TØI Report 1500/2016

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Institute of Transport Economics
Norwegian Centre for Transport Research

Safety in maritime transport

Is flag state important in an international sector?

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Sammendrag:

Denne studien benytter fire metoder for å undersøke betydningen av flaggstat for sikkerhet i maritim transport. Vi sammenlikner nasjonalt flaggede skip (NOR) med skip som seiler under bekvemmelighetsflagg. Vi konkluderer med at flaggstat ikke er den viktigste faktoren som påvirker maritim sikkerhet. Det ser imidlertid ut til at skip som seiler under nylig etablerte bekvemmelighetsflagg har en høyere risiko. Av de seks risikofaktorene vi sammenlikner ser det ut til at kommunikasjon er en risikofaktor på skip som seiler under bekvemmelighetsflagg. Disse skipene har flernasjonale besetninger, og våre resultater indikerer at disse i større grad opplever farlige situasjoner på grunn av språklige misforståelser. Kommunikasjonen kan også kompliseres av kulturelle forskjeller. Vi har imidlertid indikasjoner på at skip som seiler under bekvemmelighetsflagg gjør det bedre enn nasjonalt flaggede skip på andre faktorer med betydning for sikkerhet.

Summary:

This is a multi-method study investigating the importance of flag state for risk factors and safety outcomes in maritime transport, and is based on a comparison of nationally flagged vessels (NOR) and vessels flying “flags of convenience” (FOC). Our findings suggest that flag state is not the most important factor affecting maritime safety outcomes. However, ships flying newer FOCs are associated with worse safety outcomes. Of six risk factors investigated, communication stands out as a potential safety risk on FOC vessels. These vessels generally have multinational crews, which may be more likely to experience unsafe situations because of language difficulties, and for whom differences in national safety culture could further confound communication problems. Despite this, FOC vessels may perform better than nationally flagged vessels on other factors influencing safety.

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Preface

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

The study presented in this report is based on a literature review, qualitative interviews with 10 sector experts, reference group meeting and a small-scale survey with 222 seafarers. We are very grateful to the sector experts who shared their knowledge and views with us in the qualitative interviews. We are also very grateful to the seafarers who answered the survey.

The respondents were recruited through "Kystrederiene", an employer organisation for Norwegian based shipping companies. We are very grateful for this cooperation, and we thank director Siri Hatland for her enthusiasm and patience. An additional report focusing on personal injuries and organisational safety culture is also published based on the survey data.

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

Tor-Olav Nævestad has written the report and conducted the research. Ross Phillips is responsible for the quality assurance of the report, while Trude Kvalsvik has prepared the report for publication.

Oslo, August 2016
Institute of Transport Economics

Gunnar Lindberg
Managing director

Ross Phillips
Chief Research Psychologist

Content

Institute of Transport Economics
Norwegian Centre for Transport Research

Summary

Safety in maritime transport: Is flag state important in an international sector?

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We conduct a literature review, expert interviews and a small-scale survey of seafarers in order to investigate the importance of flag state for safety in maritime transport. From the literature review it is difficult to draw any clear conclusions about the importance of flag state for ship accidents, as existing studies point in different directions, often emphasizing other risk factors as more important (e.g. ship type and age). Results do indicate, however, that ships flying newer flags of convenience have a higher risk. Qualitative interviews support our conclusion that flag state is just one of several risk factors affecting maritime safety outcomes. In our survey we ask crew about six risk factors, and compare the responses of those sailing on nationally flagged vessels (e.g. Norwegian Ordinary Ship Register, NOR) with those sailing on vessels flying flags of convenience (FOC) . Results indicate that communication could be a risk factor on FOC vessels. These vessels generally have multinational crews, and our results indicate that these are more likely to experience unsafe situations because of language misunderstandings. Differences in national safety culture could further confound communication problems. Despite this, FOC vessels may perform better than nationally flagged vessels on other factors influencing safety. In conclusion, we question the utility of flag state as an indicator of vessel safety. We discuss eight measures aimed at the main risk factors related to internationalisation in maritime transport, and conclude that three measures should be strengthened or developed further.

Background and aims

The domestic transport of goods at sea in Norway is open to foreign actors, and port statistics show an increase in cargo transported by ships flying flags of convenience, and a sharp reduction in cargo carried by Norwegian registered vessels in the period 2003-2012 (Nævestad, Caspersen, Hovi, Bjørnskau & Steinsland 2014). Vessels flying flags of convenience account for the largest proportion of transported cargo in the 30 largest ports in Norway over recent years. In 2005 it was reported that 50 % of the total crew of 35,000 on board Norwegian-registered vessels were foreign citizens, mostly from the Philippines, India, Poland or Russia (Håvold, 2005).

It is important to establish whether the increased presence of ships flying flags of convenience and foreign crew members in Norwegian waters have safety implications, in order to implement mitigating measures if necessary. In particular, vessels flying flags of convenience are largely manned by multinational crews comprising seafarers with different languages, national safety cultures and wage and working conditions than Norwegian seafarers. It is therefore important to assess safety implications of diverse culture, varying communication abilities and working conditions on board ships in Norwegian waters.

The aims of the present study are to:

1) Examine safety outcomes of increasing internationalisation in (Norwegian) maritime transport, by comparing the safety performance of nationally flagged vessels (NOR) and vessels flying FOCs.

2) Discuss the importance of potential risk factors, comparing nationally flagged vessels (NOR) and vessels flying FOCs.
3) Discuss potential measures to increase maritime safety further.

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

Multi-method approach

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

1) *Literature review*. We conducted a literature review on safety outcomes, risk factors and measures. The literature review included 20 studies that were relevant to at least one of the three aims of the study listed above.
2) *Qualitative interviews*. We conducted qualitative interviews with 10 sector experts from employers, employees and authorities, again to inform each of the study aims.
3) *Small-scale survey*. Based on the results from the literature study and qualitative interviews on relevant risk factors, we conducted a small-scale survey (N=222) to examine the prevalence and importance of different risk factors among seafarers. The respondents were both Norwegian (N=177) and foreign (N=45) seafarers and were recruited through "Kystrederiene", an employer organisation for Norwegian based shipping companies. All of the respondents worked on ships operating from Norway. A total of 180 respondents worked on NOR vessels, 32 on FOC vessels and 10 on board NIS vessels.

   The survey included in this report was originally meant to consolidate the findings from literature review and expert interviews, and as such is based on the responses of a small sample of seafarers. We recommend therefore that the small-scale survey results should be explored by a more extensive survey and robustly designed sampling method. We expand more on this below, in the discussion of methodological limitations.

4) *Reference group meeting*. We were provided with useful information and viewpoints in a meeting with the projects' reference group held at the Institute of Transport Economics, March 2014. Results from this meeting are presented together with results from the interviews.

Flag state is one of several risk influencing factors

When it comes to the effect of flag state on ship accident risk, the literature is inconclusive. Flag state is one of several risk factors predicting ship accident risk along with factors like vessel age, main cargo, ship type, weather conditions and location/sailing patterns, but it is usually not found to be the most important variable for maritime safety. Four of the seven studies on ship accidents in the review questioned the utility of focusing on flag state as the most important risk indicator.

Some studies indicate that the safety of vessels flying newly established FOCs is lower than that of vessels registered with traditional maritime states, second registers or more established FOC states. Thus, flag state seems to be an important predictor of ship accident risk if we take the age of the flag state into account. New and inexperienced flag states may implement and enforce maritime safety rules to a lesser extent than more established flag states.

When asked whether ships from different flag states have different risks for ship accidents in Norwegian waters most interviewees were either uncertain, or they questioned the relevance of flag state as a key variable explaining ship accident risk, at least in Norwegian waters. It was mentioned that the maritime sector is an international sector and that nationality therefore is of less importance. One interviewee said that Norwegian shipping companies traditionally have chosen established FOCs. There were comments that other risk factors are more important than flag state. In particular there is considerable variation in risk within each flag state fleet, depending on the sub-sector and customers' willingness to pay for safety.

In the small-scale survey, respondents were asked the following question: "Has the vessel been involved in a shipping accident (e.g. grounding, collision, contact injury, fire) in the two last years?". A total of 43 seafarer respondents (20 %) answered yes to this question. In order to avoid counting the same ships several times in our analysis of factors predicting ship accidents, we filtered our data to only analyse results for captains (N=57). Our analyses were unable to conclude on any factors predicting ship accidents.

We also examined the relationship between registry and seven other safety outcomes, and did not find that registry was an important predictor of safety outcomes. However, the lack of findings in both these analyses may have been because there were too few FOC vessels in the sample. As far as these and some other results are concerned, the survey should be regarded as preliminary, giving useful indications that need to be followed up by more extensive survey.

Factors influencing maritime safety

We compare nationally and FOC vessels on six factors potentially influencing the risk for a ship accident. We find that there may be important differences in two of these risk factors.

Communication and language difficulties

The literature review indicates that communication may be an important factor influencing maritime safety, and that this may be a main drawback of mixed nationality crews. In a 2009 survey, the Norwegian Coastal Administration found that in communications between ships, 81 % of respondents believed language skills to be a problem of high or moderate degree. The importance of communication and language for safety was also underlined in the interviews.

Survey respondents from FOC/NIS vessels reported to work in crews that are much more multinational than those from NOR vessels. We therefore conducted survey analyses to examine factors influencing respondents' experiences of unsafe situations due to language misunderstandings.

Figure S.1 shows respondents from FOC/NIS vessels and NOR vessels' answers to the question: "Have you experienced unsafe situations because of language misunderstandings between different nationalities on board?"

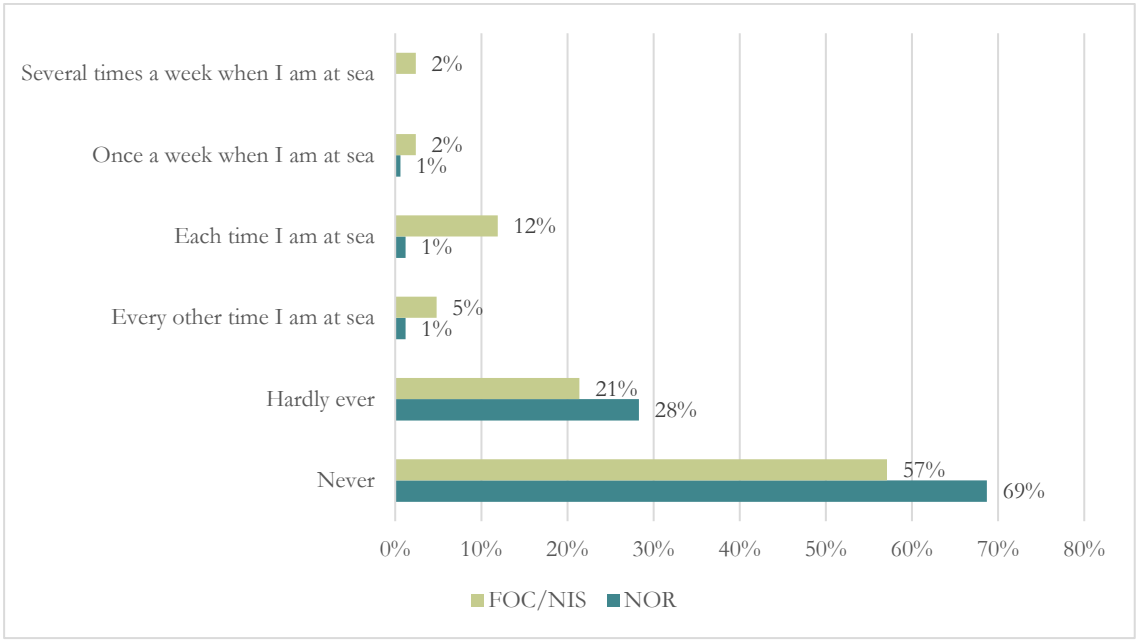

Figure S.1: Respondents answers to the question: "Have you experienced unsafe situations because of language misunderstandings between different nationalities on board?" NOR (N=166), FOC/NIS (N=42).

Results show that ship register was the strongest predictor of experiencing unsafe situations because of language misunderstandings. The second strongest predictor of experiencing unsafe situations because of language misunderstandings was the share of colleagues with different nationalities. The third most important predictor was organisational safety culture, indicating that good organisational safety culture may facilitate good and safe communication. Our analyses did not indicate that communication difficulties predict ship accidents, but we did find an association between communication difficulties and risk perceptions.

Foreign seafarers find it more impolite to intervene

The research literature indicated that national culture may influence values, communication styles, methods of conflict resolution, decision making and organisational behaviour. Our interviews also indicated the importance of national safety culture for several aspects of maritime safety. Our survey results indicate that respondents from Central/Eastern European countries and Asian countries find it far more impolite to tell colleagues to work in a different and safer way ("colleague safety intervention") than Norwegians do, which strongly implies how national culture might influence safety (Figure S.2).

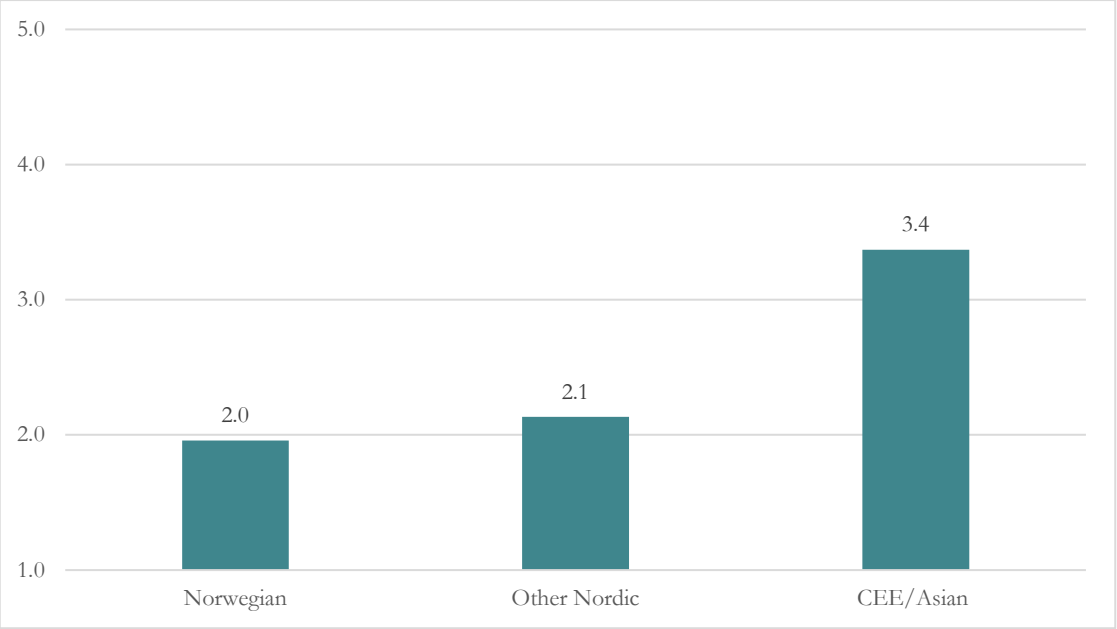

Figure S.2: Mean scores of national groups' assessment of colleague safety intervention: "It is impolite to tell colleagues to work in another and safer way". Norwegian (N=177), Other Nordic countries (N=15), Central/Eastern European countries and Asian (N=27). Answer alternatives ranged from 1 (totally disagree) to 5 (totally agreed). (the sixth answer alternative: "do not know" was removed in the analysis) * p < 0.1 ** p < 0.05 *** p < 0.01.

