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Safety Culture among Private and Professional Drivers in Norway and Greece: Examining the Influence of National Road Safety Culture

Tor-Olav Nævestad [1,*], Alexandra Laiou [2], Ross O. Phillips [1], Torkel Bjørnskau [1] and George Yannis [2]

1 Institute of Transport Economics, Gaustadalleen 21, 0349 Oslo, Norway; rph@toi.no (R.O.P.); tbj@toi.no (T.B.)
2 National Technical University of Athens, Zografou Campus, Iroon Polytechniou 5, GR-15773 Athens, Greece; alaiou@central.ntua.gr (A.L.); geyannis@central.ntua.gr (G.Y.)
* Correspondence: ton@toi.no

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Abstract: While Norway had the lowest road mortality rate in Europe in 2017, Greece had one of the worst road safety records of all EU-27 countries. The present study investigates road safety culture (RSC) as an explanation for this discrepancy by: (1) Comparing the road safety behaviours among professional and private drivers in Norway and Greece, (2) Examining factors influencing road safety behaviours, focusing especially on national road safety culture, and (3) Examining the influence of road safety behaviours and other factors (e.g., demographic and work-related variables) on accident involvement. This is done by comparing survey answers of private car (N = 796) and professional drivers (heavy goods vehicles and buses) in Norway and Greece (N = 416). Results from qualitative interviews (N = 61) are also presented. We study safety behaviours hypothesized to vary according to nationality (e.g., aggressive violations), and behaviours hypothesized to vary according to the professional versus private driver dimension (e.g., seat belt use). A central objective is to examine whether the former safety behaviours are more similar among private and professional drivers within countries than among professional and private drivers across national samples, indicating common national road safety cultures among private and professional drivers in the respective countries. The results indicate that aggressive violations are more similar among private and professional drivers within the national samples, than across the national samples, while seat belt use seems to vary according to the professional versus private dimension. The results also indicate a relationship between aggressive violations and accident involvement, although other variables were more strongly correlated. Moreover, drivers' safety behaviours were influenced by the behaviours that these groups ascribed to other drivers in their countries, indicating the existence of different national road safety cultures. The Greek RSC was characterized by more aggression and violations than the Norwegian RSC, which seemed to be characterized by a higher level of compliance and politeness. The different RSCs may perhaps shed light on the different accident records in the two countries.

Keywords: safety culture; safety behaviours; private and professional drivers; Norway; Greece

1. Introduction

1.1. Background and Aims

Road traffic crashes are a major cause of death among all age groups. About 1.35 million people are killed annually on the world's roads, while between 20 and 50 million people are non-fatally injured [1]. The numbers of people killed or severely injured in road crashes have gradually been reduced in recent years, as a result of traditional safety strategies focusing on safety behaviours,

technology, and infrastructure [2]. There are, however, still possibilities for further reductions, but it has been argued that this requires the application of new approaches to road safety. The safety culture perspective comprises such a new approach, with a great potential to reduce road accidents, as culture makes up an important risk factor not currently addressed by traditional interventions [3–5].

The relationship between organizational safety culture/climate and safety outcomes is well-documented in meta analyses of organizational safety [6,7]. Previous studies indicate a high focus on organizational safety culture in other transport sectors with a recognized high safety level, especially aviation [8,9], but also the maritime sector [10] and rail [11]. Explaining the safety performance in these sectors, these studies point to safety culture as an indispensable factor [8–11]. The safety culture level of aviation is, for instance, used as a model for improving safety culture in oil and gas [8], and also in other industries and sectors. Accordingly, studies report relatively successful implementations of safety management systems (SMSs) aiming to facilitate the development of a positive safety culture in rail [11] and in the maritime sector [10]. In comparison, it seems that the safety culture perspective has been applied to some extent by companies and regulators in the road sector. This is partly due to the fact that the road sector lacks SMS requirements focusing on safety culture. Studies have nevertheless found strong relationships between organizational safety culture and safety outcomes in the road sector (e.g., [12–15]).

The concepts of safety culture and climate have traditionally been applied to organizations. Organizational safety culture can be defined as shared and safety-relevant ways of thinking or acting that are (re)created through the joint negotiation of people in social settings [16]. Safety climate can be conceived of as "snapshots", or manifestations of safety culture [17]. As drivers at work are members of organizations, they have been subjected to organizational safety culture/climate studies, which have documented a relationship between culture/climate and safety outcomes (e.g., behaviours, near misses, accidents) [12,14,15]. About 40% of fatal accidents in Norway involve drivers at work [18]. Most of these are members of organizations, and thus susceptible to organizational safety culture measures.

The safety culture perspective has, however, only recently been applied to the road sector, and more research is needed if we are to exploit its full potential as a tool for developing road safety measures. An important step in this process is to also employ the safety culture concept to analytical units additional to organizations [4,5]. Edwards et al. [5] conclude that road safety culture (RSC) can be understood as a different application of the same foundational concept as organizational safety culture. The difference is that when we apply the safety culture to road safety in general, we also apply it to other sociocultural units than organizations. This involves also applying it to private car drivers, and the sociocultural units that they are part of, e.g., nations, communities, and peer groups [4,5]. As Luria et al. [19] suggest, most drivers on the road at any one time are not at work. Given the potential importance of the safety culture perspective for road safety, we should therefore also employ it to private drivers, especially since these include groups (e.g., young and old drivers) with higher accident risk. There are, however, few studies applying the road safety culture/climate concept to private drivers [3,5,19]. Those that do exist concur that the safety culture concept should not necessarily be restricted to organizations, but applied to other social units, such as nations, regions, sectors, communities, and peer groups (cf. [3,5,19]). This is a relatively unresearched issue that the present study contributes to.

Differences in national road fatality rates indicate that the national level is a key sociocultural unit to also apply the safety culture perspective to, and it is not unreasonable to hypothesize that differences between national RSC may shed light on national differences in fatality rates (cf. [3]). Studies of national differences between road safety behaviours (e.g., [20,21]) often hypothesize that the results indicate differences in national culture, without specifying or measuring the (cultural) mechanisms generating these different national behaviours. Several factors that could influence road safety culture are national (e.g., traffic rules, the police enforcing the rules, road user interaction, infrastructure). For these reasons, we could expect the existence of different national road safety cultures. On the other hand, we could perhaps hypothesize that some groups within countries, e.g., professional drivers, are less

influenced by national RSC, as they undergo EU-standardized training (Directive 2003/59/EC), and as they often are members of organizations that are obliged to facilitate to safe transport. Professional drivers differ from private drivers in several important respects. First, professional drivers, unless they are self-employed, drive as part of an employment relationship, and they are members of work organizations. Previous studies have found that managers' focus on safety issues and organizational safety culture influence professional drivers' safety behaviours [12–14]. Organizational safety culture may reduce the (negative) impact of national safety culture [22]. Second, professional drivers often relate to deadlines and customers, and previous studies have found that their perceived levels of time pressure and stress influence their road safety behaviour [12,13]. We expand more on these issues below. By comparing different groups (private and professional drivers) within the same countries, we will be able to examine the importance of national road safety culture for road safety behaviours and accident involvement. If certain road safety behaviours vary less among driver groups within than across the national samples, we may hypothesize that this could be due to the influence of national RSC.

An empirical study was therefore conducted, aiming to: (1) Compare the road safety behaviours among professional and private drivers in Norway and Greece, (2) Examine the factors influencing road safety behaviours, focusing especially on national road safety culture, and (3) Examine the influence of road safety behaviours and other factors (e.g., demographic and work-related variables) on accident involvement. The present paper compares private car and professional drivers (heavy goods vehicles and buses) in Norway and Greece. We study safety behaviours that are hypothesized to vary according to nationality (e.g., aggressive violations), and behaviours that are hypothesized to vary according to the professional versus private driver dimension (e.g., seat belt use). A central objective of the study is to examine whether the former safety behaviours are more similar among private and professional drivers within the countries than among professional and private drivers across national samples, indicating common national road safety cultures among private and professional drivers in the respective countries. In the present study, we define road safety culture (RSC) as shared patterns of behaviour, shared norms prescribing certain road safety behaviours and thus shared expectations regarding the behaviours of others.

Norway and Greece were selected for comparison since the road safety status in the two countries differs significantly. Norway had the lowest road mortality rate in Europe with 20 road deaths per million inhabitants in 2017, and the lowest road death risk [23]. In comparison, the mortality rate in Greece in 2017 was 69 road deaths per million inhabitants, which was well above the EU average of 50 [23]. According to Yannis and Papadimitriou [24], Greece has one of the worst road safety records of all EU-27 countries. The fatality rate of Greece was higher than the EU average in all years between 2001 and 2014. The age-standardized number of deaths for all forms of road transport in 2010 was 136 per million population, with only Romania performing worse [25]. The corresponding figure for Norway in 2010 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 [26,27].

Our study is carried out as part of 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). Results from this project focusing only on professional drivers have been presented in conference papers, focusing on heavy goods vehicle (HGV) drivers [28] and bus drivers [29]. The conference paper on bus drivers was also developed into a journal paper [22]. The present study builds on these previous studies by including and comparing findings from private drivers from Norway and Greece. A very short and previous version of the present study has also been presented as a conference paper [30]. The results in the present study have also been presented in an extended Norwegian Safe Culture project report, which also presents full results from 61 qualitative interviews [31].

1.2. Previous Research

1.2.1. Factors Influencing Safety Behaviours among Private and Professional Drivers

The present paper compares factors influencing safety behaviours among professional and private drivers. Road safety behaviours are measured by means of the driver behavior questionnaire (DBQ). The DBQ originally distinguished between three types of aberrant behaviours, based on Reason et al. [32]: lapses, errors, and violations. Lapses typically involve problems with attention and memory. Errors typically involve observation failures and misjudgments. Violations involve deliberate deviations from safe driving practices (cf. [33]).

Age, Gender, Experience. Previous research has found that demographic variables (e.g., age, gender, nationality) influence the road safety behaviour of both private and professional drivers. Research on private drivers finds that older drivers and females are more inclined to be involved in lapses, while errors do not seem to be related to any specific demographic groups [34]. Moreover, violations (which seem to be the behaviour most strongly related to accidents) seem to be more prevalent among young drivers and male drivers [34]. Previous research on private drivers has also established a relationship between drivers' level of education and driving behaviours. In a study using the DBQ in a Czech population of drivers, Sucha et al. [35] report, for instance, lower levels of what they term dangerous violations and dangerous errors with increasing levels of education.

Organisational and Work-Related Variables. As indicated above, previous studies have found relationships between organizational safety culture/climate and DBQ items [12–14] for professional drivers, and also between time pressure, stress, and DBQ items [12,13]. Davey et al. [12] suggest that higher perceived levels of work/pressure stress are related to mistakes for professional drivers, while Öz et al. [13] find that higher perceived levels of work/pressure stress are related to errors and violations.

