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Safety culture among bus drivers in Norway and Greece

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ABSTRACT

The aims of the present paper are to: (1) Examine the influence of national safety culture, sector safety focus and organizational safety culture on the safety behaviours of professional drivers, compared with other explanatory variables (e.g. age, type of transport, working conditions), and to (2) Examine the influence of safety behaviours and other factors (e.g. age, mileage, type of transport) on self-reported crash involvement. A survey was conducted, including 215 bus drivers in Norway and Greece. Our study provides four main results. First, more bus drivers in Greece than in Norway report being involved in more aggressive violations in traffic (e.g. become angered by other drivers and indicate hostility, sound their horn). Second, aggressive violations were predicted by national road safety culture, specified as descriptive norms ("violations") and values/attitudes (individual freedom to take risk in traffic). Third, Greek bus drivers' aggressive violations in traffic predicted their self-reported crash involvement, although reports on "work related variables" (e.g. experienced work pressure) were more strongly correlated with their crash involvement than their self-reported aggressive violations. Fourth, organizational safety culture contributed negatively to aggressive road safety behaviours, meaning that a positive organizational safety culture may reduce (the negative impact of national road safety culture on) aggressive violations in traffic. Although more research is needed, our study indicates a relationship between national road safety culture, road safety behaviour and crash involvement, that could be developed further to help explain differences in national road safety records.

1. Introduction

Road crashes represent a serious public health problem. Recent data shows that 1.35 million people die each year on the world's roads, and between 20 and 50 million people sustain non-fatal injures (WHO, 2018). Thanks to traditional safety strategies targeting safety behaviours, technology and infrastructure, the number of road fatalities has steadily decreased (Elvik, Vaa, Erke, & Sorensen, 2009), but there is still considerable room for safety improvement. One important crash risk factor not currently addressed by traditional road safety interventions is poor safety culture (Nævestad & Bjørnskau, 2012; Ward, Linkenbach, Keller, & Otto, 2010).

The concept of safety culture is usually traced to the 1986 Chernobyl disaster, which led to a shift of focus in the investigations and studies of safety in organizations. Safety culture/climate has, in the years following Chernobyl, been applied to

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an ever increasing range of sectors and industries, including professional and private road transport, where a relationship between safety culture/climate and safety performance is indicated (Bjørnskau & Nævestad, 2013; Edwards, Freeman, Soole, & Watson, 2014). Organizational safety culture can be defined as "safety relevant aspects of culture in organizations" (Antonsen, 2009; Hale, 2000; Nævestad, 2010). Safety climate is often defined as the more transient, quantitatively measureable manifestions of safety culture, reflecting the perceived focus on and importance of safety in organisations (Flin et al., 2000; Huang et al., 2013). The concepts are, however, often used interchangeably.

Since safety culture is by definition shared, it must be related to social units. The safety culture perspective has traditionally been ascribed to organizations, and since professional drivers are part of organizations, they can be subjected to traditional safety culture studies and interventions. Different groups of professional drivers have been studied with respect to safety culture/climate (e.g. bus drivers, taxi drivers, van drivers and truck drivers) (Davey, Freeman, & Wishart, 2006; Wills, Biggs, & Watson, 2005). Organisations are, however, not the only sociocultural unit influencing the road safety behaviours of professionals. Several factors that could influence road safety culture are national (e.g. traffic rules, the police enforcing the rules, driver licensing, and driver education). For these reasons, we could expect the existence of different national road safety cultures (cf. Nævestad et al., 2019). In spite of comprehensive international standards for training, procedures etc., research has found that national cultures influence safety behaviour in other transport sectors, e.g. aviation (Merrit, 2000) and maritime (Håvold, 2005). It is also documented that organisational safety culture differs between transport sectors, i.e. aviation, road, rail, and sub sectors (e.g. helicopter and airlines) (Bjørnskau & Longva, 2009). This is probably due to differences in framework conditions like rules/enforcement, competition and regulation, which differ considerably in different sectors.

Thus, if we are to fully understand its effects on safety in road transport, we should study not only safety culture particular to organisations, but also that particular to sectors and nations. We define road safety culture (RSC) as shared norms prescribing certain road safety behaviours, and thus shared expectations regarding the behaviours of others (Nævestad & Bjørnskau 2012; Nævestad et al., 2019), and shared values and attitudes signifying what is important (e.g. safety, mobility, respect, politeness) (cf.Elvebakk, 2015). An important aspect of our approach is that overall RSC is a composite of overlapping safety cultures associated with such different types of sociocultural units (cf. Nævestad & Bjørnskau, 2012; Edwards et al., 2014).

The safety culture perspective is quite new to the road sector, and more research is needed for the perspective to be as crucial in the road sector as it is in hazardous industries. It is decisive to establish the importance of RSC in influencing road safety behaviour and safety outcomes, and to clarify how this knowledge can be used to enhance road safety. In this framework, a research project titled "Safety culture in private and professional transport: examining its influence on behaviours and implications for interventions" funded by the Norwegian Research Council, and undertaken by the Institute of Transport Economics - TØI (Norway) and the National Technical University of Athens - NTUA (Greece) is exploring safety culture in land and sea based, professional and private transport in Norway and Greece. The main aims of the project are to examine safety culture and behaviour in road and sea transport, and to clarify implications for safety intervention strategies. The present paper provides the first results from the project, focusing only on bus drivers in the two countries. The first version of the paper was presented at the 2017 RSS conference. A recent paper from the project outlines and discusses a comparsion of both private and professional drivers in Norway and Greece, based on qualiatative and quantitative data (Nævestad, Laiou, Phillips, Bjørnskau, & Yannis, 2019).

Norway and Greece were selected for comparison since the road safety record of the two countries differs significantly. The road fatality rate of Norway was the lowest in the EU in 2017 (20 fatalities per million population) (ETSC, 2018). On the other hand, Greece has one of the worst road safety records of all EU-27 countries (Yannis & Papadimitrou, 2012). The fatality rate of Greece has been higher than the EU average (69 fatalities per million population in 2017) in all years between 2001 and 2014. The age-standardised number of deaths for all forms of road transport in Greece in 2010 was 136 per million population, with only Romania performing worse (OECD, 2015). The corresponding figure for Norway was 52 per million citizens. Greek motorists also report poorer safety behaviours in traffic, and recent research points to serious flaws in the way road safety is managed at all levels in Greece (Papadimitriou, Yannis, & Muhlrad, 2015).

The probability of crash involvement is lower for bus than for other vehicle types. Due to their mass and size, however, the consequences of bus crashes are often very severe. European research reveals large national differences among countries on bus crash risks (DACOTA, 2011; European Commission, 2016), in spite of common European safety rules and driver training. The average fatality rate in crashes involving buses or coaches in the EU was 1.4 per million population in 2015. The respective number was 0.6 in Norway and 1.7 in Greece (European Commission, 2016).

The aims of the present paper are to: (1) Examine the influence of national safety culture, sector safety focus and organizational safety culture on the safety behaviours of professional drivers, compared with other explanatory variables (e.g. age, type of transport, working conditions), and to (2) Examine the influence of safety behaviours and other factors (e.g. age, mileage, type of transport) on self-reported crash involvement.

2. Theoretical approach and previous research

2.1. Conceptualizing and operationalizing road safety culture

Although the concept of driving culture first was used as early as in 1992, there are no commonly acccepted definitions of road or traffic safety culture (Edwards et al., 2014). In 2014, Edwards et al noted that a compendium following from a work

shop about road safety culture, arranged by the American Automobile Association (AAA, 2007), comprised the bulk of literature on road safety culture. The few definitions given in this compendium focus on e.g. the "beliefs, norms and values and things people use that guide their social interactions in everyday life" (Moeckli & Lee, 2007), "implicit shared values and beliefs", "common practices, expectations and informal rules that drivers learn by observation from others in their communities" (Lonero, 2007).

Thus, by defining RSC as shared norms prescribing certain road safety behaviours, shared expectations regarding the behaviours of others and shared values and attitudes signifying what's important, we seem to include most of the recognized key aspects of RSC. Our definition is congruent with our operationalisation of RSC as descriptive norms (Cialdini, Reno, & Kallgren, 1990). Ward et al. (2010) asserts that that the theoretical link between safety culture and safety behaviours often is omitted in research, and that the applicability of the safety culture perspective is dependent on developing a theoretical model to explain this relationship. Individuals' perceptions of peers' opinions about a given behaviour are often defined as injunctive norms, while individuals' perceptions of what peers actually do often are defined as descriptive norms (Cialdini et al., 1990; Ward et al., 2010). Descriptive norms may influence behaviour by providing information about what is normal (Cialdini et al., 1990). Previous research measuring road safety culture as descriptive norms found it to predict respondents' own road safety behaviours, which in turn predicted their crash risk (Nævestad, Elvebakk, & Bjørnskau, 2014). Operationalising RSC as descriptive norms, we may refer to the mechanism mediating between safety culture (shared norms and expectations) and safety behaviours as "subtle social pressures" (Cialdini et al., 1990), or informal rules creating pressures for conformity (Naveh and Katz Navon, 2015). Finally, it is important to note that the descriptive norms mechanism– how we think others behave –may be strengthened through the false consensus bias, in which individuals overestimate the prevalence of risky behaviour among their peers in order to justify their own behaviour (Berkowitz, 2005).

Our definition of RSC also includes values and attitudes, as previous studies indicate a relationship between these and road safety. Moeckli and Lee (2007) links for instance the relatively poor road safety records in the United States to the American values of freedom, individualism, self-realisation, prosperity and progress (cf. Edwards et al., 2014). Similar relationships are also discussed in Elvebakk (2015). Accordingly, some of the definitions of road safety in the AAA publication (2007), additional to Moeckli and Lee (2007), also include values.