We conducted analyses to examine factors predicting respondents' views on colleague safety intervention. When we included register in the analysis, we saw that nationality ceased to contribute significantly, and that register was the strongest predictor. Crew of FOC vessels are generally small multinational communities, and research indicates that it is particularly important to avoid conflict in order to optimise working environment and safety on such vessels. This could explain why register became the most important predictor of views on colleague safety intervention. Perhaps foreign respondents' view on intervention is a result of their working conditions, i.e. multinational crews, rather than national culture (i.e. values seafarers have before they start working in the multinational crews), or perhaps both? This is a question that could be examined in future research.

The literature finds that nationality is a strong influence on the cultural dimensions of "deference to authority" and the "value of the individual versus the group". We did not find statistically significant differences between the groups on the deference to authority dimension, but the numbers of foreign respondents in our survey were small. More research is needed to examine this

Do FOC vessels perform better on some risk factors?

Qualitative data suggested that fatigue and manning levels may influence safety more than flag state does. Some interviewees had the impression that the manning levels are higher on board FOC and NIS vessels than on NOR vessels. The reason is that FOC and NIS vessels are permitted to pay foreign seafarers according to the lower wage levels in their home countries. It was suggested that lower wage level may facilitate employment of more people on board. This is merely a hypothesis.

Reference group members agreed that fatigue and manning levels are among the most important factors influencing maritime safety in Norwegian waters. They suggested that the small Norwegian vessels sailing along the coast of Norway have low manning levels, and that this contributes to high levels of workload and time pressure. They suggested that these risk factors are particularly important in this segment of the NOR fleet, and that they may lead to fatigue and stress which may be negative to safety. However, our small-scale survey indicates that seafarers from Central/Eastern Europe and Asia (on FOC vessels) report higher levels of stress and pressure than seafarers from Norway/Nordic countries. More research is needed to examine this.

In the survey, we asked respondents about the manning levels on their vessels. The results indicate that manning levels on board FOC vessels could possibly be higher than they are on NOR vessels, but a more extensive survey is required to confirm this.

The survey also suggests that manning levels are important for safety, as analyses indicate that vessels' manning level influence respondents experiences of shift delays, 16-hours of continuous work and interrupted rests and their inclination to be fatigued in manners that may compromise safety.

Finally, we have also discussed the impact of other risk factors than those highlighted above. Our data have, however, not been sufficient to evaluate these. More research is therefore needed to examine whether and how the following factors may explain variations in safety among vessels of different flag states: technology and equipment, failing implementation and enforcement, fatigue and working conditions, safety management system and training, competence and experience.

Measures

We discuss eight measures aimed at: 1) Newly emerging flags of convenience and 2) Communication problems related to language difficulties and cultural differences. We suggest that three measures in particular should be strengthened and developed further:

1) Continued development of supranational inspection agencies like EMSA (European Maritime Safety Agency)
2) Further development of the new risk-based PSC (port state control) regime and
3) Improved communication (English) skills.

Methodological challenges

1) *Small samples*. The most important methodological challenge of the present study is the small survey samples. The survey included in this report was originally meant to consolidate the findings from literature review and expert interviews, and as such is based on the responses of a small sample of seafarers (N = 222). Analysis of the responses gave rise to some findings that are unique and potentially important, but because it was meant only to consolidate other findings the survey design is not robust enough to be able to draw solid conclusions.

   When interpreting results, it is therefore crucial to remember that the samples for several key variables are small, for instance for foreign seafarers and NIS and FOC vessels. This influences our abilities to draw conclusions; it is for instance less likely to find statistically significant differences with small samples on key variables. We must also remember, that with small samples in key groups, respondents may not be representative. These reservations are important to bear in mind when looking at the results of the small-scale survey. We must be very careful when it comes to generalizing results.

   We recommend therefore that the small-scale survey results should be explored by a more extensive survey and robustly designed sampling method. It would be important in such a survey that samples are both representative of crewing populations, and large enough enable solid conclusions to be drawn when comparing the responses of crew on Norwegian versus foreign-registered vessels (i.e. give sufficient statistical power).

2) *Respondents from different countries have different points of reference*. The seafarers may refer to different baselines, and their survey answers may have different anchoring. If safety standards vary substantially between different nationalities or cultures, respondents' evaluative judgments are based on different expectations to the safety commitment of their managers and their colleagues, and the safety level of their businesses. Many of the survey questions involve subjective definitions, e.g. "safety-compromising fatigue", "pressured to work even though it is not perfectly safe" and "unsafe situations."

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

4) *Awareness of comparison*. Seafarers may be aware that they would be compared to other national groups, and respond correspondingly. In the presentation of the survey it was stated that a central purpose was to compare nationalities and flag states. Respondents had to report their nationality and vessels register in the survey.

5) *The need to use underdeveloped survey items*. This line of research is at an early stage, and so we needed to develop many of the questions for this survey. There is a need to develop these items further in order to test for psychometric robustness.

6) *National culture and reporting*. Measuring safety culture and reporting culture by means of surveys (i.e. self-reports) is in one sense paradoxical, as giving straightforward answers is dependent on a culture which encourages the communication of negative issues (i.e. a good reporting culture). A previous study of safety culture in construction in Denmark, UK and The Netherlands found that Eastern European migrant workers generally rated their managers more positively than employees who were born in the respective countries. The study suggests that that Eastern European migrant workers' deference to authority may explain this.

   Deference to authority is as a trait of national culture that may explain over-reporting of positive results. It may perhaps also explain under-reporting of negative results. One of the interviewees suggested that deference to authority will influence how foreign seafarers answer the survey, stating that "for the foreign seafarers, the survey is an authority". In line with this, Størkersen et al (2011) found that the foreign respondents that they interviewed were less critical when answering their quantitative survey than they were in the preceding qualitative interviews. Although these questions are interesting, it is impossible for us to conclude on this. These hypotheses should therefore be examined further in future research.

7) *Structural incentives for "laying low"?* The answers foreign seafarers give in surveys may also be influenced by structural features; e.g. time limited job contracts that are renewed regularly. In international shipping, ratings may be hired on a contract basis from one assignment to another, and the staffing agency may have information on the employment history of each seafarer. Such arrangements may provide foreign seafarers with structural incentives for "laying low" when answering the survey. It is impossible for us to conclude on this. These hypotheses should therefore be examined further in future research.

   Finally, we wish to point out a typographical error on one of the survey response scales in the Engligh language version of the survey. There are good grounds to believe that this did not influence responses, and this is explained fully in the main body of the report.

Transportøkonomisk institutt
Stiftelsen Norsk senter for samferdselsforskning

Sammendrag

Sikkerhet i maritim transport: Er flaggstat av betydning i en internasjonal sektor?

TØI rapport 1500/2016
Forfatter: Tor-Olav Nævestad
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Denne studien benytter fire metoder for å undersøke betydningen av flaggstat for sikkerhet i maritim transport. En litteraturstudie viser at det er vanskelig å trekke noen klare konklusjoner om betydningen av flaggstat for skipsulykker. Studiene som undersøker dette peker i ulike retninger, og de understreker ofte at andre risikofaktorer har større betydning (f.eks. skipstype og alder). Det ser imidlertid ut til at skip som seiler under nylig etablerte bekvemmelighetsflagg har en høyere risiko. De kvalitative intervjuene våre støtter konklusjonen om at flaggstat kun er én av flere faktorer som påvirker maritim sikkerhet. Vi sammenlikner seks risikofaktorer for nasjonalt flaggede (NOR) skip og skip som seiler under bekvemmelighetsflagg. I spørreundersøkelsen vår spør vi respondentene om seks risikofaktorer og sammenlikner resultatene til sjøfolk på nasjonalt flaggede skip (NOR) og skip som seiler under bekvemmelighetsflagg. Resultatene tyder på at kommunikasjon kan være en risikofaktorer på skip som seiler under bekvemmelighetsflagg. Disse skipene har flernasjonale besetninger, og våre resultater indikerer at disse i større grad opplever farlige situasjoner på grunn av språklige misforståelser. Kommunikasjonen kan også kompliseres av kulturelle forskjeller. Det er imidlertid viktig å huske at vi også har indikasjoner på at skip som seiler under bekvemmelighetsflagg gjør det bedre enn nasjonalt flaggede skip på andre faktorer med betydning for sikkerhet. Vi konkluderer med å stille spørsmål ved betydningen av flaggstat som indikator på sikkerhetsnivået til skip. Vi diskuterer åtte tiltak rettet mot de viktigste risikofaktorene knyttet til internasjonalisering i maritim transport, og foreslår at tre bør styrkes og videreutvikles.

Bakgrunn og mål

Godstransport til sjøs har lenge vært åpen for utenlandske aktører, og den norske havnestatistikken viser at det har vært en stor økning i godsomslaget som transporteres med skip under bekvemmelighetsflagg, samtidig som det har vært en kraftig reduksjon i gods som fraktes av norskregistrerte skip i perioden 2003-2012 (Nævestad, Caspersen, Hovi, Bjørnskau & Steinsland 2014). Skip som seiler under bekvemmelighetsflagg har stått for den største andelen av transportert gods i de 30 største havnene i Norge de siste årene. I tillegg, ble det i 2005 rapportert at 50 % av det totale mannskapet på 35 000 om bord på norskregistrerte fartøy var utenlandske statsborgere, de fleste fra Filippinene, India, Polen eller Russland (Håvold, 2005).

Gitt økningen av skip som seiler under bekvemmelighetsflagg og utenlandske besetningsmedlemmer i norske farvann, er det viktig å vurdere om, og i hvilken grad flaggstat har betydning for sikkerhet i en internasjonal sektor som sjøfart. Dette er en forutsetning for å sette inn tiltak. Fartøyene som seiler under bekvemmelighetsflagg er gjerne bemannet av flernasjonale mannskap med ulike språk, nasjonale sikkerhetskulturer samt lønns- og arbeidsvilkår enn det norske sjøfolk har. Det er derfor viktig å undersøke sikkerhetsmessige implikasjoner av dette.

Målene med den foreliggende studien er derfor å:

1) Undersøke sikkerhetskonsekvensene av økende internasjonalisering av maritim godstransport (i norske farvann) ved å sammenlikne sikkerhetsnivået til nasjonalt flaggede skip (NOR) med skip som seiler under bekvemmelighetsflagg.
2) Diskutere betydningen av ulike risikofaktorer, gjennom sammenlikning av sikkerhetsnivået til nasjonalt flaggede skip (NOR) med skip som seiler under bekvemmelighetsflagg.
3) Diskutere potensielle tiltak som kan forbedre maritim sikkerhet ytterligere.

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

Metoder

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

1) *Litteraturstudie.* Vi har gjennomført en litteraturstudie av sikkerhetskonsekvenser, risikofaktorer og tiltak. Litteraturstudien inkluderte 20 studier som er relevante for minst ett av de tre målene for studien.
2) *Kvalitative intervjuer.* Vi har gjennomført 10 kvalitative intervjuer med sektoreksperter fra arbeidsgivere, arbeidstakere og myndigheter.
3) *Spørreundersøkelse.* Vi har gjennomført en liten spørreundersøkelse (N=222) for å undersøke forekomsten av, og betydningen av ulike risikofaktorer blant norske (N=177) og utenlandske (N=45) sjøfolk. Disse ble rekrutterte gjennom «Kystrederiene», som er en arbeidsgiverorganisasjon for norske rederier. Respondentene arbeider derfor på norskopererte skip. Totalt 180 respondenter jobbet på skip som var registrert i Norsk Ordinært skipsregister (NOR), 32 jobbet på skip som seilte under bekvemmelighetsflagg og 10 jobbet på skip som var registrert i Norsk Internasjonalt Skipsregister (NIS).

   Spørreundersøkelsen vår skulle opprinnelig komplementere funnene fra litteraturstudien og intervjuene, og den er derfor basert på et relativt lite utvalg av sjøfolk. Vi anbefaler derfor at resultatene fra vår begrensede spørreundersøkelse undersøkes ytterligere i en større spørreundersøkelse som er basert på et mer robust design. Vi kommer tilbake til dette under, i drøftingen av metodologiske begrensninger.
4) *Referansegruppemøte.* Vi fikk mange nyttige synspunkter og informasjon i et møte som ble holdt med prosjektets referansegruppemøte på TØI, mars 2014. Resultatene fra dette møtet presenteres sammen med fra intervjuene.

Flaggstat er én av flere faktorer som påvirker sikkerhet

Vår gjennomgang av forskingslitteraturen viser at det er vanskelig å trekke noen klare konklusjoner om betydningen av flaggstat for skipsulykker. Studiene som undersøker dette peker i ulike retninger, og de understreker ofte at andre risikofaktorer har større betydning (f.eks. skipstype og alder). Flaggstat er kun én av flere faktorer som påvirker maritim sikkerhet. Andre viktige faktorer er fartøyets alder, godstype, skipstype, værforhold og seilingsmønster og -rute. Fire av de syv studiene vi ser på som fokuserer nettopp på dette stiller spørsmål ved nytten av å fokusere på flaggstat som den viktigste indikatoren på skipsulykkesrisiko.

Det ser imidlertid ut til at skip som seiler under nylig etablerte bekvemmelighetsflagg har en høyere risiko enn tradisjonelle maritime stater, deres sekundære registre og etablerte bekvemmelighetsflagg. Flaggstat synes derfor å være viktig for å forklare skipulykkesrisiko, når vi også tar flaggstatens alder med i betraktningen. Forskningslitteraturen indikerer at nye og uerfarne flaggstater i lavere grad enn etablerte flaggstater implementerer og håndhever maritime sikkerhetsregler.

Da vi spurte de intervjuede om skip fra ulike flaggstater har ulik risiko for skipsulykker i norske farvann, var de fleste enten usikre, eller de stilte spørsmål ved relevansen til flaggstat som en indikator på maritim sikkerhet, i alle fall i norske farvann. Det ble nevnt at den maritime næringen er internasjonal og at nasjonalitet derfor er av mindre betydning. En av de intervjuede sa at norske redere tradisjonelt har valgt gode bekvemmelighetsflagg. Det ble også nevnt at andre forhold er viktigere enn flagg for å forklare sikkerhetsnivå, og at den interne variasjonen innenfor de ulike flaggstatene er stor, avhengig av hvilke næringer man ser på, og ikke minst at kundenes villighet til å betale for sikkerhet er forskjellig i ulike subsektorer under samme flagg.

I spørreundersøkelsen ble respondentene spurt følgende spørsmål: «Har fartøyet vært involvert i en skipsulykke (f.eks. grunnstøting, kollisjon, kontakt skade og brann) i de to siste årene?». Totalt 43 respondenter (20 %) svarte ja på dette spørsmålet. For å unngå å telle de samme skipene flere ganger i vår analyse av hvilke faktorer som påvirker skipsulykker, filtrerte vi dataene slik at vi kun analyserte svarene til kapteinene i utvalget vårt (N = 57). Antakelig på grunn av små tall, kunne vi ikke bruke analysene til å konkludere om hvilke faktorer som influerer på skipsulykker. Vår undersøkelse har derfor ikke vært tilfredsstillende på dette punktet.

Vi undersøkte sammenhengen mellom flaggstat og syv ulike mål på sikkerhetskonsekvenser, og våre analyser indikerer ikke at flaggstat er en sentral faktor for å forklare ulike sikkerhetskonsekvenser. Det er imidlertid viktig å huske på at studiens kvalitet er begrenset av at det er svært få skip som seiler under bekvemmelighetsflagg i studien vår. Vi konkluderer derfor med at resultatene våre kun kan betraktes som foreløpige, men at de indikerer viktige spørsmål som bør følges opp i videre forskning.

