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Safety culture in maritime cargo transport in Norway and Greece: which factors predict unsafe maritime behaviours?

Tor-Olav Nævestad[a], Kristine V. Størkersen[b], Alexandra Laiou[c*], George Yannis[c]

[a]*Institute of Transport Economics, Gaustadalleen 21, 0349 Oslo, Norway*
[b]*NTNU Samfunnsforskning, Dragvoll alle 38b, 7049 Trondheim, Norway*
[c]*Department of Transportation Planning and Engineering, National Technical University of Athens, Zografou Campus, Iroon Polytechniou 5, 15773 Athens, Greece*

Abstract
The aim of the study is to examine the influence of national safety culture, sector safety culture and organizational safety culture on safety behaviours among Greek (N=99) and Norwegian (N=93) crewmembers on cargo vessels, and to discuss results in light of additional explanatory variables. We focus on three types of unsafe maritime behaviours: 1) Violations/risk acceptance, 2) Working under the influence of alcohol, or while being hungover, and 3) Non-intervention/non-reporting. Linear regression analyses indicate that organisational factors like demanding working conditions and organizational safety culture are the most important predictors of violations/risk acceptance and non-intervention/non-reporting. National safety culture is the most important predictor of respondents' tendency to work under the influence of alcohol, or while being hungover. National safety culture is measured as descriptive norms and as values ("freedom to take risks at sea"). The study indicates that safety culture at different analytical levels influence different types of unsafe behaviours.

Keywords: safety culture; maritime transport; cargo; Norway, Greece

* Corresponding author. Tel.: +30-210-772-1265; fax: +30-210-772-1454.
E-mail address: alaiou@central.ntua.gr

1. Introduction

1.1. Background and aim

About 90% of the goods traded worldwide are transported by sea, and although safety improvements have led to a significant decrease in the mortality rates of seafarers in recent decades, seafaring is still termed one of the most hazardous occupations (Oldenburg & Jensen 2012). Thus, it seems that there still is a need to develop and refine approaches that may inform preventive measures. In this paper, we examine the importance of safety culture for safety behaviours among Greek and Norwegian crewmembers on cargo vessels, in order to produce knowledge that may serve as the basis for new safety initiatives. Although there are, few studies of maritime safety culture compared to other sectors (Bjørnskau & Nævestad 2013), studies have highlighted the importance of organisational safety culture for maritime safety, (Håvold & Nesset 2009; Lu & Tsai 2010; Mearns et. al., 2000; Williamson et al. 1997). Few studies have, however, examined the importance of sector safety culture, or national safety culture for safety behaviours.

If we are to fully understand the effects of safety culture on safety in transport, we should study not only safety culture in organisations, but that particular to other social units, like peer-groups, sectors, regions and nations. Since safety culture is by definition shared, it must be related to social units. We define transport safety culture 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, politeness) (Nævestad & Bjørnskau, 2012).

The aim of the present study is to examine the influence of national safety culture, sector safety culture and organizational safety culture on safety behaviours among Greek and Norwegian crewmembers on cargo vessels, and to discuss results in light of additional explanatory variables (e.g. working conditions, age, position).

1.2. The "SafeCulture" project

The data in this paper have been collected as part of the "SafeCulture - Safety culture in private and professional transport: examining its influence on behaviours and implications for interventions" project, which is 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). The project is exploring safety culture in land and sea based, professional and private transport in Norway and Greece.

