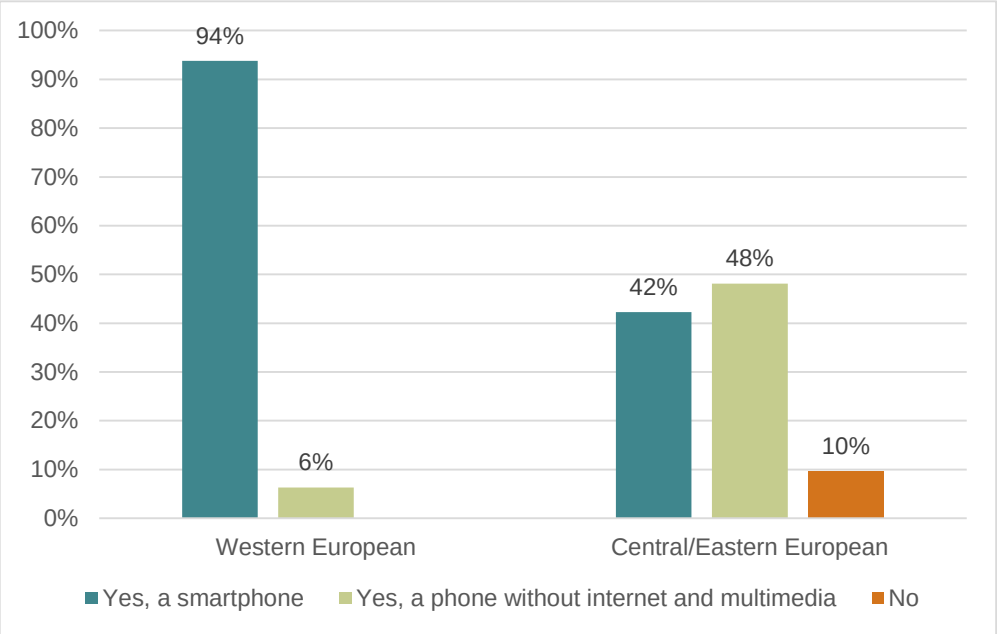


Figure 15.3 Do you have a phone that works in Norway? Western European country (N=17), Central/Eastern European country (N=52).

We see that most of the drivers from WE have smartphones, while only 42 % of the CEE drivers have. Additionally, a tenth of the latter drivers do not have a phone that works in Norway. We also asked respondents about the potential for introducing new communication channels:

-Would you register your phone number when you cross the Norwegian border, if you could get text messages with information in your own language about dangerous driving conditions, extreme weather, closed roads, and so on?

- If there was a free app/application for your mobile phone with map and information about rest stops, petrol stations, closed roads, and so on, would you download it?

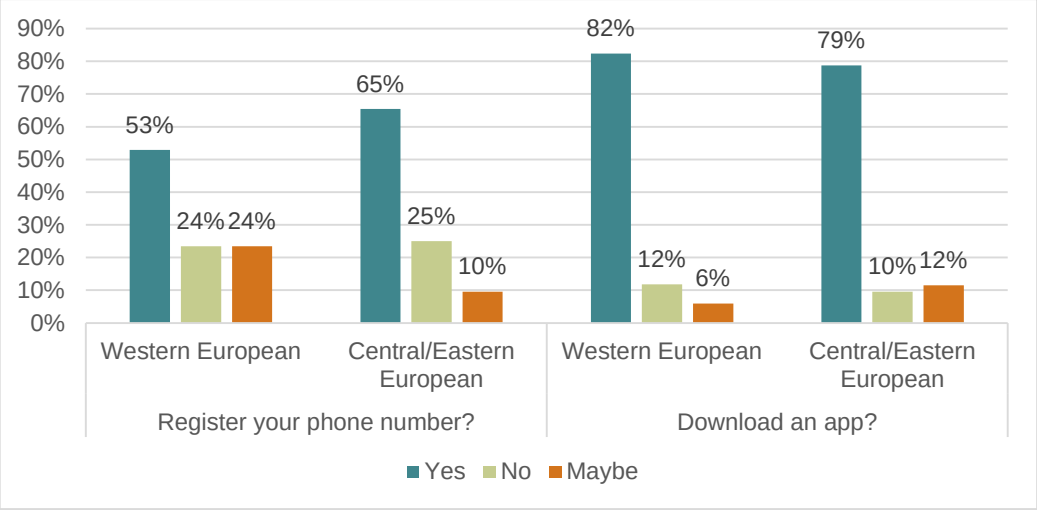


Figure 15.4 Would you register your phone number when you cross the Norwegian border to get relevant information?, and Would you download an app to get relevant information? Western European country (N=17), Central/Eastern European country (N=52).

All in all, it seems that the drivers are positive to communication by means of their phones, but it is important to note that they are most positive to getting information by downloading an app.

15.5 Summing up

Above, we have discussed 13 main categories of measures addressing risk factors for foreign actors transporting goods on Norwegian roads We conclude that six of these measures in particular are important for transport safety: 1) Increase heavy vehicle inspections, 2) Education/information on winter driving and Norwegian road conditions aimed at foreign drivers, 3) Clarify (and increase) the responsibilities of transport buyers, 4) Expand the authority of the NPRA, 5) Change the sanctioning opportunity from police reports to fines, 6) Increased cooperation between domestic authorities. Finally, we also discuss other measures that could be considered further, but which we do not emphasize as much as the six above mentioned measures. These are: technical requirements for driving in some parts of Norway in the winter, enforce payment of fines, increased cooperation with EU/EEA countries, clarification of rules, road design, introduce certification/approval systems and app-communication with foreign drivers in Norway.

16 Discussion

16.1 How can we explain the unexpected group differences indicated in the small-scale survey?

In the small scale-survey we commented on several unexpected results when we compared the Norwegian drivers, the drivers from WE, the CEE drivers and the drivers in the Norwegian II sample. These differences were for instance related to the safety commitment of managers and colleagues, self- reported accidents and self-reports of whether the drivers have ever fallen asleep behind the wheel, whether they ever drive while fatigued and speed and seat belt use of drivers in their companies.

We found that CEE- and WE-drivers report a very high level of safety, and receive very high scores for some safety culture items in their firms. In some cases, they exceed the scores of Norwegian firms (Norwegian II sample) with a documented history of targeted safety work and very low accident levels, which would be expected to outperform any random group of HGV drivers.

The results are also not supported by our estimations of HGV accident risk in this study, showing that the accident risk for HGVs from CEE-countries and WE-countries is significantly higher than that of Norwegian HGVs. We therefore hypothesize that the results are not straightforwardly comparable between national samples, and should be used with extreme caution. Below, we discuss several potential explanations for this. It is important to note that many of these are hypotheses that should be examined further in future research:

16.1.1 Small samples

The samples are small (in the case of WE-drivers, extremely small), and respondents may not be representative.

The first sample of Norwegian drivers consist of 61 drivers recruited through a web link to the survey on the website of the Institute of Transport Economics. We therefore do not know the response rate of this sample. The web link was introduced on the Institute of Transport Economics website. A link to this site was also presented on the Facebook website to members of the "Norwegian cabotage study", which is a group for fans of a study attempting to map cabotage driving in Norway. We used this Facebook site, as we assumed that most of the members would be Norwegian HGV drivers.