Nationality. Previous research has highlighted nationality as a risk factor, indicating that being foreign to the road infrastructure may influence both behaviour and accident risk [36]. To understand the emerging issue of young drivers' involvement in traffic accidents abroad, Huang et al. [37] compared risk-taking behaviors in familiar and unfamiliar driving situations. Results showed that risk-taking behaviors while driving in unfamiliar conditions were mediated by psychological factors, such as self-assessment of being a good driver, more than the actual knowledge of road regulation rules. There are some cross-cultural studies of safety behaviours using DBQ items among private drivers (e.g., [20,21]). Warner et al. [21] compare safety behaviours among private drivers in Finland, Sweden, Turkey, and Greece (each with N = 200). The study identifies nine key DBQ items that drivers from different countries rate differently. Warner et al. [21] found a higher prevalence of aggressive violations (e.g., become angered and indicate hostility, sound the horn to indicate annoyance) and ordinary violations (pull too far out of a junction) in Greece and Turkey than in Sweden and Finland. They also found a higher prevalence of over speeding in Sweden and Finland than the two other countries. Finally, they found a higher prevalence of lapses in Finland than the other countries. Özkan et al. [20] compare DBQ items in six countries: Finland, Great Britain, Greece, Iran, The Netherlands, and Turkey (each with N = 240). One of the main results from this study is that that Greek drivers reported to commit aggressive violations more often than other nationalities, especially behaviours indicating their annoyance and hostility to other road users. Drivers from Western/Northern European countries, on the other hand, scored higher on ordinary violations, especially on the "speeding on a motorway" item.

It is important to note that only some road safety behaviours (DBQ items) can be related to national road safety culture, and that variation in road safety behaviours also should be sought by looking at other variables. Consequentially, we have included two variables in the study that we primarily expect to vary according to the professional versus private dimension. These items are: driving under the influence of alcohol and driving without using a seatbelt. The first is a crucial predictor of accident involvement, while the latter is strongly related to the severity of accidents [2]. The prevalence of

driving while under the influence of alcohol is lower for professional drivers than it is for drivers of private cars, although this also varies between countries [38]. Additionally, professional drivers are less inclined to wear a seat belt than private drivers, although this has improved in recent years [39].

1.2.2. Factors Influencing Accident Involvement among Private and Professional Drivers

Demographic Variables. Nationality is a crucial demographic variable influencing the accident risk of both professional drivers of heavy vehicles and private drivers of passenger vehicles [26,36,40]. Moreover, age is also an important variable influencing accident risk for both professional and private drivers [41,42]. The same applies to gender: male drivers have a higher risk of being involved in accidents with passenger cars than female drivers [42]. Focusing on private drivers, Özkan et al. [43] study how sex (male and female) and gender roles (masculinity and femininity) and their interaction were associated with driving skills and accident involvement among young drivers. Sex (male) predicted accidents, while masculinity predicted positively perceptual-motor skills, and femininity predicted positively the safety skills.

Safety Behaviours. In a meta study of 174 studies using the DBQs and measures of self-reported accidents, De Winter and Dodou [44] found especially violations, but also errors, predicted accidents. Moreover, in their study of safety behaviours among private drivers in Finland, Sweden, Turkey, and Greece, Warner et al. [21] found that five of the DBQ items predicted driver self-reported accident involvement (for the last three years) in an analysis where all the countries were taken together.

Mileage. The number of kilometers driven each year is an important risk factor influencing the risk of being involved in an accident. Although the number of accidents per kilometer may be fairly similar for professional and private drivers [2], professional drivers are statistically more likely to have experienced an accident each year than private drivers, as professionals drive more kilometers each year.

Time pressure and stress. Time pressure and stress may influence the accident risk of professional drivers [18]. This relationship often seems to be mediated by safety behaviour [12,13].

Sector (focus on safety). For professional drivers, sector or subsector may also influence accident risk. HGVs transporting dangerous goods have a 75% lower accident risk than other HGVs [2], presumably as the sector focus on safety is higher, as indicated by rules/enforcement, training, and transport buyers' focus on safety.

1.3. What Is National Road Safety Culture?

Edwards et al. [5] note that, although the concept of "driving culture" was already introduced in 1992, there are still no definitions of road safety culture that are commonly accepted by road safety researchers. Edwards et al. [5] review the status of the road safety culture concept, in a paper contributing to a 2014 special issue (in "Transportation Research Part F") devoted to traffic safety culture. Their review concludes that most of the current literature on the concept was collected in an anthology collecting papers from the American Automobile Association's (AAA) workshop on road safety culture [45]. The definitions of road safety culture provided by the contributors to the anthology were, e.g., the "beliefs, norms and values and things people use that guide their social interactions in everyday life" [46], "implicit shared values and beliefs", and "common practices, expectations and informal rules that drivers learn by observation from others in their communities" [47]. These aspects of RSC can be studied both by using quantitative and qualitative methods. Among the few studies available of RSC, the quantitative approach is the most common, measuring RSC by means of safety climate questionnaires (e.g., [19,48–50]). RSC can, however, also be studied by means of in-depth qualitative studies (e.g., ethnography, interviews), elucidating deeper patterns of meaning motivating and legitimizing behaviours, and which are related to identity (e.g., [51]).

The mentioned studies of national differences between DBQ items [20,21] often hypothesize that the results indicate differences in national culture. These studies do not, however, directly measure RSC or specify the (cultural) mechanisms generating these different national behaviours. According to

Ward et al. [3], research on road safety culture often seems to lack an explanation of the theoretical link between safety culture and safety behaviours. They state that the applicability of the safety culture perspective requires the development of a theoretical model to explain this relationship.

In the present study, we define RSC as shared patterns of behaviour, shared norms prescribing certain road safety behaviours, and thus shared expectations regarding the behaviours of others. Road safety culture can be understood as a different application of the same foundational concept as organizational safety culture [5], which generally is defined as shared and safety-relevant ways of thinking and acting [16]. Thus, our definition of road safety culture seems to include the most important aspects, focusing on shared patterns of behaviour, shared norms, and shared expectations. Other studies have, however, also included shared values, beliefs, assumptions, etc. The latter aspects of RSC (shared norms and expectations) are operationalized as descriptive norms, which refer to individuals' perceptions of what other people actually do [52]. Descriptive norms may influence behaviour by providing information about what is normal [52]. Operationalizing RSC partly as descriptive norms, we may refer to the mechanism mediating between safety culture (shared norms and expectations) and safety behaviours as "subtle social pressures" [52]. It is also important to note that descriptive norms can also influence behaviour through the false consensus bias, in which individuals overestimate the prevalence of risky behaviour among their peers in order to justify their own behavior [53].

Finally, as discussed by Nævestad and Bjørnskau [4] and Edwards et al. [5], safety culture is a concept that can be related to several different sociocultural units. Although studies of professional drivers indicate the importance of organizational safety culture [12,14], other studies indicate the importance of regional road safety culture [49], community safety climate [19], and RSC related to peer-groups [50].

1.4. Hypotheses

Based on previous research, we first hypothesize that there will be more aggressive violations in the Greek sample than in the Norwegian sample (Hypothesis 1). Second, we assume that there will be more over speeding in the Norwegian sample than in the Greek sample (Hypothesis 2). Third, we hypothesize that some safety behaviours (i.e., aggressive violations and over speeding) will be more similar among private and professional drivers within the national samples, than among professional and private drivers across the national samples (Hypothesis 3), indicating different national RSC (specified as shared patterns of behaviour) in the two countries. Fourth, in accordance with previous research, we hypothesize that other safety behaviours (i.e., driving under the influence and seat belt use) will be more similar between private drivers and professional drivers across countries, indicating that being a private or professional driver is more important than nationality in these instances (Hypothesis 4). Fifth, we also measure national RSC as descriptive norms, and hypothesize that we will see relatively similar scores comparing means for national RSC between the groups within countries, but significantly different when comparing groups across countries (Hypothesis 5). In accordance with this, we expect relationships between respondents' behaviours and national RSC, especially on the variables that we primarily hypothesize to vary according to nationality. Sixth, we hypothesize that the safety behaviours of professional drivers will be influenced by work-related variables, such as organizational safety culture, time pressure, and sector focus on safety (Hypothesis 6). Seventh, we hypothesize that the safety behaviours of private drivers will be influenced by factors such as the road safety culture in their community, or in their peer groups, and their level of education (Hypothesis 7). Eight, we hypothesize that professional and private car drivers' safety behaviours will be influenced by demographic variables, such as age, gender, and nationality (Hypothesis 8). Ninth, we hypothesize that drivers' accident involvement will be influenced by their safety behaviours (e.g., aggressive violations) (Hypothesis 9). Tenth, we hypothesize that drivers' accident involvement will be influenced by demographic variables, such as age, gender, and nationality (Hypothesis 10). Eleventh, we hypothesize that drivers' accident involvement will be influenced by their mileage (Hypothesis

11). Twelfth, we hypothesize that work-related variables, such as time pressure and stress, sector, and framework conditions, will influence the accident risk of professional drivers (Hypothesis 12).

2. Methods

2.1. Recruitment of Respondents

The Norwegian professional driver respondents were recruited in the last trimester of 2016 through the Norwegian researchers' contact with Norwegian transport companies and unions. Web links to the questionnaires were distributed along with an introductory text explaining the purpose of the survey and stressing that the surveys were confidential. The Norwegian private driver respondents were recruited through the Preference Database of the Norwegian Postal Service, consisting of 430,000 people in 2016, who had consented to receive information or advertising through the moving or holiday service of the Postal Service. In September 2017, e-mails with web-links to the survey were submitted to 45,483 people in three Norwegian counties. Of the 45,452 people who received the e-mail, 6727 people (14.8%) opened the e-mail, and 645 (9.6%) completed the survey. Surveys were sent to three Norwegian counties, and one of these was the capital Oslo. Counties were selected based on differences in accident risk and attitudes. In an attempt to increase response rates, Norwegian respondents were informed that they could participate in a draw for a present card of 2000 NOK, if they wanted to. The Greek respondents (N = 416) were recruited through a marketing research company in Greece, which was under the scientific supervision of researchers from the NTUA. Recruitment of 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. The private drivers in Greece were sampled from two different areas: the capital Athens and the Greek island Rhodes. This sampling is based on an assumption that the RSC on an island could be different from the capital, as an island is a geographical enclosed area, and as it has many tourist drivers.

2.2. Survey Themes

Demographic variables. Both the survey to professional drivers and the survey to private drivers included questions on age, experience as a driver, gender, nationality, kilometers driven with a professional or private car in the last two years, etc. (cf. Hypothesis 8).

Questions to Private Drivers. For private drivers, questions were also included on their highest attained level of education, their place of living (e.g., rural, urban), for how long they have had their driver's license, how often they drive, the type of car they usually drive, etc. Private car drivers were also asked about the driving behavior of their closest friends who regularly drive a car. These questions were intended to measure peer road safety culture (cf. Hypothesis 7).

Questions to Professional Drivers. The survey to professional drivers included work-related variables with potential safety consequences, e.g., drivers' experiences with work and time pressure that may compromise safety, payment types (e.g., bonus for efficiency), management focus on driving style, and seat belt use. The professional driver survey also included an organizational culture index, consisting of 10 questions (cf. [22]) from the Global Aviation Information Network (GAIN) scale on organizational safety culture [54]. Professional drivers were also asked questions intended to measure sector focus on safety (cf. Hypothesis 6).

Safety Behaviours. The present study reports results of seven questions on road safety behaviour (cf. Hypotheses 1–4). Most of these were taken from the DBQ and based on the results of previous research [21]. Five of these were DBQ questions that Scandinavian and Southern European drivers have scored significantly different on in previous studies, and which were related to accident involvement [21] (cf. Table 5). The sixth item is related to driving under the influence of alcohol, which is one of the single factors that has been found to be one of the most important predictors of accident involvement [2]. The seventh item is "Drive without using a seat belt", as a seatbelt is a measure that may reduce the

risk of being killed or severely injured with 60% for drivers of light vehicles and with between 47% and 42% for drivers of heavy vehicles, respectively [55]. Seat belt use is, however, related to the severity and not the occurrence of accidents. 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"). Answer alternatives were changed, as previous research indicates that different demographic groups tend to interpret questions and formulations differently (i.e., what does "often" mean?) (cf. [56]).