2.2. Factors influencing the safety behaviours of professional drivers

Nationality. There is, as far as we know, no previous research comparing Norwegian and Greek bus drivers, but there is some research comparing private car drivers in Northern Europe and Southern Europe. Previous Research, especially using driver behaviour questionnaire (DBQ) items, shows that when southern Europe (Greece) and Northern Europe are compared, there are more aggressive violations in Greece (Özkan, Lajunen, Chliaoutakis, Parker, & Summala, 2006; Warner, Özkan, Lajunen, & Tzamalouka, 2011). Özkan et al. (2006) compares DBQ items in six countries: Finland, Great Britain, Greece, Iran, The Netherlands, and Turkey (each with N = 240). The study concludes that a three-factor DBQ structure (aggressive violations, ordinary violations, and errors) is applicable in each country, and that driving styles (measured as DBQ items) mediates the relationship between traffic culture (i.e country) and crash level within each country. The study does, however, not link driving styles and crash involvement at the individual level.

Warner et al. (2011) compare DBQ items in Finland, Sweden, Turkey, and Greece (each with N = 200). This study includes information about drivers' crash involvement in the last 3 years. The study identifies nine key DBQ items that drivers from different countries rate differently, and five of these explain drivers' crash involvement across the four countries. The nine items are "Become angered by a certain type of driver and indicate your hostility by whatever means you can", "Disregard the speed limit on a motorway", "Disregard the speed limit on a residential road", "Overtake a slow driver on the inside", "Pull out of a junction so far that the driver with right of way has to stop and let you out","Get into the wrong lane approaching a roundabout or a junction", "Sound your horn to indicate your annoyance to another road user", "Attempt to drive away from the traffic lights in third gear", and Misread the signs and exit from a roundabout on the wrong road. They find that different (or no) items predicted crash involvement in each national sample, indicating that different countries have different challenges related to driving behaviours, indicating the need for tailored national road safety interventions. These studies did not focus on professional drivers.

National road safety culture. The above-mentioned studies of national differences between DBQ items (Özkan et al., 2006; Warner et al., 2011) ascribe national DBQ items to differences in national road safety cultures, but they do not explicitly examine or compare these cultures, or specify the (cultural) mechanisms generating these different national behaviours. Thus, this is an issue requiring more research.

Organisational safety culture/climate. Research indicates a relationship between organisational safety culture/climate and safety outcomes (e.g. safety behaviours) in road transport (Bjørnskau & Nævestad, 2013). Davey et al. (2006) for instance uses the DBQ, a Driver Attitude Questionnaire (DAQ) and a safety culture questionnaire (SCQ) to examine the self-reported crash involvement of a sample of Australian fleet drivers (N = 4195). The study concludes that increased work pressures, which was one of the SCQ subfactors, as well as driving mistakes were predictive of crash involvement, even after controlling for exposure to the road. The mentioned study of Öz, Ozkan, and Lajunen (2013) also finds a relationship between organisational safety culture aspects and DBQ factors, as does Öz, Ozkan, and Lajunen (2014). Wills et al. (2005) also identifies a significant relationship between organisational safety culture and DBQ items (errors, distraction, violations) among drivers at work. Huang et al. (2013) develop and test the reliability and validity of a new scale designed for measuring safety

climate among lone workers, using truck drivers as exemplar. They study the predictive power of organization-level safety climate dimensions such as proactive practices, driver safety priority, supervisory care promotion, and the group-level safety climate dimensions: safety promotion, delivery limits, and cell phone disapproval. They examined the relationship between the general safety climate scale and the industry specific scale with safety outcomes (self-reported behaviours, hard braking and road injury), and found that the industry specific scale items were most strongly correlated with safety outcomes.

2.3. Factors influencing the crash risk of professional drivers

Safety behaviour. The above mentioned studies find that the higher prevalence of aggressive violations in southern countries (e.g. Greece) are related to drivers' self-reported crash involvement (cf. Warner et al., 2011), or the crash level between countries at the macro level (Özkan et al., 2006). Reviews of crashes involving drivers at work in general and drivers of heavy vehicles indicate that drivers' safety behaviour is the most frequently cited risk factor, especially too high speed for the conditions and failure to use a seat belt, although it is important to remember that the safety behaviours of drivers at work often are related to work related factors and framework conditions (Mitchell, Driscoll, & Healey, 2004; Nævestad, Phillips, & Elvebakk, 2015). We expand on this below.

Working conditions. Nævestad et al. (2015) compared professional drivers who triggered fatal crashes with those who did not (i.e. were merely involved), and showed that triggering drivers were to a greater extent in a state of haste, stress, fatigue or subject to other external influence such as alcohol, drugs or illness. This may suggest that stress is a key risk factor in fatal crashes triggered by drivers at work (Nævestad et al., 2015). Their analysis involves drivers of vehicles that the Accident Analysis Groups of the Norwegian Public Roads Administration define as triggering for the accident. The term "triggering" is not necessarily, but frequently, synonymous with legal liability. It generally refers to vehicles with the decisive triggering risk factors (e.g. too high speed for circumstances, insufficient information gathering) (Nævestad et al., 2015).

Davey et al. (2006) concludes that that increased work pressures were related to crash involvement, presumably as it influences driver behaviour (DBQ mistakes). It is not unreasonable to hypothesize that safety behaviours mediates between working conditions and crash risk. Öz et al. (2013) identify a relationship between the time pressure of drivers at work and driving behaviours (violations and errors). There is also evidence to suggest that payment systems rewarding production (e.g. km's, transported tonnes) may influence safety outcomes negatively (e.g. Mooren et al., 2014).

Sector safety focus (framework conditions). We have not found previous research focusing on the influence of sector on drivers' safety behaviours. Previous research indicates, however, that differences in framework conditions like rules/enforcement, competition, regulation, transport buyers' focus on safety etc. generate considerable differences between the safety performance of different transport sectors and subsectors (cf. Bjørnskau & Longva, 2009). HGVs transporting dangerous goods have for instance a 75% lower crash risk than other lorries (Elvik et al., 2009). Based on this research, we may hypothesize that sector safety focus, as indicated by framework conditions, influences drivers' safety behaviours, which in turn influence their crash risk.

Demographic factors. As mentioned, nationality is a crucial demographic variable influencing the crash risk of drivers of heavy vehicles (DaCoTa, 2012; European Commission, 2016; Nævestad, Phillips, Levlin, & Hovi, 2017). Salminen (2000) find that older drivers (50–65 years) at work and unmarried drivers have a higher risk, while Charbotel, Martin, and Chiron (2010) find that younger drivers at work (25–34) years have a higher risk.

To sum up, we may hypothesize that the following factors influence bus drivers' safety behaviours (1) Nationality (there will be more aggressive violations among the Greek bus drivers) *(Hypothesis 1),* (2) We may hypothesize that this could be due to national RSC *(Hypothesis 2),* but mechanisms mediating between RSC and behaviour have not been highlighted in previous research. (We specify RSC as descriptive norms and values/attitudes.) (3) Organisational safety culture, as bus drivers are part of organisations with managers influencing their work situation *(Hypothesis 3).* Additionally, we hypothesize that the following factors influence bus drivers' crash risk: (1) The (hypothesized) higher prevalence of aggressive violations in Greece are related to bus drivers' increased crash risk (although previous research only focuses on private drivers) *(Hypothesis 4),* (2) Working conditions may also influence bus drivers' crash risk, as previous research has found that time pressure, stress and payment systems rewarding production may influence safety outcomes negatively *(Hypothesis 5),* (3) Sector safety focus may also influence bus drivers' crash risk, as previous research indicates considerable differences in the crash risk of different types of heavy vehicle transport, presumably because of different framework conditions *(Hypothesis 6).* We have, however not found research comparing the risk of subsectors within bus transport. (4) Demographic variables, as previous research indicates a higher crash risk for bus transport in Greece, and a higher crash risk for young and old drivers *(Hypothesis 7).* Fig. 1 sums up the hypothesized relationships depicted in hypotheses 1–7.

3. Methodology

3.1. Recruitment of respondents

Qualitative interviews were conducted with ten bus drivers in Norway and ten in Greece. The purpose was to acquire rich qualitative data on the importance of nationality, sector and organizations in influencing safety behaviours and outcomes. The purpose was also to get input on the applicability of scales, and find out if additional questions should be added. The

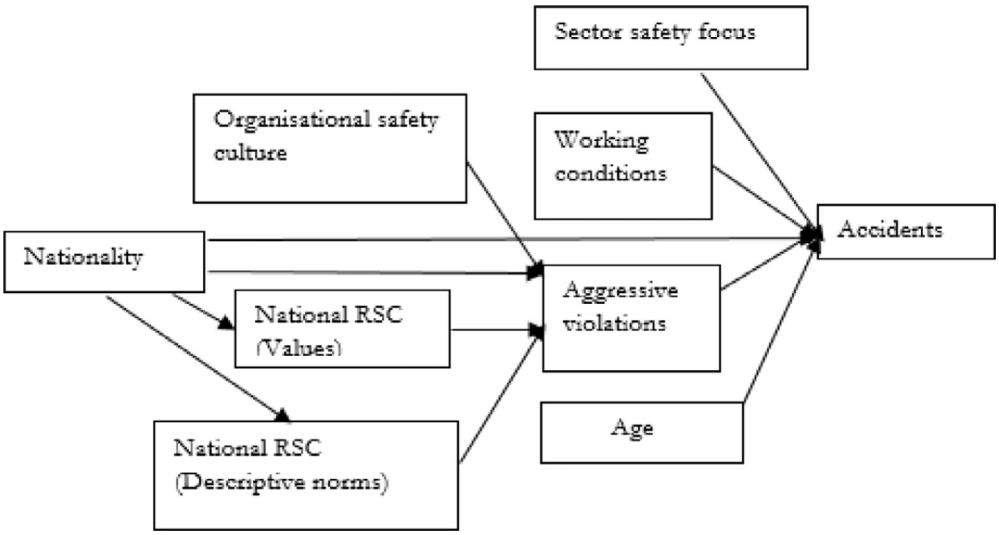

Fig. 1. Illustration of the hypothesized relationships depicted in hypotheses 1–7.

interviews by and large indicated that the survey questions to bus drivers were suitable, but we got some important information regarding how to use and interpret factors specific to bus driving in Norway and Greece (e.g seat belt use, stress and time pressure in urban bus transport, especially in Greece) (cf. Nævestad et al., 2019).

