Safety culture in professional road transport in Norway and Greece

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Abstract

The objective of this paper is to present the key findings on the exploration of safety culture of bus drivers in Norway and Greece. An empirical study was conducted to examine whether and how membership in different socio-cultural units influences transport safety behaviour and outcomes in professional transport. Qualitative interviews with bus drivers in Norway and Greece were conducted, followed by a survey among 228 bus drivers in Norway and Greece. Our study provides four main results. First, bus drivers in Greece report of more aggressive violations in traffic than Norwegian bus drivers. Second, aggressive violations are predicted by national transport safety culture, specified as descriptive norms ("violations") and values (individual freedom to take risk in traffic). Third, respondents' aggressive violations in traffic predicted their accident involvement, although "work related variables" were more strongly correlated. Fourth, organizational safety culture contributes negatively to aggressive transport safety behaviours, meaning that a positive organizational safety culture may reduce (the negative impact of national transport safety culture on) aggressive violations in traffic. Although more research definitely is needed, our study indicates a relationship between national transport safety culture, transport safety behaviour and accident involvement, that perhaps could be developed further to shed light on national transport safety records.

Keywords

Road Safety; Culture; Bus; Norway; Greece

1. Introduction

Transport accidents represent a serious public health problem. Recent data shows that 1.24 million people die each year on the world's roads and between 20 and 50 million people sustain non-fatal injures (WHO, 2013). Thanks to traditional safety strategies targeting safety behaviours, technology and infrastructure, the number of fatalities has steadily decreased (Elvik et al. 2009), but there is still considerable room for safety improvement. One important accident risk factor not currently addressed by traditional transport safety interventions is poor safety culture (Ward et al. 2010, Nævestad & Bjørnskau 2012).

The concept of (organizational) safety culture is usually traced to the 1986 Chernobyl disaster, which led to a shift of focus in the investigations and studies of safety in organizations. Several major accident investigations subsequently identified safety culture as a major contributing factor (Cullen, 1990; NASA, 2003; National Commission on the BP Deepwater Horizon Oil spill and Offshore Drilling, 2011). Organizational safety culture can be defined as "safety relevant aspects of culture in organizations" (Hale, 2000; Antonsen, 2009; Nævestad, 2010a). It is widely recognized that safety culture is important for safety in organizational settings in hazardous industries (Nævestad, 2010a). The concept is applied to an ever increasing range of sectors and industries, including professional and private transport (Wills, et al. 2005; Davey et al. 2006; AAA 2007; Girasek 2012; Nævestad, Elvebakk & Bjørnskau 2014).

Recent research suggests that safety culture explains considerable variation in safety behaviour in various transport forms operated by both private and professional drivers (Nævestad & Bjørnskau, 2012). This research also suggested that if we are to fully understand its effects on safety in transport, we should study not only safety culture particular to organisations, but that particular to peer-groups, sectors, regions and nations. We define transport safety culture (TSC) as shared norms prescribing certain transport safety behaviours, shared expectations regarding the behaviours of others and shared values signifying what's important (e.g. safety, mobility, respect, politeness) (Nævestad & Bjørnskau, 2012). An important aspect of our approach is that overall TSC is a composite of overlapping safety cultures associated with different types of sociocultural unit.

Since safety culture is by definition shared, it must be related to social units. The safety culture perspective has traditionally been ascribed to organizations, and since professional drivers are part of organizations, they can be subjected to traditional safety culture studies and interventions. Different groups of professional drivers have been studied with respect to safety culture (e.g. bus drivers, taxi drivers, van drivers and truck drivers) (Wills et al., 2005; Davey et al., 2006). These studies often combine organizational safety climate questionnaires with

questionnaires measuring self-reported driving behaviours (e.g. the Driving Behaviour Questionnaire (DBQ)), perceptions of risky behaviours, attitudes to safety interventions, self-reported accidents (e.g. Davey et al., 2006).