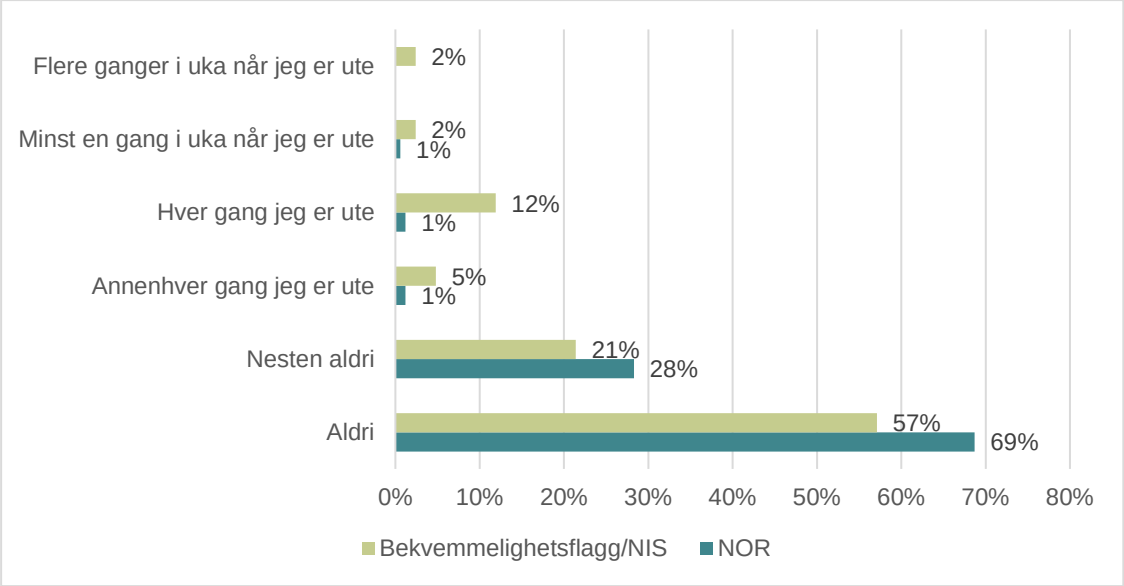
Faktorer som påvirker maritim sikkerhet

Vi sammenlikner betydningen av seks risikofaktorer på nasjonalt flaggede skip og skip som seiler under bekvemmelighetsflagg, og konkluderer med å peke på to.

Kommunikasjon og språkproblemer

Litteraturgjennomgangen viser at kommunikasjon kan være viktig for sjøsikkerhet, og at dette kan være en av de mest sentrale utfordringene på skip med flernasjonale mannskap. I en undersøkelse fra 2009, fant Kystverket at 81 % av respondentene mente at språkferdigheter i høy eller moderat grad er et problem i kommunikasjonen mellom skip. Betydningen av kommunikasjon og språk for sikkerhet ble også understreket i intervjuene.

Respondentene fra skip som seiler under bekvemmelighetsflagg eller som er registrert i NIS hadde i langt større grad enn NOR respondentene kolleger med andre nasjonaliteter. Figur S.1 viser respondentens svar på spørsmålet: «Har du opplevd farlige situasjoner på grunn av språklige misforståelser mellom ulike nasjonaliteter om bord?»



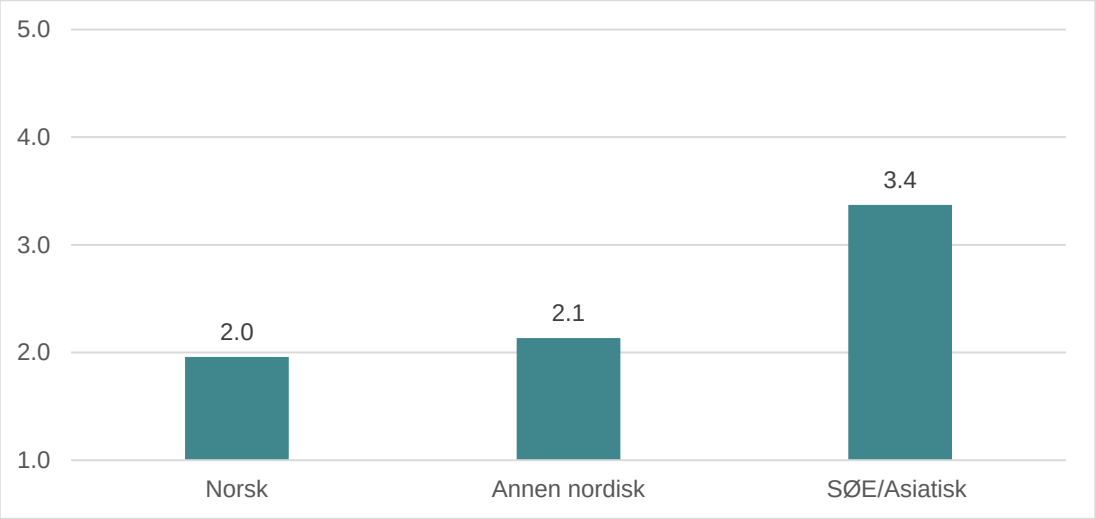
Figur S.1: Respondentens svar på spørsmålet: «Har du opplevd farlige situasjoner på grunn av språklige misforståelser mellom ulike nasjonaliteter om bord?» NOR (N=166), Bekvemmelighetsflagg/NIS (N=42).

Resultatene viser at flaggstat var den mest avgjørende faktoren som påvirket det å ha opplevd farlige situasjoner på grunn av språklige misforståelser mellom ulike nasjonaliteter om bord. Den nest viktigste faktoren som påvirker opplevelsen av farlige situasjoner på grunn av språklige misforståelser er andelen kolleger med ulik nasjonalitet. Den tredje viktigste faktoren var organisasjonssikkerhetskultur; noe som indikerer at god organisasjonssikkerhetskultur kan tilrettelegge for en god og sikker kommunikasjon. I analysene av dataene fra spørreundersøkelsen fant vi ikke at farlige situasjoner på grunn av språklige misforståelser influerte på skipsulykker eller personskader. Det påvirket imidlertid respondentenes risikopersepsjon.

Utenlandsks sjøfolk oppfatter det som mer uhøflig å si fra til kolleger

Forskningslitteraturen indikerer at nasjonal kultur kan påvirke verdier, kommunikasjonsformer, konfliktløsningsmetoder, beslutningstaking og atferd. I tillegg tyder intervjuene på at nasjonal sikkerhetskultur har betydning for flere ulike aspekter ved maritim sikkerhet.

Spørreundersøkelsen indikerer at respondenter fra Sentral- og Øst-Europa og Asia finner det langt mer uhøflig å be kolleger om å arbeide på en annen og sikrere måte («sikkerhetsintervensjoner») enn det norske respondenter gjør, og dette kan indikere en sammenheng mellom nasjonal kultur og sikkerhet (Figur S.2).



*Figur S.2: Gjennomsnittsskårer på nasjonale gruppers vurderinger av sikkerhetsintervensjoner rettet mot kollegaer: «Det er uhøflig å si til kolleger at de bør arbeide på en annen og sikrere måte». Norske (N=177), Annen nordisk (N=15), Sentral/Øst Europeisk (SØE)/Asiatisk (N=27). Svaralternativene varierer mellom 1 (helt uenig) og 5 (helt enig). (Vi fjernet det sjette svaralternativet «vet ikke» i analysene). * p < 0.1 ** p < 0.05 *** p < 0.01.*

Vi gjennomførte analyser for å undersøke hvilke faktorer som påvirker holdninger til sikkerhetsintervensjoner mellom kolleger. Da vi inkluderte flaggstat i analysen, opphørte den signifikante effekten av nasjonalitet. Bekvemmelighetsflagg er dermed det om sterkest påvirker respondentenes syn på det å be kollegaer arbeide på en ny og sikrere måte. Mannskap på fartøy med bekvemmelighetsflagg er små multinasjonale samfunn, og forskningslitteraturen viser at det er spesielt viktig for arbeidsmiljøet og sikkerheten å unngå konflikt på slike fartøy. Dette kan forklare hvorfor flaggstat ble den viktigste variabelen som forklarer respondentenes syn på kollegaintervensjon i analysen. Er det slik at de utenlandske respondentenes syn på kollegaintervensjon skapes av arbeidsbetingelsene, dvs. flernasjonale mannskap, eller er dette synet et resultat av nasjonal kultur (dvs. verdier som sjøfolkene hadde før de begynte å arbeide i flernasjonale mannskap), eller begge deler? Mer forskning rundt dette temaet er nødvendig.

Litteraturgjennomgangen viser at nasjonalitet kan være en viktig kilde til kultur til sjøs, særlig når det gjelder respekt for autoriteter og syn på individets verdi i forhold til sosiale grupper. Vi fant ikke statistisk signifikante forskjeller mellom gruppene på dimensjonen «respekt for autoritet», men dette kan skyldes det lave antallet utenlandske respondenter. Vi trenger mer forskning for å belyse dette temaet.

Gjør utenlandskflaggede skip det bedre på noen risikofaktorer?

Kvalitative data tyder på at trøtthet og bemanning har større betydning for maritim sikkerhet enn flaggstat. Noen av de vi intervjuet hadde inntrykk av at bemanningen på skipene som seiler under bekvemmelighetsflagg eller er registrert i NIS er større enn på NOR-skipene. Årsaken som ble oppgitt er at disse ansetter mange utenlandske sjøfolk, og at rederiene kan betale disse etter det (lavere) lønnsnivået som foreligger i sjøfolkenes hjemland. En mulig hypotese er at et lavere lønnsnivå kan føre til at rederiene velger å ha større mannskap om bord.

Referansegruppemedlemmene mente at «fatigue» og bemanning er blant de viktigste faktorene som påvirker maritim sikkerhet i norske farvann. De mente at de små NOR registrerte skipene som seiler langs norskekysten gjerne har lav bemanning, betydelig

arbeidspress og knapt med tid. De foreslo at disse risikofaktorene er spesielt viktige i dette segmentet av NOR flåten, og også at dette kan lede til «fatigue» og stress som kan svekke sikkerheten om bord. Spørreundersøkelsen indikerte imidlertid at respondentene på skip som seiler under bekvemmelighetsflagg rapporterte om mer arbeidspress og tidspress. Vi trenger mer forskning for å undersøke disse forholdene.

Vi spurte respondentene i spørreundersøkelsen om bemanningsnivået på deres skip. Med det viktige forbeholdet om at tallene våre er for små til å sammenliknes, kan bemanningen på skip som seiler under bekvemmelighetsflagg muligens være høyere enn på NOR skip. Dataene våre er imidlertid utilstrekkelige på dette området, og vi trenger mer forskning for å trekke konklusjoner om dette.

Spørreundersøkelsen tyder på at bemanning er viktig for sikkerheten, fordi analysene våre viser at skipenes bemanning påvirker respondentenes erfaringer med skiftforsinkelser, 16-timers kontinuerlige arbeidsperioder og avbrutte hviler og deres svar på påstanden «Det hender at jeg er så trøtt i arbeidstiden at det går på sikkerheten løs».

Vi har også undersøkt betydningen av andre risikofaktorer enn de vi vektlegger over. Våre data har imidlertid ikke vært tilstrekkelige for å avgjøre betydningen av disse. Vi trenger derfor mer forskning for å undersøke hvorvidt og eventuelt hvordan følgende faktorer forklare forskjeller mellom sikkerhetsnivået til ulike flaggstater: teknologi og utstyr, utilstrekkelig implementering og håndhevelse, trøtthet og arbeidsforhold, sikkerhetsstyringssystemer og opplæring, kompetanse og erfaring.

Tiltak

Vi diskuterer åtte tiltak rettet mot: 1) Nylig etablerte bekvemmelighetsflagg og 2) Kommunikasjonsproblemer knyttet til språklige misforståelser og kulturelle forskjeller. Vi foreslår at tre bør styrkes og videreutvikles:

1) Videreutvikling av overnasjonale tilsynsorganisasjoner som EMSA (European Maritime Safety Authority),
2) Videreutvikling av det nye risikobaserte systemet for havnestatskontroll, og
3) Bedrede kommunikasjons- og engelskferdigheter.

Metodologiske utfordringer

1) Små utvalg. Den største metodologiske utfordringen med den foreliggende studien er små utvalg i spørreundersøkelsen. Spørreundersøkelsen vår skulle opprinnelig komplementere funnene fra litteraturstudien og intervjuene, og den er derfor basert på et relativt lite utvalg av sjøfolk (N=222). Analysene av resultatene indikerer imidlertid noen nye resultater som er unike og potensielt viktige, men siden spørreundersøkelsen opprinnelig hadde til hensikt å komplementere de andre resultatene, er ikke spørreundersøkelsens design robust nok til å trekke solide konklusjoner.

Ved tolkning av resultatene er det derfor viktig å huske at utvalgene for flere sentrale variabler er små, f.eks. for utenlandske sjøfolk og for respondenter fra NIS fartøy og bekvemmelighetsfartøy. Dette påvirker vår evne til å trekke konklusjoner; det er f.eks. mindre sannsynlig at man finner statistisk signifikante forskjeller med små utvalg på viktige variabler. Vi må også huske at med små utvalg er respondentene ikke nødvendigvis representative. Det er svært viktig å huske disse forbeholdene når vi tolker resultatene av spørreundersøkelsen. Vi må være forsiktige med å generalisere resultatene.

Vi anbefaler derfor at resultatene fra vår begrensede spørreundersøkelse undersøkes ytterligere i en større spørreundersøkelse som er basert på et mer robust design. I en slik studie er det viktig at utvalgene for sjøfolk fra NOR skip og skip som seiler under bekvemmelighetsflagg er både representative og store nok til å tillate solide konklusjoner.

2) *Respondenter i ulike land har ulike referansepunkter.* Sjøfolkene kan forholde seg til ulike referansepunkter og deres svar i spørreundersøkelsen ha ulik forankring. Dersom sikkerhetsstandarder varierer betydelig mellom ulike land eller kulturer, kan vurderingene som respondentene gjør når de svarer på undersøkelsen bli gjort på grunnlag av svært ulike og tatt-for-gitte forventninger til lederes og kollegers fokus på sikkerhet, og til virksomheters sikkerhetsnivå osv. Mange av spørsmålene i spørreundersøkelsen legger opp til subjektive definisjoner, f.eks. av «så trøtt at det går på sikkerheten løs», «presset til å fortsette å jobbe selv om sikkerheten kan være truet» og «farlige situasjoner».

3) *Erfaring med og tillit til spørreundersøkelser.* Sjøfolk fra ulike land eller kulturer kan forholde seg forskjellig til spørreundersøkelser. Det er sannsynlig at norske sjøfolk er vant til å delta i ulike tester og undersøkelser. Sjøfolk fra andre nasjonaliteter kan i mindre grad ha en kultur for dette, og derfor forholde seg annerledes til en spørreundersøkelse. Det kan f.eks. tenkes at de ikke har tillit til forskeres garantier om anonymitet.

4) *Bevissthet om sammenligning.* Sjøfolkene kan ha skjønt at de vil bli sammenlignet med andre grupper, og svart deretter. I presentasjonen av undersøkelsen ble det uttalt at et sentralt formål var å sammenligne nasjonaliteter. Respondentene måtte oppgi nasjonalitet i undersøkelsen, og undersøkelsen inkluderte ett spørsmål om kompetansen til henholdsvis norske og utenlandske sjøfolk.