The methods for data collection in the present project have been approved by the Norwegian Centre for Research Data (NSD), which assists researchers with research ethics of data gathering, data analysis, and issues of methodology. We conducted two surveys among professional bus drivers from four companies in Norway (including 25 drivers with unknown company) and two companies in Greece (total N = 215). The interviews and the surveys among bus drivers were completed during the last trimester of 2016.

The Norwegian respondents were recruited through the Norwegian researchers' contact with Norwegian transport companies and unions. Web links to the questionnaires were distributed by the companies or unions to all employees, along with an introductory text explaining the purpose of the survey and stressing that the surveys were confidential. Thus, Norwegian respondents answered the surveys themselves on the electronic device (PC, PDA, phone) that they use to open their e-mail. The Greek respondents were recruited through a marketing research company in Greece, which was under the scientific supervision of researchers from the NTUA. As recruitment of respondents in Norwegian bus companies was somewhat difficult (according to the four criteria mentioned below), employees in the participating companies were informed that they could participate in a draw for a gift voucher worth 2000 NOK (230 USD), if they wanted to. This also applied to respondents who already had answered; they were encouraged to contact us by e-mail if they wanted to participate in the draw. Recruitment of bus drivers in Greece was also difficult. Therefore, it was decided to approach candidates in person and further explain the scope of the survey. This helped eliminate their doubts and fears about confidentiality and the use of the information they would provide. Then the survey interviews were conducted face-to-face, meaning that the Greek respondents answered the surveys orally, in face-to-face interviews.

In order to have comparable companies in the two countries, the recruitment of companies was based on the following criteria: (1) The vast majority (i.e. minimum 90%) of bus drivers in each company should be of the main nationality (Norwegian or Greek), (2) Each company should have about 200 to 400 drivers, working from the organisational units where they were recruited, (3) Each company should have between 100 and 400 vehicles operating from these units, (4) Recruited drivers should be mostly involved in urban traffic in cities with a population of minimum 50.000 and up to 200.000, but also drive in rural areas. Despite the difference in the recruitment methods, recruiting drivers from similar professional environments based on the above-mentioned criteria ensures the comparability of the samples in Norway and in Greece. Based on these criteria, the four companies in Norway were companies located in, or around major cities in Norwegian counties (e.g. with population between 50 000 and 180 000). The companies generally dated their histories long back in time (e.g. 1880s, 1920s), though they had undergone several reorganizations and different organisational constellations through the years. Although some of the companies were parts of larger organisations with e.g. 2000–3000 employees in total operating several cities or regions, we recruited from branches operating in specific areas matching our criteria, meaning that we define the specific branch as a company, according to our criteria. The same applies to the two Greek companies. The first is an urban transport company established in the 1900s. The other is the regional transport company, a private consortium of drivers and bus owners, established in 1920s, divided in different Greek prefectures. Both companies operate transport routes in and around cities in the wider area of Athens (Attica region). As the Norwegian companies, these were also larger companies comprised of regional branches.

3.2. Survey themes

Working conditions with safety implications: five questions on working conditions with safety implications based on previous work (Nævestad & Bjørnskau, 2014) were included, e.g. drivers' experiences with work and time pressure that may compromise safety: "In my job I experience that time pressure and deadlines may negatively affect traffic safety", payment types (e.g. bonus for efficiency), management focus on driving style and seat belt use.

Organizational safety culture: ten questions from the Global Aviation Information Network (GAIN) scale on organisational safety culture were used:

- Management regards safety to be a very important part of all work activities
- Management detects drivers who drive unsafely
- Management often praises drivers who drive safely
- Drivers usually report all safety problems and unsafe situations that they experience in their work
- The drivers in my company do all they can to prevent accidents and unwanted incidents
- In my company, there are routines (procedures) for reporting safety problems and safety violations
- All defects or hazards that are reported are corrected promptly
- After an accident has occurred, appropriate actions are usually taken to reduce the chance of reoccurrence
- Drivers in my company receive adequate training to drive in a safe way
- Safety within my company is better than in other companies

The GAIN-scale is presented in the "Operator's Safety Handbook" (GAIN, 2001). The questions were selected based on the following criteria: (a) at least one question from each theme in the index, (b) choose questions focusing on concrete things (e.g. what a manager does), i.e. not general questions (e.g. manager commitment), (c) choose questions measuring the most important aspects of the theme, (d) select questions seen in previous research to generate different scores among the studied organisations (these are generally the specific/concrete questions).

Safety behaviours: Five questions taken from the Driving Behaviour Questionnaire and based on the results of previous research (Warner et al., 2011) were included (cf. Table 5). The chosen DBQ questions were those who Scandinavian and Southern European drivers scored significantly different on, which were related to crash involvement (Warner et al., 2011), and which were applicable to bus drivers. We did for instance not include the DBQ question of "overtaking a slow driver on the inside" (although this predicted crash involvement in Warner et al. (2011) Greek sample), as we assume that this is a less relevant behaviour for bus drivers, given the size and relative low acceleration of their vehicle compared to private cars.

The DBQ answer alternatives have been changed from relative to absolute alternatives (e.g. Question: "For every ten trips, how often do you ...?", Alternative answers: "Never", "Once or twice", "Three or four times", "Five or six times", "Seven or eight times", "More than eight times but not always", "Always"). The reason is that previous research shows that different demographic groups tend to interpret questions and formulations differently (i.e. what does "often" mean?), and that this may influence comparison of DBQ results among such groups (Bjørnskau & Sagberg, 2005). This effect has also been found in surveys comparing the organisational safety culture and behaviours of different national groups, e.g. HGV drivers from Norway and Central & Eastern Europe (Nævestad et al., 2017). In the latter case, the authors concluded that results were not straightforwardly comparable across national samples due to such reporting effects.

National road safety culture. Measuring RSC as descriptive norms (Cialdini et al., 1990), we used the 9 questions on "expected national road safety behaviours" presented in Table 8. These reflect items used for respondents' own behaviour, including some additional questions. These were introduced with the following text: "When driving in my country, I expect the following behaviour from other drivers:". Answer alternatives were: "(1) none/very few, (2) less than half, (3) about half, (4) more than half, (5) nearly all/all".

Second, we also measure national road safety culture as values and attitudes, focusing on personal freedom and paternalism (cf. Table 9), as Elvebakk (2015) holds that this is a key issue, defining the status of road safety in countries. She argues that increased traffic safety comes at the price of increased paternalism and less individual freedom for road users. Based on Dworkin (1972, in Elvebakk, 2015), she defines paternalism as: "the interference with a person's liberty of action justified by reasons referring exclusively to the welfare, good, happiness, needs, interests or values of the person being coerced". Moreover, Elvebakk states that paternalistic measures force people to do something for the sake of their own good, although they themselves would not, or might not, have chosen to do so themselves. Given the highly different road safety levels in Norway and Greece, we therefore found it relevant to compare these issues in the two countries. We measure this by means of seven items presented in Table 9. Answer alternatives ranged from "Totally disagree" (1) to "Totally agree" (5). The items were developed partly based on Elvebakk, Storesund Hesjevoll, and Julsrud (2016).

Sector safety culture: The survey includes five questions on sector safety culture, influenced by previous research on framework conditions for road safety in road, sea and air transport (e.g. Bjørnskau & Longva, 2009; Nævestad et al., 2015). We found that three of the questions were ambiguous and unsuitable for measuring sector safety culture, as indicated by the Cronbach's Alpha and factor analysis (cf. Section 4.2.4). Thus, we made an index measuring sector focus on safety by

means of the two remaining questions: "Safety is more important than deadlines to our principals", "Safety is more important than price to our principals".

Safety outcomes: We report results for one question on respondents' crash involvement while driving a heavy vehicle at work in the last two years, with four answer alternatives: (1) no, (2) yes, involving property damage, (3) yes, involving personal injuries, (4) yes, involving fatal injuries.

3.3. Analysis

Two regression analyses were conducted to analyze the factors predicting respondents' answers on the dependent variables measuring aggressive violations and crash involvement. In the first analysis, hierarchical, linear regression analyses, where independent variables are included in successive steps was used. Variables are gradually introduced based on the analytical level that they address. First variables addressing the individual driver are presented, before variables addressing the organisational, sectorial and national level. The most basic independent variables are thereby included first. Although no conclusions about causality can be made, as this is a cross-sectional and correlational study, we use the term predict when we describe the regression analyses.

4. Results and analysis

4.1. Descriptive statistics

In Tables 1–5, the main characteristics of the survey sample are presented. The majority of drivers in the survey were aged between 46 and 55 years old, although the Greek drivers in average were younger than the Norwegian drivers (Table 1). There were, for instance, two and a half times more Greek drivers in the age group 36–45, and over five times more Norwegian drivers in the oldest age group (56+ years). A chi square test indicate that differences were statistically significant at the 1% level.

Overall, most survey participants usually drove a local bus. In Greece, the sample was equally distributed among local and long-distance bus drivers (Table 2). The national samples were comparable when it comes to local bus, as they each had about half of the respondents in this category, but while the other half of the Greek respondents drove long distance, the other half of the Norwegian drivers were distributed over long distance, school bus and other types. A chi-square test indicates that differences were statistically significant at the 1% level.

As Table 3 shows, 40% of drivers in each sample had a significant professional experience of more than 20 years. About 60% across the two samples had at least 16 years' experience: 57% in the Norwegian and 65% in the Greek sample, although Table 1 indicates that Norwegian respondents generally were older. A chi square test indicated that differences were statistically significant at the 5% level ($p = 0.015$).