National RSC Index. In addition to drawing inferences about national RSC based on national shared patterns of behaviour (among private and professional drivers), we also measure national RSC as descriptive norms [52], reflecting drivers' perceptions of what other drivers in our country do (cf. Hypothesis 5). The survey includes nine questions on expectations of other road users. Seven of these reflect those used for respondents' own behavior, while two questions concern compliance and politeness (Cf. Table 8). Five answer alternatives ranged between 1 (none-very few) and 5 (almost all/all).

Safety Outcomes. We report results for one question on respondents' crash involvement while driving (private or professionally) 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 (cf. Hypotheses 9–12).

2.3. Analysis of the Quantitative Data

Factor Analysis. We conduct factor analyses in the paper; one of the items measuring road safety behaviour, and one of the items measuring national RSC. In these analyses, we examine whether the studied items comprise a smaller number of coherent subscales, "factors", i.e., whether items load on underlying factors (e.g., aggressive behaviour in traffic). We employ either a confirmatory or an exploratory approach, depending on whether previous research indicates a given number of factors or not.

Cronbach's Alpha. We construct several indexes of different concepts (e.g., the factors) to compare how different groups score on these concepts. Cronbach's Alpha measures the correlation among responses on the indexes. The value varies between 0 and 1. A Cronbach's Alpha over 0.9 is very high, a score between 0.7 and 0.9 is good, a score between 0.5 and 0.6 is acceptable, and a score below 0.5 is unacceptable.

Comparison of Means. We also compare whether mean scores on the indexes are different, when testing, e.g., Hypotheses 1–4, in accordance with the first aim of our study, and Hypothesis 5, which is related to the second aim. When comparing the mean scores of different groups, we use one-way ANOVA tests, which compare whether the mean scores are equal (the null hypothesis) or (significantly) different. We also use two-way ANOVA, e.g., to test for interaction effects.

Regression Analyses. We conduct regression analyses when testing Hypotheses 6–12, in accordance with the second aim of our study. A total of 15 regression analyses are conducted. In the first 12 analyses, we use linear regression analysis, examining the factors predicting four different types of road safety behaviours. We conduct three analyses for each road safety behaviour variable: one for both professional and private drivers in Norway and Greece, one for only professional drivers in both countries, and one for only private car drivers in both countries. The separate analyses enable us to test the hypotheses on the unique factors influencing the safety behaviours of private (Hypotheses 7 and 8) and professional drivers (Hypotheses 6 and 8). The most basic independent variables are included first (e.g., gender, age, nationality), then the other independent variables are included.

Finally, we conduct four logistic regression analyses when testing Hypotheses 9–12, in accordance with the third aim of the study. In these analyses, we examine the factors predicting respondents' answers on the dependent variable measuring accident involvement. Logistic regression analysis is used in these analyses, as the dependent variable has two values (no = 1, yes = 2). 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. Of course, it is impossible to conclude about causality, as this is a cross-sectional and correlational study. The term 'predict' is nevertheless used when the regression analyses are described.

2.4. Qualitative Interviews

As noted, Nævestad et al. [31] present an extended version of the present study, including the full results from 61 qualitative interviews. Due to spatial limitations, we are unable to fully report the results of these interviews in the current paper, but we mention the most important results. In all instances, the mentioned interview results are based on [31]. The purpose of the qualitative interviews was to invite interviewees to present their views on and illustrate the themes and questions in the quantitative survey with concrete examples. A central purpose was to provide additional and contextual information about these issues. Ten private and 15 professional drivers from Norway were interviewed. Corresponding numbers from Greece were 16 and 20. Analyzing the interviews, we systematically compared each of the four groups to look for common patterns and individual differences on each of the four studied road safety behaviours, to obtain concrete and typical examples and contextual information that can shed light on important issues.

3. Results

3.1. Description of the Sample

The study sample includes 596 private car drivers and 216 professional drivers from Norway, and 286 private car drivers and 199 professional drivers from Greece. In Tables 1–4 the main characteristics of the survey sample are presented.

Table 1. Distribution of drivers per city/county and sector.

Group	County/Sector	Number	Share	Share of Males
Private Norway	Oslo	461	36%	59%
	Aust-Agder	91	7%	64%
	Finnmark	44	3%	50%
Private Greece	Athens	199	15%	64%
	Rhodes	87	7%	62%
Professional Norway	Bus	115	9%	93%
	HGV	101	8%	97%
Professional Greece	Bus	100	8%	100%
	HGV	99	8%	99%
Total	-	1297	100%	72%

Table 1 indicates, as expected, that the share of male drivers is between 90 and 100% in the groups of professional drivers from both countries. The share of males is slightly higher in the Greek sample in general: There are five percentage points more males in both the private and professional groups in the Greek sample. A Chi-square test involving the private drivers does not indicate significantly different gender distributions in the two countries: X2 (1, N = 882) = 2099, $p = 0.147$. A Chi-square test involving the professional drivers indicates significantly different distributions of gender in the two countries: X2 (1, N = 415) = 7772, $p = < 0.01$. The gender differences in the national samples are statistically significant at the 1% level.

Table 2 indicates a higher share of respondents in the oldest group in the Norwegian samples of professional and private drivers compared to the Greek samples. The tendency is the opposite for the

second oldest group of drivers. A Chi-square test indicated that differences between the Greek and the Norwegian total groups are significant at the 1% level: X2 (4, N = 1297) = 64,513, $p = < 0.01$. Comparing driver experience, there were higher shares in the group with the longest experience (>20 years) among the Norwegian drivers, but only for the private drivers.

Table 2. Distribution of drivers per group (professional/private) and age.

Nationality/Group	<26 Years	26–35	36–45	46–55	56+
Norwegian private	7%	27%	23%	18%	26%
Norwegian professional	1%	18%	22%	36%	23%
Greek Private	5%	23%	30%	28%	14%
Greek professional	0%	12%	36%	45%	8%
Norwegian total	5%	25%	23%	23%	25%
Greek total	3%	18%	32%	35%	12%
Total	5%	22%	26%	27%	20%

We obtained aggregated official data on private car license holders in Norway and Greece in order to evaluate the representativeness of our national samples. These data indicate a proportion of 51% males among Norwegian car license holders (59% in the survey), while the corresponding proportion for Greece was 66% (64% in the survey) (cf. Table 2). Thus, women are somewhat under-represented in the Norwegian private driver sample.

The aggregated data for age groups in the two countries (cf. Table 3) are not totally comparable to the age groups applied in Table 2, but they indicate that the proportions of car drivers of 55 years and older are under-represented in both the national samples, but especially in Greece. Drivers between 25 and 34 years are over-represented in both national samples. There were no data on the education level of the car license holders in the two countries.

Table 3. Aggregated data on private car license holders in Norway and Greece.

Age Groups	Norway	Greece
<25	8%	5%
25–34	16%	14%
35–44	18%	20%
45–54	20%	19%
55+	38%	42%
Gender: M	51%	66%

For the private drivers, questions were also included about their highest level of education. National categories were somewhat different, also including Lyceum (a type of high school; 14–18 years) in the Greek sample. To adapt the alternative to Greece, we categorized the answer alternatives into four: (1) Primary school (Norway 3%, Greece: 2%), (2) High school (Norway 22%, Greece: 44%), (3) 3–4 years university/college (Norway 36%, Greece: 28%), (4) >5 years university (Norway 40%, Greece: 25%). Thus, the level of education was higher in the Norwegian sample of private drivers.

Questions were also included about the type of car private drivers usually drive and how often they drive a car. Passenger car was the most prevalent type in the Greek sample (90%) compared to 50% in the Norwegian sample. The Norwegian sample also included considerable proportions of station wagon (29%) and sports utility vehicle (SUV) (15%). Additionally, respondents were asked whether they usually drive an electric car or a hybrid, and 18% in Oslo answered yes, while 5% in Aust-Agder and 0 in Finnmark did. Corresponding proportions for Greece were 5% on Rhodes and 3% in Athens.

Respondents were also asked how often they drive. Comparing the five geographical locations in the two countries, the results indicated that drivers in Oslo and in Norway in general drove less than the other groups. On Rhodes and Athens, 77% and 76% answered that they drive every day, respectively. Corresponding proportions for Norway were: 24% (Oslo), 43% (Aust-Agder), and 66% (Finnmark).

The bus drivers from Norway were recruited from four companies (including 25 drivers with an unknown company), while bus drivers in Greece were recruited from two companies. About half of the drivers in each national sample drove a local bus. The other halves in the national samples were unevenly distributed: the other half of the Greek respondents drove long distance, while the other half of the Norwegian drivers were distributed on long distance (16%), school bus (24%), and other types. Two surveys among professional HGV drivers from seven companies in Norway (and a group of drivers from unknown companies) and two companies in Greece were undertaken. Most of the HGV drivers were usually driving long distance (17% Norway (NO), 52% Greece (GR)), followed by a combination of long distance and distribution (35% NO, 24% GR) and distribution (12% NO, 24% GR). Table 4 presents numbers for kilometers, accidents, and accident risk for the four groups in the study.

Table 4. Estimated mean thousand kilometers (Kms) driven in the last two years with a car or heavy vehicles, including share and number of respondents who answered that they had experienced an accident in the last two years, total number of million kms, and estimated risk of accidents with property damage, based on self-reported numbers of kilometers and accidents.

Group	Kms	N	Std. Dev.	Accidents %	Accidents N	Mill Kms	ESTIMATED RISK
Private Norway	22	596	21.49	10%	57	13.1	4.4
Private Greece	22	286	11.42	16%	49	6.2	7.9
Professional Norway	97	216	79.85	17%	34	21.0	1.6
Professional Greece	122	196	73.24	36%	72	23.9	3.0

The proportion of 36% accident involvement in the professional Greek sample is surprisingly high. It is, however, important to note that, in this study, accidents refer to incidents that at least involve property damage. Thus, accidents may refer to events ranging from incidents involving broken wing mirrors to fatal accidents. In the Norwegian HGV sample, 37% usually drove dangerous goods, which is known to have a higher safety level than other HGV transport [2]. The accident risk of the Norwegian HGV drivers who drove dangerous goods in the sample was 0.5 accidents per million vehicle kilometers (three accidents per 6.3 million vehicle kms), compared to 0.9 for those who did not (seven accidents per 8.1 million vehicle kms).

It is difficult to compare the risk estimates in Table 4 with statistics based on more objective accident records, as they generally focus on other measures of exposure (billion population) and other types of incidents (fatal accidents). Nevertheless, the previously mentioned statistics of fatal accidents per billion population indicates that the risk in Greece is 3.5 times higher than in Norway. Our estimates of the risk of property damage accidents per million vehicle kilometers indicate that the risk is nearly 2 times higher among Greek drivers.

3.2. Road Safety Behaviours

3.2.1. Survey Results

The present section relates to the first aim of our study, which is to compare road safety behaviours among professional and private car drivers in Norway and Greece. More specifically, the section lays the foundation for testing Hypotheses 1–4. Previous research [22] has indicated that a two-factor solution was appropriate for the five DBQ items (aggressive violations and speeding) that we included in the study based on previous research [21]. We therefore conducted a confirmatory factor analysis (CFA) to examine the underlying factor structure of the five DBQ items measuring road safety behaviours (cf. Table 5). The tests indicated that the five items and the data were suitable for factor analysis.