5) *Målene er ikke gode nok.* Denne forskningen er på et tidlig stadium, og vi har derfor utviklet mange av de målene vi bruker spesielt for denne undersøkelsen. Siden mange av spørsmålene er nye, trenger vi trenger å benytte dem i flere studier for å fullt ut være i stand til å vurdere kvaliteten på dem.

6) *Nasjonal sikkerhetskultur og rapportering.* Måling av sikkerhetskultur og rapporteringskultur ved hjelp av spørreundersøkelser (dvs. egenrapportering) er i en viss forstand paradoksalt, siden det å gi oppriktige svar forutsetter en kultur som oppmuntrer til rapportering av negative forhold (dvs. en god rapporteringskultur). En studie av sikkerhetskultur i bygg og anleggsbransjen i Danmark, Storbritannia og Nederland fant at østeuropeiske arbeidsinnvandrere generelt vurderte sine ledere mer positivt enn ansatte som var født i landene. Studien foreslår at østeuropeiske arbeidsinnvandreres «respekt for autoriteter» kan forklare dette resultatet.

   Respekt for autoriteter er et trekk ved nasjonal kultur som kan forklare overrapportering av positive resultater, og kanskje også underrapportering av negative resultater. En av de intervjuede antydet at respekt for autoritet kan påvirke hvordan utenlandske sjøfolk svarer på undersøkelsen, og sa at «for utenlandske sjøfolk er undersøkelsen en autoritet». I tråd med dette fant Størkersen m.fl. (2011) at de utenlandske respondentene de intervjuet var mindre kritiske da de svarte på deres kvantitative spørreundersøkelse enn de var i de foregående kvalitative intervjuene. Selv om dette er interessante spørsmål, er det umulig for oss å konkludere om dette. Disse hypotesene bør derfor undersøkes nærmere i fremtidig forskning.

7) *Strukturelle insentiver for «ligge lavt»?* Svarene utenlandske sjøfolk gir i undersøkelser kan også bli påvirket av strukturelle trekk; f.eks. tidsbegrensede arbeidskontrakter som må fornyes jevnlig. I utenriksfart blir noen underordnede innleid på kontraktbasis fra et oppdrag til et annet, og bemanningsselskapene kan ha informasjon på ansettelseshistorikken til hver enkelt. Slike ordninger kan gi utenlandske sjøfolk strukturelle insentiver for å «ligge lavt» når de svarer på undersøkelsen. Det er umulig for oss å konkludere om dette, og disse hypotesene bør derfor undersøkes nærmere i fremtidig forskning.

   Endelig må det nevnes at det var en skrivefeil i det ene svaralternativskalaen i den engelske versjonen av spørreundersøkelsen. Vi har gode grunner til å anta at dette ikke har påvirket svarene. Vi utdyper dette i metodekapittelet.

1 Introduction

1.1 The international character of shipping

Sea transport is central to world trade, as it carries about 90 % of internationally traded produce (Alderton & Winchester 2002). Sea transport dominates long distance goods transport in Norway, where it constitutes about 81 % of the import, measured in tonnes, including passenger ferries, and about 73 % of the export measured in tonnes, including ferries and excluding crude oil and natural gas (St. melding nr. 31 2003-2004).

Cabotage at sea refers to maritime transport between ports within a country. Since the 1970s the transport of goods by ship has been increasingly internationalised, and foreign actors can legally conduct cabotage, both in Norway and in other maritime nations, given some exceptions such as the U.S.[1]

The international character of shipping is reflected in Norwegian and other waters by the presence of vessels associated with different *flag states*, different *operator states,* and with multinational crews. (Here the *flag state* is the nation where the ship is registered, to which taxes are paid and whose regulations are followed, whereas the *operator state* is the home nation of the shipping company or operator.)

In the sea sector, a foreign actor can thus be a foreign crew member, a ship registered abroad, or a shipping company based abroad, and the different constellations of these various actors mean that shipping is complexly international in nature. As a consequence, Alderton & Winchester (2002) suggest that the maritime industry is not only central to world trade, it is also the only example of a fully globalized industry:

> The ship and the seafarers aboard are at the centre of a complex constellation of multiple interests with situated ship owners and seafarers in fluid and, sometimes, volatile, legal, political and social circumstances. (Alderton & Winchester 2002: 36).

It is not unusual that the vessel, owners, operators, shippers, charterers, insurers, the classification society, officers and the crew are all of different nationalities (IMO 2008, in Liang 2011: 3). These complex constellations offer several challenges to safety management and regulation. Håvold (2005) cites an example from the British newspaper «The Independent», (London) February, 22. 1996, describing the situation following the oil spill involving «The Sea Empress»:

> Built in Spain, owned by a Norwegian registered in Cyprus; managed from Glasgow; chartered by the French; crewed by Russians; flying a Liberian flag; carrying an American cargo; and pouring oil into the Welsh coast… BUT WHO TAKES THE BLAME? (cf. Håvold 2005: 442).

[1]The "Jones Act" (Merchant Marine Act of 1920) prohibits cabotage between U.S. ports. According to Wikipedia, Section 27 of the Jones Act, deals with cabotage, and requires that all goods transported by water between U.S. ports must be carried on U.S.-flag ships, constructed in the United States, owned by U.S. citizens, and crewed by U.S. citizens and U.S. permanent residents. Cf. https://en.wikipedia.org/wiki/Merchant_Marine_Act_of_1920. In Norwegian waters cabotage is prohibited for vessels registered in the Norwegian International Ship Register (NIS), although these restrictions currently are being liberalized somewhat.

Given the importance of maritime transport in Norway, and the increasing complex international character of shipping in its waters, surprisingly little has been done to investigate the effects on safety of either flag state, operator state or crew nationality. In the present study we therefore wish to begin addressing this issue by examining the importance of flag state for safety.

1.2 Opportunities for foreign actors

1.2.1 Legal framework conditions

It is interesting to note that thirteen years ago five operator states stood for more than 50 % of the world's tonnage: Greece, Japan, Norway, the U.S. and China (Llácer 2003: 522). However, most of the vessels owned by these states were flying flags of convenience (FOCs): 70 % of vessels in Greece flew FOCs, 86 % of those in Japan and 76 % of those in the U.S.

Vessels flying the Norwegian flag can either be registered in the Norwegian Ordinary ship Register (NOR), or the Norwegian International Ship Register (NIS). NOR is the register for ships with a Norwegian basis, which mainly carry out transports within Norway or to or from Norway. NOR registered vessels must adhere to Norwegian rules on working conditions and wages (St. melding nr. 31 2003-2004). This may however increase operational costs and reduce ships' abilities to compete with foreign ships.

As a consequence, NIS was established in 1987, in order to improve the competitive abilities of Norwegian ships sailing abroad (St. melding nr. 31 2003-2004). Several traditional maritime states (e.g. UK, France, Denmark) have established so called "second registers" providing more lenient framework conditions than the national registers, in order to prevent national shipping companies from flagging out (Roberts, Marlow and Jaremin 2012). One of the main advantages for owners of NIS registered vessels compared with NOR registered vessels is that the former are permitted to pay foreign crew members in accordance with the wage level of their respective home countries. On the other hand, NIS-registered vessels need special permits to conduct domestic assignments (cabotage) in Norwegian waters (Statistic Norway 2013). This rule was introduced out of a concern that NIS vessels would outcompete NOR vessels and force them out of the market.

The restrictions on NIS vessels' opportunities to go between Norwegian ports have recently been eased somewhat, allowing some ferries and vessels which also go to Northern European ports to go between Norwegian ports. As a consequence, about 30 vessels had changed from foreign flag to NIS by June 2016.

In order to register a vessel in NOR or NIS, it is required that the ship is operated from Norway, and that the ship is involved in economic activities that are established in Norway. It is also required that the majority of the owners are located in the European Economic Area (EEA). NIS vessels have a few more alternatives than NOR vessels in this respect (Statistic Norway 2013).

FOC, also called "open registers", constitute a separate type of flag state. Flagging vessels out to FOCs has become widespread in recent decades, as FOCs provide the opportunity to avoid strict regulations (e.g. on wage and working conditions) and high taxes (Zwinge 2011; Fan et al 2014; International Transport Workers' Federation 2012).

The modern practice of flagging out vessels to foreign countries started in the 1920's, when U.S. ship owners were dissatisfied with U.S labour costs and increased regulations and

started flagging out ships to Panama. The term "flag of convenience" has been in use since the 1950's (Llácer 2003). In 2009, the major ten open and international registers had 55 % of the world's merchant shipping tonnage (Zwinge 2011).

In 2012, the International Transport Workers' Federation defined 34 countries as FOC states: Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, Bolivia, Burma, Cambodia, Cayman Islands, Comoros, Cyprus, Equatorial-Guinea, The Faroe Islands, French International Ship Register, German International Ship Register, Georgia, Gibraltar, Honduras, Jamaica, Lebanon, Liberia, Malta, Marshall Islands, Mauritius, Moldova, Mongolia, Dutch Antilles, North-Korea, Sao Tome and Príncipe, St Vincent, Sri Lanka, Tonga & Vanuatu (International Transport Workers' Federation 2012).

1.2.2 Lower labour costs

By flying FOC flags, ship operators may cut operative costs and increase their ability to compete internationally (Fan, Luo & Yin 2014). Both second registers and FOCs provide the opportunity to avoid strict regulations, which can lead to economic benefits for the operator (Fan et al 2014; International Transport Workers' Federation 2012).

The most important framework condition influencing the competitive abilities of transport companies is the level of wages (Hovi & Hansen 2011). Using survey data to rank by level of importance the various reasons that shipping companies have for flagging out vessels, Bergantino & Marlow (1998) found that the most important factors mentioned by shipping companies for flagging out were: 1) savings in crew costs (26 %), 2) escaping from bureaucratic control under their own national flag (17 %), 3) availability of skilled labour (13 %), and reductions in compliance costs (12 %) (Bergantino & Marlow in Fan et al 2014: 351).

While traditional maritime states have had restrictions on labour applying to nationality, pay and conditions, FOCs have few such restrictions. The crews aboard the ships flagged to these states are labelled "crews of convenience" by some, as they tend to be from less developed countries, are paid less than colleagues from more developed states, have lower levels of union membership, lower levels of union recognition and inferior working conditions (Alderton & Winchester 2002: 37).

It is important to note that although maritime regulations on e.g. working hours and manning levels to a great extent are international, in order to prevent inferior working conditions from being a competitive advantage, it is up to each flag state to ratify, implement and enforce the rules. According to Fan et al (2014: 350), some FOC countries treat ship registration fees "(…)simply as a source of income and are not motivated to ensure that their national fleet complies with international safety standards." Hoffman et al (2005) also suggest that some flag states use their registry only as an "income generating venture" and lack resources to implement and enforce IMO requirements on their fleets.

1.3 Increasing internationalisation

The maritime industry has seen an increasing internationalisation in recent decades, indicated by a steady rise in vessels being flagged out to FOCs. By 1st January, 2015, three flags of convenience - Panama, Liberia and the Marshall Islands - were the largest vessel registries, accounting for 41.8 % the world tonnage (UNCTAD 2015: 41). Moreover, over three quarters of the world fleet were registered in developing countries, including in many open registries (UNCTAD 2015: 41).

Port statistics show an increase in the number of tonnes transported by ships to and from Norwegian ports during the period 2003-2012 (Nævestad, Caspersen, Hovi, Bjørnskau & Steinsland 2014). Figure 1.1 shows the trend for different flag states.

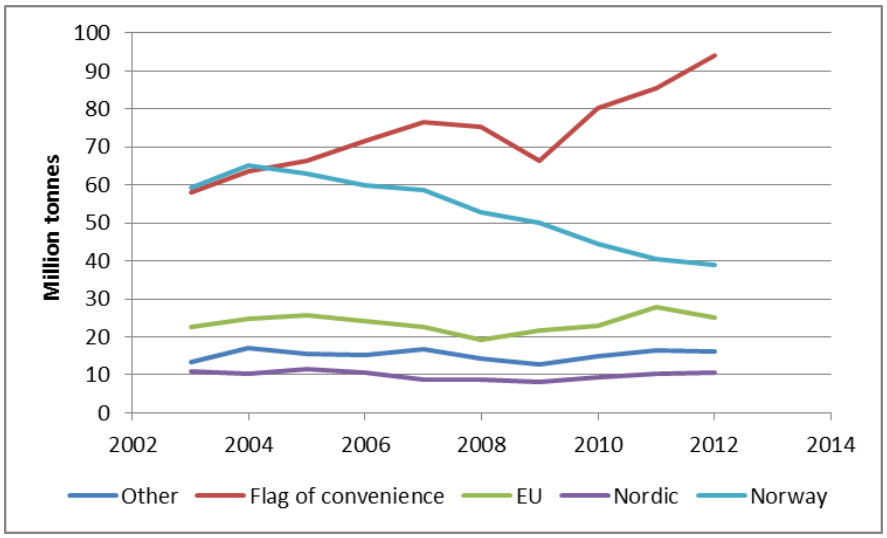


Figure 1.1 Distribution of loaded/unloaded cargo in the 30 largest ports in Norway, for flag states, in the period 2003-2012. Source: Nævestad et al (2014).

The figure shows two particular trends in the port statistics. One is a sharp reduction in cargo carried by Norwegian registered vessels (registered in NIS and NOR), and the other is a large increase in goods transported by ships flying flags of convenience. Vessels flying flags of convenience account for the largest proportion of goods transported in the 30 largest ports in Norway in recent years. The trend is evident both for domestic- and international transport. This indicates a phase-out of Norwegian registered ships to ships with flags of convenience.

Nævestad et al (2014) used Automatic Identification System (AIS)-data for 2012 to closer examine the flags and operators for ships sailing along the Norwegian coast. They found that of 3924 cargo ships sailing the Norwegian coast in 2012, 52 % were registered in a state with a flag of convenience. In comparison, only 6.7 % of these were operated by actors from the state of convenience themselves. Most of the ships flying flags of convenience were operated by EU states, while Norway operated 8.2 % of them.

Shipping companies from the EU accounted for the operation of the largest share of vessels in Norwegian waters in total in 2012, and was registered as operator of 1387 cargo vessels. Norwegian actors operated 563 ships. If the distribution for 2012 is representative, and trends in the port statistics continue, it is likely that the amount of goods transported by NOR/NIS-registered ships will continue to fall. (Nævestad et al 2014).

Crews are increasingly multinational, both on Norwegian-registered ships and ships registered abroad. In contrast to land transport, there is a relatively good overview of participation of foreign actors in shipping in Norway, whether in the form of ship ownership, country of registration or seafaring as ratings or officers. Over the last 20 years, the share of Norwegian seafarers involved in traditional shipping has been drastically reduced (Bergene & Underthun, 2012). In 2005 it was reported that 50 per cent of total crew of 35,000 on board Norwegian-registered vessels were foreign citizens, mostly from the Philippines, India, Poland or Russia (Håvold, 2005).

International research asserts that approximately two-thirds of all ship crews are now multinational (Hetherington, Flin, & Mearns, 2006). According to Wu (2002 in Liang 2011: 7), about 150 nationalities are recorded on the seafarers' supply list. Over 40 % come from the Far East, 30 % from Eastern Europe, more than 10 % from South Asia and the Middle East, while 13 % come from the traditional maritime countries.

Studying general cargo ships, Ellis and Sampson (2008, in Liang 2011: 7), found that 24 % of the crew members were from the Philippines, 9 % were from Russia, 8 % were from Ukraine, 5 % from China, 5 % from India, 4.5 % from Turkey, 4 % from Indonesia, 4 % from Poland, 3 % from Myanmar, 2 from Germany, while 31 % were from "other" states.