Table 1
Distribution of professional bus drivers per nationality and age.

	Driver's age				
Nationality	26–35	36–45	46–55	56+	Total
Norwegian	11%	15%	38%	36%	115
Greek	11%	40%	42%	7%	100
Total	11%	27%	40%	22%	215

Table 2
Distribution of professional bus drivers per usual type of bus driven.

Nationality	Local bus	School bus	Long distance	Express bus	Tour bus	Airport express	Total
Norwegian	53%	24%	16%	4%	3%	2%	115
Greek	51%	0%	50%	0%	0%	0%	100
Total	52%	13%	32%	2%	1%	1%	215

Table 3
Distribution of professional bus drivers per years of working experience.

	Years working as professional driver					
Nationality	0–5	6–10	11–15	16–20	20+	Total
Norwegian	13%	17%	13%	17%	40%	115
Greek	6%	6%	23%	25%	40%	100
Total	10%	12%	18%	21%	40%	215

Table 4
Estimated number of km (10^3) driven in the past two years, based on self-reports.

	Estimated number of km (10^3) driven in the past two years		
Nationality	Mean	N	SD
Norwegian	57.74	115	47.07
Greek	106.76	97	74.30
Total	80.17	212	65.63

As shown in Table 4, the mean number of thousand km driven during the last two years was higher for the professional Greek bus drivers than it was for the Norwegian bus drivers, probably reflecting the higher share for long distance bus in the Greek sample. A one-way ANOVA test indicated that the difference was statistically significant at the 1%-level.

Table 5 presents statistics for the crash involvement of Norwegian and the Greek drivers. A total of 25% of the Norwegian respondents reported that they had been involved in traffic crashes while at work in the last two years. The corresponding share among Greek drivers was 34%. This could be related to the higher number of km's driven in the Greek sample. A chi square test indicated that differences were not statistically significant (P = 0.153).

Table 6 presents Pearson's R correlations between the key dependent and the key independent variables that we examine in the present study

As Table 6 shows, we found statistically significant relationships between aggressive violations and four of the independent variables included in the table. The variable National RSC (violations) correlated most strongly with aggressive violations. This was per definition a moderate Pearson's R correlation. National RSC (individual freedom) had the second strongest correlation with aggressive violations (a weak Pearson's R correlation). As Table 6 also shows, we found significant relationships between drivers' crash involvement and four of the independent variables included in the table. The variable with the strongest correlation with crash involvement was drivers' experienced time pressure (weak Pearson's R correlation). The variable with the second strongest correlation with crash involvement was bus type, which was dichotomized into local bus and other. The results indicated a higher prevalence of crash involvement among local bus drivers (36.9%). This is a weak Pearson's R correlation.

4.2. Factor analyses

4.2.1. Factor analysis of the road safety behaviour scale

A confirmatory factor analysis (CFA) was conducted in order to examine the underlying factor structure of the five items measuring road safety behaviours. Based on previous research (Warner et al., 2011), it was assumed that a two-factor solution was appropriate (aggressive violations and speeding). The tests indicated that the items and the data were suitable for

Table 5
Crash involvement of professional bus drivers.

Nationality	None	Property damage	Personal injury	Fatal injury	Total
Norwegian	75%	22%	4%	0%	115
Greek	66%	32%	1%	1%	100
Total	71%	27%	2%	1%	215

Table 6
Pearson's R correlations between the key dependent and the key independent variables.

Variables	Aggressive violations	Crash involvement
Age group	−.142**	−.058
Experience	.054	−.037
Mileage	−.010	.055
Aggressive violations	–	.130*
Bus type (1 = other, 2 = local bus)	.097	.173**
Fixed payment (=1, 2 = other)	.100	−.132*
Experienced time pressure	.190***	.201***
Organisational safety culture	−.052	−.062
Sector focus on safety	.070	−.019
National RSC (violations)	.465***	.074
National RSC (individual freedom)	.293***	.072

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

factor analysis. Bartlett's test of sphericity (approx. Chi-square) was 239.241 ($p < 0.001$). The Kaiser–Meyer–Olkin's measure of sampling adequacy showed a value of 0.665. The two first components had an Eigenvalue higher than 1, which explained a total of 70.7% of the variance. The scree plot also suggested a two-factor solution. We used a principal component analysis (PCA) with Oblimin rotation, where we set the number of factors to two and the cutoff values of the factor loadings at 0.3. This produced the following result.

Answer alternatives were: "Never", "Once or twice", "Three or four times", "Five or six times", "Seven or eight times", "More than eight times but not always", "Always"). We made an aggressive violations index based on the sum scores of the three items loading on this factor in Table 7 (Cronbach's Alpha: 0.743) (min 3, max 21). Results indicated more aggressive violations among Greek bus drivers (6 points, versus 4.78 points) than among Norwegian bus drivers (SD were 3.04 for the Greek and 2.62 for the Norwegian respondents). A one-way Anova indicated that the difference was significant at the 1% level ($P = 0.003$). We also made an over-speeding index based on the two items loading on this factor in Table 7 (Cronbach's Alpha: 0.696) (min 2, max 14). Norwegian bus drivers scored higher than the Greek drivers (4.15 points versus 3.4), but the difference was only statistically significant at the 10% level ($P = 0.077$). Examining driving behaviour among Norwegian and Greek bus drivers in the rest of the paper, we primarily focus on aggressive violations, as we found a significant difference between the two groups on this factor at the 5% level.

CFAs were also conducted in the two national samples. The tests indicated that the items and the data were suitable for factor analysis in both national samples. Bartlett's test of sphericity (approx. Chi-square) was 120.087 in the Norwegian sample and 197.695 in the Greek sample, both with ($p < 0.001$). The KMO was 0.650 in the Norwegian sample, and 0.660 in the Greek sample. The tests indicated the same factor structure as the sample including both nationalities, with comparable factor loadings. The two first components had an Eigenvalue higher than 1, which explained a total of 70.6% of the variance in the Norwegian sample, and a total of 76.2% of the variance in the Greek sample.

4.2.2. Factor analysis of the national road safety culture measured as expected behaviours

An exploratory factor analysis (EFA) was conducted to examine the underlying factor structure of the items measuring national road safety culture, measured as descriptive norms: the behaviours expected from other drivers in your country. The tests indicated that the items and the data were suitable for factor analysis. Bartlett's test of sphericity (approx. Chi-square) was 1078.844 ($p < 0.001$). The Kaiser–Meyer–Olkin's measure of sampling adequacy showed a value of 0.861. The Eigenvalues and the scree plot indicated a two-factor solution. The two first components had an Eigenvalue higher than 1, which explained a total of 69.7% of the variance. This produced the results presented in Table 8.

Answer alternatives were: "(1) none/very few, (2) less than half, (3) about half, (4) more than half, (5) nearly all/all". We made a National culture aggression/violations index based on the sum scores of the seven items loading on this factor in Table 8 (Cronbach's Alpha: 0.906) (min 7, max 49). Results indicated that Greek bus drivers expected significantly ($P = <0.01$) more violations from other drivers in their country than Norwegian bus drivers (19.2 points versus 13.7 points) (SD were 7.43 for the Greek and 5.78 for the Norwegian respondents). We also made a National culture compliance/politeness index based on the sum scores of the two items loading on this factor in Table 8 (Cronbach's Alpha: 0.817) (min 2, max 14). Results indicated that Norwegian bus drivers expected significantly ($P = <0.01$) more compliance/politeness from other

Table 7
Factor analysis results – road safety behaviour scale.

Item ("For every ten trips, how often do you …?")	Aggressive violations	Over speeding
(1) Sound your horn to indicate your annoyance to another road user	0.851	
(2) Become angered by a certain type of driver and indicate your hostility by whatever means you can	0.818	
(3) Pull out of a junction so far that the driver with right of way has to stop and let you out	0.750	
(4) Disregard the speed limit on a residential road		0.861
(5) Disregard the speed limit on a motor way road		0.881

Table 8
Factor analysis results for national road safety culture scale items designed to measure descriptive norms.

Item ("When driving in my country, I expect the following behaviour from other drivers:")	Aggression/ Violations	Compliance/ politeness
(1) That they sound their horn to indicate their annoyance to another road user	0.887	
(2) That they become angered by a certain type of driver and indicate their hostility by whatever means they can	0.882	
(3) That they drive when they suspect they might be over the legal blood alcohol limit	0.841	
(4) That they disregard the speed limit on a motor way road	0.774	
(5) That they overtake a slow driver on the inside	0.754	
(6) That they drive without using a seatbelt	0.723	
(7) That they disregard the speed limit on a residential road	0.697	
(8) That they respect and follow traffic rules		0.875
(9) That they are polite to other road users		0.850

drivers in their country than Greek bus drivers (7 points versus 6.1 points) (SD were 2.63 for the Norwegian and 2.2 for the Greek respondents).

CFAs were also conducted in the two national samples. The tests indicated that the items and the data were suitable for factor analysis in both national samples. Bartlett's test of sphericity (approx. Chi-square) was 439.723 in the Norwegian sample and 581.834 in the Greek sample, both with ($p < 0.001$). The KMO was 0.787 in the Norwegian sample, and 0.843 in the Greek sample. The tests indicated the same factor structure as the sample including both nationalities, with comparable factor loadings, although factor loadings were somewhat lower on the first factor in the Norwegian sample. The two first components had an Eigenvalue higher than 1, which explained a total of 63.6% of the variance in the Norwegian sample, and a total of 71.7% of the variance in the Greek sample.