The level of safety culture in organisations and companies has traditionally been perceived as reflecting the management's focus and emphasis on safety in the company's operations and activities (Reason 1997; Hale 2000). Organisations are, however, not the only sociocultural unit influencing the transport safety behaviours of professionals. It is well documented that also national cultures influence professional transport operators' safety behaviour and risk, both in road transport (Nævestad et al., 2014) and in aviation (Merrit, 2000). It is also documented that professional TSC differs between transport sectors, i.e. aviation, road, rail, and sub sectors (e.g. helicopter and airlines) (Bjørnskau & Longva, 2009). This is probably due to differences in framework conditions like rules/enforcement, competition and regulation, which differ considerably in different sectors.

The safety culture perspective is quite new to the transport sector, and more research is needed for the perspective to be as crucial in the transport sector as it is in hazardous industries. It is decisive to establish the importance of TSC in influencing transport safety behaviour and safety outcomes, and to clarify how this knowledge can be used to enhance transport safety.

In this framework, a research project titled "Safety culture in private and professional transport: examining its influence on behaviours and implications for interventions" funded by the Norwegian Research Council, and undertaken by the Institute of Transport Economics - TØI (Norway) and the National Technical University of Athens - NTUA (Greece) is exploring safety culture in land and sea based, professional and private transport in Norway and Greece. The main aims of the project are to examine safety culture and behaviour in road and sea transport, and to clarify implications for safety intervention strategies.

Norway and Greece were selected to be compared since the road safety status in the two countries differ significantly. The road fatality rate of Norway is one of the lowest in the EU (around 29 fatalities per million population in 2014). Its development was similar to the EU average in the period 2001-2014. (European Commission, 2016a). On the other hand, Greece has one of the worst transport safety records of all EU-27 countries (Yannis & Papadimitriou, 2012). The fatality rate of Greece has been higher than the EU average (around 73 fatalities per million population in 2014) in all years between 2001 and 2014. Especially in the years up to 2010, difference in the rates was substantial. Since 2009, the Greek rate decreased faster than the EU average rate. (European Commission, 2016b). The age-standardised number of deaths for all forms of transport in 2010 was 136 per million population, with only Romania performing worse (OECD, 2015). The corresponding figure for Norway was 52 per million citizens. Greek motorists also report poorer safety behaviours in traffic, and recent research points to serious flaws in the way road safety is managed at all levels in Greece (DACOTA, 2011, Papadimitriou et al. 2015).

The accident risk of buses is in general relative low, but because of the mass and size of these vehicles, accident consequences are very severe. European research reveal large national differences in such risk figures (DACOTA, 2011; European Commission, 2016c), in spite of common European safety rules and driver training. In 2014, the share of bus occupant fatalities was 5% in Norway and lower than 1% in Greece while the respective EU average was 1% (European Commission, 2016a; 2016b). The EU average fatality rate in accidents involving buses or coaches is 1,5 per million population. The respective number was 2,3 in Norway and 1,6 in Greece (European Commission, 2016c).

Based on the above, the main aims of this paper are therefore to examine the influence of national, sectorial and organizational safety culture on transport safety behaviour among Norwegian and Greek bus drivers. The effect of these three safety cultural influences are compared with other key variables like age, sex, experience and working conditions by means of linear regression analyses.

2. Methodology

First, qualitative interviews with ten bus drivers in Norway and ten in Greece were conducted. The purpose was to get input on the applicability of scales, and if additional questions should be added. The purpose was also to acquire rich qualitative data on the importance of nationality, sector and organizations in influencing safety behaviours and outcomes. Then two surveys among professional bus drivers from four companies in Norway and two companies in Greece were undertaken (total N=228). In order to have comparable companies in the two countries, the recruitment of companies was based on the following criteria: 1) The vast majority (i.e. minimum 90%) of bus drivers in each company should be of the main nationality (Norwegian or Greek), 2) Each company should have about 200 to 400 drivers, 3) Each company should have between 100-400 vehicles, 4) Recruited drivers should be mostly involved in urban traffic in cities with a population of minimum 50.000 and up to 200.000, but also drive in rural areas. The interviews and the surveys among bus drivers were completed during the last trimester of 2016. Questions included in the interview guide and the survey questionnaire concerned these subjects:

Working conditions with safety implications: five questions based on previous work (Nævestad and Bjørnskau, 2014; Jensen et al) were included. It was hypothesized that key background variables and national culture, sectorial culture and organisational culture predict safety behaviours and outcomes, but respondents in this sample are professional drivers, and it is known from previous research (e.g. Nævestad and Phillips, 2013; Nævestad and

Bjørnskau, 2014) that work pressure, wage arrangements and management focusing on certain safety behaviours (speeding, seat belt use) also influence safety outcomes and safety behaviour. Thus, these variables also needed to be included in the analysis.