1.4 Safety outcomes of internationalisation

An interesting question given the increased presence of foreign actors in Norwegian seas; in terms of both ships flying FOCs and foreign crew members, is whether there are any repercussions for safety. What are for instance the safety outcomes of the increased transport with ships flying FOCs along the coasts of Norway, and the reduction of transport with Norwegian registered ships?

FOC vessels are largely manned by multinational crews with different wage and working conditions than for instance Norwegian seafarers. It is therefore important to examine the safety outcomes of multinational crews on ships sailing in Norwegian waters, and to assess the effect on safety outcomes of diverse cultural and working conditions and potentially varying standards of communication on board ships in Norwegian waters. While we were interested to find out if Norwegian waters present unique safety-related challenges to foreign crews, we were also open to the possibility that foreign ships or foreign crews are safer than their Norwegian counterparts.

1.5 The aims of the study

The aims of the present study are to:

1) Examine safety outcomes of increasing internationalisation in (Norwegian) maritime transport, by comparing the safety performance of nationally flagged vessels (NOR) and vessels flying FOCs (dealt with in Chapter 3).
2) Discuss the importance of potential risk factors, comparing nationally flagged vessels (NOR) and vessels flying FOCs. These risk factors are:
    a. National safety culture (dealt with in Chapter 4).
    b. Communication (Chapter 5).
    c. Working conditions and fatigue (Chapter 6).
    d. Rules, implementation and enforcement (Chapter 7).
3) Discuss potential measures to increase maritime safety further (Chapter 8).

The present study employs the following methods: 1) literature study of safety outcomes, risk factors and measures, 2) interviews with sector experts, 3) survey directed at seafarers, examining the importance of various risk factors and 4) reference group meeting.

1.5.1 About the project «Safe Foreign Transport»

The present study is part of a larger research project aiming to assess the effect on accident risk of the increasing shares of foreign actors in road and sea transport of goods in Norway; and to provide a scientific knowledge base that Norwegian authorities can use to develop measures to reduce any increased risk identified. The project examines the risk factors brought forth by the increasing internationalisation of road and sea transport of goods, and discusses possible measures that can be implemented to deal with these challenges.

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

2 Methods

2.1 Introduction

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

1) Literature study of safety outcomes, risk factors and measures.
2) Interviews with sector experts from employer organisations, employee organisations, authorities and other organisations involved in maritime safety.
3) Survey of seafarers, examining the importance of various risk factors.
4) Reference group meeting.

2.2 Literature study

A literature search was conducted, aiming to: 1) Examine safety outcomes of internationalisation in maritime transport, 2) Discuss the importance of potential risk factors and 3) Discuss potential measures to increase maritime safety further.

Although initial searches were done throughout 2014 and 2015, the final systematic literature searches were conducted in November and December 2015. The searches included four scientific online libraries: Sciencedirect, Ovid, Google Scholar and Trid. General searches in Google were also conducted.

The searches in the scientific databases included a combination of the following terms "nationality" and "maritime safety", "flag state" and "safety", "open register" and "maritime safety", "nationality" and "shipping accidents", "flags of convenience" and "safety", "mixed nationalities" and "safety", "nationality" and "safety in shipping". Some of these key terms were also translated into Norwegian, to search for documents written in Norwegian.

When possible, for instance in the "Sciencedirect" searches, we searched for these terms in the "title, abstract and key words" of scientific papers for all years. The titles of publications generated were read, and when titles were considered relevant the abstracts of the publications were also read. Finally, the literature search was also supplemented by research literature that we already knew about, and which we perceived as relevant to the aims of the study. These were not uncovered by the searches. All in all the literature search generated 20 studies that were relevant to at least one of the three aims of the study. These are presented in Appendix 1.

The studies on safety outcomes are reviewed in light of three criteria:
1) Approach/methodology,
2) Results, and
3) Strenghts/limitations.

When reviewing the studies on risk factors and potential measures, we focus less on reviewing the methods and approaches used by the study and more on what the studies may tell us about relevant risk factors, under which conditions these risk factors may be relevant, how the risk factors have been operationalized in surveys, and what kind of measures the risk factors would call for.

2.3 Interviews

We also conducted qualitative interviews with 10 sector experts from employer organisations, employee organisations, authorities and other organisations involved in maritime safety in order to gain knowledge on safety outcomes of increasing internationalisation, potential risk factors and relevant measures to increase maritime safety further. The interviews generally lasted for about 75 minutes.

We used a semi-structured interview guide (cf. Appendix 2), and the themes in the guide were influenced by results from our previous study (Nævestad et al 2014) and the results from the literature study. The interview guide contained questions on the following risk factors: organisational safety culture, national safety culture, communication, competence and training, economy, manning level and competition long work periods and fatigue, technology and equipment, implementation and enforcement. The interview guide also contains questions on potential measures to address these risk factors, e.g. flag state enforcement, port state controls, targeting of substandard vessels, classification societies, improvement of communication skills (cf. Appendix 2). The interview guide is also based on the three aims of the study, but the focus is primarily on aims 2 and 3 (cf. Section 1.5). We asked the interviewees only a couple of questions on safety outcomes in order to obtain their views on the safety consequences of internationalisation.

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

2.4 Reference group meeting

We present the results from the interviews together with some of the results of a project reference group meeting which was held at The Institute of Transport Economics (TØI) March 27, 2014. Seven external participants were present at the reference group meeting, in addition to three internal researchers. The external participants were from authorities, employer organizations and employee organizations, insurers and research. We got important feedback, learned more about nuances within our research field, and got suggestions to further research. As we got many important view points and comments in the reference group meeting, we choose to also include some relevant highlights from this meeting together with the presentation of the interview results.

2.5 Small-scale survey

Based on the results from the literature study and qualitative interviews on relevant risk factors, we conducted a small-scale survey (N=222) in an attempt to consolidate any findings on the prevalence and perceived importance of the identified risk factors among seafarers.

2.5.1 Recruitment of respondents

The respondents were both Norwegian and foreign seafarers and were recruited through "Kystrederiene", an employer organisation for Norwegian based shipping companies. Thus, all of the respondents work on ships that are operated from Norway, i.e. the shipping companies are located in Norway.

Web links to the questionnaires were distributed by "Kystrederiene" to all its members along with an introductory text explaining the purpose of the survey. The survey and the introductions were distributed both in Norwegian and in English (cf. Appendix 3).[2] In the introductory texts (cf. Appendix 4) the shipping companies were asked to distribute the survey links to all employees working on ships. There were introductory texts in the beginning of each web survey, explaining the purposes of the surveys and stressing that the surveys were confidential.

2.5.2 Survey themes and questions[3]

The surveys included a total of eighty-seven questions on the following themes:

1) Background variables related to respondents: 7 questions.
2) Organisational safety culture: 18 questions.
3) Nationality, language, communication and safety: 9 questions.
4) Manning and fatigue: 19 questions.
5) Economy, efficiency, competition and safety: 5 questions.
6) Vessel characteristics and technology and safety: 6 questions.
7) Port calls and time pressure: 3 questions.
8) Competence, nationality and safety: 3 questions.
9) National safety culture: 7 questions.
10) Safety outcomes: 6 questions.
11) Risk analyses and procedures: 4 questions.

[2] Unfortunately, there was an error in parts of the English version of the survey, which involved that the text in the answer alternatives ranging from 1 to 5 was: 1) Totally disagree, 2) Disagree somewhat, 3) Neither disagree or agree, 4) Disagree somewhat and 5) Totally agree. The underlined alternative should have been "Agree somewhat". We do, however, not believe that this has had any influence on the survey answers. First, respondents were introduced to a correct version of the answer alternative scale before the erroneous. Second, respondents got the following information before each list of questions: "On a scale from 1-5 where 1 is totally disagree and 5 is totally agree, how do you respond to the following statements?". Thus, we assume that respondents understood that the second occurrence of "disagree somewhat" in the answer alternatives should be "agree somewhat". We were able to contact two of the vessels, and thereby about half of the respondents who answered the English version of the survey. We talked to the captains who confirmed that the crew members had seen/discussed this error and interpret it as "agree somewhat".

[3] We do not report all of the results from the survey in the present report. The results on crew members' injuries on board and organisational safety culture are presented in (Nævestad 2016).

A structured version of the survey, where items are related to the themes that they are supposed to measure, is presented in Appendix 3. The items are in Norwegian, but available from the author in English on request. Many of the survey questions are from the study of Størkersen et al (2011). This is highlighted in Appendix 3. Additionally, many of the questions are based on a questionnaire developed by Safetec for The Norwegian Maritime Authority. This is also highlighed in Appendix 3.

2.5.2.1. The organisational safety culture index (GAIN-scale)

We made an organisational culture index, consisting of 18 questions from the GAIN-scale on organisational safety culture. We have used this scale in previous research from different transport sectors (Bjørnskau & Longva 2009; Nævestad & Bjørnskau 2014). The GAIN-scale is presented in the "Operator's Safety Handbook" (GAIN 2001).[4]

The GAIN-scale originally consists of 25 questions, but we only included 18 questions from the scale, as our survey includes a large number of questions (cf. Appendix 1). The scale is based on five themes. Table 2.1 lists each theme and the questions that each theme consists of.

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

Table 2.1: Themes and questions in the shortened GAIN-scale on organisational safety culture. Answer alternatives range from 1 (totally disagree) to 5 (totally agree).

GAIN-scale on organisational safety culture
1)Management commitment to safety
1a) Shipping company commitment to safety
• The shipping company regards safety to be a very important part of all work activities
• The shipping company is aware of the most important safety problems that we have on board
1b) Ship management commitment to safety
• Ship management regards safety to be a very important part of all work activities
• Ship management is aware of the most important safety problems that we have on board
• Ship management stops unsafe operations and activities
• Ship management detects crew members who work unsafely
• Ship management often praises crew members who work safely
2) Employee commitment to safety
• 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
3) Reporting culture
• There are routines (procedures) on board for reporting safety problems
• All defects or hazards that are reported are corrected promptly
• After an accident has occurred, appropriate actions are usually taken to reduce the chance of reoccurrence
• Everyone has sufficient opportunity to make suggestions regarding safety
4) Safety training
• All crew members on board receive adequate training to work in a safe way
• All newly employed are provided with sufficient training for their work activities
• Everyone on board is kept informed of any changes which may affect safety
5) General safety questions
• Safety on board is generally well controlled
• Safety on board this vessel is better than on other vessels

2.5.3 Description of the samples

Table 2.2 sums up the characteristics of our respondents and their vessels on key background variables.

Table 2.2: Characteristics of the 222 respondents and their vessels on key background variables. Column percentages are shown to give the subcategory shares e.g. in the column headed "Age group" we see that there were 26 % younger than 31 years, 20 % between 31 and 40 years old etc.

	Age group	Position	Experience	Nationality	Register	Vessel type	Year the vessel was built	Vessel size
1	Younger than 31 years	Captain	Less than one year	Norwegian	NOR	Bulk	Before 1980	<500 DWT
	26 %	27 %	4 %	80 %	81 %	32 %	14 %	16 %
2	31-40	Deck officer	1-3 years	Other Nordic:	NIS	General cargo	1980-1985	500-3000 DWT
	20 %	24 %	8 %	7 %	5 %	22 %	7 %	72 %
3	41-50	Deck crew	4-10 years	Other western EU	FOC	Tank vessel	1986-1991	>3000 DWT
	27 %	21 %	23 %	1 %	14 %	4 %	3 %	13 %
4	51-60	Chief engineer	11-15 years	Central Eastern EU -	-	Well vessel	1992-1997	-
	22 %	7 %	10 %	9 %	-	28 %	14 %	-
5	Older than 60 years	Engine officer	More than 15 years	Asian	-	Stand by vessel	1998-2003	-
	6 %	1 %	56 %	3 %	-	1 %	19 %	-
7	-	Engine crew	-	-	-	Anchor handling vessel	2004-2009	-
	-	5 %	-	-	-	1 %	28 %	-
8	-	Catering	-		-	Container vessel	2010-2015	-
	-	5 %	-	-	-	2 %	17 %	-
9	-	Apprentice	-	-	-	Fish farming vessel	Before 1980	-
	-	8 %	-	-	-	5 %	14 %	-
10	-	Other	-	-	-	Other	1980-1985	-
	-	1	-	-	-	6 %	7 %	-
Total	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %

We do not show the distribution of seafarers' gender, as there are only two female respondents in the sample.

When we look at all the respondents, most (81 %) work on NOR registered ships, 14 % work on ships flying flags of convenience, while the remaining 5 % work on NIS registered vessels.

Table 2.2 also shows that 80 % of the respondents are Norwegian, while the remaining 20 % (N=45) are foreign. Fifteen of these 45 foreign respondents were from Other Nordic countries, 3 were from Other Western European countries, 20 were from Central and Eastern European countries and 7 were from Asian countries.

In the analyses, we have collapsed the vessel type variable into five categories:

1) Bulk: 31.5 %
2) General cargo: 21.6 %
3) Tank vessel: 4.1 %
4) Well vessel: 27,5 %
5) Other: 10.8 %.

We collapsed the position/line of work variable by recoding into four values:

1) Captain: 27 %
2) Deck personnel: 45 %
3) Engine personnel: 13 %
4) Other: 15 %

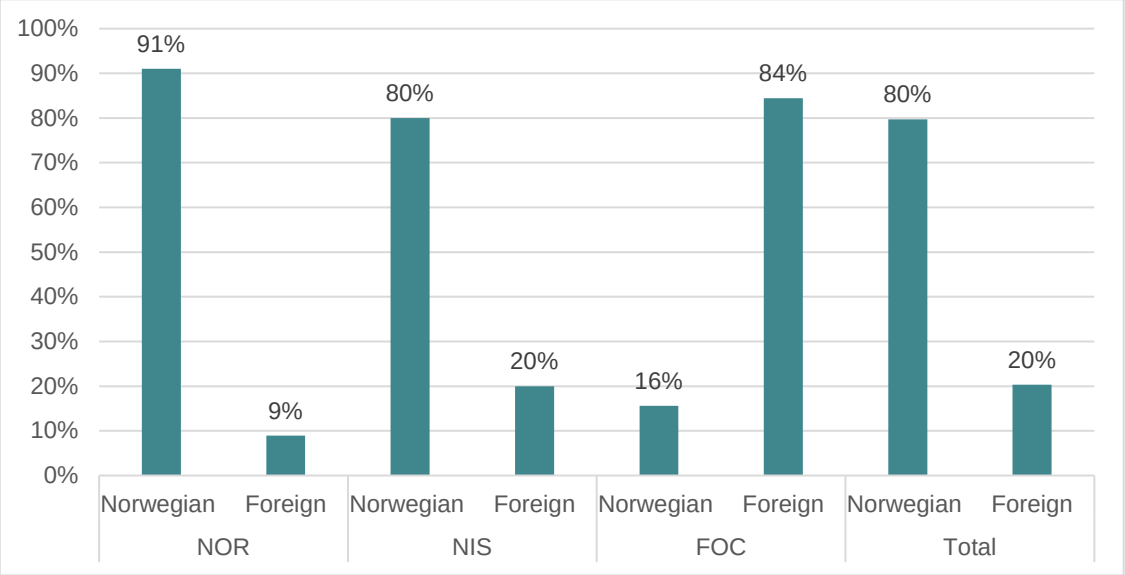


Figure 2.1: Nationality of seafarers and registry of seafarers' vessels. NOR (N=180), NIS (N=10), Flag of convenience (N=32).