4.2.3. Factor analysis of national road safety culture measured as values and attitudes

The survey also included six questions on paternalism and individual freedom related to road safety, partly based on Elvebakk et al. (2016), indicating that the items measure two different aspects of road safety values and attitudes: paternalism and individual freedom. A confirmatory factor analysis (CFA) was conducted in order to validate that these items tap into two factors. Bartlett's test of sphericity (approx. Chi-square) was 247.002 ($p < 0.001$). The Kaiser–Meyer–Olkin's (KMO) measure of sampling adequacy showed a value of 0.585. The tests indicated that the items and the data were suitable for factor analysis, although it should be noted that the KMO value was a bit lower than the recommended value of 0.6. We chose to conduct the analysis for three reasons. First, Bartlett's test of sphericity was significant. Second, the correlation matrix indicated several correlations >0.3 between the items. Third, the KMO was very close to the recommended value. The two first components explained a total of 59.8% of the variance. We used a principal component analysis (PCA) with Oblimin rotation, where we set the number of factors to two and the cutoff values of the factor loadings at 0.3. This produced the results presented in Table 9.

Based on the factor analyses in Table 9, we suggest that the six individual items reflect and measure two underlying values (factors) related to road safety: three of them measure paternalism, and three of them measure individual freedom. The Oxford Living Dictionary (2019) refers to values as "The regard that something is held to deserve; the importance, worth, or usefulness of something.". The two values in Table 9 concern the role of authorities versus the individual when it comes to road safety. Previous research indicates that values make up an important part of national road safety culture, especially values related to individual freedom (Moeckli & Lee, 2007).

Answer alternatives ranged from "Totally disagree" (1) to "Totally agree" (5). We made an index comprised of the sumscores of the three factors loading on Paternalism in Table 9 (each with minimul value = 3, and maximum value = 15). Comparing scores on the paternalism factor (Cronbach's Alpha = 0.719), Norwegian drivers scored 11.2 points on the index, while Greek drivers scored 13.6 points. (s.d. was 2.8 for the Norwegian and 1.8 for the Greek respondents) The difference was statistically significant at the 1% level. This indicate that the Greek respondents were more in favour of authorities' traffic safety interventions than the Norwegian respondents. It may, however, be difficult to assess whether this reflects different values in Greece, or a higher perceived need for more traffic safety interventions among the Greek bus drivers (e.g. increased enforcement) (cf. Nævestad et al., 2019).

We also made an index comprised of the sumscores of the three factors loading on Individual freedom in Table 9 (each with minimul value = 3, and maximum value = 15). Comparing scores on this factor (Cronbach's Alpha = 0.555), Norwegian drivers scored 6.1 points on the index, while Greek drivers scored 8.2 points. (SD were 2.6 for the Norwegian and 2.8 for the Greek respondents). The difference was statistically significant at the 1% level. Thus, Greek respondents agreed more with the statements underlining the significance of individual freedom when it comes to traffic safety: "the individual freedom to take risk". Examining the influence of RSC measured as values/attitudes on e.g. road safety behaviours in Table 10, we use the individual freedom factor, as this is related to risky behaviours, while the paternalism factor is related to governmental intervention (cf. Elvebakk et al., 2016).

4.2.4. Sector focus on safety

The survey included 5 questions on what we originally intended to measure as sector safety culture. The Kaiser–Meyer–Olkin's measure of sampling adequacy showed a value substantially lower than 0.6 (0.538), thus these questions were not

Table 9
Factor analysis national road safety culture scale -values/attitudes.

Items	Paternalism	Individual freedom
(1) The authorities should make it more difficult for people to engage in risky behaviour in traffic (e.g. by lowering speed limits, increasing police enforcement)	0.830	
(2) The fact that accidents still happen in traffic, shows that the authorities should control road users' behaviour to a greater extent than they do today	0.828	
(3) It is morally and ethically unacceptable that people are killed or severely injured in traffic accidents[a]	0.717	
(4) Road users should be able to choose risky activities in traffic, as long as they do not expose other to risk		0.794
(5) A skilled person can take more risks than others		0.733
(6) Road users know best themselves how they should behave in traffic		0.654

[a] Item 3, measuring paternalism is one of the key justifications of the "Zero vision" of the "Norwegian National Plan of Action for Road Safety 2018-2021".

Table 10
Linear regression. Dependent variable: "Aggressive violations" Standardized beta coefficients.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9
Age group	**−.142****	**−.161****	**−.152****	**−.155****	**−.128***	**−.121***	**−.111***	−.058	−.057
Commission pay (1 = fixed, 2 = commission)		**.124***	.107	.108	**.139****	**.135****	.090	.089	.090
Experienced time pressure			**.175****	**.169****	**.150****	**.178****	**.112***	.080	.080
Organisational safety culture				−.042	−.062	**−.139***	−.114	**−.122***	**−.122***
Bus company 1 (=2, others = 1)					**.163****	**.150****	.027	.002	.000
"Sector focus on safety"						**.157****	.073	.059	.058
National RSC ("violations" factor)							**.419*****	**.403*****	**.402*****
National RSC ("individual freedom" factor)								**.190*****	**.189*****
Country (Norway = 1, Greece = 2)									.003
Adjusted R^2	.016	.026	.052	.049	.069	.082	.232	.258	.255

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

suitable for factor analyses. The Cronbach's Alpha was also low for these five questions (0.248). Based on Cronbach's Alpha analysis showing values if items were excluded, the "sector focus on safety" index was comprised of only two questions: "Safety is more important than deadlines to our principals" and "Safety is more important than price to our principals". The index with these two questions had a Cronbach's Alpha of 0.835. Thus, bus subsectors were compared on an index comprised of two questions. The index is labelled "Sector focus on safety" (min = 2, max = 10). Among the bus types with adequate number of respondents, long distance (9 points) had the highest score on the index, followed by local bus (7.9 points) and school bus (7.5 points). Differences were statistically significant at the 1%-level.

4.2.5. Organizational safety culture

We developed an organisational culture index, consisting of 10 questions from the GAIN-scale on organisational safety culture. The Cronbach's Alpha value for the index comprised of the 10 questions was 0.858. An exploratory factor analysis (EFA) was conducted in order to examine the underlying factor structure of the 10 items measuring organizational safety culture. Our tests indicated that the items and the data were suitable for factor analysis. Bartlett's test of sphericity (approx. Chi-square) was 868.958 ($p < 0.001$). The Kaiser–Meyer–Olkin's measure of sampling adequacy showed a value of 0.872. The Eigenvalues indicated a two-factor solution, but the scree plot and the low factor loadings, which all cross loaded with the first factor indicated a one-factor solution. The one factor solution explained a total of 45.6% of the variance.

The scores of the different companies were compared on the organisational safety culture index. The scores of the two Greek bus companies were 38.4 and 40.2 points. The scores of the Norwegian bus companies varied between 32 points and 42.6 points. Differences between the companies were statistically significant at the 1% level. The average score for the Norwegian drivers on the organisational safety culture index was 34.8 points, while it was 39.3 points for the Greek drivers.

4.3. Regression analyses

4.3.1. Which factors influence safety behaviours?

In Table 10 we show results from a hierarchical, linear regression analysis, where independent variables are included in successive steps to examine the variables predicting respondents' road safety behaviours (aggressive violations) (min = 3, max = 21). The table presents the standardized beta coefficients. The contributions of the different independent variables on the dependent variables can therefore be compared directly. In Table 10, variables are gradually introduced, based on the analytical level that they address: first variables addressing the individual driver level (Step 1) were presented, then variables addressing the company level (Step 2–5), then sector level (Step 6) and finally the national level (Step 7–9). The variable introduced in Step 9 is (nationality) related to hypothesis 1. Variables introduced in Step 7 and 8 (national RSC) are related to hypothesis 2, while Step 4 introduce a variable (organisational safety culture) related to hypothesis 3. Variables introduced at Step 1, 2, 3 and 6 were included as they have been found to be related to crash involvement in previous research (cf. Section 2.3), and as we wanted to examine whether these relationships could be related to safety behaviours.

First, Table 10 indicate that drivers' age contributed significantly and negatively to aggressive violations, until the national culture factor "individual freedom" was included in the analyses. This could indicate that lower age in the Greek sample explained the preliminary relationship between age and aggressive violations, or at least that aggressive violations are related to the age of the respondents.

Commission pay contributed significantly until "Experienced time pressure" was included in Step 3, indicating, as expected, that the relationship between commission payment (i.e. bonus arrangements) and aggressive violations was mediated by experienced time pressure. As expected, drivers' "Experienced time pressure" contributed significantly. It ceased, however, to contribute significantly when national RSC (individual freedom) was included. This was perhaps due to more time pressure in the Greek sample, or at least the variables may be related.

The significant and negative contribution of organisational safety culture at the 10% level indicate that this variable was more important than other organisational level variables in the model (time pressure, commission payment). A positive safety culture is related to a lower incidence of aggressive violations.

A dichotomized bus company variable was also included, in Step 5. When dichotomizing the company variable, we chose the company with the highest score on the aggressive violations index (Company 1, which was Greek had a 6.2-point average). Company 1 contributed significantly in Step 5–6, until national RSC violations was introduced, indicating that its contribution initially was an effect of national RSC among (the Greek) Company 1 respondents.

Sector focus on safety contributed significantly in Step 6, but it ceased to contribute significantly when national RSC (violations) was included, indicating that national culture was more important than sector, and perhaps that sector answers also were influenced by nationality?

National road safety culture was measured in two ways: first as a "aggession/violations factor", where national culture was specified as descriptive norms, i.e. what respondents think that other road users in their countries do. This was the strongest contributor to aggressive violations. Second, national road safety culture was specified as the "individual freedom" factor, which is an index made up of three items reflecting the value of individual freedom to take risk in traffic. This was the second strongest contributor to aggressive violations in the analysis. Finally, a nationality variable was included, which did not contribute significantly in Step 9. The Adjusted R^2 decreased slightly when this variable was included. This indicates that the national RSC variables were the most important country level variables in the analysis in Table 10, and that the influence of these did not seem to be due to other unmeasured national differences.