1.3. Previous research

1.3.1. National safety culture and safety behaviour

It is interesting to examine the importance of national culture for safety behaviours, as previous research indicates that the maritime industry is the only example of a fully globalized industry (Alderton & Winchester 2002). International research asserts that approximately two-thirds of all ship crews are now multinational (Hetherington, Flin, & Mearns, 2006). We should thus, perhaps assume that nationality is of less importance in this sector. Previous studies indicate, however, that nationality predicts personal accident risk on board merchant vessels (Hansen et al 2002; Jensen et al 2004). Moreover, Håvold (2005) found significant differences between nationalities in his study of maritime safety culture. He measures safety culture in shipping by means of a 40 item scale, that was distributed to 20 vessels, with a response rate of 60% (N=349). The respondents were mainly Filipino, Indian, Norwegian, Polish and Croat seafarers. Håvold found significant differences between nationalities on the most important factor "Management and employee attitudes to safety and quality", which includes 11 items. In the present study, we measure national transport safety culture in two ways; as descriptive norms (Cialdini et al 1990), and as shared values. Descriptive norms may influence behaviour by providing information about what is normal (Cialdini et al., 1990). Such normative pressures on behaviour have been found in several studies of traffic safety behaviours (Nævestad et al, 2014).

1.3.2. Sector safety culture and safety behaviour

Previous research has found that organizational safety culture scores differ between transport sectors, i.e. aviation, road, rail, and sub sectors (e.g. helicopter and airlines) (Bjørnskau & Longva, 2009), indicating that the safest lines of transport have the highest organizational safety culture scores. The observed differences in safety culture scores

are probably due to differences in framework conditions like rules/enforcement, competition and regulation, which differ considerably in different sectors. Additionally, Nævestad et al (2017a) find different organizational safety culture scores comparing Norwegian coastal cargo and Norwegian maritime passenger transport. Little research focus, however, specifically on sector safety culture, with items tailored to measure sector characteristics influencing safety.

1.3.3. Organisational safety culture and safety behaviour

Most studies of safety culture in the maritime sector focus on organizational safety culture. Håvold & Nesset (2009) include safety behaviour as a safety outcome variable in a large study containing 141 vessels and 2558 responses. Their study develops the safety culture concept further and defines "safety orientation" as an implementation of the safety culture concept. The authors conclude that the study confirms the usefulness of safety culture/climate factors as predictors of unsafe behaviour. The influence of safety culture on seafarers' safety behaviour is also investigated by Lu and Tsai (2010) by use of a safety culture survey combined with self-reported safety behaviour. This study also revealed a positive relationship between safety culture and safety behaviour. In a study comparing Norwegian coastal cargo and passenger transport, Nævestad et al (2017a) find that poor organizational culture (and work pressure) is closely related to unsafe working behaviours (violations, risk taking/acceptance), which in turn is associated with personal injuries on board.

1.3.4. Working conditions and safety behaviour

Størkersen et al (2011) underline the importance of framework conditions and working conditions for unsafe maritime behaviours in Norwegian coastal cargo transport. In the daily conflict between protection and production, the latter often wins in this sector. A third of the respondents reported that they put themselves in danger to get the job done, while about 40% violate procedures to get the job done, especially because of efficiency demands. Thus, work pressure is a central variable that often is related to unsafe behaviours. As noted, Nævestad et al (2017a) find that work pressure (and poor organizational safety culture) is closely related to unsafe working behaviours.

1.3.5. Demographic and work related factors and safety behaviour

Previous studies have found other (i.e. apart from nationality) demographic and work related factors to be related to maritime safety behaviours and safety performance. Hansen et al (2002) found the following factors to be related to occupational accident risk: 1) Vessel type (i.e. coastal cargo vessels), 2) Age: younger seafarers had a higher risk 3) Change of ship and the first period aboard a ship were identified as risk factors, 4) Walking from one place to another aboard the ship caused serious accidents, and 5) The most serious accidents happened on deck. Jensen et al (2004), found the following factors to be related to personal accident involvement: 1) Seafarers' age (<35 years), 2) Tour lengths (<117 days), 3) Position, i.e. rating, 4) Work in engine room.