Figure 2.1 indicates that vessels flagged in all the three types of registries have foreign crew members, but the share of foreign crew members is substantially higher for the ships flying flags of convenience than in the NOR-registered vessels. Because of the low number of respondents on NIS vessels, we will as a main rule not report results for these respondents. Moreover, when comparing means, we exclude groups of seven or less respondents.

2.5.4 Analysis of quantitative data

Cronbach's Alpha. We constructed several indexes of different concepts in order to compare how different groups scored on these concepts. An index represents a measure of a concept which consist of several items measuring different aspects of this concept.

We assume that respondents' answers to these questions correlate, meaning that a person who agrees with one question in an index will tend to agree with the other questions, for instance related to safety attitudes or behaviours. This is a test of the index's internal consistency, an important psychometric parameter. Cronbach's Alpha provides a way of testing this assumption, as it measures the correlation among responses on the index. The value varies between 0 and 1. A Cronbach's Alpha over 0.9 indicates very high internal

consistency, a score between 0.7 and 0.9 indicates good internal consistency, a score between 0.5 and 0.6 is acceptable and a score below 0.5 is unacceptable.

Significance tests of means. When comparing group scores on different variables and indexes, we examine the probability that the differences we observe are due to statistical chance. We do this by calculating the confidence intervals of the mean scores. The confidence intervals indicate the error margins of the mean scores, i.e. the range of scores in which a given probability indicates that the "true mean score" lies. We conduct a sample study, and the "true mean score" is that of the population from which the sample is drawn (e.g. the population Norwegian seafarers working on board NOR vessels). When comparing mean scores, we may state that the difference between two mean scores is statistically significant if the means do not lie within each-others' confidence intervals.

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

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

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

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

2.5.5 Multivariate analysis of quantitative data

We have conducted seven regression analyses (logistic and linear) to analyze the factors predicting respondents' answer on the following dependent variables:

1) Shipping accident in the last two years (1 item).
2) All in all, how do you assess the safety of your work place situation? (1 item).
3) It is impolite to tell colleagues to work in a different and safer way (1 item).
4) Have you experienced unsafe situations because of language misunderstandings between different nationalities on board? (1 item).
5) Sometimes I am so tired during working hours that safety is compromised (1 item).
6) Demanding working conditions index (index consisting of 3 items).
7) We never have a dedicated watch on the bridge (1 item).

We chose logistic regression analysis in the first regression analyses, as the dependent variable has two values (yes=0, no=1). In this analysis we include different independent variables in the analyses step-wise in order to be able to examine the isolated effect of the independent variables, i.e. when the other variables are held constant. Odds ratios (exp (B)) are presented and they indicate the risk, or the odds, of a shipping accident when the independent variable increases with one value, when the effect of the other independent variables in the step are controlled for.

Odds values higher than 1 signifies a positive effect, meaning that the variable increases the chance of having a ship accident and that an increase in the value of the independent variable increases the chance of accident or injury. Numbers lower than 1 means a negative effect, and that an increase in a value on the independent variable reduces the chance of accident or injury.

In the other analyses, 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, sex, vessel type, position. 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. Generally, factual variables (e.g. manning levels, number of port calls) are included before conceptual variables (e.g. safety culture).

It is often difficult to assess the internal relationships and primacy between the conceptual independent variables *before* conducting the analyses, i.e. whether the effect of one of the independent variables on the dependent variable is (partly) caused by another. The analyses give us, however, indications about this. Thus, *after* the analyses, we conclude that if the effect of one variable is removed when another independent variable is included in the analysis, the latter variable is more important. If the effect of one variable is reduced when another independent variable is included in the analysis, the variables seem to be strongly related. 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.

2.6 Quality assurance

The report has been submitted to quality assurance both internally and externally. To ensure that the results of our analyses and our interpretations of the results are as correct and plausible as possible, we have sent the report to relevant sector experts for quality assurance before publication; i.e. to relevant authorities, employer organisations, employee organisations and other user groups. These sector experts were mainly recruited from the project's reference group, but experts from outside the reference group was also used for quality assurance. The experts conducting the quality assurance were invited to comment on the results, our analyses and our interpretations. We are very grateful to those who have commented on the report. Our documentation of the interview results was sent to the interviewees, who were encouraged to correct mistakes they might find and to make further comments.

3 Safety outcomes of internationalisation

3.1 Results from the literature study

In the following, we present and discuss 1) Approach/methodology, 2) Results and 3) Strengths/limitations of seven publications focusing on the first aim of the present study, which is to examine safety outcomes of increasing internationalisation in maritime transport. Ways in which safety outcomes of internationalisation can be studied include looking for a) differences in ship accident risk among different flag or operator states and b) differences among flag states when it comes to vessel safety standard, measured for instance through results from port state controls. We present the oldest studies first.

3.1.1 Study 1: The safety and quality of flags of convenience

1) Approach/methodology. Li (1999) seeks to test the commonly held assumption that ships flying flags of convenience are less safe than other vessels, by quantifying the *accidental total loss rates* of fleets flying flags of convenience, and comparing these numbers with the world average. The *accidental total loss rate* is the average annual number of ships lost for every thousand ships, over a period of 20 years (1977-1996).

The quality of a ship is measured in terms of its detention rates in port state controls in 37 countries. The detention rate of a flag is defined as the number of ships detained by the number of ships inspected annually. Port state controls focus on issues like safety management, fire-fighting appliances, radio, navigation, anti-pollution, quality of food and accommodation (Li 1999: 138). Deficiencies in these areas will cause the ship to be detained.

The study focuses on 18 fleets, or 18 flags of convenience: Antigua and Barbuda, Bahamas, Barbados, Belize, Bermuda, Cyprus, Gibraltar, Honduras, Lebanon, Liberia, Malta, Marshall Islands, Mauritius, Panama, Saint Vincent, Sri Lanka, Tuvalu and Vanuatu. When it comes to ship type, the study focuses on propelled sea-going merchant ships, including cargo and passenger ships that are no less than 100 gross tonnage. The average size of the flag of convenience ships in the study was 15,180 GT, which is nearly three times higher than the world average of 5,615. The average vessel age was 18 years, one year less than the world average of 19 years.

2) Results. Li concludes that the average annual total loss rate of the flag of convenience fleet in the period was 7.31 ‰, which is about two times higher than the world average. Li found however that safety of the FOCs had improved substantially over the twenty year period. The annual loss rate of 1996 was only a fourth of that in 1977. Nevertheless, the total loss rate for FOCs in 1996 was about twice that of the world average the same year. The safety of some FOC states had not improved during the period, however. These were: Honduras, Lebanon, Gibraltar and Antigua and Barbuda.

Comparing detention rates from port state controls, Li (1999) found that the detention rate of vessels from FOCs was 19.8 ‰, which is nearly four times more than the world average of 5.71 ‰.

Li (1999) also finds a high correlation between the age of ships, quality (detention rates) and safety (annual loss rates). Given the result that the quality of ships decreases with age, he thereby suggests that port state controls to some extent should target inspections based on vessel age (as PSCs do today). The six FOC fleets with the highest risk all were more than 20 years old, with the exception of Cyprus.

In conclusion, Li (1999) states that although the study confirms that ships flying flags of convenience are less safe and have lower quality than the world average, it is not sufficient to judge the safety and quality of ships by means of flag state. Li found that the safety of FOCs has increased substantially in recent years, and that about 40 % of the FOC tonnage are above the world average when it comes to safety and quality.

3) Strengths/limitations. The main quality of this study is that it measures both ship accidents and PSC detention rates, giving weight to the important conclusion that it is not sufficient to judge the safety and quality of ships by means of flag state, not least because considerable differences are found among the individual FOC states. . A limitation of this study is that it is 17 years old.

3.1.2 Study 2: The flag state conformance index

1) Approach/methodology. Alderton and Winchester (2002) pick up on the fact that it is important to discern between new and old flags of convenience. They therefore provide a new measure of the safety and quality of maritime flag states, labelled the "Flag state conformance index" (FLASCI).

The FLASCI is made up of six elements:

1) The nature of the maritime administration, examining whether the extent of its responsibilities and degree of efficiency place it into the category of a) national, b) second, or c) international ship register (e.g. distance of ownership, restrictions on crewing and certification, scale of registration fees and taxation structure).
2) Characteristics of the flag state fleet of vessels (e.g size, tonnage, age, PSC detention rates, casualty statistics, pollution).
3) Provisions made for seafarers safety and welfare.
4) The nature of national labour law (e.g. legitimacy of trade unions, rights of collective bargaining, access to independent arbitration, rights of non-indigenous seafarers).
5) National company law (e.g. how far can a ship owner legitimately place themselves in arm's length from their interests in a vessels?, i.e. is it possible for the state to exert control over the ship owners, and to what extent is it done? To what extent are ship owners held financially accountable after e.g. accidents?).
6) The nature of governance in the flag state (e.g. degree of politico-economic risk, levels of corruption, government's relationship with capital).

The overall aim of Alderton and Winchester's (2002) study is to operationalize these six key concepts into variables that can be scored and weighted in order to generate an overall FLASCI score for each flag state.

2. Results. Alderton and Winchester (2002) found substantial differences between the FLASCI scores of flags of convenience and national flags. They also find important differences between different flags of convenience. Flag states can be grouped according to their FLASCI scores as follows:

1) flag states with high FLASCI score (72-84 points), which are traditional maritime states and second registers that are centrally operated and controlled (e.g. Norway, UK, DIS, NIS, Netherlands, GIS).
2) flag states with medium-high FLASCI score (58-64), which are semi-autonomous second registers (e.g. Hong Kong, Isle of Man, Madeira).
3) flag states with medium FLASCI score (41-50), that are more established open registers with higher scores belonging to states seeking EU-memberships. National registers (e.g. Cyprus, Malta, Netherlands Antilles, Russia, Philippines, Vanuatu, Bahamas, Liberia).
4) flag states with low-medium FLASCI score (35-36), which are newer open registers (Marshall Islands, Ukraine, Honduras, Lebanon).
5) flag states with low FLASCI score (19-30), which are new in the open register market (Bolivia, Saint Vincent and the Grenadines, Belize, Equatorial Guinea, Cambodia).

The latter group is referred to as "bottom of the market", i.e. registers with low costs and few to no requirements. These registers are often formed in a way that obscures and minimizes the link between flag state and the ship owner.

Further validating their FLASCI index results, Alderton and Winchester (2002) compare their FLASCI scores with results from a 1996 questionnaire to seafarers (N=6,000). They compared their own results on the FLASCI index with variables concerning working environment and safety.

Alderton and Winchester (2002: 40-41) found correlations between their own FLASCI scores and the questionnaire results on self-reported dissatisfaction with a range of different working environment issues in the questionnaire. Seafarers from the highest FLASCI-scoring flag states were generally least dissatisfied, while those from the lowest FLASCI-scoring flag states were most dissatisfied. Seafarers from lowest FLASCI scoring flag states had the highest shares of seafarers who were dissatisfied with a) work-loads and working hours, b) time for sleep/rest, shore leave, tour lengths, c) stress levels, d) pay levels, job security, morale generally, support/help with problems, e) unfair treatment because of their race, physical abuse from officers, mental abuse, and f) they also found correlation between FLASCI scores and seafarers perception of whether their vessel was in poor safety condition and in poor state of repair.

Alderton and Winchester (2002: 42) conclude that there are distinct differences between the performances of different flags of convenience. Moreover, they state that among the new flags of convenience with low scores on the FLASCI index, there seem to be a lack of formal regulation and no capacity or willingness to regulate maritime safety; lacking enforcement is what these flag states offer to ship owners.

3) Strengths/limitations. Alderton and Winchester's study is useful as it provides a broad and relatively multi-faceted measure of the safety and quality level of different flag states. Their FLASCI index is the broadest measure used by the studies reviewed. It is a comprehensive measure, not just focusing on ship losses and port state detention rates, but also on crew members' working environment, crew members' rights and the enforcement systems and political-bureaucratic environments of the different flag states. Their general focus is on the legal/political framework (implementation/enforcement) of flag states.

3.1.3 Study 3: Accidental oil spills from tankers

1) Approach/methodology. The aim of Burgherr's (2007) study is to give a global overview of accidental oil spills (min 700 tonnes) from all sources in the period 1970-2004, and to

examine trends in accidental tanker spills. Burgher (2007) test for differences in the number of annual oil spills or oil spill volumes, according to key factors including in addition to flag state, hull type, tanker age etc.

2) Results. This study shows that the number and volumes of tanker oil spills have decreased substantially since the 1970's, and this is attributed to a set of initiatives and regulations implemented by governments, international organisations and the shipping industry. Again, we see the importance of implementation and enforcement of international rules.

Estimating the importance of key factors causing tanker oil spills, the authors found significant differences between different flag states when it comes to the number of oil spills and spill volumes. Spill number and volumes were higher for FOC countries than in other country groups. Moreover, a trend of decreasing spill numbers and volumes was found for the groups of flag states labelled EU25, Other OECD and FOC-countries, while non OECD countries showed an opposite pattern.

Annual averages for the period 1995-2004 also showed large differences among the country groups. While the oil spill volume for EU25 and OECD countries decreased to 1000 tonnes in average, FOC countries had an average oil spill volume that was thirty times higher (30,000 tonnes). Nevertheless, it is important to remember, that despite the high spill volumes, the authors found that the spill number for FOC countries decreased throughout the study period. This development is in accordance with other research that is reported here, showing that the safety record of many (old) FOC countries has converged to the level of traditional maritime states.

Additionally the authors found significant differences when they examined other key factors that may influence tanker oil spill risk. They found significant differences between spills and volumes, depending on vessels' hull type (pre MARPOL single hull tankers were more accident prone and contributed to the largest spill volumes). Looking at tanker age, the authors did not find significant differences between spill numbers and volumes of different tanker age categories. This is in contrast to other research that is mentioned in the current review. Comparing different categories of causes, the authors found significant differences. Collision, explosion/fire and grounding accounted for more than 80 % of the spill causes. Finally the authors tested whether they found significant differences between spill numbers and volumes in different geographical areas, focusing on so called Large Marine Ecosystems (LME). Spill numbers and volumes were not significantly different within and outside LME boundaries.*3) Strengths/limitations.* It is important to note that while many of the other studies reviewed above conduct multivariate analyses of causes of maritime accidents, Burgherr's (2007) largely presents bivariate analyses of causes. The reason is that they main focus of their study is not to examine the effect of flag states compared to other factors. In multivariate analyses, it is possible to examine the isolated effect of individual risk factors on the dependent variable (e.g. oil spill volume), while controlling for the effects of other risk factors (e.g. hull type, tanker age). In bivariate analyses on the other hand, we may get indications of the importance of risk factors, but it is impossible to know whether this significant difference is caused by a third variable. Burgherr's discussion of hull type and vessel age illustrates this challenge, as hull type and vessel age is related. Moreover, it is also possible that vessel age and flag state is related, and this illustrates the limitations with Burgherr's analysis of risk factors. Multivariate studies mentioned above have for instance found vessel age to influence casualty rates, and these studies examine the independent effect of key variables, controlled for other key variables.

3.1.4 Study 4: To what extent does vessel flag influence PSC detention?

1) Approach/methodology. As a consequence of failure by certain flag states to implement and enforce international maritime safety laws, the system of port state control (PSC) was created to identify and detain substandard vessels until they have fixed any deficiencies identified. There are nine regional Memoranda of Understandings (MOUs) on PSC, setting criteria or "target factors" for inspections (Cariou et al 2009). According to Cariou et al (2009: 848), three main types of information are considered when choosing vessels for PSC: 1) vessel characteristics: type and age, 2) performance of the flag of registry, classification society and ship owner, and 3) records from previous inspections for a specific vessel.