It may be argued that some of these Norwegian are likely to be critical to foreign drivers, and that they therefore could answer strategically in the survey. The introduction text to the survey did, however, not tell the respondents that the data was collected on behalf of the Safe Foreign Transport project (SAFT), or that their results would be compared to those of foreign drivers. Moreover, we have also seen that these Norwegian drivers have less "favourable" scores than the foreign drivers on several issues, which do not indicate that they have answered strategically.

We compare the results of the survey involving the three above mentioned national groups with those of a previous study of safety culture among drivers (N=224) in three Norwegian haulage companies (Nævestad & Bjørnskau 2014). We refer to this sample as "Norwegian II". The Norwegian II sample is included to supplement our interpretations of the differences between the three groups. Based on our previous qualitative research in the companies of the Norwegian II sample, we have seen that these companies work extensively with safety culture and safety management of work related factors with safety implications. Moreover, we have also seen that these companies have high scores when it comes to safety culture and work related factors with implications for transport safety.

Given the presumably random recruitment of respondents to the Norwegian I sample, and the fact that the Norwegian II sample companies were recruited based on their positive work on safety culture and safety management, we expected the Norwegian II sample to score somewhat higher than the sample of 61 Norwegian drivers on questions related to safety culture and work related factors with safety implications. The present study supported this hypothesis, indicating that the Norwegian sample does not seem to be substantially biased in a positive or negative direction.

The group of drivers from "Western European countries" (WE) is unfortunately too small to be useful for drawing any conclusions about this group. This group actually consists of 8 drivers from Nordic countries and 9 drivers from other European countries (mostly from Holland). The small size of the WE group reflects the limited kilometres driven by these foreign drivers on Norwegian roads. The kilometres driven by Other EU15 countries made up 1 % of the kilometres driven with HGVs in Norway in the period 2007-2012 and 18 % of the kilometres driven with foreign HGVs in Norway. Moreover, only 2 % of the inspected HGVs in the NPRA's winter inspections in 2015 were from Western Europe, while 20 % were from Central and Eastern Europe. Thus, it may seem that the low share of Western European drivers in our sample to some extent reflects the fact that this group also has a relatively low share of drivers on Norwegian roads.

The group of drivers from CEE countries was established because of a small sample of foreign drivers. Other publications (e.g. Nævestad et al 2014) discern between "older" (Poland, Baltics) and "newer" (Romania, Bulgaria) EU members from Central Eastern Europe. In this sample, however, we group all these countries together. Nævestad et al (2014) did not find the differences between the accident risks of HGVs from "older" and "newer" EU members from Central or Eastern Europe in Norway to be statistically significant. The group of 52 drivers from CEE countries are distributed among the following nationalities: 29 Polish, 16 Baltic (mostly Lithuania), and the rest from Romania, Bulgaria, Hungary and Slovakia.

The foreign drivers were recruited by Gunhild Meyer Levlin on rest stops, terminals and parking lots in the South Eastern region of Norway in May 2014. Levlin counted the number of drivers who did not want to answer her survey as she approached them, and she states that the drivers who were unwilling to answer either could not answer because of their language, or because they did not have time or because they did not want to. According to her estimates, a total of 33 % of the drivers that the approached were unwilling to answer the survey, giving her a response rate of 67 %. She states however, that most of the drivers who were unwilling to answer were unwilling because she did not have the survey available in their language (19 %).

16.1.2 Respondents in different countries have different points of reference

The drivers may refer to different baselines or have different anchoring: if safety standards vary substantially between different nationalities or cultures, evaluative judgments could be passed relative to radically different expectations. Respondents from different countries may have different expectations to the safety commitment of their managers and their colleagues, and the safety level of their businesses. It is on the basis of these (different) expectations that respondents make the assessments that the survey implicitly invites them to do (for example, "The drivers in my company do everything they can to avoid unwanted incidents and accidents" and "The manager of my company focuses on safety").

This may explain some of the surprising results we have seen in the small-scale survey, for instance when we compared CEE drivers and the Norwegian II sample. In this case, it is likely that respondents in the Norway II sample took the safety level and the safety measures of their own business for granted while answering (e.g. dangerous goods transport in Norway), while drivers from CEE took the safety level and the safety measures of their own business for granted while answering (e.g. CEE based transport company with border crossing transport). Although the absolute or the actual safety levels may differ substantially between these two contexts, the survey does not take this into account, as each group of drivers answer on the basis of their own perspective and knowledge.

If we should have had a real comparison across countries, the respondents would perhaps need full knowledge of, or experience with each other's national realities. Of course this is just a hypothetical example, but it illustrates that we cannot control for the safety level and the safety measures that respondents take for granted when they answer the survey. This illustrates the need for also collecting other data (e.g. interviews, accident data), in order to compensate for the potential weaknesses of survey methods.

One possible way to reduce the effect of the challenge with different baselines and relative answer alternatives could be to make the questions more specific, more focused on actual behavior and most importantly: distribute the answer alternatives on an absolute scale (for example: how often discuss managers and employees safety?, how often are safety issues reported in the company?, how often are assignments interrupted for the sake of safety?, how many procedures exist for safe work?, how often are safe job analyses performed?). These are questions we often ask in the qualitative interviews, and we thereby get important information that can be used to discuss possible interpretations of the results of quantitative data.

In a previous study of safety culture in three Norwegian goods transport companies, we concluded that our questionnaire worked well, as the results of the quantitative survey were in accordance with the results from our qualitative interviews with managers and employee representatives (Nævestad & Bjørnskau 2014). These three companies were all Norwegian, and we may perhaps assume that the respondents' baselines and their expectations to managers, colleagues and businesses not were very different. In the present study, we may perhaps have to conclude that it appears to be difficult to assess safety culture, safety management and safety behaviours across national borders, because the reference points of respondents' answers are different.

16.1.3 Experience with and trust in surveys

Drivers from different nationalities or cultures may relate to surveys differently. Norwegian drivers are accustomed to being subjects of various tests and surveys. Drivers from other nationalities, however, may be less culturally attuned to these kinds of surveys, and react to them differently. This may have implications for how employees understand and answer such surveys. It is conceivable, for instance, that promises of anonymity are not trusted.

If Scandinavian employees are more accustomed to various tests and surveys, the result may be that Scandinavian employees provide more modest answers (generating lower scores). We see a general tendency, for instance, that CEE-drivers choose the extreme values of the scales to a much larger degree than Norwegian drivers, which seems to indicate that they relate to statements in a different manner. This is, however, mere speculation and more research is needed on this issue.

16.1.4 Awareness of comparison?

Drivers may be aware that they would be compared to other groups, and respond correspondingly. We intentionally omitted to inform the Norwegian sample that they would be compared to foreign drivers, as we believed this might compromise results. In the sample of foreign drivers, however, this was more complicated. In spite of the fact that they were not informed about the comparison, they would perhaps take this as a given, as they were approached in their capacity as foreign drivers in Norway. Since these two groups are competing in the same market, it is conceivable that this influenced responses. Although it is impossible to determine the potential influence of this mechanism, we should be aware of the possibility that this has influenced the answers of the foreign drivers and interpret results with caution.