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

Safety behaviours: Previous Research (Warner et al, 2011; Özkan et al 2006), especially using DBQ items, shows that when southern Europe (Greece) and Northern Europe is compared, there are more aggressive violations in Greece. Thus, seven questions including questions taken from the Driving Behaviour Questionnaire and based on the results of previous research (Warner et al, 2011). The chosen DBQ questions were those who Scandinavian and Southern European drivers scored significantly different on, and which were related to accident involvement (Warner et al 2011). The DBQ answer alternatives have been changed from relative to absolute alternatives (e.g. Question: "For every ten trips, how often do you …?", Alternative answers: "Never", "Once or twice", "Three or four times", "Five or six times", "Seven or eight times", "More than eight times but not always", "Always"). The reason is that previous research shows that different demographic groups tend to interpret questions and formulations differently (i.e. what does "often" mean?) This effect has been found in surveys comparing the culture and behaviours of different national groups, e.g. HGV drivers from Norway and Central & Eastern Europe (Nævestad et al 2016).

National transport safety culture index (Paternalism index, Trust in authorities, Expectations to other road users): The survey includes 9 questions on expectations to other road users, reflecting those used for respondents' own behaviour. We may refer to the questions on "expected national transport safety behaviours" as descriptive norms (Cialdini et al 1990). In previous research on traffic safety culture among bicyclists, such descriptive norms of respondents' peer groups were found to predict respondents' own traffic safety behaviours, which in turn predicted their accident risk (Nævestad, et al 2014). Individuals' perceptions of peers' opinions about a given behaviour are often defined as injunctive norms, while individuals' perceptions of what peers actually do often are defined as descriptive norms (Ajzen, 1991; Rivis & Sheeran, 2003; Ward et al 2010). Since injunctive norms are normative they can be expected to directly influence peoples' behavior. Descriptive norms may influence behaviour by providing information about what is normal (Cialdini et al., 1990), but they 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 (Nævestad et al 2014). The focus on normative influences on behaviour is important in the theory of planned behaviour (TPB) (Ajzen, 1991, 2006), and in the critique of it (Rivis & Sheeran 2003). In short, TPB predicts that our behaviour is the result of our intention to carry out the behaviour, and that our intention to carry out a particular behaviour is influenced by our attitudes towards the behaviour, injunctive norms and our perceived control over our behaviour (Ajzen, 1991). In the professional (organisational) setting, managers are an important source of social pressure, as well as colleagues, and the interaction between people within the organisation is important for the creation and maintenance of a safety culture influencing behaviour.

Sector transport safety culture: Six questions were constructed for this survey, but they are influenced by previous research on framework conditions for transport safety in road, sea and air transport (e.g. Bjørnskau & Longva, 2009; Nævestad, Phillips & Elvebakk 2015). It is noted that questions *"I don't expect safety improvements in my sector in the next 10 years"* and *"Society accepts the current level of accidents that we have in my sector"* are difficult to be used for comparison. These questions assume a poor safety level. *Safety outcomes:* 4 questions based on previous work on fatigue (Nævestad and Bjørnskau, 2014; Nordbakke, 2004), on safety assessment (Størkersen et al, 2011) and also newly developed questions. Accidents is the most important outcome measure.

3. Analysis and Results

In Tables 1 to 5 the main characteristics of the survey sample are presented. The majority of drivers in the survey were aged between 46 and 55 years old. This was also the case among Norwegian and Greek drivers. However, most foreign drivers working in Norway were aged 26 and 35 years old (Table 1).