2. Method

2.1. Recruitment of Respondents

The Norwegian respondents were recruited through the Norwegian researchers' contact with Norwegian shipping companies, i.e. shipping companies that are located in Norway, with mainly Norwegian crew members. Web links to the questionnaires were distributed by the shipping companies to all employees working on board vessels, along with an introductory text explaining the purpose of the survey, and stressing that the surveys were confidential. The Greek respondents were recruited through a marketing research company in Greece, which was under the scientific supervision of researchers from the NTUA. Seafarers working for Greek shipping companies, i.e. shipping companies that are located in Greece, with mainly Greek crew members, were approached for face-to-face survey undertaken on their ship.

2.2. Survey measures

1) Background variables (15 questions): sex, nationality, age group, seafarer experience, position/area of work, employment status, vessel type, vessel size, manning on board, ship register, year vessel was built, days on/off board, work schedule, number/share of nationalities on board, number of employees in the shipping company.
2) Safety performance (5 questions): questions about, respondents' occupational injuries on board, ship accidents, type of ship accidents, safety compromising fatigue and assessment of work place safety level (1-10).

3) Safety behaviours (7 questions): "How often do you think the following events tend to occur for every 100 working days/nights on board?: (Answer alternatives: 1) Never, 2) 1-2 times, 3) 3-5 times, 4) 6-10 times, 5) 11-15 times, 6) 16-20 times 7) More than 20 times, 8) Do not know/not relevant).
Based on previous analyses (Nævestad et al 2017a) and conceptual considerations about what the questions actually measure, we separated these seven questions into three sets. First, we made a violations/risk acceptance index, comprised of four questions: "I violate procedures to get the job done", "I accept small risks because the "situation demands it" (e.g. because of time pressure, bad weather)", "I refrain from using the required protection equipment in my work", "I work, even though I am so tired that safety may be compromised". Second, we analysed results for the question "I work while being under the influence of alcohol (e.g. one beer or more), or while being hungover" separately, as it is difficult to relate this conceptually to the other behaviour questions. Third, we made a non-intervention/ non-reporting index of two questions: "I refrain from telling risk taking colleagues to work in a safer way, as I find it impolite to intervene" and "I refrain from reporting safety problems and unsafe situations that I experience in my work to the ship management", as we assume that these are related to the same conceptual phenomenon; communicating about safety problems to colleagues and managers (i.e. "reporting culture").
4) **Working conditions** (4 questions): How often do you think the following events tend to occur for every 100 working days/nights on board: "Your shift change is delayed because of work operations, for instance port calls?", "You work more than 16 hours in the course of a 24-hour period?, "You are interrupted when you are off duty" (Answer alternatives: 1) Never, 2) 1-2 times, 3) 3-5 times, 4) 6-10 times, 5) 11-15 times, 6) 16-20 times 7) More than 20 times, 8) Do not know/not relevant). We removed the eight answer alternative and made a "Demanding working conditions index" of these three questions. The survey also included a question on work pressure: "Sometimes I feel pressured to continue working, even if it is not perfectly safe" (Answer alternatives: 1=totally disagree - 5=totally agree, 6=Do not know/not relevant).
5) **Organisational safety culture** (11 questions): We made an organisational culture index, consisting of questions from the GAIN-scale on organisational safety culture, 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 (GAIN 2001), but we have reduced the scale to 11 questions: "Ship management regards safety to be a very important part of all work activities", "The shipping company regards safety to be a very important part of all work activities", "Ship management detects crew members who work unsafely", "Ship management often praises crew members who work safely", "My colleagues on board usually report all safety problems and unsafe situations that they experience in their work", "My colleagues on board do all they can to prevent accidents and unwanted incidents", "There are routines (procedures) on board for reporting safety problems".
6) **National safety culture**: We measure national safety culture first as descriptive norms: "What we think or expect that other seafarers from respondents' own countries do": "When working on vessels, I expect the following behaviours from other seafarers from my country:" "That they sometimes violate procedures to get the job done", "That they sometimes refrain from using the required protection equipment in their work", "That they sometimes work, even when they are so tired that safety may be compromised", "That they sometimes work being under the influence of alcohol (e.g. one beer or more), or while hungover", "That they sometimes take small risks if the "situation demands it" (e.g. because of time pressure, bad weather)", "That they sometimes avoid telling colleagues taking risks to work safely", "That they sometimes refrain from reporting safety problems and unsafe situations that they experience in their work to the ship management". We made an index, summing the scores on the 7 national safety culture (descriptive norms) items. Additionally, we measure national maritime safety culture as values, by means of an index measuring "freedom to take risk at sea" based on previous factor analyses in a study of safety culture in the Norwegian and Greek road sector (Nævestad et al 2017b). This index is composed of three questions: "People know best themselves how they should behave when they are at sea", "People should be free to take risks at sea, as long as they do not expose others to risk", "A skilled person can take more risks than others".
7) **Sector safety culture**: We measure sector safety culture by means of an index comprised of two questions that were selected after a "scale if items deleted" analysis and a substantial consideration of five items in a previous study (Nævestad et al 2017a): "Safety is more important than deadlines to our customers", "Safety is more important than price to our customers". This index comprised of two questions to make it comparable to our other studies.