The adjusted R^2 value increased from 0.07 in Step 6 to 0.237 in Step 7, when national RSC (violations) was included in the analysis. This demonstrates the high importance of national RSC as a predictor of aggressive violations. Results indicated statistically significant R^2 changes (from the previous step) at the 5% level at step 3, 5 and 6, and at the 1% level at step 7 and 8. Finally, the adjusted R^2 value in Step 9 was 0.255, indicating that the model explained 26% of the variation in the aggressive violations variables.

Finally, we also ran separate linear regression analyses for Norway and Greece (excluding country variables and company variables, as Company 1 was Greek). We found that the models explained more of the variation in aggressive violations in the Norwegian sample, which had an adjusted R value of 0.379, compared to 0.148 in the Greek sample. Three variables contributed significantly in the Norwegian sample: a) experienced time pressure at the 1% level, b) National RSC (violations factor) and c) National RSC (individual freedom factor). One variable contributed significantly at the 1% level in the Greek sample: National RSC (violations factor). Organisational safety culture contributed significantly at the 10% level in the Greek sample. The contribution of National RSC (violations factor) was similar in the Norwegian (0.349) and the Greek (0.291) sample. Thus, it seems that the higher adjusted R value in the Norwegian sample was related to the significant contributions of experienced time pressure and National RSC, measured by means of the individual freedom factor).

4.3.2. Which factors influence crash involvement?

A total of 25% of the Norwegian respondents reported to have been involved in traffic crashes while at work in the last two years. The corresponding share among Greek drivers was 34%. A logistic regression analysis was conducted with self-reported crash involvement as the dependent variable, in order to find the variables predicting crashes among our respondents (Table 11). In this analysis, the crash variable, which originally had four answer alternatives, was dichotomized, 0 = no crash, 1 = crash. B values are presented, and they indicate whether the risk of personal injuries is reduced (negative B values) or increased (positive B values), when the independent variables increase with one value. We include different independent variables step-wise in the analyses to be able to examine the isolated effect of the independent variables, i.e. when the other variables are held constant. In Table 11, variables based on the analytical level that they address are gradually introduced: first variables addressing the individual driver level are introduced (Step 1–3), then variables addressing the company level (Step 4–6), then the sector level (Step 7–8) and finally the national level (Step 9). Step 2 introduce a variable related to

Table 11
Logistic regression. Dependent variable: self-reported crash involvement in the last two years (dichotomized: 0: no crash, 1 = crash involvement). B values.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9
Age group	−.110	−.074	−.068	−.018	−.017	.039	.018	.018	−.001
Aggressive violations		**.084***	**.085***	**.104***	.079	.066	.066	.066	.073
Mileage last 2 years			.002	.002	.002	.003	**.005***	**.005***	**.007****
Fixed payment (0 = commission, fixed = 1)				**1.049****	**1.155****	**.995***	**.905***	**.906***	**.990***
Experienced time pressure					**.302*****	**.295*****	**.258****	**.259****	**.261****
Bus company (Company 1 = 0, Other = 1)						−**.648***	−.291	−.286	−.795
Type of bus transport (0 = local bus, 1 = other)							−**.780***	−**.783***	−.607
Sector focus on safety								.003	.024
Country (Greece = 0, Norway = 1)									.547
Nagelkerke R^2	.003	.022	.026	.056	.106	.123	.144	.144	.148

* $p < 0.1$.
** $p < 0.05$.
*** $p < 0.01$.

hypothesis 1 on crash involvement (behaviour), Step 4 and 5 introduce variables related to hypothesis 2 (working conditions), while Step 7 and 8 introduce variables related to hypothesis 3. Step 1 and 9 introduce variable related to hypothesis 4 (demographic variables).

Table 11 indicates that three variables contributed significantly to respondents' crash involvement. First, drivers' mileage in the last two years contribute significantly, indicating a relationship between kilometres driven and crash involvement. The B value is low, because of the scaling of the variable. The B-value indicates the contribution of one thousand kilometres, controlled for the other variables in the model.

Second, results indicated significant contributions of two work-related variables. Fixed payment contributed significantly and positively to respondents' crash involvement. This is unexpected, but it is likely to be due to the higher incidence of fixed payment in the Greek bus driver sample (94% vs. 76.5% in the Norwegian sample), which also had a higher incidence of crashes (34% vs. 25% in the Norwegian sample). Third, drivers' experienced time pressure contributed significantly and positively, indicating that drivers who agreed that they experience that time pressure and time limits can impede safety in their work were more likely to be involved in a crash, controlled for the other variables in the model.

Fourth, Table 11 indicates that age group did not contribute significantly to crash involvement, in neither of the models. Neither did drivers' nationality, controlled for the other variables in the model.

Fifth, results indicated that neither of the variables denoting the sector level contributed significantly to drivers' crash involvement in the final model at Step 9. This was unexpected. Local bus had the highest share of crash involvement (36.9%), and this variable contributed significantly in Step 7 and 8, until country was included in Step 9.

Finally, Table 11 indicated that aggressive violations only contributed significantly in Step 2–4, until experienced fixed payment was included in the analysis. This could indicate a relationship between aggressive violations and fixed payment, as we have seen that both variables were related to nationality (Greek).

The Nagelkerke R^2 value in Step 9 was 0.148, indicating that the model explained about 15% of the variation in the crash involvement of the respondents. The fact that this value is lower than the adjusted R^2 value is to some extent due to the fact that these values are not directly comparable.

Finally, as our results indicated that aggressive violations were more prevalent among Greek bus drivers, and thus presumably more critical to road safety in the Greek sample, we also ran separate logistic regression analyses for Norway and Greece (excluding company and country variables). As expected, we found that the models explained more of the variation in accident involvement in the Greek sample, which had a Nagelkerke R^2 value of 0.315, compared to 0.219 in the Norwegian sample. Two variables contributed significantly in the Greek sample: aggressive violations at the 10% level and experienced time pressure at the 1% level. Two variables contributed significantly in the Norwegian sample: mileage at the 1% level and local bus at the 10% level.

5. Discussion

The main aims of the study were to: (1) Examine the influence of national safety culture, sector safety focus and organizational safety culture on the safety behaviours of professional drivers, compared with other explanatory variables (e.g. age, type of transport, working conditions), and to (2) Examine the influence of safety behaviours and other factors (e.g. age, mileage, type of transport) on self-reported crash involvement.

5.1. Which factors influence respondents' safety behaviours?

The first main result is that bus drivers in Greece reported of more aggressive violations in traffic than Norwegian bus drivers. This is in accordance with what we hypothesized, based on previous research on private car users in Scandinavia and southern Europe (Warner et al., 2011) (cf. Hypothesis 1). This previous research refers, however, to private drivers, and it is interesting to see that the same results apply to the behaviour of professional drivers, indicating that these also are part of the "national road safety culture", despite the professional training that they have to undergo as bus drivers (2003/59/EF) and their employers' attempts to standardize their behaviour through company procedures and training (cf. Nævestad et al., 2019).

The second main result is that that respondents' aggressive violations were predicted by national road safety culture (cf. Hypothesis 2), specified as descriptive norms, which refer to individuals' perceptions of what other people actually do (Cialdini et al., 1990). This was the strongest contributor to respondents own aggressive violations in traffic. As noted, previous research (e.g. Özkan et al., 2006; Warner et al., 2011), infer different national DBQ item patterns to national road safety culture, but they do not specify the mechanisms through which national road safety culture influences drivers' safety behaviours. The present study suggests that descriptive norms represent an important mechanism which may shed light on the relationship between national road safety culture and driver behaviour. Descriptive norms may influence behaviour by providing information about what is "normal", constituting "subtle social pressure" (Cialdini et al., 1990).

Additionally, national road safety culture was also specified by means of an "individual freedom" factor, which is an index made up of three items reflecting the value of individual freedom to take risk in traffic (cf. Elvebakk, 2015). We found that Greek bus drivers scored higher on this factor, and we also found that this factor predicted bus drivers' aggressive violations. It is difficult to explain this, but we may hypothesize that people who value individual freedom to take risks in traffic are less

inhibited from taking risks in traffic, if they want to. Perhaps this also applies to aggressive violations. This is, however, mere speculation, and more research is needed. The result that values related to road safety varies between countries has also been highlighted in previous research. The large EU-funded research project "SARTRE" reported national differences among European car drivers' attitudes towards road safety (SARTRE, 1994). Our factor analyses also indicate other dimensions of national road safety culture, e.g. a "Compliance/politeness factor and a paternalism factor, which we have not investigated further in the present paper. It seems that national road safety culture is comprised of many different elements (e.g. norms, values, attitudes), and that little is known about this in current research. Future research should investigate the relationship between national road safety values, attitudes, (descriptive) norms, safety behaviours and crash involvement (cf. Edwards et al., 2014).

The third main result is that we found that organizational safety culture contributed negatively to aggressive road safety behaviours (cf. Hypothesis 3), meaning that a positive organizational safety culture may reduce (the negative impact of national road safety culture on) aggressive violations in traffic. The result that organizational safety culture influences professional drivers' safety behaviour (measured by means of DBQ items) is in accordance with previous research (Davey et al., 2006; Wills et al., 2005; Huang et al., 2013). Previous research has, however, not highlighted that organizational safety culture may reduce the negative impact of national safety culture, like we do in the present study. Above, we noted that the professional bus drivers were influenced by their national safety cultures, in spite of their professional training and their companies' efforts to standardize their behaviour by means of procedures and training. In spite of this result, the influence of organizational safety culture on behaviour indicates the importance of the organizational level influencing professional drivers' safety behaviours.