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

	Driver's age				
Nationality	26-35	36-45	46-55	56+	Total
Norwegian	11%	15%	38%	36%	115
Greek	11%	40%	43%	7%	101

Foreign in Norway	50%	25%	17%	8%	12
Total	13%	26%	39%	21%	228

In total, most of the survey participants are usually driving a local bus. In Greece, the sample was equally distributed among local and long distance bus drivers (Table 2).

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

Nationality	Local bus	School bus	Long distance	Express bus	Tour bus	Airport express	Total
Norwegian	53%	24%	16%	4%	3%	2%	115
Greek	51%	0%	50%	0%	0%	0%	101
Foreign in Norway	83%	8%	0%	8%	0%	0%	12
Total	54%	12%	30%	2%	1%	1%	228

Most drivers have a significant professional experience of more than 20 years. Only in the case of foreign drivers in Norway, the majority has a shorter professional experience, up to 5 years (Table 3).

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

	Years working as professional driver					
Nationality	0-5	6-10	11-15	16-20	20+	Total
Norwegian	13%	17%	13%	17%	40%	115
Greek	6%	6%	24%	25%	40%	101
Foreign in Norway	50%	33%	17%	0%	0%	12
Total	12%	13%	18%	20%	38%	228

As shown in Table 4, the mean number or thousand km driven during the last two years by professional Greek bus drivers is much higher than for Norwegians and even higher than for foreigners working in Norway, probably reflecting the higher share for long distance bus in the Greek sample.

Table 4: Estimated number of km ($10^{3)}$ of driven during the past two years

	Estimated number of km ($10^{3)}$ of driven during the past two years		
Nationality	Mean	N	Std. Deviation
Norwegian	72,22	115	101,188
Greek	114,28	98	88,666
Foreign in Norway	44,83	12	34,858
Total	89,08	225	95,936

3.1 Factor analysis of the transport behaviour scale

A confirmatory factor analysis (CFA) was conducted in order to examine the underlying factor structure of the items measuring transport safety behaviours. The items are based on the study of Warner et al (2011), who compare DBQ items in Finland, Sweden, Turkey and Greece. Their DBQ items which were either rated significantly differently and with eta values higher than 0,10 (=*), or which were rated significantly differently, and with eta values higher than 0,10 and which explain accident involvement (=**) (Warner et al 2011) were included in the analysis. These items were included, as they have been found in previous cross-cultural research to measure important differences that are closely related to accident involvement.

Based on this previous research, it was assumed that a two-factor solution was appropriate (aggressive violations and speeding). The tests indicated that the items and the data were suitable for factor analysis. Bartlett's test of sphericity (approx. Chi-square) was 260,703 ($p < .001$). The Kaiser–Meyer–Olkin's measure of sampling adequacy showed a value of 0,676. The two first components had an Eigenvalue higher than 1, which explained a total of 70,9% of the variance. The scree plot also suggested a two factor solution. We used a principal component analysis (PCA) with Oblimin rotation, where we set the number of factors to two and the cutoff values of the factor loadings at 0,3. This produced the following result.

Table 5: Factor analysis results - transport behaviour scale

Item	Aggressive violations	Over speeding
Sound your horn to indicate your annoyance to another road user	0,851*	

Become angered by a certain type of driver and indicate your hostility by whatever means you can	0,827**	
Pull out of a junction so far that the driver with right of way has to stop and let you out	0,731**	
Disregard the speed limit on a residential road		0,860**
Disregard the speed limit on a motor way road		0,886**

In the remaining analyses in the present paper, these five DBQ questions from Warner et al (2011) are used in the two-factor solution, although the "aggressive transport safety behavior index" was primarily used. As noted, the original relative DBQ answer alternatives have been replaced with absolute answer alternatives, in order to avoid comparison problems across national groups due to different baselines and reference points.