2.3. Analysis of quantitative data

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 have also conducted three regression analyses to analyze the factors predicting respondents' answer on the dependent variables measuring the different

types of unsafe maritime behaviours. We use hierarchical, linear regression analyses, where independent variables are included in successive steps. The most basic independent variables are included first, e.g. age, position, then the other independent variables are included. Of course, we cannot conclude about causality, as this is a cross-sectional and correlational study. We nevertheless use the term predict when we describe the regression analyses.

3. Results

3.1. Description of the sample

In this study, we only include respondents who are either Norwegian (N=93) or Greek (N=99). Norwegian respondents work on Norwegian vessels with mainly Norwegian crews sailing in Norwegian waters. The same principles apply to the Greek respondents. We have chosen this sampling strategy, as we want to examine the influence of national culture, which we measure partly as what kind of behaviours respondents expect from seafarers from their own country.

In Tables 1 to 3 the main characteristics of the survey sample are presented. Chi square analyses indicate that the differences in the distributions in Tables 1 to 3 are statistically significant (P=<0.01).

Table 1. Distribution of respondents per nationality and age.

Nationality	<26	26-35	36-45	46-55	56+	Total
Norwegian	17%	27%	20%	28%	8%	93
Greek	3%	17%	27%	31%	21%	99
Total	10%	22%	24%	30%	15%	192

The majority of respondents in the survey were aged between 36 and 55 years old. However, the share of young seafarers was larger in the Norwegian sample. The share of Norwegian seafarers 35 years old or younger was twice that of the Greek sample (44% vs. 20%) (Table 1).

Table 2. Distribution of respondents per nationality and vessel type/sector.

Nationality	Bulk	General cargo	Tanker	Live fish carrier	Other	Total
Norwegian	33%	20%	0%	37%	10%	93
Greek	15%	19%	59%	0%	7%	99
Total	24%	20%	30%	18%	8%	192

Comparing subsectors within the two national samples (Table 2), we see that the main difference is that the Greek sample includes a majority of respondents working on tankers (59%), while a large proportion of the Norwegian respondents (37%) work on live fish carriers. It is important to note this when comparing samples.

Table 3. Distribution of respondents per nationality and position/line of work.

Nationality	Captain	Deck officer	Deck crew	Machine chief	Machine officer	Machine crew	Catering	Apprentice	Other	Total
Norwegian	24%	24%	18%	5%	2%	6%	9%	6%	5%	93
Greek	5%	13%	15%	7%	16%	37%	3%	2%	1%	99
Total	14%	18%	17%	6%	9%	22%	6%	4%	3%	192

Table 3 compares the position/line of work in the two samples. We see that 61% of the respondents in the Greek sample are “machine crew” (3 positions), compared to 13% in the Norwegian sample. The share of captains is also larger in the Norwegian sample. It is important to note this when comparing the two samples.