Bartlett's test of sphericity (approx. Chi-square) was 1149.146 ($p < 0.001$). The Kaiser–Meyer–Olkin's measure of sampling adequacy showed a value of 0.647. The two first components had an Eigenvalue higher than 1, which explained a total of 66.4% of the variance. We used a principal component analysis (PCA) with Oblimin rotation, where we set the number of factors to 2 and the cutoff values of the factor loadings at 0.3. This produced the following result.

Table 5. Factor analysis results: road safety behaviours.

Item	Aggressive Violations	Over Speeding
(1) Sound your horn to indicate your annoyance to another road user	0.882	-
(2) Become angered by a certain type of driver and indicate your hostility by whatever means you can	0.845	-
(3) Pull out of a junction so far that the driver with right of way has to stop and let you out	0.632	-
(4) Disregard the speed limit on a residential road	-	0.839
(5) Disregard the speed limit on a motor way road	-	0.837

Based on the factor analysis in Table 5, we made an aggressive violations index based on the sum scores of the three items loading on this factor (Cronbach's Alpha: 0.698) (min 3, max 21), and an over speeding index based on the two items loading on this factor (Cronbach's Alpha: 0.591) (min 2, max 14).

Two additional and unrelated behaviour items were also included in our study "Drive when you suspect you might be over the legal blood alcohol limit" and "Drive without using a seat belt". These were not included in the factor analysis, as these items have not been found to be related to the two factors in Table 5 in previous studies, and as there are no substantial or theoretical reasons to assume that they are related to them. As noted, these two behaviours were included to test the hypothesis that they were more strongly correlated with the professional versus private dimension than nationality. Table 6 presents mean scores for the road safety behaviour variables.

Table 6. Mean scores for four road safety behaviour variables in the four groups: Aggressive violations (min: 3, max: 21), Over speeding (min: 2, max: 14), Driving under the influence (DUI) (min: 1, Max: 7) Driving without a seat belt (Min: 1, max: 7).

Group	Aggressive Violations	Over Speeding	Driving under the Influence	Driving without Using a Seat Belt
Private Norway	4.3	5.1	1.0	1.1
Professional Norway	4.7	4.5	1.1	1.5
Private Greece	5.7	5.1	1.4	2.4
Professional Greece	5.8	4.0	1.0	5.3
Total Norway	4.4	4.9	1.0	1.2
Total Greece	5.7	4.7	1.2	3.6
Correlation with accident involvement	0.102 ***	0.014	0.017	0.185 ***
Correlation with National RSC	0.376 ***	0.113 ***	0.252 ***	0.421 ***
Correlation with accident risk	0.098 ***	0.083 **	0.218 ***	−0.042

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

We conducted post-hoc tests (Tukey) to examine whether the differences between the mean scores were significantly different, using one-way ANOVA (based on a variable with one value for each the four groups). In accordance with Hypothesis 1, we found a significantly higher score for aggressive violations in the Greek sample ($p = < 0.01$). Contrary to Hypothesis 2, we did not find significant differences between Norwegian and Greek drivers ($p = 0.210$) on the over speeding index.

Looking more specifically at the group scores on the aggressive violations index, we did not find significant differences between the private and professional drivers within each country, but we did for each group across countries (at the 1% level). This is in accordance with Hypothesis 3, and it could indicate different national RSCs within the countries, specified as patterns of behaviours shared by private and professional drivers.

Comparing means on driving under the influence variable, we only found significant differences between private drivers from Greece and all the other groups. This is partly in accordance with Hypothesis 4, as it indicates a higher prevalence of driving under the influence (DUI) among private drivers. Comparing means on the driving without a seatbelt variable, we found statistically significant differences between the scores of all the groups. This could also be interpreted to be in accordance with Hypothesis 4, as we found higher scores for professional drivers than for private drivers in both countries, although the difference between private and professional drivers is far higher in Greece than in Norway.

To examine possible interaction effects between the two variables (nationality and professional-private driver), we conducted two-way ANOVA analyses using the nationality and the professional versus private variables. The results show, as the mean scores indicate, interaction effects between nationality and professional-versus-private driver on driving under the influence of alcohol ($p = < 0.01$) and driving without seatbelt ($p = < 0.01$). This means that the effect of the professional versus private variable on these two behaviours is contingent on nationality. The *p*-value for the interaction tests involving aggressive violations was 0.278, while it was 0.246 for over speeding.

3.2.2. Results from the Qualitative Interviews

Aggressive Violations. The Greek private drivers described themselves and other Greek drivers as irritated in traffic. They explained this by pointing to challenging traffic conditions and time pressure. They mentioned that these conditions lead to tension and nervousness, while other road users' unpredictable driving gives them a constant sense of alertness and anxiety. They said that these are conditions that occur, if not every day, so very often. All the Greek bus drivers also mentioned that they often get angry with other drivers, but that they are trying to stay calm because they are professionals, and because they are also aware that they have passengers. Greek HGV drivers also mentioned that it is common in Greece to signal anger and irritation through inappropriate non-verbal gestures, inappropriate language, and honking. They also perceived that this has become worse due to the financial crisis; that Greek drivers have become more tense in the last few years of the financial crisis; and that it makes them more prone to "explode" in traffic. The majority of the Norwegian private car drivers mentioned that they sometimes get annoyed or angry when driving. However, it does not appear that this is a widespread characteristic of the driving of the Norwegian drivers we interviewed. First, they expected little irritation and anger from other drivers. Second, irritation and anger occurred relatively rarely among those we interviewed, and they did not refer to themselves as "irritated drivers", as Greek private car drivers did. The Norwegian drivers referred to aggressive drivers as exceptions requiring specific (psychological) explanations. Norwegian professional drivers also said that they could get irritated in traffic, especially as other drivers often show little understanding of, and patience with the behaviour and needs of heavy vehicles in traffic. They said, however, that they seldom show irritation in traffic; instead, they obtain an outlet for this when they talk to their colleagues, e.g., in their lunch breaks.

Over Speeding. All the Greek private drivers believed that over speeding often occurs, and that it is an important cause of accidents. The Greek bus drivers said that they drive below the speed

limits, either because of the speed limiter and the tachograph, or because they have passengers on board, generally to avoid accidents. The Greek HGV drivers said that they drive slower than the speed limits in urban areas, and that they in some cases cross the speed limit on motorways. They also said that their choice of speed depends on time pressure and pressure from customers, or from management to deliver goods at a certain time. Norwegian private drivers asserted that drivers in Norway generally respect speed limits in residential areas, but that they often can drive slightly above the speed limit, for example on motorways. In addition, Norwegian HGV drivers mentioned that their managers influence their choice of speed, e.g., through fleet management systems and a focus on speed and driving style in their communication. Several also mentioned that their companies participate in programs focusing on traffic safety and driver behavior.

Driving under the Influence of Alcohol. The Greek private drivers referred to driving under the influence of alcohol as a common situation, both in Athens and on Rhodes, especially during the summer holidays with tourists. The majority of the interviewees said that they have seen, or know of, many cases of driving under the influence of alcohol. The Greek private drivers explained the relatively high incidence of DUI by saying that drivers often have the belief that they can drive equally safely even if they are influenced by alcohol, that the chances of being discovered by the police are small, that the distances are short, and that "there is little chance of an accident". In addition, they mentioned that, especially in Athens, taking a taxi home after drinking alcohol is a "foreign mentality". The Norwegian private drivers emphasized that driving under the influence of alcohol is very socially unacceptable, nor did they expect other drivers in Norway to drive after drinking alcohol. One mentioned that he would only do it if he was far away in the mountains, if someone was hurt, and their life depended on his choice. Such examples (e.g., "only if someone's life depended on it" versus "taking a taxi home after drinking alcohol is a foreign mentality") indicate the importance of descriptive norms, in the sense that they show differences in what is socially unacceptable in the Greek and Norwegian society. Our results indicate that it is even less accepted to drive under the influence of alcohol in Norway than in Greece. It seems that the descriptive norms concern "what one does, and what one does not", and the interviews indicate that this is strongly related to morality and identity, in that there are certain things one does not do because it is morally wrong. It seems that this is linked to feelings, morals, and identity, cf. "if someone's life depended on it". The Norwegian drivers emphasized that those who drive in an alcohol-influenced state are special cases of exemption, which often have to be "explained" by referring to "deviating personality traits". The qualitative data seem to indicate that the national dimension is very central to explaining differences in driving under the influence of alcohol. On the other hand, Norwegian interviewees also mentioned that they were aware of DUI from the media, from their own municipality, etc. They also said that this may be something that happens late in the night.

Driving without Using a Seat Belt. The Greek private drivers asserted that driving without a seat belt was relatively widespread in their society, because of: (a) drivers' excessive beliefs in their own skills and safety, (b) the chances of being discovered by the police are small, and (c) the distances are short, and therefore there is "little chance of an accident". They asserted that the same reasons explained why they believed that driving under the influence of alcohol was relatively widespread. The Greek private drivers stressed that the absence of an effective traffic police is the main cause of unsafe driving and traffic offenses. The Greek HGV drivers said that their managers did not necessarily require them to use seat belts. However, they believed that the use of seat belts in the Greek community has increased. Most interviewees reported relatively low seat belt use among HGV drivers, based on a perception that heavy vehicles act as protective shields in accidents. None of the Norwegian private drivers said that they were driving without using a seat belt. One of them said that this might have occurred in a few special cases: "Have been driving maybe 20 m down to the mailbox; it has happened. It is at the cottage in the countryside." The interviewees also believed that other private drivers in Norway generally use seat belts. Most of the interviewed Norwegian HGV drivers reported that their managers do not focus on their seat belt use, either because they take for granted that they use it, or because they see it as the driver's own responsibility. One of the interviewees said that he has

seen a shift in the use of seat belts among HGV drivers from the time he started driving to the situation as it is today.

3.3. National Road Safety Culture

The present section relates to Hypothesis 5, assuming that we will see relatively similar scores comparing means for national RSC between the groups within countries, but significantly different when comparing groups across countries. The study includes nine items measuring national road safety culture, operationalized as descriptive norms. A previous study [22] indicated that a two-factor solution was appropriate for these nine items. We therefore conducted a confirmatory factor analysis (CFA) (cf. Table 7). The tests indicated that the five items and the data were suitable for factor analysis. Bartlett's test of sphericity (approx. Chi-square) was 6352.290 ($p < 0.001$). The Kaiser–Meyer–Olkin's measure of sampling adequacy showed a value of 0.870. The two first components had an Eigenvalue higher than 1, which explained a total of 68% of the variance. We used a principal component analysis (PCA) with Oblimin rotation, where we set the number of factors to 2 and the cutoff values of the factor loadings at 0.3.

Table 7. Factor analysis results: national road safety culture scales.

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	0.854	-
(2) That they become angered by a certain type of driver and indicate their hostility by whatever means they can	0.852	-
(3) That they overtake a slow driver on the inside	0.824	-
(4) That they drive when they suspect they might be over the legal blood alcohol limit	0.792	-
(5) That they drive without using a seatbelt	0.771	-
(6) That they disregard the speed limit on a motor way road	0.725	-
(7) That they disregard the speed limit on a residential road	0.706	-
(8) That they respect and follow traffic rules	-	0.914
(9) That they are polite to other road users	-	0.882

We made a National RSC aggression/violations index based on the sum scores of the seven items loading on this factor in Table 8 (Cronbach's Alpha: 0.899) (min 7, max 49). We also made a National RSC compliance/politeness index based on the sum scores of the two items loading on this factor in Table 8 (Cronbach's Alpha: 0.783) (min 2, max 14). Table 9 shows results on the two national RSC indexes for the different groups.

Table 8. National Road safety culture indexes.