Table 6: Aggressive violations index (min 3, max 21)

Nationality	Mean	N	Std. Deviation
Norwegian	4,7826	115	2,61836
Greek	6,0000	101	3,06594
Foreign in Norway	5,0833	12	2,60971
Total	5,3377	228	2,87554
P=0,007			

Table 7: Over speeding index (min 2, max 14)

Nationality	Mean	N	Std. Deviation
Norwegian	4,1478	115	3,24779
Greek	3,4455	101	2,88609
Foreign in Norway	3,6667	12	2,26969
Total	3,8114	228	3,05521
P=0,239			

3.2 Factor analysis of the national culture scale

An exploratory factor analysis (EFA) was conducted in order to examine the underlying factor structure of the items measuring national transport safety culture. We also wanted to examine whether it was relevant to reduce the number of items. The tests indicated that the items and the data were suitable for factor analysis. Bartlett's test of sphericity (approx. Chi-square) was 1090.614 ($p < ,001$). The Kaiser–Meyer–Olkin's measure of sampling adequacy showed a value of 0,854. The Eigenvalues and the scree plot indicated a two factor solution. The two first components had an Eigenvalue higher than 1, which explained a total of 68,4% of the variance. We used a principal component analysis (PCA) with Oblimin rotation, where we set the number of factors to two and the cutoff values of the factor loadings at 0,3. This produced the following result.

Table 8: Factor analysis results - national culture scale

Item	Aggression/Violations	Compliance/politness
That they sound their horn to indicate their annoyance to another road user	0,837	
That they become angered by a certain type of driver and indicate their hostility by whatever means they can	0,835	
That they drive when they suspect they might be over the legal blood alcohol limit	0,819	
That they disregard the speed limit on a motor way road	0,763	
That they overtake a slow driver on the inside	0,760	
That they drive without using a seatbelt	0,755	
That they disregard the speed limit on a residential road	0,744	
That they respect and follow traffic rules		0,915
That they are polite to other road users		0,905

Table 9: National culture: violations (min 7, max 49)

Nationality	Mean	N	Std. Deviation
Norwegian	13,6783	115	5,78041
Greek	19,1881	101	7,39691
Foreign in Norway	15,5833	12	2,77843
Total P=0,000	16,2193	228	6,96215

Table 10: National culture: politeness

Nationality	Mean	N	Std. Deviation
Norwegian	7,0174	115	2,63573
Greek	6,0792	101	2,19401
Foreign in Norway	6,9167	12	1,44338
Total P=0,016	6,5965	228	2,43404

The survey also included six questions on paternalism and individual freedom related to road safety. A confirmatory factor analysis (CFA) was conducted in order to validate that these questions make up to factors. The tests indicated that the items and the data were suitable for factor analysis. Bartlett's test of sphericity (approx. Chi-square) was 247.002 (p < ,001). The Kaiser–Meyer–Olkin's measure of sampling adequacy showed a value of 0,602. The two first components explained a total of 60,5% of the variance. We used a principal component analysis (PCA) with Oblimin rotation, where we set the number of factors to two and the cutoff values of the factor loadings at 0,3. This produced the following result.

Table 11: Factor analysis - paternalism and individual freedom

Items	Paternalism	Individual freedom
The fact that accidents still happen in traffic, shows that the authorities should control road users' behaviour to a greater extent than they do today	0,831	
The authorities should make it more difficult for people to engage in risky behaviour in traffic (e.g. by lowering speed limits, increasing police enforcement)	0,827	
It is morally and ethically unacceptable that people are killed or severely injured in traffic accidents	0,726	
Road users should be able to choose risky activities in traffic, as long as they do not expose other to risk		0,784
A skilled person can take more risks than others		0,737
Road users know best themselves how they should behave in traffic		0,683

Table 12:Paternalism

Nationality	Mean	N	Std. Deviation
Norwegian	11,1565	115	2,78653
Greek	13,5347	101	1,81969
Foreign in Norway	10,3333	12	3,08466
Total P=0,000	12,1667	228	2,71045

Table 13: Individual freedom

Nationality	Mean	N	Std. Deviation
Norwegian	6,1217	115	2,57569
Greek	8,2178	101	2,79501
Foreign in Norway	6,4167	12	3,23218
Total P=0,000	7,0658	228	2,88854

3.3 Sector culture

The survey included 5 questions on sector culture. The Kaiser–Meyer–Olkin's measure of sampling adequacy showed a value below 6; thus these questions are not suitable for factor analyses. The Cronbach's Alpha was also low for these five questions (,248). Based on Cronbach's Alpha analysis showing values if items were excluded, the "sector culture" is comprised of only two questions: "Safety is more important than deadlines to our principals" and "Safety is more important than price to our principals". The index with these two questions had a Cronbach's Alpha of 0.843. Thus, bus subsectors were compared on an index comprised of two questions.