Cariou et al's (2009) study examines the probability of a vessel being detained in PSC and the probability of a given number of deficiencies being recorded during an inspection. The first objective of the study is to examine whether the factors explaining the two events are significantly different, and the second objective is to examine whether the inspecting authority has a significant impact on detention records. Their study is based on about 26 515 PSC inspections conducted in the Indian MOU region from 2002-2006.

2) Results. Examining the factors predicting detention of vessels and the number of deficiencies found in PSC, Cariou et al (2009: 856) conclude that the factors explaining the identification of deficiencies and detention were fairly similar. The most important factors predicting detention of vessels in PSC were 1) age of vessel (40 %), 2) the recognized classification society (31 %) 3), inspecting authority (17 %), 4) type of ship (6 %), 5) flag of registry (4 %) and 6) year of inspection (2 %). The result that flag state seems to be one of the less important predictors of detention is interesting and somewhat surprising, given the above mentioned results on FOC detention rates (Li 1999). We return to this below.

Finally, the authors assert that the result that the inspecting authority was a key factor in explaining identification of deficiencies and detentions is interesting, as one of the objectives of PSCs is to apply uniform standards across the states conducting PSC. This was, however, mostly a result of the characteristics of the vessels calling in the different ports where the inspections were carried out.

3) Strengths/limitations. The findings of this study contrast with those of Li (1999) (above), who found that the detention rate of vessels from FOCs in port state controls was 19.8 ‰, which is nearly four times more than the world average of 5.71 ‰. It may well be that Cariou et al's (2009) multivariate analysis controls for factors that are not included in Li's (1999) analysis, indicating for instance that Li's conclusion must be revised. However, Li (1999) also finds a high correlation between the age of ships, quality (detention rates) and safety (annual loss rates), but concludes that flag state nevertheless is more important. The discrepancy between the results of two studies could be due to the fact that Li uses the world average as the basis for comparison.

3.1.5 Study 5: Ship and crew accidents among UK-operated ships

1) Approach/methodology. Many UK shipping companies chose foreign flags for their vessels in the period 1970 to the late 1990's. Roberts, Marlow and Jaremin (2012) examine the safety outcomes of this, focusing both on *ship casualty rates* and *crew fatality rates*, using ship years as a measure of exposure. *Ship casualty rate* is defined as the number of ship casualties per 1000 ship years within the different fleets. They use Lloyds casualty records from 1970 to 2005 to compare ship casualties (1970-2005) and crew fatalities (1980-2005) in three groups: a) UK flagged vessels, b) UK second registers (Bermuda, Cayman Islands,

Gibraltar, Hong Kong and the Isle of Man) and c) six foreign flags used frequently by UK shipping companies (Bahamas, Belize, Cyprus, Malta St. Vincent and Vanuatu).

It is important to note that they focus on crew fatalities following from ship accidents, and not crew fatalities following from e.g. work accidents aboard. It is also important to note that three of the five UK second registers (i.e. group number two in the study) also are flags of convenience: Bermuda, Cayman Islands, Gibraltar.

In addition to examining accident rates, the authors also examine the importance of 12 different risk factors that may shed light on the observed accident rates: ship type, ship age, gross tonnage, flag, year and country in which the ship was built, year and month of casualty, main cargo carried, trading voyage, location of the casualty and reported weather conditions.

2) Results. There were 1198 shipping casualties in the twelve flag states studied in the years 1970 to 2005, and a total of 1642 crew fatalities. Throughout the study period the shipping casualty rate was highest for Cyprus (11.9 per 1000 ship years), Cayman Island (10.7), Belize (9.7) and Gibraltar (8.4). The shipping casualty rate was lowest for Hong Kong (1.2), Isle of Man (1.9) and the UK (2.2). Crew fatality rates were highest for ships registered in Malta, Belize and Cyprus and lowest for the Isle of Man and UK.

The overall ship and crew casualty rates increased sharply from the late 1970 with a peak in the 1980's and a smaller peak in the 1990's. After this, the rates declined substantially. Comparing different flags, the authors found that shipping casualty and crew fatality rates fell over time for UK registered ships, for UK second registers and for ships flying older flags of convenience, but not for ships flying newer flags of convenience, such as Belize and St. Vincent. It is important to note that some flags, like the UK, had relatively low crew fatality and ship casualty rates throughout the whole study period.

Conducting a multivariate analysis of various factors, the authors found flag state to be a weaker predictor of ship casualty rate than: 1) Main cargo (transport of iron ore contributed to an 18-fold increase in risk), 2) typhoons (17-fold increase), 3) trade route(from south Europe to North Europe gave a 13-fold increase), 4) heavy weather (8.3-fold increase), 5) ship size (>5000 compared with <500 gross tonnage gave a 8.3-fold increase).

The following factors were independent predictors of crew fatalities: 1) cargo (coal and iron ore), 2) trade (highest for south Europe to Northern Europe), 3) location (Baltic Sea and North Sea), 4) sea state (typhoon and heavy weather) and 5) country where the ship was built (low for UK)

3) Strengths/limitations. Few studies offer systematic comparisons of both ship accidents and crew fatalities, like the present study does, and it therefore provides an important contribution to the field. As the authors compare tendencies over time, considerable differences between flag states in declines of accident rates become visible, and it becomes necessary to explain why some states fail to have the same sharp and stable decline in accidents as others. Comparing among FOCs, authors show that the development in the old FOCs has improved, while it has not improved in the new FOCs. Thus, it seems perhaps that high risk ships and thereby also the ship casualty risk has been transferred from the old to the new flags of convenience.

Another important contribution of the study is that it provides a multivariate analysis of factors predicting casualty rates, and suggests that factors other than flag state are important for safety when the different factors are compared alongside each other. Organisational and cultural factors were not included in the analysis, and other research

designs are needed can compare the effects of such factors with those factors that the authors shed light on in this study.

Finally, it is important to note that the authors focus on crew fatalities resulting from ship accidents and exclude fatalities caused by work accidents aboard. Thus, it is not surprising that the authors found relatively similar tendencies for the two different types of accidents, e.g. that the same factors that were found to cause ship casualties also were found to influence crew fatalities (that were caused by ship casualties).

3.1.6 Study 6: Casualty rate of bulk carriers from 1980 to 2010

1) Approach/methodology. Roberts, Pettit and Marlow (2013) examine the casualty rates and risk factors of dry bulk shipping in the period 1980 to 2010. The aims of their study are to: 1) investigate ship casualty rates and crew fatality rates in the period, 2) compare these rates with other cargo ship types, 3) compare these rates across flag states and 4) determine risk factors influencing these rates in the period from 1997 to 2010. The study is based on casualty data on dry bulk carriers from the Lloyd's register of shipping in the period 1980 to 2010. After filtering some incidents, the analysis focuses on 510 dry bulk casualties resulting in a total of 1824 lives lost. Eleven shipping risk factors influencing the risk of dry bulk carrier foundering were studied. Fatality rates were expressed per 1000 ship years.

2) Results. Of the 501 dry bulk casualties studied, 29 % of the vessels were wrecked after grounding, 28 % foundered/disappeared, 19 % were lost in fires/explosions and 11 % in collisions/contacts, hull/machinery damage. Most of the crew fatalities were a result of foundering (84 %). The authors found a general reduction in casualty rate over time in the period 1980 to 2010, with an average annual decrease of 2.4 % in casualty rate. Yet, there were some modest peaks in the mid 1980's, and in the early and late 1990's. The authors found however an increase in the casualty rate from 2005. The crew fatality rates followed, with some exceptions, the same general development over time as the ship casualty rates. When comparing casualty rate across cargo ship types, the authors found that general cargo ships had the highest level of casualties during the period, as these often are comprised of smaller coasters that are more predisposed to groundings because of their sailing pattern.

Comparing casualty rates across flag states, Roberts et al (2013) found that the four flags with the highest casualty rates were "new FOCs": Belize, Georgia, Mongolia and St Vincent. Splitting the study period in two, because of reduction in casualty rates over time, the authors found that Belize, Mongolia and St Vincent had the highest rates from 1996 to 2010, while Chile, Malta and South Korea had the highest rates from 1980 to 1995. Looking at crew fatality rates, the authors found that in 1996-2010 St Vincent, South Korea and Cyprus were the flag states with the highest crew fatality rates, while corresponding flag states for 1980-1995 were Malta, Italy and Yugoslavia.

Roberts et al (2013) also grouped the flag states, and concluded that older FOCs had the highest casualty rates in the early 1990's, while new FOCs had the highest casualty rate from the mid 1990's to 2003, and Panama since 2003. Results show that when the new flag states emerged, they initially had very high bulk carrier loss rates.

Studying 11 risk factors influencing the probability of dry bulk casualty, the authors conclude that the strongest independent predictors of foundering and crew fatalities were flag state, the type of cargo, the location of the casualty, weather conditions and gross tonnage. The authors did not find vessel age to predict casualty risk.

3) Strengths/limitations. This study is important and relevant to the current literature review, as it provides a multivariate analysis of factors predicting casualty rates that includes flag

state. The study employs fairly similar methods to Roberts et al (2012), discussed above. Roberts et al (2012) found that factors other than flag state were important when it comes to predicting accident rates. In contrast, the current study found flag state to be the most important predictor of dry bulk vessel foundering. We may note the same limitations regarding lacking focus on organisational and cultural factors as we did above for Roberts et al (2012), and also remember that the crew injuries follow from ship casualties

3.1.7 Study 7: Accident risk of Norwegian operated ships

1) Approach/methodology. Nævestad et al (2014) study the distance sailed of Norwegian and foreign flagged vessels operated from Norway and involved in transport of cargo at sea in Norway, and match the results with accident data from the Norwegian Maritime Authority, in order to calculate and compare the accident risk of ships operated from Norway. The study is based on Statistics Norway's (SSB) quarterly port statistics covering the years 2003-2012, The Norwegian Coastal Administration's (NCA) AIS-data (Automatic Identification System) from 2012 and accident data from The Norwegian Maritime Authority (NMA), for the period 1981-2012.

The port statistics include information about number of port calls, tonnes loaded and unloaded, product type and the ships' flag states for public traffic ports with an annual cargo of at least 1 million tonnes or at least 200,000 passengers. In addition to using port statistics as a measure of exposure, AIS data are used to analyse the distance sailed (in km) by ships operating along the Norwegian coast. These data contain information on both the operating state and flag state, but they were only available for 2012. The AIS data set contains static data like ship identification, vessel type, size and flag, as well as dynamic data such as time and location.

The statistics for accidents at sea are collected from the NMA, which annually records accidents and near misses along the Norwegian coast, both with Norwegian and foreign vessels. The NMA data distinguishes between ship accidents and personal accidents. The authors have associated data on the vessels' sailing distance with accident data from NMA, to get a measure of ship accident risk. Risk is measured both as the number of accidents per tonnes and number of km sailed.

2) Results. The authors' estimates of ship accident risk were hampered, as they found indications of considerable differences in the reporting of accidents between different flag states, both for ship accidents with little or no damage and for serious maritime accidents. Nævestad et al (2014) also got indications that ships sailing under foreign flags may rather report serious maritime accidents directly to their respective flag states and not to the NMA. Thus, it was concluded that these tendencies may lead to underestimations of the ship accident risk of foreign ships.

As a result, Nævestad et al (2014) chose to only compare the accident risk of Norwegian operated ships, distinguishing between Norwegian and foreign flags. This comparison is based on the assumption that Norwegian operated ships flying foreign flags report accidents to the NMA to the same extent as NOR/NIS-ships do. It is important to note that the authors are uncertain about this assumption, and advise that results be interpreted with caution.

Nevertheless, results showed that ships sailing under Norwegian flag (NIS/NOR) had about three times higher risk of reported ship accidents of all damage rates than vessels with foreign flag with Norwegian operator. The authors found no statistically significant difference between the groups, when they compared the risk of ship accidents with serious

damage. Nævestad et al's (2014) conclude that they lack the data to conclude about differences in accident risk and that results are inconclusive.

3) Strengths/limitations. Nævestad et al (2014) conclude that the data are insufficient to examine whether foreign actors have higher accident risk than Norwegian actors in the Norwegian maritime sector. The foreign ships that they compared with were Norwegian in the sense that they were operated from Norway, with Norwegian management systems on board and in the company offices, even though they were sailing under foreign flags with foreign crews. Additionally, NOR-registered ships sailing along the coast of Norway also include foreign seafarers in their crews due to lack of Norwegian seafarers. And as noted, it was also suggested that Norwegian shipping companies choose flags of convenience for their newest and safest ships instead of Norwegian flags. Thus, Nævestad et al (2014) conclude that the term "foreign actor" is complex in shipping, and that it is timely to question how important flag state is when it comes to explaining differences in accident risk between cargo ships sailing along the Norwegian coast. Finally, it is also important to note that the study's assumption that Norwegian operated ships flying foreign flags report accidents to the NMA to the same extent as NOR/NIS-ships is not necessarily valid. Moreover, this study ends up by comparing ship accidents of all severity rates, which we know are influenced by reporting effects. Thus, results from Nævestad et al's (2014) study are inconclusive.

3.2 Results from interviews

3.2.1 Is flag state important for safety?

When asked whether ships from different flag states have different risk of ship accidents in Norwegian waters, most of the interviewees were either uncertain or questioned the relevance of flag state as a key variable influencing safety,. It was suggested that other variables are more important than flag state. Several stated that while many might believe that FOC ships have a higher risk of ship accident, it is difficult to check whether this actually is true. The main challenge with examining this question is underreporting of ship accidents to Norwegian authorities.

Several interviewees stated that they did not find flag state to be a meaningful indicator of accident risk. Although there may be some poorly performing flag states, there are no FOCs who stand out with huge risk factors, one interviewee said. Vessels are inspected in accordance with international regulations through the Paris MOU inspection regime. Flag states are ranked according to their orders, and according to this interviewee, there is nothing to indicate that some flags have a much higher risk than others. Norway is among the top three in this ranking. Another interviewee also stated that Norwegian ship owners are known for choosing high quality FOCs like Panama and Bahamas.

Other interviewees stated, however, that there are differences in the quality of different ship registers, referring to new FOCs e.g. Togo, Mongolia, Congo, St. Kitt and Nevis as examples of poor registers. It was suggested that these differences are reflected in results from port state controls. One respondent stated that there are several examples of "post box registers", and that these tend to have a lower degree of implementation and enforcement than other flag states (e.g. traditional maritime states). When asked how many of these flags sail along the coast of Norway, one interviewee suggested perhaps about 20. Another interviewee suggested that that foreign ships could be overrepresented in the grounding statistics. On the other hand, it was also mentioned that there are several

established FOCs with a good safety standard. The established FOC Panama is for instance on the White list of the Paris Memoranda of Understanding.

One of the important accident risk factors that was suggested as more important than flag state by the interviewees was for instance whether ship crews are familiar with the Norwegian coastline and Norwegian waters, or whether ship crews are familiar with coastal navigation from coasts similar to the Norwegian, with many long and narrow fjords. Respondents also mentioned other factors influencing ship accident risk, for instance poorly planned sailing routes and fatigue

Another important risk influencing factor that was mentioned by one interviewee was shipping companies' choice of classification society. Shipping companies may save considerable sums if they choose a poorer classification company, and the choice of classification company has significant ramifications for ship safety.