It is also possible that the foreign drivers in the small-scale survey feared that the survey had some kind of relationship to Norwegian inspection authorities, or perhaps that their admissions of violations could lead to consequences of some sort. After all, the registration numbers of their HGVs were visible to Gunhild Levlin who interviewed the foreign drivers, and she also saw company logos on the trailers. She stressed, however, that the she was not a representative of Norwegian authorities, and that the survey was anonymous. She experienced that the drivers believed her, but it is of course impossible to verify this impression.

One of the main strengths of our chosen way of recruiting foreign drivers in coincidental resting areas, and without going through their "superiors" is that we hoped to avoid "strategic answers" from the respondents. Another possible strategy of recruiting foreign drivers, could for instance be to go through foreign transport companies, transport centrals or forwarder companies. A potential weakness with such a strategy could be that the drivers' relationship to these third parties could influence their answers, perhaps as they were fearing that negative results could lead to termination of their contracts. We hope that our recruiting strategy minimized such mechanisms, although we cannot rule out that the drivers were conscious about their reputation, or fearing consequences when they answered the survey.

16.1.5 The items are not good enough

When questionnaires generate results that are unexpected, and when actual objective differences between groups are not reflected in survey results, we should also consider whether the items are good enough to take into account the different

contexts of the groups we compare. A general rule here is probably that if the items have worked well in previous research in comparable groups, we would expect them to be "good enough" to register differences between groups. Nevertheless, the quality of questions must always be considered through for instance qualitative interviews with respondents and in pilot surveys.

Based on previous research, we may conclude that it seems that general and "abstract" questions are less suitable to register differences between groups than concrete and specific questions. "The manager of my company focuses on safety" is an example of a fairly general and abstract question which perhaps is unlikely to generate notable differences between groups. "In my company there are routines for reporting safety problems and safety violations", is an example of a better survey question, because it refers to a more concrete aspect (routines) than "focus on safety". It is therefore supposedly easier to answer for respondents.

16.1.6 National culture and reporting

National culture may not only influence safety behaviours, it may also influence answers given to questions (Tronpenaars & Hampden-Turner 1997 in Håvold 2005). Measuring safety culture and reporting culture by means of surveys (i.e. self-reports) is in one sense paradoxical, as giving straightforward answers requires a culture which encourages the communication of negative issues (i.e. a good reporting culture). A reporting culture is characterized by employees reporting incidents and near misses and taking actively part in evaluations of the organization's safety performance. Moreover, it involves actively management encouragement of employees reporting incidents, who are confident that management treat reports and people involved in a just manner (Reason 1997).

If these preconditions are lacking; if employees fear that reports are not confidential, and that reports that may reflect negatively on themselves will lead to punishment, it is likely that they will avoid reporting more or less unfavourable conditions. Thus, perhaps good measurements of safety culture is reliant upon the existence of good safety culture; i.e. a reporting culture involving frank communication of both positive and negative issues.

Deference to authority

Guldenmund et al (2013) suggest that deference to authority may explain why foreign employees gave the answers that they did in a study of safety culture in construction in Denmark, UK and the Netherlands. This study found that groups of Eastern European migrant workers generally rated their managers more positively than employees who were born in the respective countries.

Drawing on Hofstede (2001), Håvold (2005: 453) stress that societies with high power distance teach obedience at school. In the same countries subordinates in work organizations are expected to be told what to do and not to question hierarchies and authority. In cultures with low power distance on the other hand, it is opposite: teachers and pupils are equal, and in work organizations hierarchy must be justified and it have to serve a particular purpose in order to be accepted (Håvold 2005).

Sivesind's (1997) doctoral thesis on culture in Norwegian and German companies shows that the Scandinavian labor market may hold a unique position in Europe when it comes to the egalitarian relationship between managers and employees.

While managers in Norway underlined that it is valuable that managers are friends with their employees, it was the opposite in German companies. This may also apply to other countries bordering Germany, for example, countries in Central and Eastern Europe.

It is conceivable that cultural norms concerning the relationships between employees and managers may influence how respondents answer surveys on working environment and safety culture (cf. Håvold 2005). Such surveys often include a range of questions where respondents are invited to evaluate the efforts of their managers. Management commitment to safety is the most important dimension in studies of safety culture and climate (Flin et al 2000). If employees have great respect for (or perhaps even fear their managers) they may be reluctant to give negative answers.

Thus, we may perhaps hypothesize that respondents from cultures with a high power distance and deference to authority are more likely to give survey answers that are in accordance with what they believe that "management wants to hear". This could mean under reporting negative conditions and over reporting positive conditions. We may perhaps also expect that respondents from cultures with individualistic cultures with low power distance(e.g. Norway, UK) are less likely to report "what they believe management want to hear". This is, however, mere speculation and more research is needed on this issue.

As noted in the method section, one of the strengths of the methodological approach employed in the current study is that the foreign drivers not were recruited through their work places. They were also ensured that they were anonymous. We therefore hoped to reduce the consequences of "deference to authority" and answers shaped by deference to authority.

It is impossible to judge the extent to which deference to authority has influenced our survey answers. These issues should therefore be followed up in future qualitative and quantitative research. It is an important topic because it influences employees' willingness to report negative circumstances that may be related to safety; what we can call reporting culture. Moreover, the quality of reporting cultures also influences the quality of questionnaire data.

Reluctance to admitting mistakes and violations

Research indicates that people from different national cultures have different views on what it means to admit mistakes (Lamvik & Ravn 2004). Seafarers from some countries are reluctant to admit their own and others' mistakes, as this may be conceived of as the same as saying that they are incapable of doing their job (and perhaps that they therefore should not have it) (Lamvik & Ravn 2004). This is a cultural trait that may inhibit reporting of incidents and mistakes, especially when it is combined with cultural traits like deference to authority, focus on pleasing superiors and not being a burden. If these cultural traits influence reporting rates, it is hard to measure them quantitatively, as answering such items correctly requires a good reporting culture. Thus, this represents a considerable methodological challenge.

These cultural traits may also be supported by structural features; e.g. time limited job contracts that are renewed regularly, and whose renewal is dependent on performance. Some foreign HGV drivers are hired by agents, and future research should examine how these agents use information about the drivers when choosing the right driver for an assignment. Future research could also examine this cultural aspect.

17 Conclusion

The aims of the present study were to: 1) Examine safety outcomes of increasing internationalisation in (Norwegian) road transport of goods, 2) Discuss the importance of potential risk factors, and 3) Discuss potential measures to increase the safety of road transport of goods further. We have used the following five methods to fulfil the aims of our study: 1) Accident analysis, 2) Literature review, 3) Interviews, 4) Field works and 5) Small-scale survey. We also draw on NPRA inspection results and statistics from towing companies.