5.2. Which factors influence respondents' crash involvement?

The fourth main result is that aggressive violations influence bus drivers' crash involvement at the 10% level (cf. Hypothesis 4), but only in the Greek sample. We ran separate logistic regression analyses for Norway and Greece, as results indicated that aggressive violations were more prevalent among Greek bus drivers, and thus presumably more critical to road safety in the Greek sample. Results supported this assertion, and we found that the models including aggressive violations explained a higher proportion of drivers' crash involvement in the Greek sample compared to the Norwegian sample (32% vs. 22%, respectively). This result is in accordance with previous research (Warner et al., 2011), focusing on private drivers. The contribution of aggressive violations is not very strong, and it is weaker than e.g. work-related variables like experienced work pressure, but it is nevertheless interesting, as it is in line with previous research. Moreover, as the present study focuses on professional drivers, who are part of an organisational work context, it is not surprising that we also find that other "work related variables" (e.g. time pressure) were more strongly correlated with crashes.

The fifth main result of the study is the unexpected positive contribution of fixed payment on respondents' crash involvement (cf. Hypothesis 5). This result is contrary to previous research, which indicates that different types of performance-based payment schemes may influence safety outcomes negatively (e.g. Mooren et al., 2014). This result is, however, probably related to the distribution of payment schemes in the national samples. As noted, 94% in the Greek bus driver sample had fixed payment, compared to 76.5% in the Norwegian sample. There were also more crashes in the Greek sample, and a higher prevalence of aggressive violations.

The sixth main result of the study is that drivers' experienced time pressure influenced their crash involvement (cf. Hypothesis 5). This result is also in accordance with several previous studies, (e.g. Nævestad et al., 2015; Davey et al., 2006). Based on analyses of fatal accidents involving drivers at work, Nævestad et al. (2015), hypothesized that drivers' level of perceived stress and pressure could influence their speed. Öz et al. (2013) identified a relationship between time pressure of drivers at work and driving behaviours (violations and errors). Our results did, however, not indicate that work pressure influenced aggressive violations (when national RSC was included in the models) (Table 10), and thus we have been unable to identify the unsafe transport behaviours mediating between work pressure and crashes. Based on previous research, it could be speeding, but the mechanism could also be fatigue, inattention etc. More research is needed. Finally, it should also be noted that when we ran analyses for countries separately, work pressure only contributed significantly in the Greek sample.

The seventh main result is that neither of the variables denoting the sector level contributed significantly to drivers' crash involvement in the model including both national samples (cf. Hypothesis 6) (Table 11). This is unexpected. Local bus had the highest share of crash involvement (36.9%) probably in many property damage crashes on small roads, in urban transport. Although previous research indicates the importance of framework conditions for safety outcomes (cf. Bjørnskau & Longva, 2009; Elvik et al., 2009), the subsectors in our study are limited. This could explain why sector focus on safety failed to contribute significantly. Nevertheless, we found that local bus transport had a lower score (7.8 points), than long distance bus (9 points) on the sector focus on safety index. Finally, it is important to note, however, that local bus transport contributed significantly to crash involvement at the 10% level in the regression analyses that were run separately for the Norwegian sample. A potential explanation to this is that local buses presumably drive more often in urban areas with more road users, intersections etc., increasing the risk of (property damage) accidents.

Finally, it is also important to note that although previous research indicates that demographic variables like age influences the crash risk of drivers at work (Charbotel et al., 2010; Salminen, 2000), age did not contribute significantly to crash involvement (cf. Hypothesis 7). Age contributed however significantly and negatively in all the models of variables

influencing drivers' safety behaviour except the two last. The contribution was negative, indicating that older drivers are involved in less aggressive violations behaviours. Age ceased to contribute significantly in the eight model, when National RSC measured as violations was included. Additionally, mileage contributed significantly to crash involvement. Previous research also report that drivers' exposure influence their crash involvement (cf. Elvik et al., 2009).

5.3. Methodological limitations and issues for future research

Lack of a theoretical model to explain the relationship between RSC and safety behaviours. In their White Paper on traffic safety culture, Ward et al. (2010) state that the future utility of traffic safety culture research is contingent on the development of a theoretical model to describe the relationship between traffic safety culture and safety behaviour. We have not aimed to develop such a theoretical model in the present study. Instead, we have chosen to focus on the descriptive norms mechanism, in line with the social norms approach (Berkowitz, 2005). We have provided empirical analyses indicating that the supposedly subtle social pressures induced by descriptive norms may explain the observed relationships between national RSC and road safety behaviour. It is, however, important to remember that descriptive norms would only constitute one of several elements in a well-developed theoretical model aiming to explain the relationship between RSC and behaviours. Social psychological research has several well-developed conceptualizations of the relationships between norms and behaviour, e.g. the theory of planned behaviour (TPB), the health belief model (HBM), and the locus of control model (LC) (cf. Lajunen & Räsänen, 2004). TPB, for instance, identifies descriptive norms as just one of several predictors of behaviour, together with e.g. attitudes, perceived behavioural control and behavioural intentions (Ajzen, 1991). Future research should examine how conceptualizations of national RSC can be adapted to such well-developed theoretical models. This research should also clarify the role of road safety values and attitudes for behaviour. As noted, our study indicates a relationship between values and attitudes signifying what is important ("individual freedom") and road safety behaviour ("aggressive violations"), but we do not have a good theoretical explanation for this relationship. We hypothesized that people who value individual freedom to take risks in traffic are less inhibited from taking risks in traffic, if they want to, but this is mere speculation indicating an area for future research. Future research should also clarify the relationships between the aspects (e.g. norms, attitudes, behaviours) comprising RSC.

The elements included in our definition of RSC. In this study, we define road safety culture as shared norms prescribing certain road safety behaviours, and thus shared expectations regarding the behaviours of others, and shared values and attitudes, signifying what's important. Apart from the inclusion of values and attitudes, our definition is congruent with our operationalization of RSC as descriptive norms. It is evident that future definitions of RSC also could include additional elements, e.g. depending on the abovementioned development of future theoretical models. Nevertheless, it should be noted, that there are currently no agreed upon definitions of road safety culture, and that the same applies to organisational safety culture. Edwards et al. (2014) hold that road safety culture can be understood as a different application of the same foundational concept as organizational safety culture. Most definitions of organisational safety culture seem generally to refer to shared and safety relevant ways of thinking and acting that are (re)created through interaction processes in groups (Nævestad, 2010). More specifically, organisational safety culture provide frames of reference that guides individuals' interpretations of actions, hazards, and their identities, and which motivates and legitimizes behaviours that have an impact on safety, and which are created through interaction within groups (Antonsen, 2009; Nævestad, 2010). Our definition of national RSC covers the most important of these aspects. First, the shared (descriptive) norms guide interpretations of behaviours (e.g. What is normal/expected? What is dangerous?). Second, the shared norms motivate (and legitimize) road safety behaviour through subtle social pressure. Third, we hypothesize that the norms are (re)created through road user interaction. We have, however, not discussed the norms' relationship with identity (see Nævestad et al., 2019 for a discussion of this).

Operationalization of key variables. An additional limitation with the current study is that the key variables of interest were measured using a relatively small number of items, and that the conceptualization of the underlying nature of some of these is narrow in scope. This was particularly the case for the road safety behaviour scale, which was primarily operationalized in terms of three items focusing on engagement in aggressive driving behaviours). It also applies to the national RSC scale operationalized as descriptive norms and the sector safety culture scale.

It is evident that a comparison of road safety behaviour between countries ideally should be broader in scope and more multifaceted, as aggressive driving only represents one limited aspect of the driving behaviour in a country. This is for instance indicated by the studies comparing the significance of different DBQ items in different countries (Özkan et al., 2006). Our results indicated that aggressive driving was of less relevance in Norway compared to Greece. The main reason that many of the key variables are measured using a relatively small number of items, was the relatively high number of key variables in the study in general. A key focus of the study was to examine the influence of culture at different levels, working conditions, demographic variables etc. on road safety behaviours. To avoid a too high number of questions in the questionnaire, we therefore had to limit the number of items measuring each of the key variables. Choosing items for the key variables, we focused on items that have been found to be important in previous research (e.g. Warner et al., 2011). In the case of road safety behaviour, we focused on DBQ items that were significantly different in previous studies comparing northern European and Southern European countries and which predicted crash involvement (e.g. Özkan et al., 2006; Warner et al., 2011). Additionally, we also focused on DBQ items that were suitable for heavy vehicles.

Self-reported data. The results of this study are primary based on self-reported data. The quality of such data is contingent on respondents' memory, truthfulness, social or psychological biases that may influence reporting etc. Such factors may challenge the quality of survey data in general, but they also represent a special challenge when comparing cross-cultural samples, as different national samples may be influenced by different baselines, and as expectations may vary between national samples (cf. Nævestad et al., 2017). Moreover, national differences could also be influenced by different levels of experience with surveys, lacking trust of anonymity etc., which also may vary between national samples (Nævestad et al., 2017). It is difficult for us to conclude about this.

False consensus. The most important potential source of bias is the false consensus mechanism, which means that individuals may overestimate the prevalence of risky behaviour among other people to justify their own behaviour (Berkowitz, 2005). It could be argued that the effect of national culture, specified as violations, to some extent could be a result of the false consensus effect. The relationships we observed were, however, contrary to this. Greek bus drivers scored for instance on average 1 point higher than Norwegian bus drivers on the aggressive violations index, and five points higher on the national culture (violations) index. Additionally, Norwegian bus drivers scored on average 0.7 points higher than the Greek drivers on the over speeding index, but they still rated the over speeding of other drivers in their country as lower than the Greek bus drivers. This is an important argument against the contention that the false consensus bias is an important source of error in our study. Moreover, it is also important to note that the national culture violations factor contained only 3 questions with the same wording as the behaviour questions, limiting the potential scope of a specific false consensus effect. Additionally, we also saw that the "individual freedom" factor predicted aggressive violations, and this factor was not "derived" from the behaviour questions.