Nationality/Group	Aggression/Violations		Compliance/Politeness	
	Mean	**Std.D**	**Mean**	**Std.D**
Norwegian private	10.7	3.58	7.7	2.59
Norwegian professional	14.0	5.51	6.9	2.51
Greek Private	18.6	7.05	6.6	2.08
Greek professional	18.6	7.22	5.4	2.27
Norwegian total	11.6	4.42	7.5	2.59
Greek total	18.6	7.11	6.1	2.24
Total	14.2	6.53	7	2.55

Table 9. Linear regression analyses for three groups. Dependent variable: "Aggressive violations". Standardized beta coefficients.

Variables	Both Groups	Professional	Private
Gender (Male: 1, Female: 2)	**−0.095** ***	−0.040	**−0.092** ***
Age Group	**−0.095** ***	**−0.081** *	**−0.093** ***
Nationality (Nor.: 1, Greek: 2)	0.022	0.08	−0.001
National RSC: Aggression/violations	**0.288** ***	**0.289** ***	**0.122** ***
National RSC: Compliance/politeness	0.008	0.045	0.011
Rhodes (Other = 1, Rhodes = 2)	**0.123** ***		**0.089** **
Organizational safety culture	-	**−0.119** **	
Education	-	-	**−0.061** *
Professional Greek (Other: 1, Prof. Greek: 2)	0.053	-	-
Time pressure/stress	-	**0.125** **	-
Dangerous goods (Other: 1, Dang. goods: 2)	-	−0.027	-
Station wagon (1: Other, 2: Station wagon)	-	-	−0.005
Peers' RSC	-	-	**0.287** ***
Sector focus on safety	-	**0.104** *	-
Adjusted R^2	0.168	0.146	0.223

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

We conducted post-hoc tests (Tukey) to examine whether the differences between the mean scores were significantly different using one-way ANOVA. We did not find significant differences between the private and professional drivers within Greece on the Aggression/violations index, but we found significant differences between private and professional drivers in Norway (at the 1% level). The similar scores for Greek professional and private drivers on the Aggression/violations index is in accordance with Hypothesis 5, but the significantly different scores for the Norwegian drivers are not. Comparing scores on the Compliance/politeness index, we found statistically significant differences between all groups except private drivers in Greece and professional drivers in Norway. This is not in accordance with Hypothesis 5. We return to this below.

3.4. Factors Influencing Road Safety Behaviours

In this section, we conduct 12 regression analyses when testing Hypotheses 6–8, in accordance with the second aim of our study. We conduct three analyses for each road safety behaviour variable: one for both professional and private drivers in Norway and Greece, one for only professional drivers in both countries, and one for only private car drivers in both countries. First, we examine factors influencing aggressive violations, then over speeding, driving under the influence, and finally a lack of seat belt use.

3.4.1. Aggressive Violations

In Table 9, we show results from three linear regression analyses, where we examine the variables predicting aggressive violations in three groups, testing Hypotheses 6–8: (1) both professional and private drivers in Norway and Greece, (2) only professional drivers in both countries, and (3) only private drivers in both countries. The first five independent variables in the three models are the same, then variables that are unique to either professional drivers or private drivers are introduced. The table presents the standardized beta coefficients. The contributions of the different independent variables on the dependent variables can therefore be compared directly. The scores on the dependent variable vary between 3 and 21.

If we look at the first five variables that are similar in the three models, we first see that the national road safety culture (RSC) measured as aggression/violations has the strongest contribution in the first two analyses (both groups and professionals) and has the second strongest contribution in the third model (private). This indicates that respondents who expect more aggressive and risky driving from drivers from their own country drive more aggressively themselves. We have seen that this applies to the Greek respondents.

Second, we see that age contributes significantly in all analyses, and indicates less aggressive driving with increased age. Third, gender contributes significantly in two of the analyses, indicating that women are drive less aggressively. A fourth important finding is that nationality does not contribute significantly. It may therefore appear that the national influence on driving behaviour in this case is primarily mediated through national RSC.

Focusing on the professional drivers, we see that high (positive) organizational safety culture scores are related to less aggressive violations and vice versa. This indicates that (the effect of nationality on) aggressive road safety behavior can be prevented to some extent by working systematically with organizational safety culture in transport companies. As expected, time pressure/stress contributes to an increased occurrence of aggressive violations among the professional drivers. Sector focus on safety also contributes significantly to increased prevalence of aggressive violations, and this is difficult to explain. This may due to the fact that the Greek professional drivers report a higher focus on safety and a higher degree of aggressive driving. We found that national RSC generally was more important for the professional drivers' possible aggressive violations than work-related and organizational variables, although it is important to point out that organizational safety culture also contributed significantly.

Focusing on the private car drivers, we first and foremost see that peers' road safety culture is the variable with the strongest contribution. This variable was also included in the analyses for both groups. The scale measuring peer RSC was based on the same items as the national RSC scale, addressing expectations to "your friends who regularly drive a car". Respondents answering the latter were filtered based on the question: "Do you have friends who regularly drive a car?" (only a total of 30 respondents answered no). Private car drivers from Rhodes score significantly higher on the aggressive violations index (7.1 points versus 4.8 points for the other groups and 5.1 points for Athens). Education contributes negatively to aggressive driving, indicating less aggressive violations with increasing education. Station wagon does not contribute significantly. The rationale for this variable was that results indicated the lowest level of aggressive violations for station wagon (4.3 points) compared to all other private car types (4.9 points).

Comparing the adjusted R^2 values, we see that the analysis with both groups explains about 17% of the variation in the aggressive violations of the private car and professional drivers, and about 15% in the variation of the professional drivers' aggressive violations. The analysis involving only the private car drivers has somewhat higher explanatory power and explains 22% of the variation in their aggressive violations.

3.4.2. Over Speeding

In Table 10, we show results from three hierarchical, linear regression analyses, where we examine the variables predicting over speeding in three groups.

Table 10. Linear regression analyses for three groups. Dependent variable: "Over speeding". Standardized beta coefficients.

Variables	Both Groups	Professional	Private
Gender (Male: 1, Female: 2)	−0.043	0.052	**−0.085** **
Age Group	**0.070** **	0.081	**0.093** ***
Nationality (Nor.: 1, Greek: 2)	**−0.137** ***	**−0.120** *	**−0.236** ***
National RSC: Aggression/violations	**0.140** ***	**0.117** **	**0.129** ***
National RSC: Compliance/politeness	0.031	0.007	0.036
Rhodes (Other = 1, Rhodes = 2)	**0.181** ***		**0.139** ***
Organizational safety culture	-	**0.100** *	-
Education	-	-	−0.051
Professional Greek (Other: 1, Prof. Greek: 2)	−0.052	-	-
Time pressure/stress	-	0.041	-
Dangerous goods (Other: 1, Dang. goods: 2)	-	−0.012	-
Station wagon (1: Other, 2: Station wagon)	-	-	−0.008
Peers' RSC	-	-	**0.167** ***
Sector focus on safety	-	−0.006	-
Adjusted R^2	0.058	0.012	0.089

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

Looking at the first five variables that are similar in the three models, we first see that nationality seems to be the independent variable with the strongest contribution in the analyses. This variable contributes negatively, which means that Greek nationality was related to less over speeding. Second, we see that national road safety culture (aggression/violations) contributes significantly in all analyses. This indicates a relationship between the respondents' speed behaviour and the violations and aggression that they attribute to other drivers in their own country. Third, we see that age contributes significantly in two of the analyses, indicating more over speeding with increased age. This is difficult to explain, and may be due to more over speeding at a somewhat higher age in the Norwegian sample. Fourth, gender contributes significantly and negatively in the analysis of the private drivers, indicating that women are less likely to over speed controlled for nationality, age, education, etc.

Examining the variables that influence the professional drivers' over speeding, we see that organizational safety culture contributes positively. This is difficult to explain, and may be related to national differences in over speeding and organizational safety culture (i.e., high levels of both in the Norwegian sample). None of the other work-related or organizational variables contribute significantly.

Nationality is the variable contributing most strongly (and negatively) to private drivers' over speeding. This reflects lower levels of over speeding among the Greek respondents. Peers' road safety culture has the second strongest contribution, indicating a relationship between respondents' behaviour and their perceptions of the behavior of their own friends who drive cars regularly. The variable with the third strongest contribution to over speeding is Rhodes. This suggests more over speeding among respondents on Rhodes, controlled for the other variables in the model, including gender and age. This variable was included because Rhodes respondents had the highest average score on the over speeding index (7 points compared to the 4.8-point average). Since we control for gender and age, the higher score on Rhodes does not necessarily appear to be due to sample effects. It is interesting that the influence of Rhodes on over speeding is the opposite of the influence of nationality (i.e., less over speeding for Greek drivers, but more over speeding for Greek island drivers). This indicates that drivers from Rhodes are different from the other Greek drivers in the sample.

Comparing the adjusted R^2 values, we see that the analysis with both groups explains about 6% of the variation in the over speeding of the private car and professional drivers. This is low and indicates that the model did not provide a good prediction of the factors influencing respondents' over speeding. The value is even lower in the analysis that only involved the professional drivers: 0.012, which means

that this analysis explained 1% of the variation. This is very low. The analysis that only involves the private car drivers explains 9% of the variation in their over speeding.

3.4.3. Driving under the Influence of Alcohol

In Table 11, we show results from three hierarchical, linear regression analyses, where we examine the variables predicting driving under the influence of alcohol in three groups.

Table 11. Linear regression analyses for three groups. Dependent variable: "Driving when you suspect that your blood alcohol content may be higher than the legal limit". Standardized beta coefficients.

Variables	Both Groups	Professional	Private
Gender (Male: 1, Female: 2)	**−0.086** ***	−0.062	**−0.077** **
Age Group	−0.041	**−0.096** **	−0.009
Nationality (Nor.: 1, Greek: 2)	**0.144** ***	**−0.240** ***	**0.119** ***
National RSC: Aggression/violations	**0.186** ***	**0.282** ***	0.055
National RSC: Compliance/politeness	0.017	0.068	0.005
Rhodes (Other = 1, Rhodes = 2)	**0.117** ***	-	**0.097** **
Organizational safety culture	-	0.068	
Education	-	-	−0.004
Professional Greek (Other: 1, Prof. greek: 2)	**−0.210** ***	-	-
Time pressure/stress	-	0.064	-
Dangerous goods (Other: 1, Dang. goods: 2)	-	**−0.088** *	-
Station wagon (1: Other, 2: Station wagon)	-	-	0.009
Peers' RSC	-	-	**0.192** ***
Sector focus on safety	-	0.060	-
Adjusted R^2	0.119	0.085	0.142

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

Looking at the first five variables that are similar in the three analyses, we first see that nationality contributes strongly in all the analyses. Interestingly, the influence of nationality is different for private and professional drivers: it is positive for the private drivers and negative for the professional drivers. This indicates that, when we look only at the professional drivers, being Greek is related to a lower prevalence of driving under the influence (AVG: NO=1.1, GR=1.0), while it is opposite for the private drivers (AVG: NO=1.0, GR=1.4). We also saw this in the analysis of both groups, where Greek nationality contributed positively, while the professional Greek variable contributed negatively.

Second, we see that national road safety culture (aggression/violations) contributes significantly in the first two analyses, but not in the analysis that only includes private drivers. The effect of national road safety culture indicates that respondents who report to sometimes drive under the influence of alcohol expect a higher degree of aggression and violation among drivers in their own country and vice versa.