3.2. Regression analyses

3.2.1. Violations/risk acceptance Index as the Dependent Variable

In Table 4 we show results from a hierarchical, linear regression analysis, where independent variables are included in successive steps to examine the variables predicting respondents’ scores on the violations/risk acceptance index, which is made by adding the scores of four items measuring this. The scores on the dependent variable vary between 4 (never) and 28 (more than 20 every 100 working days/nights on board). The average score is 7.9. Table

4 presents the standardized beta coefficients. The contributions of the different independent variables on the dependent variables can therefore be compared directly.

Table 4. Linear regression. Dependent variable: Violations/risk acceptance Index. Standardized beta coefficients.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Age group (26-35 years=2)	.313***	.294***	.245***	.209***	.181***	.146***	.118**	.118**
Position/line of work (Machine crew=2)		-.235***	-.203***	-.180***	-.199***	-.147***	-.128**	-.105*
Demanding working conditions index			.372***	.264***	.344***	.302***	.281***	.283***
Sometimes I feel pressured to continue working, even if it is not perfectly safe				.224***	.093	.054	-.030	-.026
National safety culture: descriptive norms					.366***	.325***	.238***	.247***
Sector safety culture						-.273***	-.185***	-.189***
Organisational safety culture							-.285***	-.268***
National safety culture: individual freedom index								-.072
Adjusted R^2	.093	.143	.275	.307	.426	.485	.522	.524

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

Table 4 provides five main results. First, we see that age contributes significantly and positively, meaning that when we go from all other age groups to that with respondents between 26-35 years in the sample, the score on the violations/risk acceptance index is higher, indicating that this group is involved in more violations and risk acceptance. This variable was dichotomized after a comparison of means indicating that respondents between 26 and 35 had the highest score on the index. The position variable was dichotomized after a comparison of means indicating the group with the lowest score: Machine crew scored lowest on the violations risk acceptance index. Thus, the contribution is negative, but only significant at the 10%-level. As noted, there are more Greek respondents in this group (cf. Table 3).

Second, we see that the demanding working conditions index contributes positively and significantly to unsafe behaviours. This indicates that the more demanding working conditions the respondents experience, the more likely they are to be involved in violations/risk acceptance. The Norwegian seafarers score statistically significantly higher than the Greek (9.5 vs. 6.4) on the demanding working conditions index. The contribution of this variable is the strongest in the model.

The third main result is that the national safety culture - descriptive norms index contributes positively and significantly to unsafe behaviours. This indicates that the more unsafe behaviours the respondents say that they expect from seafarers from their own country, the more likely they are to be involved in unsafe behaviours themselves. We did not find significant differences between the Greek and Norwegian seafarers on national safety culture index. The contribution of this variable is the third strongest in the model. The national safety culture - individual freedom index did not contribute significantly. Greek respondents score significantly higher on this index (9.1 vs. 6.8), and the difference is statistically significant at the 1%-level.

The fourth result is that sector safety culture contributes negatively and significantly to unsafe behaviours: the more respondents' customers care about safety, the less violations and risk acceptance the respondents are involved in. This is the variable in the model with the fourth strongest contribution. We have grouped the cargo sub-sectors within five categories, and tanker transport has the highest score on the sector safety culture index, while live fish carriers had the lowest score. The former group was comprised only by Greek respondents, the latter only by Norwegian respondents.

The fifth result is that organizational safety culture is the second most important predictor of respondents' safety behaviour; contributing negatively to violations and risk acceptance among the respondents. This indicates that the higher organizational safety culture scores the respondents report, the less unsafe are their behaviours.

The Adjusted R^2 indicates the amount of variance in the dependent variable that is explained by the independent variables in the model. In Step 8 the Adjusted R^2 is 0.524 which indicates that the independent variables explain about 52% of the variance in the dependent variable.

3.2.2. Working under the influence of alcohol, or while being hungover as the Dependent Variable

In Table 5 we show results from a hierarchical, linear regression analysis, where independent variables are included in successive steps to examine the variables predicting respondents' scores on the dependent variable: "I work while being under the influence of alcohol (e.g. one beer or more), or while being hungover".