17.1 Foreign drivers have twice the risk of domestic drivers

In the literature review, we found eight studies indicating that the HGV accident risk varies by a factor of up to ten in European countries, and that the accident risk of foreign HGVs is approximately two times higher than that of domestic HGVs in the studied European countries. Thus, it seems that increased internationalisation of road transport of goods in Norway has the potential to increase the number of HGV accidents. It must be noted, however, that Germany has a relatively low HGV related fatality risk (AECOM 2014), despite having probably the highest share of transport with foreign HGVs in Europe (35 %). Future studies of this issue should therefore compare risk and risk factors of foreign and domestic HGVs in Germany.

Analysis of AAG data from 2010-2013 indicates that 17 % of the professional drivers involved in fatal accidents in Norway (N=230), had a foreign nationality (while they account for 6 % of the travelled HGV kilometres in Norway). Results also indicate that foreign professional drivers in Norway seem to be more likely to trigger fatal accidents than Norwegian drivers. Less than a third (29 %) of the Norwegian professional drivers drove triggering vehicles but more than half (58 %) of the foreign drivers did so.

Results from analysis of police reported traffic accidents with personal injuries (2007-2012) indicate that foreign HGVs have a three times higher risk of single vehicle accidents than Norwegian HGVs, twice the risk of head-on collisions, and nearly twice the risk of collisions with vehicles driving in the same direction.

The risk of being involved in intersection collisions is similar for Norwegian and foreign HGVs, probably because Norwegian HGVs have a higher share of their driving in densely populated areas with more intersections, while foreign HGVs have a higher share of their driving on main roads.

17.2 Risk factors

We identify 12 potential risk factors related to internationalisation of the haulier industry in Norway, based on previous research and interviews:

1) winter driving
2) drivers' transport safety behaviours
3) company follow up of drivers' transport safety behaviours
4) safety culture
5) organization of transport assignments
6) safety management
7) competence, training and experience
8) technology and equipment
9) economy, competition and pay
10) rules and enforcement
11) working hours and fatigue
12) the road and road environment

We are unable to conclude on the importance of several of these risk factors, either because we have not measured the relative importance of these risk factors in our survey, or because results from the different methods that the study employs diverge. Nevertheless we can say that two risk factors seem to be important: (1) experience with/competence on Norwegian roads and (2) winter driving.

17.3 Experience with and competence on Norwegian roads/conditions

According to the results of the literature review, Norwegian roads offer conditions that may be challenging for foreign drivers, e.g. winter conditions, regions with roads with poorer standard (e.g. narrow roads with many turns) than roads on the European continent and hilly terrain (steep inclination and ascent).

In accordance with the assumption that the Norwegian road network is demanding for foreign drivers, previous research (Nævestad et al 2014) indicates that HGVs from non-Scandinavian countries have a three times higher accident risk than Scandinavian vehicles in the western, central and northern regions of Norway. HGVs from non-Scandinavian countries have twice the risk of accidents in western/central/northern Norway that they have in the south/east. In comparison there is little difference between accident risks for Scandinavian HGVs in these two parts of the country. Thus, we may assume that it is more difficult for foreign drivers to drive in some parts of Norway, perhaps because they lack the experience and competence of Norwegian drivers.

Interviewees underlined that Norwegian road conditions put strong demands on (foreign) driver competence. Driving safely under winter conditions is strongly dependent on driver' experience, which allows them to judge situations correctly, evaluate risks and adapt their speed to conditions. Because of their experience, they are able to recognize dangerous situations and judge risks correctly.

17.4 Winter driving

Analysis of personal injury accident data indicates that HGVs from non-Scandinavian countries (62 %) have a greater proportion of the accidents in the winter than the Scandinavian (53 %) vehicles have. In addition, HGVs from non-Scandinavian countries (38 %) have a greater proportion of the accidents on road

surfaces with ice/snow/slippery conditions than the Scandinavian (29 %) vehicles have. This may indicate that foreign HGVs have a higher accident risk in the winter than Norwegian HGVs.

Interviewees agreed that winter driving is the main safety challenge related to foreign drivers in Norway. This challenge is multi-faceted. Foreign HGVs are less suited to Norwegian winter conditions as they often have two axles, providing them with a poorer grip than three axle HGVs, which can lift the rear "boggi axle" and increase the weight on the driving axle. Winter equipment (tyres, snow chains) has previously been a challenge, but it seems that this situation has improved.

In the small-scale survey, we examined several aspects of winter driving, comparing Norwegian and foreign drivers. Results indicate that, given their different exposure to winter roads, it seems that foreign drivers and especially drivers from CEE have a higher risk of being in need of towing assistance when driving on Norwegian winter roads than Norwegian drivers.

Results indicate that Norwegian drivers have a stronger feeling of mastery of winter conditions than foreign drivers, especially compared to drivers from CEE. We also found that CEE drivers are more worried about "getting stuck" when driving under winter conditions than Norwegian drivers. Interviewees believed that foreign HGV drivers have a considerably greater risk of "getting stuck" under winter conditions than Norwegian HGV drivers.

Drivers from CEE reported of a lower number of snow chains for their trucks/ trailers than Norwegian drivers, and it seems that the Norwegian drivers are more inclined than the two other groups to use snow chains when they need to. Also, the Norwegian drivers report of a higher incidence of winter tyres on their vehicles when driving on winter roads. NPRA inspection data (2012-15) on winter equipment indicates that this has improved in recent years.

In the small-scale survey we included a question to compare drivers' competence on winter loading by asking them to respond to the statement: "In the winter, I load the trailer so that I get maximum weight on the driving axle". 80 % of the Norwegian and 88 % of the WE drivers correctly agreed with the statement, while only 40 % of the CEE drivers did. This indicates that the former groups have a better competence on loading for winter conditions.

17.5 Measures

We discuss 13 main categories of measures addressing risk factors for foreign actors transporting goods on Norwegian roads, and conclude that six of these measures in particular are important for transport safety:

13) Increase heavy vehicle inspections.
14) Education/information on winter driving and Norwegian road conditions aimed at foreign drivers.
15) Clarify (and increase) the responsibilities of transport buyers.
16) Expand the authority of the NPRA
17) Change the sanctioning opportunity from police reports to fines
18) Increased cooperation between domestic authorities.

Finally, we also discuss other measures that could be considered further, but which we do not emphasize as much as the six above mentioned measures. These are: technical requirements for driving in some parts of Norway in the winter, enforce payment of fines, increased cooperation with EU/EEA countries, clarification of rules, road design, introduce certification/approval systems and app-communication with foreign drivers in Norway.

17.6 Questions for future research

The current study lacks data to conclude on the importance of several of the risk factors that we have discussed in this report, and in some cases, the different methods we use in the study provide divergent results on the risk factors. This indicates the need for more research on the following topics:

1) Drivers' transport safety behaviours
2) Company regulation of drivers' transport behaviours
3) Safety culture
4) Organization of transport assignments and safety management system
5) Economy, competition and pay
6) Technology and equipment.
7) Working hours and fatigue

In the introduction, we mentioned that Nævestad et al (2014) point to four issues that should be examined in future research: 1) Why do Other EU15 HGVs have the highest accident risk?, 2) Are the national groups' risk of material-damage only accidents distributed in the same way as their risk of personal injury accidents?, 3) What kind of accidents/situations are the different national groups involved in?, and 4) What proportion of the accidents are triggered by foreign drivers? We have nearly answered three of these questions.