Limitations of the samples. When interpreting the results that compare the importance of different types of road safety behaviours among bus drivers in Norway and Greece, it is important to note that the samples in the two countries are small, and respondents may not be representative for the national populations of bus drivers, or car drivers in general. Moreover, our comparisons of respondents on key variables (Tables 1–4) indicate that the two country samples are confounded by differences in age, driving experience, and driving exposure. Although these variables are tested in the regression analyses, that does not negate the fact that the samples are not "equal" with respect to demographic representation. Thus, we should take care when making conclusions about different national RSCs based on the present study.

On the other hand, the potential importance of the results should not be dismissed. First, we may argue that professional drivers often are more comparable across countries than private car drivers, as the professional drivers generally have the same gender, relatively similar education, and relatively similar age (cf. Nævestad et al., 2019). Second, our main results about road safety behaviours align with those of previous studies of private drivers (Warner et al., 2011). Third, our main results about road safety behaviours and road safety culture measured as descriptive norms are also in line with our other studies on HGV drivers and private car drivers in Norway and Greece (N = 1297) (Nævestad et al., 2019). The issue of representativeness is, however, always crucial, and more studies are required to arrive at robust conclusions. Thus, to further develop our knowledge about road safety culture, and to obtain even more accurate results, we suggest that future research on this subject should cover larger driver samples, including more companies, larger samples of private road users and even other groups of road users.

Is it meaningful to compare national RSC in Norway and Greece? Norway and Greece were selected to be compared because of substantially different safety records. In a 2018 EU ranking of national road safety levels and progress in the road safety work, Norway had the lowest road mortality rate in Europe with 20 road deaths per million inhabitants in 2017, and the lowest road death risk (ETSC, 2018). The mortality rate in Greece in 2017 was 69 road deaths per million inhabitants, which was well above the EU average of 50 (ETSC, 2018). The dramatically different national road safety records of the two countries make a good point of departure for comparisons, as it may shed light on the different factors influencing national fatality rates and national RSC, e.g. (1) interaction, (2) enforcement, (3) education, (4) infrastructure, (5) the composition of road users and 6) economic factors (Nævestad et al., 2019). On the other hand, given the considerable differences between Norway and Greece on these factors, we may also question the extent to which the countries are comparable, and thus the extent to which it is meaningful to compare them in a study. To this it can be argued that comparing road safety cultures and influencing factors in countries with very different safety records may highlight differences in ways that facilitate the identification of important relationships. Nevertheless, to further validate hypotheses on factors influencing national RSC, and to obtain more knowledge on the challenges of road safety cultures in countries with good safety records (like Norway), further studies should also include more similar countries (e.g. Scandinavian and Southern European).

The distribution of subsectors in our sample. Although companies were chosen based on four criteria to make the national samples comparable (cf. Section 3.1), it is important to remember that the national groups that we study are not totally comparable, e.g. when it comes to the distribution of types of bus transport in the national samples. Additionally, the Greek drivers were in average younger than the Norwegian drivers. Based on our results, it seems however, not that these sample differences have influenced our national comparisons substantially. Although sector focus on safety was higher in the long-distance bus sector, which was more prevalent in the Greek sample, Greek bus drivers did not drive safer than Norwegian bus drivers.

Modification of DBQ response categories. When comparing results from the present study with previous research, it should be noted that the response categories for the DBQ items that we use were modified from the originals. The original DBQ responses are recorded on a six-point scale from "Never" to "Nearly all the time", or "very often". We changed the six relative DBQ response categories to seven absolute alternatives (e.g. Question: "For every ten trips, how often do you ...?",

Alternative answers: "Never", "Once or twice" etc. Thus, our modification may have impacted on the psychometric properties. We chose to do this mainly because previous research shows that the meaning of such terms is subjective, and that different demographic groups tend to interpret questions and formulations differently (i.e. what does "often" mean?). Bjørnskau and Sagberg (2005) used the DBQ in comparisons of novice and experienced drivers' behaviour. They used both the original ordinal answer scale with relative alternatives and a modified interval scale with absolute alternatives. As discussed by De Winter and Dodou (2010), Bjørnskau and Sagberg (2005) actually found that their modified DBQ (with absolute answer alternatives) revealed correlations between errors and violations and driving experience that were not detected using the traditional DBQ. Such reporting effects, possibly based on different baselines and interpretations between demographic groups have also been found in surveys comparing the culture and behaviours of different national groups, e.g. HGV drivers from Norway and Central & Eastern Europe (Nævestad et al., 2017). To sum up, these studies seem to indicate that respondents' interpretations of what relative answer categories mean or involve are contingent on their social group and the culture that they are members of. As comparing different national cultures are the prime focus of the present study, we therefore chose to use absolute answer alternatives for the items measuring road safety behaviour.

One potential drawback with this is that the same absolute scale does not necessarily fit to every item, whereas an "always-never" scale works with different frequencies. For example, drinking and driving is a rare event among average drivers, while speeding is a frequent event. We still chose to use the absolute scale, and the main reason is indicated by this potential drawback. This line of argumentation indicates the level of context dependent interpretation that is required of respondents (and researchers) when using relative answer alternatives: it is for instance not unreasonable to expect that drinking and driving may be more frequent in some countries than others, and that drivers in such different countries therefore will differ in their interpretations of what drinking and driving "often" or "very often" means.

Different recruitment of respondents in the national samples. The recruitment of respondents was different in the two national samples (cf. Section 3.1). Moreover, as recruitment of enough respondents in companies matching our four criteria was difficult in both countries, measures intended to motivate participation were introduced. Different approaches to this were chosen in the two countries (cf. Section 3.1). The different ways of recruiting and motivating the respondents and administering the surveys in the two countries is a potential methodological weakness of the study which is important to bear in mind when interpreting the results. On the other hand, when considering this, it is important to remember that the respondents primarily were recruited as they were members of the companies matching our four criteria applied to make the national samples comparable. The different ways of administering the surveys and motivating respondents to participate were implemented to get as many as possible to participate. Moreover, in a recent Norwegian study of HGV drivers, we did not find significant differences between respondents answering the survey in different ways (Nævestad, Blom & Phillips, 2018).

Correlated residuals within higher level groups) i.e. *organisations and nations).* A possible limitation with the present study is that it applies regular (ordinary least square-OLS) regression analyses (linear and logistic), which assume that observations are independent. This assumption is not necessarily true for our sample, which includes higher level groups on at least two levels: organisations and nations. This indicates that the data may be structurally dependent; with drivers grouped within national samples and within organisations. This means that it is likely that the variation between groups may be far greater than within group in the different higher-level groups. This is an argument for choosing multilevel analysis, which allows different intercepts (group means on the dependent variables) and different regression slopes (relationships between variables). When respondents are nested within groups at different levels, residuals may be correlated within groups at the different levels. This means that that respondents within groups (e.g. nations) are likely to share factors that we have been unable to measure with our variables (e.g. measurements of national RSC). This violates the independency assumption of OLS regression, increasing the chance of observing significant relationships that are not significant (Type I error) (Field, 2009).

However, in the present study, this consideration must be weighed against the consideration of the sample size required for conducting multilevel studies. A too low level of units at the higher level(s) is related to low statistical power, increasing the chance of failing to observe existing significant relationships (Type II error) (cf. Maas and Hox, 2004; Snijders, 2005). It is generally agreed that the number of level 1 units (in our case 215 respondents) is less important than the number of units at the higher levels (Snijders, 2005). Our study includes seven units on what we may term level 2 (i.e. 6 companies and a group of Norwegian drivers with unknown company), and two units on what we may term level 3 (countries). This is too few higher-level units to conduct multilevel analysis. In one of the information pages provided by Bristol's Centre for Multilevel Modelling, it is for instance asserted that: "in practice to do multilevel analysis you need to have at least 20 higher-level units".[1] This number is generated by multiplying the higher-level units (in our case this is (7 * 2) 14). Moreover, previous research indicates that a too low level of units at the higher levels gives (too) poor statistical power. Examining sufficient sample sizes for accurate estimation, Maas and Hox (2004) conclude that a small sample size at level two (meaning a sample of 50 or less) leads to biased estimates of the second-level standard errors. According to Snijders (2005) the number of units at the highest level is the main limiting characteristic of the design. Finally, it should also be mentioned that Jones (undated) states that some argue that the use of multilevel models instead of OLS regression does not make substantive difference to model results and interpretation, in that it only affects the standard errors of the coefficients, and not the coefficients themselves

[1] http://www.bristol.ac.uk/cmm/learning/multilevel-models/data-structures.html.

(Bickel, 2007; Gorard, 2003). Jones (undated) provides, however, a good counter example to this argumentation. To avoid the possible negative effects of correlated residuals at company and country level, where residuals are nested within groups, we have included these levels as dummy variables. This is a way of capturing systematic variance, and by doing this, residuals will include respondents' deviation from their own company and their own country, which we can consider independent (Hox, Moerbeek, & van der Schoot, 2017). Without using dummy variables (or multi-level analysis, which our data is unsuitable for), the effect of company and country would have been included in the error variance, but as systematic error variance, and the residuals would not be independent (Hox et al., 2017).

6. Conclusion

As the rate of improvement in road safety has slowed down in recent years, it has been suggested that new perspectives are needed to complement the traditional perspectives on road safety. The present paper contributes to this by examining the importance of road safety culture for road safety among bus drivers in Norway and Greece. Norway and Greece were selected to be compared since the road safety status in the two countries differ significantly. In conclusion, our study indicates a relationship between national road safety culture, road safety behaviour and crash involvement, that perhaps could be developed further to shed light on national road safety records. Comparing Norwegian and Greek bus drivers, we measure several different types of national road safety attitudes, norms and values. Moreover, the study of Nævestad et al. (2019) complements the present study by also comparing road safety culture among both professional and private drivers in the two countries, and by discussing the factors influencing national road safety culture. To further develop our knowledge about road safety culture, and to obtain even more accurate results, we suggest, however, that future research on this subject should cover larger driver samples including more groups of road users within the two countries.

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