Table 5. Linear regression. Dependent variable: "I work while being under the influence of alcohol (e.g. one beer or more), or while being hungover". Standardized beta coefficients.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Age group (>56 years=2)	.051	.038	.033	.033	.028	.028	.040	.047
Position/line of work (Machine personnel=2)		.233***	.229***	.252***	.201***	.196***	.207***	.161**
Demanding working conditions index			-.123*	-.278***	-.177**	-.174**	-.184**	-.187**
Sometimes I feel pressured to continue working, even if it is not perfectly safe				.300***	.124	.128*	.089	.082
National safety culture: descriptive norms					.460***	.464***	.424***	.412***
Sector safety culture						.022	.060	.071
Organisational safety culture							-.125	-.156*
National safety culture: indiv.freedom index								.135**
Adjusted R^2	-.003	.047	.057	.118	.306	.302	.306	.318

Table 5 provides four main results. The first is that position contributes significantly and positively, indicating that machine personnel are more likely to work while being under the influence of alcohol, or while being hungover. This variable was dichotomized after a comparison of means indicating that machine personnel had the highest scores on this variable. This is the third strongest contribution in the model. Over half of the Greek respondents are machine personnel (cf. Table 3).

The second main result is that the demanding working conditions index contributes significantly and negatively, indicating that respondents working under demanding working conditions are less likely to work while being under the influence of alcohol, or while being hungover. Norwegian respondents score higher on this index than Greek respondents (7.4 vs. 6.4), and the difference is statistically significant at the 10% level. This is the second strongest contribution in the model.

The third main result is that the national safety culture – descriptive norms index contributes significantly and positively, indicating that respondents who attribute unsafe maritime behaviours to seafarers from their home country are more likely to work while being under the influence of alcohol, or while being hungover. We see that sector safety culture does not contribute significantly in the model. The organisational safety culture only contributes significantly at the 10%-level and negatively, indicating that a good organisational safety culture may reduce the effect of negative national safety culture.

The fourth main result is that the national safety culture – individual freedom index contributes significantly and positively, indicating that respondents who value individual freedom to take risks (at sea) are less likely to work while being under the influence of alcohol, or while being hungover. As noted, Greek respondents score significantly higher on this index than Norwegian respondents (9.1 vs. 6.8), and the difference is statistically significant at the 1%-level.

In Step 8 the Adjusted R^2 is 0.318 which indicates that the independent variables explain about 32% of the variance in the dependent variable.

3.2.3. Non-intervention/non-reporting index as the Dependent Variable

In Table 6 we show results from a hierarchical, linear regression analysis, where independent variables are included in successive steps to examine the variables predicting respondents' scores on the non-intervention/non-reporting index, which is made up of two variables: "I refrain from telling risk taking colleagues to work in a safer way, as I find it impolite to intervene" and "I refrain from reporting safety problems and unsafe situations that I experience in my work to the ship management".

Table 6. Linear regression. Dependent variable: non-intervention/non-reporting index Standardized beta coefficients.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Age group (>56 years=2)	-.083	-.057	-.046	-.043	-.027	-.022	.015	.001
Position/line of work (Apprentice/other=2)		.228***	.213***	.223***	.192***	.186***	.142**	.137**
Demanding working conditions index			.203***	.064	.104	.097	.071	.066
Sometimes I feel pressured to continue working, even if it is not perfectly safe				.268***	.206**	.196**	.043	.042
National safety culture: descriptive norms					.165**	.159**	.042	.029
Sector safety culture						-.049	.092	.091
Organisational safety culture							-.439***	-.459***
National safety culture: individual freedom index								.080
Adjusted R^2	.001	.048	.084	.132	.151	.149	.237	.238