We have seen that it seems that foreign HGV drivers may be more likely to trigger fatal accidents than Norwegian HGV drivers, and that they have a higher risk of single vehicle accidents, head-on accidents and collisions with vehicles driving in the same direction. Statistics also indicate that foreign heavy vehicles are overrepresented among the vehicles that got "stuck" while driving on winter roads, as 33 % (N=590) the 1781 HGVs which were "stuck" on winter roads were foreign. In comparison, 11 % of the HGVs involved in personal injury accidents in Norway were foreign. Foreign HGVs accounted for six per cent of the average domestic transport in Norway in 2009-2012. We do, however, still not know why the Other EU15 HGVs had the highest personal injury accident risk in Nævestad et al's (2014) study.

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19 Appendixes

19.1 Appendix 1: Overview of publications from the literature review

In table V.1 we provide key information on the 25 most relevant and recent publications focusing on safety outcomes of increasing internationalisation of domestic road haulage, potential accident risk factors of foreign hauliers and potential measures to address these risk factors.

Table V.1: Publications focusing on safety outcomes of increasing internationalisation of domestic road haulage (1. Aim of the study), potential accident risk factors of foreign hauliers (2. Aim of the study), and potential measures to address risk factors (3. Aim of the study).

Author	Focus	Relevance	1) Safety outcomes estimated?	2) Risk factors suggested?	3) Measures discussed?
Nævestad, Phillips and Elvebakk (2015) (Norway)	Risk factors and work related factors of fatal accidents triggered by drivers at work	Low to 1. aim, high to 2. aim and medium to 3. aim	No.	Mostly indirectly, several risk factors and framework conditions with relevance to internationalisation are presented. Does not compare nationalities.	Yes, some regulatory challenges and measures aimed at foreign HGV-drivers in Norway are suggested by interviewees.
Nævestad, Hovi, Caspersen & Bjørnskau (2014) (Norway)	Prevalence and risk of foreign HGVs in Norway	High to 1. And 2. Aim and low to 3. Aim.	Yes. Compares accident risk of national groups.	Yes, e.g. winter driving/competence.	No, but important areas for regulation (e.g. winter driving) are highlighted.
Steen Jensen et al (2014)	Working conditions and safety of Norwegian and foreign HGV and tour bus drivers in Norway	Low to 1. Aim, high to 2. Aim and high to 3. Aim.	No.	Yes, some risk factors are suggested, but the main focus is on working conditions.	Yes, several different categories of measures are discussed
Report of the Working Group on cabotage (2014)	Discuss measures to regulate goods cabotage transport in Norway. Primary focus is competition.	Low to 1. Aim, low to 2. Aim and high to 3. Aim.	No.	No, but regulatory challenges with safety relevance are discussed.	Yes, 24 measures are suggested, but they primarily focus on cabotage and competition

Author	Focus	Relevance	1) Safety outcomes estimated?	2) Risk factors suggested?	3) Measures discussed?
AECOM (2014) (Europe)	Structure of EU road haulage sector	High to 1. aim, high to 2. aim and medium to 3. aim	Yes, compares HGV accident risk in European countries	Yes, discusses causes based on previous research.	Yes, several enforcement challenges are discussed and measures to remedy them are suggested.
Nævestad & Bjørnskau (2014) (Norway)	Safety culture in three haulier companies	Low to 1. Aim, high to 2. Aim and low to 3. Aim.	No.	Indirectly, as the relationship between safety culture, work related risk factors and accident risk are studied. Does not compare nationalities.	No, but this report sheds light on important aspects of safety management that could be the focus of regulation.
Policy Research (2013) (Netherlands)	Consequences of road cabotage liberalization	Low to 1. aim, and medium to 2. and 3. Aim.	No. To be addressed in a separate report	Intensity of enforcement	Yes, recommends clarification of rules on several areas and coherent enforcement.
Sternberg (2013) (Sweden)	Scope and consequences of road cabotage	Low to 1. aim, medium to 2. Aim and low to 3. aim	No.	Enforcement and interpretation of cabotage rules	No, but focuses on the challenging "grey zone" introduced by current legislation and could be used as an argument for clarification of cabotage legislation.
European Parliament (2013) (EU)	Implementation of road cabotage, economic and social impacts	Low to 1. Aim, medium to 2. Aim and medium to 3. Aim.	No.	Enforcement and interpretation of cabotage rules	Ten country case studies of interpretations of provisions and enforcement are provided.
Vlakveld, Stipdonk & Bos (2012) (Netherlands)	Training and accident risk of Middle and Eastern European drivers	High to 1. and 2. aim and low to 3. aim	Yes, but exposure data are lacking.	Yes, competence is discussed but dismissed	No.
Bjørnskau & Nævestad (2012) (International)	Safety culture among road users	Low to 1. Aim, medium to 2. Aim and low to 3. Aim.	No	Yes, discusses national traffic safety culture	No.
Tillman (2012) (Sweden)	Carrier selection criteria- Scandinavian and Eastern European hauliers	Medium to 1. Aim, and low to 2. And 3. Aim.	Evaluates a scenario without cabotage restrictions in Sweden. Safety could be included as a carrier selection criterion.	No	No.

Author	Focus	Relevance	1) Safety outcomes estimated?	2) Risk factors suggested?	3) Measures discussed?
Alvarez-Tikkakoski, Solakivi, Lorentz & Olaja (2011) (Finland and the Baltic Sea region)	Market conditions for the safety of the HGV industry	Medium to 1. aim and medium to 2. Aim. and low to 3. Aim.	Yes, the overall safety level in HGV industry	Yes, the best and safest companies survive competition	No, although issues related to enforcement are discussed.
Warner, Özkan, Lajunen & Tzamalouka (2011) (European)	Driver behaviour of European car drivers	Low to 1. Aim, medium to 2. Aim and low to 3. Aim.	No	Yes, discusses national differences in driver behaviour	No, but shows that different countries have different problems with regard to aberrant driving behaviours which need to be taken into account when promoting traffic safety interventions.
DaCoTa (2010) (Europe)	Accident risk and characteristi cs of HGV accidents in Europe	High to 1. aim and medium to 2. Aim and low to 3. Aim.	Yes, compares HGV accident risk in European countries	To some extent, as it provides accident characteristics, and direct causes.	No.
Ward (2010) (International)	Traffic safety culture	Low to 1. Aim, medium to 2. Aim and low to 3. Aim.	No	Yes, discusses national traffic safety culture	No, but the study suggests interesting cultural approaches to designing road safety campaigns.
Danton, Kirk, Rackliff, Hill, Gisby, Pearce & Dodson (2009) (UK)	Safety challenges of foreign HGVs in UK	High to 1. and 2. Aim, and low to 3. aim	Yes, 10 % of HGVs in accidents are foreign, but exposure data are lacking.	Yes, analysis of accidents involving foreign drivers, who are unaccustomed to left-hand driving, and whose HGVs are designed for right-hand driving.	No, but the study recommends information campaigns aimed at foreign drivers and training of domestic drivers to avoid left-hand-drive accidents.
Sørensen (2009) (Denmark)	HGV – bicycle interaction in European cities	Low to 1. Aim, high to 2. Aim, and high to 3. aim	No	Yes, foreign drivers lack experience with bicycles.	Yes, discusses negative and positive traffic safety effects of a HGV prohibition zone in the city centre of Copenhagen.
Yannis, Golias & Papadimitrio u (2007) (Greece)	Accident risk of foreign and domestic drivers in Greece	High to 1. and 2. Aim and medium to 3. aim	Yes compares foreign and native drivers risk under different conditions	Yes, area type, junction and lighting conditions.	Yes, targeted interventions, better adapted to the needs and issues of each category of foreign drivers is discussed in the concluding remarks.
Elvik (2006) (International)	Literature survey and meta-analysis of deregulation and transport safety	High to 1. Aim and low to 2. Aim. and low to 3. Aim.	Yes, safety outcomes of deregulation	No	No.