Table 14:Bus sub sector index (min=2, max=10)

Which type of bus do you usually drive?	Mean	N	Std. Deviation
Local bus	7,8279	122	2,38346
School	7,4286	28	2,28406

Long distance	8,9706	68	1,69257
Express	6,2000	5	3,34664
Tour	6,6667	3	3,05505
Airport	6,0000	2	1,41421
Total	8,0526	228	2,29092
P=0,001			

3.4 Organizational culture

An organisational culture index, consisting of 10 questions from the GAIN-scale on organisational safety culture (Cronbach's Alpha=0,865) was used. The GAIN scale has been used in previous research from different transport sectors (Bjørnskau & Longva 2009; Nævestad & Bjørnskau 2014). The GAIN-scale originally consists of 25 questions measuring five themes, but the scale was reduced to 10 questions to facilitate the inclusion of other questions, measuring other topics. When choosing the 10 questions, we prioritized questions that we have found to predict variation between companies in previous research (e.g. Nævestad & Bjørnskau, 2014). These are the most concrete questions, referring to specific functions and situations.

An exploratory factor analysis (EFA) was conducted in order to examine the underlying factor structure of the 10 items measuring organizational safety culture. We also wanted to examine whether it was relevant to reduce the number of items. Our tests indicated that the items and the data were suitable for factor analysis. Bartlett's test of sphericity (approx. Chi-square) was 868,958 (p < ,001). The Kaiser–Meyer–Olkin's measure of sampling adequacy showed a value of 0,872. The Eigenvalues indicated a two factor solution, but the scree plot and the low factor loadings, which all cross loaded with the first factor indicates a one-factor solution. The one factor solution explained a total of 45,6% of the variance.

Table 15: Organisational safety culture

Company	Mean	N	Std. Deviation
Greek 1	38,4200	50	6, 64582
Greek 2	40,2200	50	5,30802
Norwegian 1	32,0227	44	7,28007
Norwegian 2	42,6154	26	5,09962
Norwegian 3	35,5652	23	9,72731
Unknown	32,3793	29	6,74226
Norwegian 4	34,5000	6	3,78153
Total	36,8991	228	7,60555
P=0,001			

3.5 Regression analyses

Two regression analyses were conducted to analyze the factors predicting respondents' answer on the dependent variables measuring aggressive transport behaviours and accident involvement. In the first analysis, hierarchical, linear regression analyses, where independent variables are included in successive steps was used. The most basic independent variables are included first, e.g. age, sex, experience. Then the other independent variables are included. It may be challenging to stick to the principle of presenting the most basic independent variables first when we include the more conceptual independent variables (e.g. safety culture, work pressure) in the regression analyses. In this case, the order of variable inclusion is based on hypotheses derived from previous research, or other hypotheses about the primacy of some independent variable over others. Of course, no conclusions about causality can be made, as this is a cross-sectional and correlational study. We nevertheless use the term predict when we describe the regression analyses.

In Table 16 we show results from a hierarchical, linear regression analysis, where independent variables are included in successive steps to examine the variables predicting respondents' transport behaviours (aggressive violations). 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 4 and 20.

Table 16: Linear regression. Dependent variable: "Aggressive violations" Standardized beta coefficients

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9
Age group	**-.143****	**-.212*****	**-.210*****	**-.224*****	**-.215*****	**-.220*****	**-.215*****	**-.146****	-.066
Experience		**.160****	**.175****	**.183****	**.169****	**.165****	**.162****	.069	.035