Table 6 provides two main results. The first is that position contributes significantly and positively, indicating that apprentices and people working in "other" positions are more likely to refrain from intervening against colleagues taking risks and reporting safety problems and unsafe situations to the ship management. This variable was dichotomized after a comparison of means indicating that these groups had the highest scores on this variable. The second main result is that organizational safety culture is the clearly most important predictor of respondents' safety behaviour; contributing negatively to the non-intervention/non-reporting index. This indicates that the higher organizational safety culture scores the respondents report, the less likely they are to refrain from intervening against colleagues taking risks and reporting safety problems and unsafe situations to the ship management. In Step 8 the Adjusted R^2 is 0.238 which indicates that the independent variables explain about 24% of the variance in the dependent variable.

4. Concluding discussion

The aim of the present study was to examine the influence of national safety culture, sector safety culture and organizational safety culture on safety behaviours among Greek and Norwegian crewmembers on cargo vessels, and to discuss results in light of additional variables. We have studied the influences on three types of unsafe maritime behaviours using three linear regression models: 1) Violations/risk acceptance/risk taking, 2) Working under the influence of alcohol, or while being hungover, and 3) Non-intervention/non-reporting.

In the present study, we measure national transport safety culture in two ways; as descriptive norms (Cialdini et al 1990), and as shared values. We define "expected national transport safety behaviours" as descriptive norms (Cialdini et al 1990). This refers to what kind of safety behaviours respondents expect from other people in their country. We found significant differences between Norwegian and Greek seafarers' tendency to work under the influence of alcohol, or while being hungover, and the regression analyses indicate that national safety culture, measured as descriptive norms is the most important predictor of this behaviour. Sector safety culture was not related to this behaviour, and organisational safety culture only contributed significantly at the 10%-level. Thus, it seems that this behaviour is more related to national culture than organizational culture, which the other studied behaviours are more related to. We also found the national safety culture index to be closely related to the Violations/risk acceptance Index, together with organizational safety culture and sector safety culture.

Descriptive norms, can however, also influence behaviour through the false consensus bias, in which individuals overestimate the prevalence of risky behaviour among their peers to justify their own behavior (Nævestad et al 2014). This is the main objection to our operationalization of national safety culture as descriptive norms. This objection is supported by the fact that we do not see significant differences between our national groups on the national safety culture index (as noted, this may also be the result of sample sub-sector characteristics). We do, however, see a significant difference between the two national groups' assessments of other countrymens' tendency to work while being drunk or hungover. Thus, it seems that we should have separated the national safety culture index into several aspects, like we did with the safety behaviour items. This lesson; that national safety culture refers to several different aspects, should be followed up in future research.

It is also important to note that we also measure national safety culture as shared values; "freedom to take risks at sea"; which is an index comprised of three items. We saw significant differences between the two national groups on this index, and we have seen that this index contributed significantly to respondents scores on the variable measuring working under the influence of alcohol, or while being hungover. Interestingly, we have also seen

significant differences between Greek and Norwegian professional drivers on the same items measuring "freedom to take risks" in another study (Nævestad et al 2017b); indicating that these items measure important national differences. In the professional driver study, we found that the "individual freedom" factor predicted aggressive violations in traffic.

The studies of Nævestad et al (2017a) and Størkersen (2017) indicate the importance of sector safety culture, which has been devoted little attention in maritime research. Previous research has found that organisational safety culture scores differ between transport sectors, i.e. aviation, road, rail, and sub sectors, but it is important to remember that this research measures and compares differences in organizational safety culture scores (Bjørnskau & Longva, 2009). In the present study, we have therefore, developed questions aiming specifically to measure the sectors' focus on safety, focusing on respondents' perceptions of customers' focus on safety versus deadlines and price, whether competition threatens safety in the sector and so forth. The reason for this operationalization is that previous research has found that the focus on safety varies substantially between sectors and sub-sectors (Bjørnskau & Longva 2009), and that customer focus on safety is a central aspect of the framework conditions influencing sector safety level (Nævestad & Bjørnskau 2014). Thus, it is not surprising that we find that high sector safety culture scores give less violations/risk acceptance among our respondents. Sector culture does not influence the other unsafe maritime behaviours, perhaps because violations/risk acceptance is closely related to production pressures and demanding working conditions, which previous research has found to be relatively sector dependent (Nævestad et al 2017a).