Third, gender contributes significantly and negatively to the analysis of both groups and in the analysis of the private drivers. This indicates that women drive less under the influence of alcohol, controlled for nationality, age, education, etc. The result that the effect of gender is not significant for the professional drivers is probably due to low gender variation in this group: the professional drivers mostly consist of men.

Focusing on the professional drivers, it can first be mentioned that the analyses indicate that being a professional (Greek) driver is the variable that is most strongly related to the lower incidences of driving under the influence of alcohol. Driving dangerous goods contributes significantly and negatively, which indicates a lower degree of driving under the influence among drivers of dangerous goods. Age contributes significantly and negatively, indicating a lower degree of driving under the influence with increased age. We found, however, that national road safety culture and nationality generally were more important for the professional drivers' potential driving under the influence of alcohol than work-related and organizational variables. Based on the analyses, it is therefore difficult

to point to the factors that might explain the strong influence of being a professional driver on (low incidence of) driving under the influence of alcohol. We may assume that it is probably related to professionalism (there are probably fewer people who drink at work than in their leisure time; especially people who drive at work, as this involves a higher accident risk) and the work context (driving under the influence is probably related to parties, often on weekends, evenings, and nights).

Focusing on the private drivers, we see that national RSC does not contribute significantly. Peers' road safety culture was the variable with the strongest contribution to the private drivers' potential driving under the influence of alcohol, in addition to (Greek) nationality and the variable Greek island. The significant contribution of peers' road safety culture indicates a relationship between the potential driving under the influence of alcohol of private drivers and the level of violations that they attributed to their own friends who regularly drive a car. Additionally, we see that being a Greek private car driver is related to a higher degree of driving under the influence, and being a car driver on Rhodes in the sample is related to an even higher incidence of driving under the influence. Being a woman is related to a lower degree of driving under the influence of alcohol.

When we compare the adjusted R^2 values, we see that the analysis with both groups explains about 12% of the variation in the private and professional drivers driving under the influence of alcohol. This is relatively low. The value is somewhat lower in the analysis that only involves the professional drivers: 0.085, which means that this analysis explains 9% of the variation in their driving under the influence. The analysis only involving the private drivers explains 14% of the variation in their driving under the influence.

3.4.4. Driving without Using a Seat Belt

In Table 12, we show results from three hierarchical, linear regression analyses, where we examine the variables predicting driving without a seat belt in the three groups.

Table 12. Linear regression analyses for three groups. Dependent variable: "Drive without a seat belt". Standardized beta coefficients.

Variables	Both Groups	Professional	Private
Gender (Male: 1. Female: 2)	**−0.070** ***	−0.025	**−0.091** ***
Age Group	0.000	−0.015	0.012
Nationality (Nor.: 1, Greek: 2)	**0.159** ***	**0.685** ***	**0.214** ***
National RSC: Aggression/violations	**0.177** ***	**0.132** ***	**0.184****
National RSC: Compliance/politeness	−0.006	−0.004	0.008
Rhodes (Other = 1, Rhodes = 2)	-	-	**0.064** *
Organizational safety culture	-	**−0.145** ***	-
Education	-	-	**−0.136** ***
Professional Greek (Other: 1. Prof. greek: 2)	**0.489** ***	-	-
Time pressure/stress	-	**−0.078** **	-
Dangerous goods (Other: 1. Dang. goods: 2)	-	−0.034	-
Station wagon (1: Other. 2: Station wagon)	-	-	0.009
Peers' RSC	-	-	**0.148** ***
Sector focus on safety	-	0.028	-
Oslo (Other = 1. Oslo = 2)	−0.040	-	-
Adjusted R^2	0.515	0.518	0.293

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

When we look at the first five variables that are similar in the three models, we see, first of all, that nationality contributes strongly in all the analyses, especially in the analyses that include only the professional drivers. The effect of nationality means that being a Greek driver is related to a higher incidence of driving without a seat belt. This especially applies to the professional Greek drivers. Second, we see that national road safety culture (aggression/violations) contributes significantly in all analyses, indicating that respondents who expect a higher degree of aggression and violations among

drivers in their own country report a higher degree of driving without a seat belt, and vice versa. Third, gender significantly and negatively contributes to the analysis of both groups and the private drivers. This indicates that women are more likely to wear belts, controlled for nationality, age, education, etc. The fact that the effect of gender is not significant in the analyses only including the professional drivers is probably due to the fact that the professional drivers are mostly men.

Focusing on the professional drivers, the analyses indicate that being a professional (Greek) driver is the variable that is most strongly related to driving without a safety belt. This was also evident in our comparisons of the group means on this variable. We created this variable for the analyses of "Both groups", as we saw that the professional Greek drivers had the highest incidence of driving without a seat belt. Organizational safety culture negatively contributes to driving without a safety belt. This indicates that a positive organizational safety culture is related to lower prevalence of driving without a safety belt and vice versa. This indicates that (the effect of nationality on) unsafe road behavior to some extent can be prevented by working systematically with organizational safety culture in transport companies. Drivers' experience of time pressure and stress in their work also contributes (negatively) to less driving without a safety belt. This is hard to explain. We found, however, that nationality and national road safety culture were more important for the professional drivers' potential driving without a safety belt than work-related and organizational variables.

Nationality and national road safety culture are also the most important explanatory variables in the analyses of the private drivers' potential to drive without a seat belt. However, these analyses also indicate that peers' road safety culture contributes significantly to private drivers' potential lacking seat belt use, in addition to education and Rhodes. The importance of peers' road safety culture indicates a relationship between private car drivers' potential lacking seat belt use, and the extent of road safety violations that they attribute to their friends. In addition, the results indicate that the prevalence of driving without a seat belt is lower with increased education, controlled for the other variables in the analysis. Being a private car driver on Rhodes in the sample is also related to driving without a safety belt, but the variable is only significant at the 10% level and contributes weakly. Finally, we see that being a woman is related to a lower degree of driving without a seat belt, controlled for the other variables in the analyses of the private drivers.

Comparing the adjusted R_2 values, we see that the analysis with both groups explains about 52% of the variation in the private and professional drivers' lack of seat belt use. This is relatively high. The value was about the same for the analysis that only involved the professional drivers, while it was 0.293, or 29%, for the private car drivers. This difference is probably due to the strong relationship between nationality and the private versus professional dimension that we see from the standardized beta coefficients in the first two analyses in Table 11.

3.5. Factors Influencing Accident Involvement

In this section, we conduct three logistic regression analyses when testing Hypotheses 9–12, in accordance with the third aim of the study. A total of 214 respondents had been involved in an accident in the course of the last two years. This applies to 10% of the private Norwegian drivers, 17% of the private Greek drivers, 16% of the professional Norwegian drivers, and 36% of the Greek professional drivers. Table 13 shows logistic regression analyses of the variables influencing accident involvement. Choosing behavioural variables potentially predicting respondents' accident involvement to include in the model, we only included aggressive violations. The first reason for this is that we only wanted to include variables related to the occurrence of accidents, and not the severity. This excludes failure to use a seat belt. Second, we chose the most important variable related to the occurrence of accidents. Aggressive violations was the only variable that was significantly (although weakly) correlated with accidents in our study (cf. Table 5).

Table 13. Logistic regression analyses for three groups. Dependent variable: "Accidents (No = 0, Yes = 1)". Beta values.

Variables	Both Groups	Professional	Private
Gender (Female = 0, Male = 1)	0.098	0.355	-0.042
Age group	−0.056	−0.067	−0.094
1000 km driven	0.000	−0.001	0.002
Aggressive violations	**0.048** *	0.036	0.032
Nationality (Greek = 0, Norw. = 1)	**−0.422** **	**−1.052** ***	**−0.585** **
Subgroup (professional Greek = 0, Other = 1)	**−0.980** **		-
Time pressure/stress	-	**0.217** **	-
Rhodes (Other = 1, Rhodes = 2)	-	-	−0.115
Dangerous goods (Other: 2, Dang. goods: 2)	-	0.611	-
Sector focus on safety	-	−0.070	-
Nagelkerke R	0.083	0.122	0.027

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

Although the presented beta values cannot be compared directly, as their size is contingent on the coding of the variables, the contributions of the three significant variables in Step 6 can be compared, as the two most important are dichotomous, and as the third only contributed significantly at the 10% level. The subgroup "professional Greek" respondents (bus, HGV) was the variable with the strongest contribution in the model including both groups, probably as these had the highest proportion of accidents (36%) compared to the other groups. There are reasons to hypothesize that this could be due to their mileage, but, surprisingly, this variable does not contribute significantly in the model. (It contributes, however, significantly if the variable professional Greek driver is excluded.)

Nationality contributed significantly and negatively, reflecting the lower proportion of accidents among Norwegian respondents. We also saw a lower incidence of aggressive violations among Norwegian drivers. However, the relationship between nationality and accidents is also due to other national conditions, as nationality also contributes significantly when controlling for aggressive violations. The third most important variable in the model is the index for aggressive violations, but it contributes less than the other two variables. The fact that this variable has a lower B value than the other two statistically significant independent variables may be because aggressive violations has more values (min: 3, max: 21) than the other two significant variables, which have only two values. The Nagelkerke R-value is 0.083. Thus, the model explains 8% of the variation in respondents' accident involvement.

Focusing on the professional drivers, we see that nationality contributes negatively and significantly, and that time pressure/stress contributes significantly and positively. This means that the analysis shows that increases in experienced time pressure and stress for bus and goods drivers is related to a higher prevalence of accident involvement. It is surprising that the variable dangerous goods does not contribute significantly. Nor does sector focus on safety. In the analyses involving only private drivers, only nationality contributes significantly. The variable Greek island was included because this group had the highest incidence of accident involvement among private drivers, but this variable does not contribute significantly in the analyses.

4. Discussion

The aims of the present study were to: (1) Compare the road safety behaviours among professional and private drivers in Norway and Greece; (2) Examine factors influencing road safety behaviours, focusing especially on national road safety culture; and (3) Examine the influence of road safety behaviours and other factors (e.g., demographic and work-related variables) on accident involvement.

4.1. Road Safety Culture Measured as Shared Patterns of Behaviour

First, we hypothesized that there would be more aggressive violations in the Greek sample than in the Norwegian sample (Hypothesis 1), as indicated by the research of Özkan et al. [20] and Warner et al. [21]. Our results supported this hypothesis. Our second hypothesis was that there would be more over speeding in the Norwegian sample than the Greek sample (Hypothesis 2), also in line with previous results from Özkan et al. [20] and Warner et al. [21]. The results did not support this hypothesis. Third, we hypothesized that some safety behaviours (i.e., aggressive violations and over speeding) would be more similar among private and professional drivers within the national samples, than among professional and private drivers across the national samples (Hypothesis 3), indicating different national RSC in the two countries (shared patterns of behaviour between private and professional drivers within countries). Our results supported this hypothesis when it comes to aggressive violations, but not when it comes to over speeding.

4.2. Road Safety Culture Measured as Descriptive Norms

Greek professional and private drivers had similar mean scores on the national RSC Aggression/violations index, in accordance with Hypothesis 5, but Norwegian professional and private drivers had significantly different mean scores on this index. The latter does not support our hypothesis. In accordance with Hypothesis 5, we also expected relationships between respondents' behaviours and national RSC, especially on the variables that we primarily hypothesized to vary according to nationality. The results from the regression analyses supported this Hypothesis: national RSC Aggression/violations was one of the most important variables in the analyses including both private and professional drivers.