Author	Focus	Relevance	1) Safety outcomes estimated?	2) Risk factors suggested?	3) Measures discussed?
Nordbakke (2004) (Norwegian)	Fatigue and falling asleep behind the wheel, private and professional drivers	Low to 1. Aim, high to 2. Aim and low to 3. Aim.	No	Yes, presents the prevalence of fatigue and falling asleep among professional and private drivers. Does not compare nationalities.	No.
Hofstede (2001)	Analysis of dimensions of national cultures. Focuses neither on safety, nor transport.	Low to 1. Aim, medium to 2. Aim and low to 3. Aim.	No.	No, but the research of Håvold (2005) may indicate that these dimensions are relevant to safety.	No
Leviäkangas (1998) (Finland)	Accident risk of Russian car drivers and HGVs in Finland	High to 1. and 2. Aim and high to 3. Aim.	Yes, compares accident risk.	Yes, traffic culture and winter driving, focusing on competence/experience and equipment.	Yes, several types of interventions are discussed in the concluding remarks, especially related to winter driving.
SARTRE (1994) (European)	Road safety attitudes of European car drivers	Low to 1. Aim, medium to 2. And 3. Aim.	No	Yes, but discusses national road safety attitudes of car drivers, and not HGV drivers.	Yes, several different interventions are suggested based on the observed road safety attitudes of car drivers.

19.2 Appendix 2: Semi-structured interview guide

I) Introduksjon

Transportøkonomisk institutt gjennomfører en undersøkelse som heter Safe Foreign Transport, som er finansiert av Forskningsrådets Transikk program. Prosjektet startet i januar 2013 og varer ut april 2016.

Prosjektets hovedmål er å vurdere om økningen av utenlandske aktører som transporterer gods på veg og sjø i Norge har effekt på ulykkesrisiko, og bidra med kunnskap som norske myndigheter kan bruke for å utvikle risikoreduserende tiltak.

Vi har tidligere gitt ut rapporter om trafikkarbeid og risiko. Nå jobber vi med en sluttrapport som skal gi svar på tre spørsmål:

1) hva er sikkerhetskonsekvensene av internasjonalisering av godstransport på veg?

2) Hva er betydningen av ulike risikofaktorer og sikkerhetsutfordringer?

3) Hvilke tiltak kan myndighetene iverksette for å møte disse?

Vi bruker følgende metoder for å svare på spørsmålene:

A) Litteraturstudie,

B) Studie av ulykkesdata,

C) Ekspertintervjuer,

D) feltarbeid, og

E) Liten spørreundersøkelse.

Det er selvfølgelig frivillig å delta og du kan trekke deg fra undersøkelsen når du ønsker. Informasjonen du gir oss behandles anonymt. Det du sier skal ikke kunne knyttes til deg. Vi kommer til å referere til deg som «sektorekspert» i rapporten. Vi er ikke ute etter din arbeidsplass «offisielle syn» på saken, men dine egne erfaringer og tanker.

Du får fremstillingen til gjennomlesning, slik at du kan kommentere og rette opp i eventuelle feil før rapporten publiseres. I tillegg understreker vi at hensikten med intervjuene er å supplere informasjonen fra de andre datakildene vi bruker i studien og gjøre oss oppmerksomme på ulike sammenhenger og hypoteser vi kan studere videre. Vi oppmuntrer derfor de vi intervjuer til å «tenke høyt» basert på sin egen erfaring og kunnskap.

II) Erfaringer med faktisk sikkerhet

1) Etter din erfaring, har utenlandske sjåfører høyere risiko for ulykker enn norske?

- personskade
- materiellskade
- bergingshjelp
- Forskjell på ulike grupper av nasjonaliteter?

III) Risikofaktorer

2) Hva mener du er de viktigste årsakene til ulykker og farlige hendelser blant utenlandske sjåfører på norske veger?

-I det følgende skal vi gå gjennom en del risikofaktorer som har blitt undersøkt i forskningen på internasjonalisering og sikkerhet på veg, og så skal jeg spørre deg hvorvidt disse forholdene kan være aktuelle på norske veger, og i så fall hvordan de kan ha konsekvenser for sikkerhet. Dersom du ikke har kunnskap eller mener noe om disse forholdene, kan du si pass, så hopper vi over dem.

3) Transportsikkerhetsatferd Har du inntrykk av at det er forskjell på norske sjåfører og sjåfører fra andre land når det gjelder risikofaktorene for høy fart etter forholdene og manglende bilbelte?

- Tror du utenlandske firmaer fokuserer systematisk på disse forholdene?

4a) Nasjonal sikkerhetskultur

i) Har du inntrykk av at sjåfører fra andre land har en annen nasjonal sikkerhetskultur enn norske? (for eksempel influert av føreropplæringen, videreutdanningen, det nasjonale politiets håndhevelse, samhandling i trafikken i hjemlandet)

ii) I så fall: hvordan gir dette seg utslag?

5b) Organisatorisk sikkerhetskultur?

Har du noen oppfatning-om om organisatorisk sikkerhetskultur i norske og utenlandske transportfirmaer? (Fokus på sikkerhet blant ledere og ansatte)

6) Organisering av frakt

- Har du kunnskap om hvem som organiserer frakten og hvordan utenlandske sjåfører i Norge har kontakt med sine fraktledere, evt, kunder?
- Har du inntrykk av at ledere eller kunder presser/stresser sjåfører?

7) Sikkerhetsstyringssystem

- Har du kunnskap om sikkerhetsstyringssystemer: 1) risikoanalyser, 2) prosedyrer og 3) opplæring) i utenlandske transportbedrifter?

8) Kompetanse, opplæring og erfaring

- Har du inntrykk av at sjåfører med ulike nasjonaliteter har ulik opplæring og kompetanse? (evt. konsekvenser for sikkerhet?)
- Har du noen oppfatning om hvorvidt norske har sjåfører bedre kompetanse enn utenlandske til å kjøre på norske veger?

9) Teknologi og utstyr

- Har du inntrykk av at det er forskjeller på kjøretøyenes tekniske tilstand når man sammenlikner norske og utenlandske tunge godsbiler?