When discussing the importance of sector for safety culture, it is also important to note that our study of national safety culture may be impeded by the composition of groups within our national samples. As noted, the Greek sample includes a majority of respondents working on tankers (59%), which is known to have stricter regulations, a high safety focus from the transport buyers (oil companies) and a higher safety level (Mostad 2009), while a large proportion of the Norwegian respondents (37%) work on live fish carriers with less strict rules, compared to tankers and a considerable work pressure (Størkersen 2017). Thus, it is not surprising that tank transport has the highest score on the sector safety culture index, while live fish carriers had the lowest score. The former group was comprised only by Greek respondents, the latter only by Norwegian respondents. Thus, our national samples are not entirely comparable, and this may explain why we do not find significant differences between the scores of the two national groups on the national safety culture -descriptive norms index.

The composition of positions/lines of work within the national samples is also different: There are more machine crews in the Greek sample. In the regression analyses, we can control for this, as we hold the effect of the different variables constant. As expected, we saw that background variables like position/line of work significantly influenced safety behaviours in the three regression analyses. Previous studies have found a relationship between position and accidents. Jensen et al (2004) found position (rating) and work in engine room to be related to personal accident involvement. Hansen et al (2002) found that walking from one place to another aboard the ship caused serious accidents related to occupational accident risk. We found that age predicted violations/risk acceptance. Previous studies have also found that age predicts accident risk: <26 years (Jensen et al 2004) and 35 years (Hansen et al 2002). We may perhaps assume that behaviours and exposure to activities and risk is the mechanism behind these observed relationships between demographic factors and accident risk. More research is needed on this.

Results indicate that organizational safety culture is strongly related to respondents' tendencies to intervene and report. This is not unexpected, as research indicates that reporting and intervening ("reporting culture") are central aspects of organisational safety culture (Reason 1997). Reporting to managers could also be influenced by national culture traits like power distance (Hofstede 2001) and deference to authority (Guldenmund et al 2013), but our results do not indicate that our measurements of national safety culture influences these behaviours. Neither do we find a significant difference between the two national groups on the question asking whether respondents expect other seafarers from their country to report safe issues to their managers. Thus, either the differences between Norwegian and Greek seafarers are small when it comes to this, or characteristics with our sample influence our comparison of means between the two national groups. We return to methodological challenges related to our sample characteristics below.

Results also indicate that organizational safety culture influences respondents' violations/risk acceptance. This is in line with a previous study of organisational safety culture and working conditions in Norwegian coastal cargo transport and passenger transport (Nævestad et al 2017a). Nævestad et al (2017a) find that poor organizational

culture (and work pressure) is closely related to violations, risk taking/acceptance, which in turn is associated with personal injuries on board.

Moreover, our study also indicates a relationship between negative working conditions and unsafe maritime behaviours, especially violations/risk acceptance/risk taking. Størkersen et al (2011) also found a relationship between violations/risk taking and negative working conditions. Her study found that a third of the respondents in the coastal cargo sector reported that they put themselves in danger to get the job done, while about 40% violate procedures to get the job done, especially because of efficiency demands. Nævestad et al (2017a) in a study of coastal cargo and passenger transport also found this relationship.

To conclude, our result that organisational safety culture influences safety behaviours is accordance with previous studies. Few previous studies have, however, also compared the influence of national safety culture and sector safety culture on safety behaviours. We have found that safety culture at different analytical levels influence different types of unsafe behaviours. Thus, our study indicates the importance of studying safety culture at different analytical levels, if we are to fully understand the influence of culture on safety in transport. Future studies should develop this approach further.

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