Comparing scores on the RSC Compliance/politeness index, we found statistically significant differences between all groups except private drivers in Greece and professional drivers in Norway. This was not in accordance with Hypothesis 5. On the contrary, this seemed to indicate the importance of similar experiences and viewpoints among professional drivers across countries and private drivers across countries. In both countries, private drivers scored higher on this index, indicating that they attributed more Compliance/politeness to other drivers in their country than professional drivers did. This could be due to the fact that professional drivers have different experiences, positions, and roles from private drivers. Results from the qualitative interviews support this interpretation: professional drivers in both countries complained about other drivers' lacking understanding of and patience with heavy vehicles in traffic. Professional drivers drive larger and slower vehicles, which often require more cooperation from other drivers, e.g., when entering the road (this especially applies to buses).

4.3. Road Safety Behaviours Varying According to the Professional Versus Private Dimension

Our fourth hypothesis was that some behaviours, i.e., driving under the influence and seat belt use [38,39], would be more similar between private drivers and professional drivers across countries, indicating that being a private or professional driver would be more important than nationality in these instances. Comparing means for driving under the influence variable, we only found significant differences between private drivers from Greece and all the other groups. This was in line with what we hypothesized, but it only applied to Greece. Comparing means on the driving without seatbelt variable, we found less seatbelt use for professional drivers in both countries, although the difference between private and professional drivers was greater in Greece than in Norway. This could be due to several different factors. It is known that the difference between private and professional drivers' seat belt wearing used to be greater in Norway than suggested by Table 7, and the little difference currently is generally attributed to successful safety efforts among companies, trade organizations, and authorities. In 2009, a bit over half of the heavy vehicle drivers in Norway wore a seatbelt, while the proportion was nearly 90% in 2015 [39]. Our results indicated statistically significant interaction effects for both seat belt use and driving under the influence. This means that the effect of the professional versus private

variable on these two behaviours is contingent on nationality. The differences between groups within countries on these variables follow national patterns. This is also indicated in the regression analyses.

4.4. Factors Influencing Road Safety Behaviours

The reason that we hypothesized that some types of road safety behaviours would vary according to the professional versus private dimension was that we assumed that these behaviours primarily would be influenced by variables located at these analytical levels rather than at the national level. Our sixth hypothesis was that the safety behaviours of professional drivers would be influenced by work-related variables, such as organizational safety culture [12,14], experienced time pressure and stress [12,13] and (sub)sector, or focus on safety [2,57] (Hypothesis 6). The analyses for the professional drivers indicated that national RSC generally was more important than organizational and work-related factors in predicting their road safety behaviours. We found, however, that organizational safety culture also was an important variable influencing the safety behaviour of the professional drivers, indicating that a positive organizational safety culture may reduce unsafe behaviours, and perhaps also the (negative) effect of national RSC on road safety behaviours. Work pressure contributed to increased aggressive violations, and was significantly higher (1 point on a 5-point scale) for the Greek HGV drivers. Gender was not an important variable in the analyses of professional drivers due to low variation in the sample, and increasing age was related to less aggressive violations and less driving under the influence (cf. Hypothesis 8).

Seventh, we hypothesized that the safety behaviours of private drivers would be influenced by factors such as the road safety culture in their community [19] or in their peer groups [50] and level of education [35] (Hypothesis 7). The separate analyses for the private car drivers generally indicated, in accordance with Nævestad et al. [50], that peer RSC was the strongest predictor of all safety behaviours, except lacking seat belt use, followed by nationality and national RSC. In accordance with Sucha et al. [35], education contributed negatively to aggressive violations and lacking seat belt use, indicating less of these behaviours with increasing levels of education. Gender also contributed negatively, indicating generally less violations among female drivers (cf. [34]) (cf. Hypothesis 8). Rhodes contributed significantly in all the analyses of private drivers' behaviours, with higher levels of unsafe behaviours. Previous research has suggested the importance of geographical areas or communities as a source of road safety culture [4,19,49].

4.5. The Influence of Safety Behaviours and Other Factors on Accident Involvement

Ninth, we hypothesized that drivers' accident involvement would be influenced by their safety behaviours (e.g., aggressive violations) (Hypothesis 9). In accordance with our hypothesis and previous research [21], we found that aggressive violations influenced drivers' self-reported accident involvement, but it was only significant at the 10% level.

Tenth, in line with previous research, we hypothesized that drivers' accident involvement would be influenced by demographic variables, such as age, gender, and nationality (Hypothesis 10). Our results indicated, however, that neither age nor gender contributed significantly, contrary to previous research [41,42]. The results, however, supported Hypothesis 10, when it comes to nationality, as we found a relationship between nationality and accident involvement, indicating a higher accident involvement among Greek drivers. Previous studies also find nationality [36] or country [26,40] to predict drivers' accident risk. As discussed, this relationship is to some extent due to aggressive violations, but only partly, as the contribution of nationality still is considerable although we control for aggressive violations. Thus, this relationship also seems to be due to other national variables that we have been unable to measure. This indicates an important area for future research.

The non-significant relationship between drivers' accident involvement and mileage is in contrast to Hypothesis 11 and previous research (e.g., [2]). It was especially important to control for this in our study, as the annual average mileage of private and professional drivers is substantially different. (Mileage, however, contributed significantly in the model for both groups until the variable professional

drivers was included.) It should also be noted that mileage is closely related to experience, which also is closely related to safety behaviours and accident risk [56,58,59] The professional drivers with a higher mileage level thereby have far higher levels of experience than the private drivers. We have unfortunately not been able to measure the effect of mileage controlled for experience in the present paper, and this indicates an issue for future research.

Twelfth, we hypothesized that work-related variables, such as time pressure and stress, sector, and framework conditions, would influence the accident risk of professional drivers (Hypothesis 12). In accordance with previous research, the results indicate a significant relationship between professional drivers' accident involvement and perceived time pressure and stress [1]. The professional Greek drivers, especially the goods drivers, mentioned in the qualitative interviews that their behaviours may be influenced by stress and time pressure. More research is needed.

4.6. Which Factors Contribute to the Existence of National Road Safety Cultures?

Interviewees underlined that norms prescribing road safety behaviours are created in road user interaction. This is in line with previous research, which indicates that shared norms continually are created and recreated through interaction among road users in traffic [19,20,60]. Discussing how different national RSC may come about, interviewees also mentioned several factors influencing the interaction. Road infrastructure is a potential factor influencing national RSC that was mentioned in the qualitative interviews. Interviewees related the poor(er) Greek road infrastructure to the financial crisis in Greece. This is in line with previous research [20], indicating that road infrastructure may set the premise for road user interaction. It is conceivable that poorly marked roads, poorly designed junctions, roads with a capacity that is too low, etc. may affect the quality of road user interaction negatively and create frustration and aggression. This is an issue for future research. Another important factor potentially influencing national RSC that was underlined by the interviewees and also previous research is the level of enforcement [20]. There is a close relationship between the level of enforcement in countries and road user behaviours [2]. Thus, if drivers in a country (or a region) perceive that some types of violations not are enforced in practice by the police, it is likely that these types of violations may be more prevalent. Our results indicate less respect for traffic rules in the Greek samples, which could be related to the level of police enforcement. Results from the qualitative interviews strongly support this, and the Greek interviewees underlined the importance of insufficient enforcement for unsafe driver behaviours in their country. Future research should examine how such different enforcement practices may give rise to different national (or regional) RSCs. Additionally, it is not unreasonable to expect that national RSC, defined partly as our expectations of other road users, to some extent can be "normalized" in formal driver training. This was also mentioned by some of the private drivers in the qualitative interviews, and it indicates an area for future research.

Another factor that should be taken into account when discussing how national RSC may come about in interaction is the composition of road users who interact in the road systems. Our study indicates that demographic characteristics (e.g., gender, age, level of education) influence drivers' behaviours. Thus, an ageing driver population (e.g., like in Norway) is likely to influence drivers' behaviour, interaction, and thus RSC. Moreover, the composition of types of road users (e.g., vulnerable road users, motor cycles, heavy vehicles) is likely to influence interaction. In this respect, it should be mentioned that the Greek road context generally includes more powered two wheelers compared to the Norwegian road context. This could influence interaction and thus perhaps also national RSC. Finally, a factor mentioned by both private and professional Greek drivers in the qualitative interviews was the influence of the financial crisis on the Greek driving culture [31]. Both professional and private Greek interviewees asserted that, because of the financial crisis, Greek drivers were more tense and uptight. Several mentioned that, especially during the last years of the financial crisis, nerves were uptight, so all drivers explode much more easily while driving.

4.7. The Relationship between National RSC and National Accident Records

Our study indicates that national RSC is important, as it is related to road safety behaviours, which in turn is related to accident involvement. Above, we discussed the factors influencing national RSC. Figure 1 provides an illustration of possible relationships that should be examined in future research, based on the data in the present project.

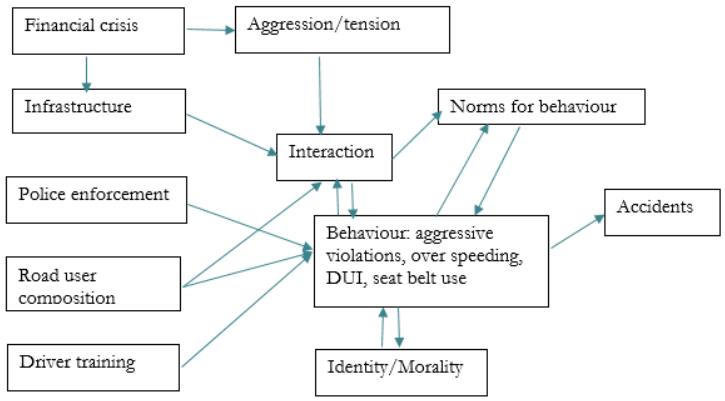

Figure 1. Illustration of possible relationships that should be examined in future research, based on the data in the present study.

The key question in the discussion of the relationship between national RSC and national road safety records is whether, or to what extent, national RSC is a cause of unsafe behaviours inducing a higher accident risk, or a symptom of a number of factors that contribute to negative RSC, negative behavior, and accidents. As indicated by Figure 1, our results do not indicate that road safety culture can provide the whole explanation of the different safety records in Norway and Greece, but that it appears to be part of and reflect on a larger picture of composite and complex factors. Above, we discussed six factors that contribute to creating a national RSC. Many of these factors are already used as key explanations for why we find variation between national accident statistics. The unique contribution of the present study is that we also associate these factors with shared patterns of behavior in traffic and shared norms of what is "normal" and expected of road users in different countries (i.e., national RSC). However, when discussing the importance of national RSC, it is important to remember that many other national factors also influence driving behaviour and its consequences (e.g., road safety campaigns, education, road design, traffic density, weather, fuel costs, vehicle fleet, enforcement (e.g., photo radar), and penalties for violations, etc.). These are factors that we have been unable to focus on in the present study. As noted, the logistic regression analysis indicated that the contribution of nationality to accident involvement still was considerable even though we controlled for aggressive violations.

4.8. Policy Implications

The relationships depicted in Figure 1 also provide an opportunity to discuss implications for policy, or how the knowledge about national RSC can be employed in efforts to improve road safety. As far as we see it, at least three general approaches can be applied as a point of departure. First, given the importance of interaction for national RSC, including the five factors influencing interaction, one way of improving national RSC (in an attempt to also improve behaviour and accidents) could be to target the five factors influencing the interaction among road users. Relevant questions in this respect are, e.g., Which factors are possible to influence? (How) do the factors interact? What are the expected outcomes? Which is the most important factor?