Type of bus transport (1=other, 2=local bus)			**.112***	**.128***	.099	.097	.106	.084	.094
Fixed payment (=1, Other=2)				**.124***	.106	**.110***	**.115***	.091	.090
Experienced time pressure					**.134****	**.125***	**.152****	.080	.044
Organisational safety culture						-.072	**-.161****	**-.144****	**-.155****
"Sector culture"							**.171****	.075	.060
National culture ("violations" factor)								**.418*****	**.398*****
National culture ("individual freedom" factor)									**.213*****
Adjusted R^2	.016	.033	.041	.052	.065	.066	.082	.239	.274

* p < 0.1** p < 0.05 *** p < 0.01***

We see that drivers' age contributes significantly and negatively to aggressive violations until the national culture factor "individual freedom" is included in the analyses. This could indicate that lower age in the Greek sample explains what we have seen on this factor, or at least that this factor is related to the age of the respondents.

Drivers' experience contributes significantly, but ceases to contribute significantly when we include national culture (violations factor). This could be due to national sample differences in experience. As we may expect, drivers' "Experienced time pressure" contributes significantly, but it ceases to contribute when national culture is included. This is perhaps due to more time pressure in the Greek sample, at least the variables may be related.

Sector culture also ceases to contribute significantly when national culture is included, indicating that national culture is more important than sector, and perhaps that sector answers also were influenced by nationality? Organizational safety culture contributes negatively to aggressive violations, indicating that a good safety culture is important for traffic safety, and may reduce the impact of national culture.

National transport safety culture is measured in two ways: first as a "violations factor", where national culture is specified as descriptive norms, i.e. what respondents think that other road users in their countries do. This is the strongest contributor to aggressive violations. Second, national transport safety culture is specified as the "individual freedom" factor, which is an index made up of three items reflecting the value of individual freedom to take risk in traffic.

The adjusted R^2 value increases from 0,082 in Step 7 to 0,239 in Step 8, when national culture (violations) is included in the analysis. This demonstrates the high importance of national culture as a predictor of aggressive violations. Finally, the adusted R^2 value is 0,274, indicating that the model explains 27,4% of the variation in the aggressive violations variables.

3.6 Accident involvement

A total of 25,2% of the Norwegian respondents reported to have been involved in traffic accidents while at work in the last two years (21,7% material damage, 3,5% personal injury). The corresponding share among Greek drivers was 34,7% (31,7% material damage, 2% personal injury, 1% fatal injury). A logistic regression analysis was conducted with accident involvement as dependent variable, in order to find the variables predicting accidents among our respondents (Table 17). In this analysis, the accident variable, which originally had four answer alternatives, was dichotomized, 0=no accident, 1=accident. B values are presented and they indicate whether the risk of personal injuries is reduced (negative B values) or increased (positive B values), when the independent variables increase with one value. We include different independent variables step-wise in the analyses to be able to examine the isolated effect of the independent variables, i.e. when the other variables are held constant.

Table 17: Logistic regression. Dependent variable: accident involvement in the last two years (dichotomized: 0: no accident, 1=accident involvement). B values.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Age group	-.066	-.029	-.021	-.003	.026	.047	.104	.092
Experience		-.061	-.026	-.053	-.060	-.095	-.134	-.141
Type of bus transport (1=local bus, 2=other)			**-.769****	**-.976****	**-.904****	**-.713****	**-.658***	**-.658***
Mileage last 2 years				.304	.274	.214	.223	.244
Fixed payment (=1, Other=2)					**.925***	**1.099****	**1.189****	**1.142****
Experienced time pressure						**.300*****	**.271****	**.260****
Aggressive transport behaviours							**.102***	**.099***
Organisational safety culture								-.018

Adjusted R^2	.001	.003	.043	.058	.080	.124	.144	.149

* p < 0.1** p < 0.05 *** p < 0.01***

Results indicate that accident involvement (material damage and/or personal injuries) in the last two years is predicted by: type of transport (local bus), no fixed payment, experienced time pressure and aggressive violations. First, we see that type of transport (i.e. not local bus) contributes negatively to accident involvement at the 10% level, indicating the correlation between local bus and accident involvement, controlled for the other variables. We dichotomized this variable, as local bus had the highest share of accident involvement (36,9%) probably in many material accidents on small roads, in urban transport.