10) Økonomi, konkurranse og lønn?

- Tror du at konkurranse mellom norske og utenlandske transportører har konsekvenser for sikkerhet?
- Vet du om de utenlandske sjåførene har mer provisjonslønn enn norske sjåfører?
- Har norske og utenlandske sjåfører fast/flat lønn uten overtidsbetaling?

11) Arbeidstid og trøtthet

- Har du inntrykk av at arbeidstid og kjøretid påvirker sikkerhet?

12) Regler og håndhevelse?

- Synes du kontrollen av norske og utenlandske kjøretøy fungerer i dag?
- Fungerer kontrollene like godt for norske og utenlandske transportører?

13) Spørsmål om vinterkjøring

- Har norske sjåfører har bedre kompetanse til å kjøre på norske vinterveger enn utenlandske?

- Er det forskjeller på norske og utenlandske sjåførers utstyr til vinterkjøring? (boggiaksel, kjetting og dekk)
- Har du inntrykk av at det er forskjeller på kompetanse når det kommer til lasting for vinterveger og bruk av boggiaksel?
- Har du inntrykk av at utenlandske sjåfører tilpasser sin atferd og kjører mer forsiktig på vinterføre enn norske pga forskjeller i kompetanse og utstyr?

IV) Relevante tiltak

- I det følgende skal vi gå gjennom en del tiltak som har blitt diskutert særlig i arbeidsgruppen om kabotasje sin rapport og i Fafo og TØI sin rapport om arbeidsforhold i gods og turbilsektoren. Jeg nevner tiltak og .dersom du ikke har kunnskap eller mener noe om dem, kan du si pass og så hopper jeg over det

14) hva er de viktigste tiltakene som bør innføres for å sikre at økning i utenlandske aktører ikke fører til høyere risiko på norske veger?

14a) Hva mener du om å øke antall tungbilkontroller?

14b) Det har blitt foreslått å etablere et nasjonalt elektronisk register over transportører og sjåførers brudd og koble dette til EU sitt ERRU register som er i anmars. Synes du det er et godt tiltak?

14c) Er det utfordringer knyttet til det å kreve inn bøter fra utenlandske transportører og trenger vi tiltak for å forbedre dette?

14d) Er økt samarbeid med EU/EØS land for eksempel relatert til kontroll, informasjonsdeling, innkreving og tilsyn med transportselskaper et godt tiltak?

14e) Dette med klargjøring av regler diskuteres i rapporten til arbeidsgruppen om kabotasje, men det er særlig relatert til regulering av konkurranse mellom norske og utenlandske transportører. Kan dette også være et sikkerhetsrelevant tiltak?

14f) Hva mener du om det nye samarbeidet mellom de offentlige etatene som fører kontroll med og tilsyn med godstransportører på veg ? Kjenner du status for dette samarbeidet, og synes du at det er et godt tiltak?

14g) Synes du at Statens vegvesen bør få større myndighet til å sanksjonere sjåfører enn det de har i dag, for eksempel til å utstede gebyr for brudd på kjøre og hviletidsbestemmelsene?

- Hvordan synes du at samarbeidet mellom Statens vegvesen og politiet fungerer ved kontroller og sanksjoner rettet mot norske og utenlandske sjåfører?

14h) Synes du at det å øke transportkjøpernes ansvar for at transportoppdrag gjennomføres på en sikker måte er et godt tiltak? («Trygg trailer»)

14i) Synes du at det å utarbeide informasjonskampanjer rettet mot utenlandske sjåfører og selskap er et godt tiltak? («Donna Diesel»)

14j) Synes du at-kampanjer rettet mot transportkjøpere i Norge (Kreve ISO sertifisering eller noe liknende?) er en god ide?

14k) Har du inntrykk av at det å introdusere sertifiseringssystemer (ISO39001) eller godskjenningssystemer slik som de har i andre bransjer (for eksempel renhold) kan være et fruktbart tiltak for å øke transportsikkerheten til norske og utenlandske transportører?

14l) Bør det innføres krav om spesiell utdanning og kurs for å kjøre i Norge, for eksempel knyttet til vinterkjøring og eller med fokus på kjøring i kupert terreng og med varierende standard?

14m) Bør det innføres tekniske krav til tunge godsbiler for å kjøre i Norge om vinteren, feks treakslet trekkvogn, evt. bare i noen landsdeler?

V) Avslutning
- Er det noe annet du mener vi burde tatt opp?
- Vi kommer som nevnt til å kontakte deg for å kvalitetssikre intervjudataene før studien sluttrapporteres.
- Tusen hjertelig takk for at du tok deg tid til dette!

19.3 Appendix 3: Small-scale survey questionnaire

Questions	Response Options
Background questions I	
1. Age group	< 26/26-35/36-45/46-55/56 +
2. The driver's nationality/country of residence	
3. The truck's nationality	
4. Are you independent or an employee in a company? (please check)	1) independent, 2) company, 3) staffing company
Questions on winter driving	
Experience	
5. Approximately how many days have you been driving on Norwegian winter roads in total?	1) have never driven in Norway in the winter (if so, go to question 13), 2) 1-10 days, 3) 11-50 days, 4) 51-100 days, 5) more than a hundred days

Questions	Response Options
6. Have you ever been in need of towing assistance due to winter conditions?	1) Yes, 2)No
Competence	
7. I feel that I cope well with the driving conditions of Norwegian winter roads	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
8. When driving in the winter I often use snow chains	
9. In the winter, I load the trailer so that I get maximum weight on the driving axle	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree, 6) I do not load the trailer myself
Risk perception	
10. I feel equally safe when driving in the winter in Norway as I do in summer	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
11. I'm worried about “getting stuck” when driving under winter conditions	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
Equipment	
12. When I drive on winter roads, my vehicle has:	1)Summer tires, 2) winter tires on the driving axle only, 3) winter tires on the truck 4) winter tires on the truck and the trailer
13. When driving on winter roads, my vehicle has snow chains for the:	1) front wheels, 2) driving axle wheels, 3) trailer wheels (feel free to choose more than one alternative)
14. I am often stressed due to technical problems with my vehicle or other equipment.	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
Winter driving training	
15. I have been trained in driving on winter roads	1) No 2) Yes, when I got my driver's license, 3).Yes, by the company where I am employed, 4) Yes, by colleagues, 5) Yes, by others
16. I would like to have more training in winter driving in Norway	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
Donna Diesel	
17. Have you obtained a «Trucker Guide to driving in Norway? (the question must include the illustration below)	1)Yes, 2) no, 3) can’t remember

Questions	Response Options
	
18. Have you read the «Trucker's Guide » ?	1) Yes, I have read the entire guide. 2) Yes, I have read parts of the guide, 3) No, I have not read the guide, 4) I can't remember, 5) I have not obtained the guide.
19. Do you have a phone that works in Norway?	1)Yes, a smartphone, 2) yes, a phone without internet and multimedia, 3) no
20. Would you register your phone number when you cross the Norwegian border, if you could get text messages with information in you own language regarding dangerous driving conditions, extreme weather, closed roads and so on?	1) yes, 2) no, 3) Maybe
21. If there was a free App/application to your mobile phone with map and information on your language about picnic stops, petrol stations, closed roads and so on, would you download it?	1) yes, 2) no, 3) maybe
Questions on safety culture from the GAIN scale	
22) The management in my company focuses on safety	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
23. The drivers in my company do everything they can to avoid unwanted incidents and accidents	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree

Questions	Response Options
24. In my company there are routines for reporting safety problems and safety violations	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
25. Drivers in my company receive adequate training to drive in a safe way	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
26. There are regular safety checks of vehicles in my company	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
Questions influenced by TØI rapport 1269 and Harald Bergland's study	
27. The drivers in this company adhere to the speed permitted by speed limits and driving conditions	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
28. All drivers in my company use seat belts	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
29. In my company, it is more important to drive safely than to deliver on time	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
30. Sometimes I break the traffic rules to get quicker to the destination	1)Totally disagree, 2) disagree somewhat, 3) Neither agree, or disagree, 4) Agree somewhat, 5) totally agree
31. Have you ever fallen asleep (or drowsed for a short moment) driving a heavy vehicle?	1) Yes 2)no
32. Has it occurred in the last 12 months?	1) Yes 2)no
33. Do you ever drive a heavy vehicle, although you actually are too tired or unfit to drive (several answers possible)	1) Yes, if it is a short trip, 2) Yes, if I know the route well, 3) Yes, if the road to the destination is short 4) Yes, if the road has rumble strips that may wake me up if I should fall asleep, 5) Yes, I believe it will turn out ok, as I start to drive, 6) Yes, for other reasons 7) No, never
Working conditions	
34. How long are you usually away from home when you are working?	1) Less than two weeks, 2) 2-4 weeks, 3) 5-8 weeks 4) 9 weeks or more
35. How many hours do you drive on a typical working day?	
36. How many hours do you work in total on a typical working day?	
37. Are rest areas in Norway: (feel free to answer more than one alternative)	1) Safe, 2) noisy 3) hygienic, 4) overcrowded, 5) Too few
38. Is your payment fixed?	
36. How much, you earn a month (included expenses for food and lodging)? (in Euros)	
39. Are you the key responsible for? (please check, if yes)	1) actually carrying out the loading/unloading, 2) cover the diesel costs
40. How many hours do you expect to drive all in all today?	
Background II	
41. Approximately how many employees are there in your company?	
42. Where did you drive from with the cargo you have now (if cargo)?	
43. Where are you driving the cargo you have now? (city/country)	
44. Do you own the truck yourself?	1) Yes, 2) No

Questions	Response Options
45. In which country are you employed?	
46. How did you get this transport?	1) myself on the spot market, 2. From my employer or principal in advance of this trip, 3. From my employer/principal on the way to/in Norway
47. Approximately how many 1000 miles have you driven with a heavy vehicle the last two years?	
48.. During the last two years, have you been involved in a road accident while at work?	1) Yes, 2)no
49. How often have you been to Norway to work as a driver in the last two years?	1) This is the first time, 2) very rare, 3) every six months, 4) every month, 5) every week

19.4 Appendix 4: Significance tests of differences in accident risk

19.4.1 Norwegian and foreign HGVs risk of different accident types

Table V4.1: Risk estimates for police-reported personal injury accidents with HGVs in Norway distributed according to accident type and vehicle registration country

	Nationality	Mill km	Accid.	Risk	Std. Exp.	Std. acc.	Std. risk		Lower	Upper
Single vehicle accidents	Norway	10311,06	507	0,05	101,54	22,52	0,002	0,004	0,04	0,05
	Foreign	602,14	97	0,16	24,54	9,85	0,018	0,035	0,13	0,20
Head-on accidents	Norway	10311,06	971	0,09	101,54	31,16	0,003	0,006	0,09	0,10
	Foreign	602,14	120	0,20	24,54	10,95	0,020	0,039	0,16	0,24
Same direction	Norway	10311,06	1050	0,10	101,54	32,40	0,003	0,006	0,10	0,11
	Foreign	602,14	113	0,19	24,54	10,63	0,019	0,038	0,15	0,23
Vehicles crossing	Norway	10311,06	449	0,04	101,54	21,19	0,002	0,004	0,04	0,05
	Foreign	602,14	23	0,04	24,54	4,80	0,008	0,016	0,02	0,05
Pedestrian involved	Norway	10311,06	113	0,01	101,54	10,63	0,001	0,002	0,01	0,01
	Foreign	602,14	11	0,02	24,54	3,32	0,006	0,011	0,01	0,03
Other	Norway	10311,06	210	0,02	101,54	14,49	0,001	0,003	0,02	0,02
	Foreign	602,14	18	0,03	24,54	4,24	0,007	0,014	0,02	0,04

Table V4.2: Significance tests of accident risk differences between Norwegian and foreign HGVs in Norway in different accident types

Significance estimates of risk differences between the groups						
	Norway	Foreign	Difference	Confidence interval		Significance
Single vehicle acc.	0,05	0,16	0,112	0,147	0,08	significant 5 %
Head-on accidents	0,09	0,20	0,105	0,145	0,07	significant 5 %
Same direction	0,10	0,19	0,086	0,124	0,05	significant 5 %
Vehicles crossing	0,04	0,04	0,005	0,022	-0,01	ns
Pedestrian involved	0,01	0,02	0,007	0,018	0,00	ns
Other	0,02	0,03	0,010	0,024	0,00	ns

19.4.2 Self-reported accident risk from the small-scale survey

Table V343: Risk estimates based on self-reported numbers on exposure and accidents in the small-scale survey

Nationality	Mill km	Accid.	Risk	Std. Exp.	std. acc.	Std. risk		Lower	Upper
CEE	11,98	4	0,33	3,46	2,00	0,19	0,38	-0,04	0,71
WE	4,40	2	0,46	2,10	1,41	0,39	0,76	-0,31	1,22
Norwegian	10,17	7	0,69	3,19	2,65	0,34	0,66	0,03	1,35
Norwegian II	21,54	26	1,21	4,64	5,10	0,35	0,69	0,52	1,90

Table V4.4: Significance tests of accident risk differences between national groups in the small-scale survey. Norwegian drivers versus the other groups.

Significance estimates of risk differences between the groups						
Group	Norwegian	Other groups	Difference	Confidence inteval		Significance
WE	0,69	0,46	0,23	1,24	-0,78	ns
CEE	0,69	0,33	0,35	1,12	-0,41	ns
Norwegian II	0,69	1,21	0,52	1,47	-0,44	ns

Table V4.5: Significance tests of accident risk differences between national groups in the small-scale survey. CEE drivers versus the other groups.

Significance estimates of risk differences between the groups						
Group	CEE	Other groups	Difference	Confidence inteval		Significance
WE	0,33	0,46	0,12	0,97	-0,73	ns
Norwegian	0,33	0,69	0,35	1,12	-0,41	ns
Norwegian II	0,33	1,21	0,87	1,66	0,09	significant 5 %

Institute of Transport Economics (TØI)
Norwegian Centre for Transport Research

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