A second relevant approach that can be employed is to attempt to change the norms directly, e.g., through campaigns. Relevant questions in this respect are, e.g., How do social norms for road safety behaviour come about? To what extent is it possible to change such norms through other ways

than the interaction processes in which (we assume) that they are created? How should it be done? To what extent are such norms an independent "social force"? The latter question concerns the extent to which norms for behaviour remain unchanged (in our minds) although the factors that contributed to them in the first place change, or whether behaviour and norms "follow" from infrastructure, police enforcement, and education. Although infrastructure and training can influence the interaction, it is also conceivable that the interaction itself creates a dynamic where new norms are developed (cf. [60]), which are more or less safe and which do not necessarily "follow" the infrastructure. For example, we saw that the respondents and those interviewed on Rhodes report other behavioral patterns and norms of behavior than the other respondents. Likewise, certain social groups may develop certain norms prescribing unsafe road behaviors, despite good training, infrastructure, and police enforcement. Our analyses show, for example, the importance of peers' road safety culture for their own behavior.

A third relevant approach is to target the relationship between norms for behaviour and behaviours through information campaigns, focusing on the descriptive norms mechanism. The underlying idea behind the social norms approach to interventions [3,53] is to remove false consensus effects supporting risky behaviour by informing risk groups about the actual prevalence of risky behaviour of their peers. This approach has successfully been employed in traffic safety interventions (e.g., [61]). As noted by Nævestad et al. [50], this approach may, however, not work if road users at risk have fairly correct perceptions of their peers' (un)safe behaviour. This could be the case in high-risk subcultures, which may be based on and defined by risky behaviours.

4.9. Methodological Limitations and Issues for Future Research

4.9.1. Conceptualization and Specification of the Main Variables

A limitation of the study is that the main variables were measured by means of a relatively small number of questions. It can also be argued that the underlying nature of some of these is narrow in scope [22]. This applies, for instance, to the road safety behaviour scale and our conceptualization of national RSC. We specified national RSC as shared patterns of behaviour and descriptive norms, based on a few key DBQ items that had been found important in previous research. The DBQ was, however, not specifically designed to measure RSC; it was designed to measure aberrant driving behaviours, primarily errors and violations. The comparison of road safety behavior between countries should ideally be broader in scope and more multifaceted, as aggressive driving only represents one limited aspect of the driving behavior in a country. This is, for instance, indicated by the studies comparing the significance of different DBQ items in different countries [21]. Additionally, the present study also indicates that aggressive driving is of less relevance in Norway compared to Greece.

The most important reason that we operationalized several of the main variables using a relatively small number of items is that the study in general includes a relatively high number of variables. This is due to the broad scope of the study, e.g., examining the influence of culture at different levels (e.g., national, sectorial, organizational, peers), examining the importance of other explanatory variables for the safety behaviours and accident involvement of professional drivers (e.g., working conditions, company and sector characteristics) and private drivers (e.g., vehicle type, demographic variables). We therefore limited the number of items measuring each of the main variables, to avoid a too high total number of questions in the questionnaire. When we chose questions to measure the main variables, we chose items that have been found to be important in previous research (e.g., [21]). Measuring road safety behavior, we focused on DBQ items that were significantly different in previous studies comparing northern European and southern European countries and that predicted crash involvement (e.g., [20,21]). It would clearly also have been interesting to include more DBQ items in the national comparison, also to further test our hypothesis that only some DBQ items vary according to nationality. Moreover, it would also have been interesting to develop all the DBQ items into a scale measuring DBQ items as descriptive norms and apply this in cross-national studies. However, this was unfortunately

not feasible given the total number of variables in the present study. Thus, it indicates an issue that could be examined in future research.

4.9.2. Representativeness of the Samples

When concluding about the existence of different national RSCs based on the present study, it is important to remember that the national samples not are entirely representative. We compared the demographic characteristics of the private drivers with aggregated data for private car license holders in the two countries, and found that women are under-represented in the Norwegian sample and that the proportions of car drivers of 55 years and older are under-represented in both the national samples, but especially in Greece. The analyses indicated that both variables were significantly related to less aggressive violations. The results also indicated that the level of education was higher in the Norwegian sample of private drivers, but comparable objective data on this are lacking. Moreover, Rhodes is not necessarily representative of Greek drivers in general. Despite the fact that the samples of private drivers probably are not entirely representative, we nevertheless suggest that we can draw conclusions about the existence of different national road safety cultures for three main reasons. First, we can use professional drivers as a reference group, which we can assume is representative, because they generally have the same gender, relatively similar age, and probably also the same level of education. Comparing the professional drivers on the most important aspect of the national RSC that we measure, i.e., aggressive driving, we see that the difference between the Norwegian (4.7 points) and the Greek (5.8 points) professional drivers is approximately the same difference as between the Norwegian (4.3 points) and Greek (5.7 points) private drivers. Second, we obtain similar results when we focus only on comparable groups, controlling for place of living, gender, sex, age, and education. Table 14 shows average scores for men from Oslo and Athens, with high school or 3–4 years of university education, and who are between 27 and 55 years on the four behavior variables in the study and the two variables for national road safety culture.

Table 14. Mean scores for men from Oslo (N = 94) and Athens (N = 74), between 27 and 55 years, with high school or 3–4 years of university education on the four behavior variables in the study and the two variables for national road safety culture. *p*-values are indicated (n.s. = not significant).

Country	Aggressive Violations	Over Speeding	Driving under the Influence	Lacking Seat Belt Use	National RSC: Aggr./Violations	National RSC: Compliance/Politen.
Norway	4.7	5.3	1.05	1.1	12.2	7.3
Greece	5.3	5.1	1.22	2.4	14.8	7.1
p-value	0.03	n.s.	0.02	0.00	0.00	n.s.

It should be noted that this comparison is not the same as making an assessment of representativeness. The populations of drivers in different countries have different demographic compositions (gender, age), and in several cases this can be one of the explanations for different national RSCs. However, the comparisons in Table 14 indicate that the differences we have seen between the national sample of private drivers do not appear to be due to different demographic compositions in the samples, or biased national samples.

Third, when controlling for these variables in the regression analyses, we still see significant differences between the groups on aggressive violations, and significant contributions of national RSC on behaviours. Also, when concluding about differences between subgroups in our samples, it is also important to remember that many of these subgroups are small, and that conclusions about their significance should be interpreted with caution. Rhodes respondents is a small group in our sample, and the sampled drivers may not necessarily be representative.

4.9.3. Self-Reported Data

The study is based on self-reported data, which could be influenced by respondents' memory, truthfulness, and social or psychological biases that may influence reporting. As noted by Nævestad

et al. [22], comparing cross-cultural samples is challenging, as different national samples may be influenced by different baselines, and as expectations may vary between national samples. The levels of experience with surveys and trust in anonymity may vary between national samples [36]. It is difficult to conclude about this.

4.9.4. False Consensus?

A potential critique that can be raised against identification of the descriptive norms mechanism is that it also may influence behaviour through the false consensus bias, which involves that people overestimate the prevalence of risky behaviour among others to justify their own behavior [52]. The main argument against this contention is that, in the present study, we also measure the contribution of peer group RSC as descriptive norms, and we find the contribution of national RSC and peer RSC to differ substantially. Moreover, the relationships with respondents' different types of behaviours and national RSC and peer RSC vary in strengths, depending on the behaviour in question, and not all relationships are statistically significant. Thus, contrary to the false consensus mechanism, which implies that perceptions about the behaviours of others reflect respondents' own behaviours, we found that respondents' perceptions of other drivers' behaviour differed according to the groups and behaviour in question.

4.9.5. Future Research Should Include More Countries

Norway and Greece are very different when it comes to road safety management and performance. Thus, it can be argued that it is difficult to conduct a systematic comparison of the countries, as they differ in many respects. Although the contrast between Norway and Greece has been instructive in the present study to highlight differences, it can for instance be argued that also including more countries that are more similar to those already included would enable us to test hypotheses more robustly.

4.9.6. Further Theoretical Development of the Relationship between National RSC and Behaviours

We operationalize national RSC as descriptive norms, inducing a mild social pressure to behave in certain ways. It should, however, be noted that social psychological research already has well-developed conceptualizations of the relationships between norms and behaviour. The theory of planned behaviour (TPB), for instance, identifies descriptive norms as just one of several predictors of behaviour (e.g., attitudes, perceived behavioural control, intentions) (cf. [62]). Future research should examine how our conceptualization of national RSC can be adapted to e.g., TPB. Another interesting approach is provided by Naveh and Katz Navon [63], distinguishing between compliance and internalization. These processes can also describe the relationship between national RSC and behaviour, including how RSC is (re)created. First, drivers may behave in line with norms if they know they will be sanctioned by other drivers if they do not. This is externally motivated influence from social norms on behavior: "compliance" [63]. Second, drivers' norm-compliant behaviour can be internally motivated, through "internalization", involving processes where drivers learn about norms and gradually recognize their importance and value until they accept them as their own [63]. Internalized norms are often linked to our identity, our assessments of morality, and our feelings. This was especially illustrated in the qualitative interviews with the Norwegian drivers, who for instance stated that they would only drive under the influence of alcohol "if someone's life depended on it".

4.9.7. The (Possible) Interaction between National Road Safety Culture and Personality

Several studies also focus on the relationships between personality traits and driver behaviour (e.g., [64,65]). Ju et al. [65], found that decision-making in an extreme, simulated accident situation is critically influenced by personality traits. Stephens et al. [64] explored the influence of anger and anxiety traits on driver evaluations and behaviour, and found that all drivers become angry when impeded, or in other anger-provoking situations, and that only drivers with high trait anger become angry and behaved aggressively in circumstances most would not consider provocative. These studies

are very interesting, as they may direct attention to how personality traits may interact with the national RSC. Future studies could, e.g., compare drivers with high anger traits in national RSC with different levels of aggression (e.g., Norway versus Greece).

5. Conclusions

In this study, we have measured national RSC as descriptive norms, hypothesizing that the mechanisms between national RSC and road safety behaviour is drivers' perception of what is "normal" and expected from drivers within their country, generating a mild social pressure to behave in certain ways. Our study indicates that the main differences between the Norwegian and the Greek RSCs first relate to the higher prevalence of aggressive violations in Greece, which we have found to be related to accident involvement. Focusing especially on aggressive violations, we found more similarities between professional and private drivers within Norway and Greece than between the groups across countries. Greek drivers generally attributed higher levels of aggression and violations to other drivers in their country, while Norwegian drivers attributed higher levels of compliance and politeness to other drivers from their country. We suggested that the different RSCs may be due to differences in: (1) interaction, (2) infrastructure, (3) enforcement, (4) education, (5) road user composition, and (6) perhaps also the financial crisis. The specific importance of these factors and possible additional factors is an issue requiring further research. A key result of the present study is that RSC is not only created at the national level. We found that respondents' memberships in several different sociocultural groups influenced their safety behaviours, e.g., being a professional driver, organizations, peer groups, and geographically enclosed areas. The present study indicates that national road safety culture is important, as it influences road safety behaviours, which in turn are related to accident involvement. Based on this, we have suggested that the concept of national RSC may be evoked to shed light on the different national accident records of Norway and Greece. In accordance with Edwards et al. [5], our study indicates that the RSC within a given nation may be comprised by a series of nested cultures, at different levels and in different contexts. The main strength of the RSC perspective, which has been illustrated in the present study, is that it indicates the power of social ties for road safety, or more specifically the importance of sociocultural group memberships for road safety behaviours. Although it may be argued that a lack of consensus on definitions may raise profound concerns with the value and validity of the RSC concept, the concept still is relatively unstudied, and more research is needed to develop definitions, theories, and measurement tools. More research is also needed on how the RSC perspective can inform preventive measures.

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