Second, we see that fixed payment contributes significantly at the 5% level. This is the strongest predictor. When we look at the group with fixed payment, 33% of the respondents in this group have been involved in accidents. This is unexpected and hard to explain. The effect could be due to other factors (i.e. local bus), but we control for these factors in the model. Additionally, it should be the other way around; i.e. that performance based pay predicts accidents. We control however for experienced time pressure. Third we find that experienced time pressure predicts accident involvement. This result was expected as it has also been found in studies of fatal accidents with professional drivers in Norway (Nævestad et al 2015). Finally, we find that aggressive transport safety behaviours (aggressive violations) predict accident involvement at the 10% level. This is in accordance with previous research (Warner et al 2011), but it is important to note that other "work related variables" were more strongly correlated.

4. Concluding discussion

As the rate of improvement in transport safety has slowed down in recent years, it has been suggested that new perspectives are needed to complement the traditional perspectives on transport safety. This research contributes on this direction by examining the importance of transport safety culture for transport safety among bus drivers in Norway and Greece. Transport safety culture is defined as shared norms prescribing certain transport safety behaviours, shared expectations regarding the behaviours of others and shared values signifying what's important. Norway and Greece were selected to be compared since the road safety status in the two countries differ significantly. While the road fatality rate of Norway is one of the lowest in the EU, Greece has one of the worst transport safety records of all EU-27 countries (Yannis & Papadimitriou, 2012). The present paper may shed some light on this difference, as it indicates differences in the transport safety cultures of bus drivers in Norway and Greece.

Our study provides four main results. The first main result is that bus drivers in Greece report of more aggressive violations in traffic than Norwegian bus drivers. This is in accordance with previous research on private road users in Scandinavia and southern Europe (Wallen et al 2011). The second main result is that that aggressive violations are predicted by national transport safety culture. In the regression analyses, national transport safety culture is measured in two ways. National transport culture is measured by means of a "violations factor", specified as descriptive norms (Cialdini et al 1990), i.e. what respondents think that other road users in their countries do. This is the strongest contributor to respondents own aggressive violations in traffic. Previous research has also found that descriptive norms predict transport safety behaviours (Nævestad et al 2014). National transport safety culture is also specified by means of an "individual freedom" factor, which is an index made up of three items reflecting the value of individual freedom to take risk in traffic. Factor analyses also indicated other dimensions of national transport safety culture. We found a "Compliance/politeness factor and a paternalism factor. The third main result is that we found that respondents' aggressive violations in traffic predicted their accident involvement. This is in accordance with previous research (Warner et al 2011), although it is important to note that other "work related variables" were more strongly correlated. The fourth main result is that we found that organizational safety culture contributes negatively to aggressive transport safety behaviours, meaning that a positive organizational safety culture may reduce (the negative impact of national transport safety culture on) aggressive violations in traffic.

It could be argued that the effect of national culture, specified as violations, is a result of the false consensus effect, meaning that people think that other people do as they do, to justify their own behaviour. Contrary to this, we may however argue that we see national patterns, i.e. a relationship between respondents' violations and the violations they attribute to their fellow countrymen. Additionally, one of the key components in our definition of transport safety culture is shared expectations regarding the behaviours of others, and descriptive norms measure this. It is also important to note that the national culture violations factor contains only 3 questions with the same wording as the behavior questions, limiting the potential scope of a specific false consensus effect. Moreover, and most importantly; we also see that the "individual freedom" factor predicts aggressive violations, and this factor is not "derived" from the behavior question, as the "violations" factor to some extent is. Another key component in our definition of TSC is shared values signifying what's important (e.g. individual freedom to take risk).

In conclusion our study indicates a relationship between national transport safety culture, transport safety behaviour and accident involvement, that perhaps could be developed further to shed light on national transport safety records. In order to obtain even more accurate results, we suggest however that future research on this

subject should cover larger driver samples, including more companies, and also private road users, to further explore organizational safety culture as well as companies including more foreign drivers in order to get a clearer idea of the influence of nationality.

Acknowledgment

This research was carried out within the project "Safety culture in private and professional transport: examining its influence on behaviours and implications for interventions", funded by the Research Council of Norway.

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