It was also mentioned that choice of ship insurance company has consequences for ship safety. Shipping companies are required to have a protection and indemnity insurance (P&I), and they may choose insurers of different quality. The maritime insurance companies are organised as clubs with advanced contracts for mutual responsibility of payments. Payment for all damages over 8-9 million dollars are shared between companies who are members of the same P&I club, but their contributions are weighted based on their tonnage. All the clubs are organised as mutual insurance clubs: the shipping company pays a sum based on the number of ships it has, and if the members of the club not have had any damages, the shipping company will get a refund of this sum

Interviewees were uncertain when they were asked whether they think that crew members of different nationalities have different risks of being injured while working on board ships. Some of the interviewees mentioned that they have heard that Filipino crew members are more safety-oriented and less prone to personal injury than crew members who are from Western Europe.

In the reference group meeting it was concluded that we lack data to conclude that the safety standard of FOC vessels is inferior to Norwegian flagged ships. There is great internal variation in the safety standard of both Norwegian flagged ships and FOC ships. Vessels' safety standard is to a greater extent dependent on the business or subsector that the ship is operating within, and how much the transport buyer is able to pay for safety.

It was also mentioned that Norwegian shipping companies often flag out their newest vessels, while older vessels are kept in the NOR registry. This may indicate that Norwegian operated FOC vessel have a good safety level. One interviewee said that port state authorities often perform stricter inspections of FOC vessels than Norwegian vessels. One reference group members suggested that this may contribute to a higher safety standard and compliance with safety rules.

The reference group meeting concluded that perhaps flag state not is the most important variable explaining differences in ship accident risk. This conclusion was based on the views that Norwegian shipping companies flag out their newest ships and that there are considerable internal variation in the safety standards of vessels within the same flag states. Differences between the ship accident risks of different flag states are probably caused by a lot of different factors, and it is likely that these factors are more important than flag state.

3.2.2 Under-reporting of maritime accidents

In the reference group meeting it was mentioned that while Norwegian flagged ships report a relatively high amount of incidents and accidents, including accidents with little or no damage, there are examples of cases where foreign flagged ships have failed to report accidents with serious damages to Norwegian authorities, even though the accidents have occurred in Norwegian waters. Instead, the foreign flagged ships report home to their own flag state. As we have said, interviewees also mentioned that different levels of reporting of incidents and accidents is a considerable challenge in the maritime sector. It makes it very difficult to study and compare the ship accident risks of vessels sailing under different flags in Norwegian waters.

Finally, reference group members stated that there are considerable differences between the accident reporting in different shipping companies and also between ships within the same shipping companies. It was suggested that such differences probably are due to differences in organisational safety culture.

3.3 Results from the small-scale survey

3.3.1 Self-reported ship accidents

Respondents were asked the following question: "Has the vessel been involved in a shipping accident (e.g. grounding, collision, contact injury, fire) in the two last years?" Twenty per cent of respondents (n=43) answered yes to this question. Of those involved in reported ship accidents (n=43), 79 % stated that the ship accident was reported to the NMA. The remaining nine seafarers did not know.

An important assumption in multiple regression analysis is that the responses are independent of each other. Since several respondents in our sample work on board the same ships (e.g. 32 respondents working on FOC vessels work on only 7 or 8 different vessels), analysis of individual-level responses is not feasible when looking at influences on ship accidents

Unfortunately we have not registered on which ships respondents work, but we may sort our data on a key variable which is unique for each ship: the captain. Although it is likely that some ships and respondents in our data not are represented by a captain in our sample, 57 of our respondents are captains and 13 of these report of ship accidents. When we filter data like this, numbers become too small for analysis and results will probably not be statistically significant. It is, however, necessary to use ships as units in this analysis to avoid overestimating tendencies in this relatively small data set, i.e. the fact that seven FOC vessels have not had any ship accidents. We may thus focus on positive and negative effects in Table 3.1 below.

Table 3.1 presents the results of the logistic regression analyses with ship accidents as the dependent variable. Odds ratios (exp (B)) are presented and they indicate the risk, or the odds, for being involved in a ship accident when the independent variable increases with one value and the effect of the other independent variables in the step is controlled for. The units in the analysis are the captains in our sample, and thereby also individual ships.

Table 3.1: Logistic regression. Dependent variable: shipping accident in the last two years (dichotomized: 0: no shipping accident, 1=shipping accident). Units in the analysis are captains/ships. Odds ratios (exp (B))

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Vessel age	.993	1.031	1.062	1.060	1.059	1.049	1.056	1.061
Vessel size		.551	.459	.435	.488	.490	.269	.285
Vessel type (General cargo=0, Other=1)			.358	.366	.408	.405	.592	.569
Manning levels				1.051	1.047	1.889	2.500	2.553
Port calls					1.308	1.310	1.349	1.428
Register (NOR=0, FOC=1)						.000	.000	.000
Dedicated watch? (0=at least Sometimes, 1=Never)							.264	.214
Challenging weather conditions								.744
Nagelkerke R^2	.000	.026	.063	.063	.110	.213	.242	.260

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

As expected given the low number of units in the analysis, none of the variables contribute significantly. Since this is the first time such an analysis has been attempted in Norway, we will nevertheless report whether effects are negative or positive, in order to inform hypotheses for important future research.

In Step 8, we see that three variables tend to contribute positively to the odds of being involved in a ship accidents: vessel age, manning level and port calls. A hypothesis for further testing is thus that the older the ships are, and the more port calls the ships have, the higher is the risk of a ship accident. This is also in accordance with previous research that we have reported above. The indication that manning levels contribute positively is harder to explain.

The following variables have a tendency to be negatively related to the odds of being involved in a ship accidents: vessel size, vessel type, register, and never having a dedicated watch. The latter is unexpected and hard to explain.

The result for Register should be ignored since there were few FOC vessels in the data (7 FOC captains), and that none had been involved in a ship accident.

Moreover, Table 3.1 indicates that the vessel type tends to contribute negatively, meaning that ship types other than general cargo decrease the odds of ship accidents, when controlling for the other variables. We dichotomized the vessel type variable when we saw that general cargo had a higher share of ship accidents (31 %) compared to the other vessel types (17 %). The difference was statistically significant at the 5 %-level.

The Nagelkerke R^2 indicates the amount of variance in the dependent variable that is explained by the independent variables in the models. In step 5 in Table 3.1 the Nagelkerke R^2 is 0.260 which indicates that the independent variables explain 26 per cent of the variance in the dependent variable, ship accidents. We must, however, remember that none of the variables contribute significantly in Table 3.1.

3.3.2 Respondents' assessment of the safety of their work place

We also asked respondents the following question: "All in all, how do you assess the safety of your work place situation?" (Figure 3.1).

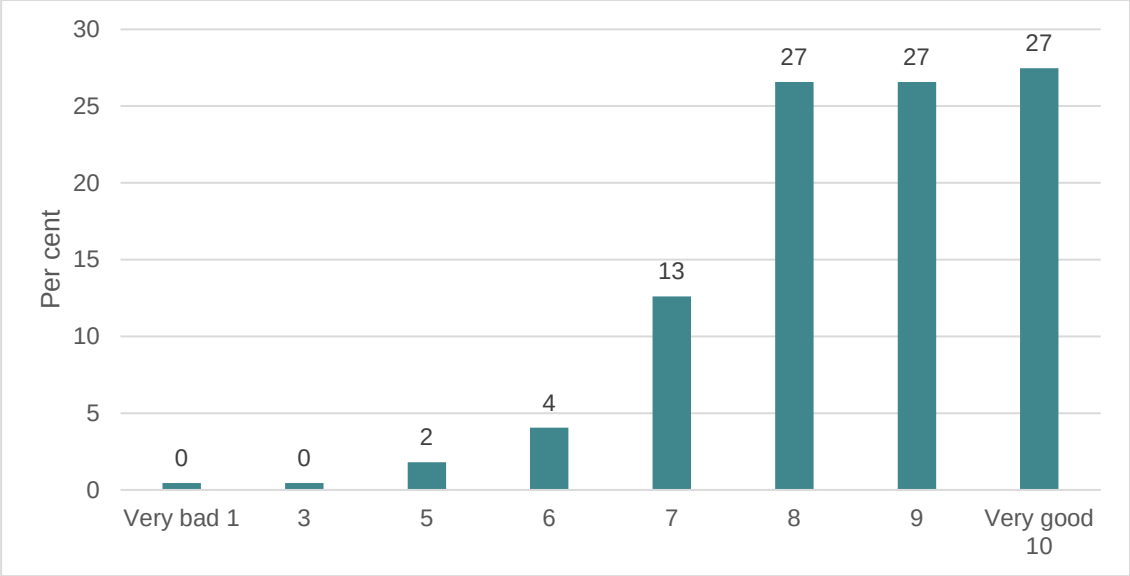


Figure 3.1: Respondents' response to the question: "All in all, how do you assess the safety of your work place situation?" Per cent. (N=222).

In Table 3.2 we show results from a hierarchical, linear regression analysis, where independent variables are included to examine factors predicting respondents' assessments of the safety of their work place. The dependent variable varies between 1 (very bad safety) and 10 (very good safety).

Table 3.2: Linear regression. Dependent variable: "All in all, how do you assess the safety of your work place situation?" Standardized beta coefficients.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Age group	.123*	.153**	.152**	.068	.051	.031	.038	.033
Position (Captain, Deck officer, Chief engineer=2)		-.119*	-.116	-.061	-.050	-.048	-.043	-.046
Vessel type (General cargo, Other=2)			.021	.054	.067	-.010	.005	-.018
Sometimes I feel pressured to continue working, even if it is not perfectly safe				-.504***	-.439***	-.238***	-.276***	-.281***
Sometimes I am so tired during working hours that safety is compromised					-.161**	-.103*	-.101	-.110*
Organisational safety culture						.405***	.416***	.397***
Nationality (Norwegian=1, Foreign=2)							-.055	-.117*
Register (NOR=1, FOC=2)								.115
Adjusted R^2	.010	.019	.015	.260	.277	.401	.400	.405

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

In Step 1, 2 and 3 we see that respondents' age contributes significantly to respondents' assessment of the safety of their work place situation. The age group variable contributes positively, indicating that the older the seafarers in our sample are, the better they assess the safety of their work place. This variable ceases however to contribute significantly in

Step 4, when we take in work pressure, perhaps indicating that younger seafarers are more inclined to experience work pressure.

The position/line of work variable only contributes significantly and negatively in step 2, indicating that senior crew members rate the safety of their work place as lower than their subordinates on board. This variable is, however, only significant in Step 2.

Vessel type does not contribute significantly. We dichotomized the vessel type variable into 1) "Other vessel types" and 2) "General cargo vessels" after conducting a comparison of means indicating that crews on general cargo vessels were more worried about the risks on board than others.

In Step 4 and 5, we included two statements: "Sometimes I feel pressured to continue working, even if it is not perfectly safe" and "Sometimes I am so tired during working hours that safety is compromised". Both statements vary between 1 (totally disagree) and 5 (totally agree). We see that both variables contribute negatively, meaning that for each increasing value on these variables, respondents' assessment of the safety level on board decreases. We see that perceived "work pressure" is a stronger predictor than fatigue.

In Step 6 we take in the Organisational safety culture index, which consist of 18 questions. We see that organisational culture contributes positively and significantly to respondents' assessment of safety This means, not surprisingly, that the better safety culture the respondents report, the higher they rate the safety level of their work place.

Finally, Step 8 indicates that registry does not contribute significantly to respondents' worry about the risks on board, when we control for respondents' age, their position/line of work, the vessel type that they work on, work pressure, fatigue and safety culture.

We see however that nationality contributes negatively, although it is only significant at the 10 %-level. This means that controlled for the other variables in the model, foreign respondents rate the safety level of their work place lower than Norwegian respondents. We must remember that these foreign respondents work on both NOR and FOC vessels.

In conclusion, Table 3.2 indicates that respondents' perception of work pressure, fatigue and organisational safety culture are more important predictors of their assessment of the safety level of their work places than their nationality and the registry of their vessels.

3.4 Summing up

Above, we have discussed seven publications focusing on safety outcomes of internationalisation in maritime transport. Four of the studies (Li 1999, Alderton & Winchester 2002, Burgherr 2002, Roberts et al 2013) indicate negative safety outcomes of internationalisation, i.e. that generally new FOCs are less safe, and/or have been inspected/detained more in port state controls than traditional maritime states and established FOCs. Two of the reviewed studies concluded that other factors were more important than flag state: vessel age (Cariou et al 2009) and main cargo (Roberts et al 2012). In one of the studies, the results were inconclusive (Nævestad et al 2014).

Finally, four of the studies suggest that flag state (and FOC) is not necessarily a straightforward indicator of safety level, or question the utility of focusing of flag state as the most important indicator of ship accident risk (Li 1999; Cariou et al 2009; Roberts et al 2012; Nævestad et al 2014).

Most of the interviewees were either uncertain when they were asked whether they think that ships from different flag states have different risk of ship accidents in Norwegian waters, or they questioned the relevance of flag state as a key variable explaining ship accident risk. This is consistent with the literature findings, and suggests other variables may be more important than flag state when accounting for safety. Internal variation within the flag state fleets is considerable, depending particularly on the sub-sector's or customers' "willingness" to pay for safety. We examined variables predicting ship accidents in the small-scale survey, but results were inconclusive.

Thus, we find little concrete support for the idea that simply having a FOC directly influences ship accident risk, and four of the seven studies we reviewed question the utility of focusing on flag state as an important indicator of ship accident risk. Flag state in itself would not seem to be the most important predictor of varying levels of maritime safety. Having said that, some studies indicate that the safety of newer FOCs is lower than that that of traditional maritime states, second registers and established FOCs, possibly because newer and more inexperienced flag states may implement and enforce maritime safety rules to a lesser extent.

4 National safety culture

In this Chapter we explore whether differences in national safety culture between NOR-registered vessels and FOC vessels might have implications for safety. We do this by literature review, expert consultation and a small-scale survey of seafarers.

4.1 Results from the literature study

Even though the concept has traditionally been applied to organisations, research indicates that safety culture can be applied to other social units than organisations. It can for instance be applied to studying the (transport) safety culture of members of social units like nations, communities and peer groups (Nævestad & Bjørnskau 2012; Nævestad, Elvebakk & Bjørnskau 2014). Studying safety culture within other social units than organisations requires the same focus on how shared and safety relevant ways of thinking or acting are created and recreated by members of these units. Studies of safety culture often treat safety culture as shared and safety relevant ways of thinking or acting that are (re)created through the joint negotiation of people in social settings (Nævestad 2010).

When we apply the safety culture perspective to the maritime sector, units like the shipping company, the vessel, the trade (seafarer), the position (e.g. captain, deck workers, engine room personnel) and crew member nationality may constitute relevant sources of culture. We may perhaps assume that all of these different socio-cultural units may be relevant when it comes to explaining patterns of thinking and acting, and thus that their importance should be examined empirically. In the following, we will however focus on nationality as a source of culture.

4.1.1 Hofstede's four dimensions of national culture

The research literature shows that nationality is an important source of culture in the maritime sector. This literature shows that national culture influences values, communication styles, methods of conflict resolution, decision making and organisational behaviour (Håvold 2005). Lamvik and Ravn (2004) point out that the literature studying the link between national culture and work practice is scarce. The most notable researcher in this area is probably Geert Hofstede. In 1980, Hofstede published "Culture's consequences", a seminal study which showed that national culture varies substantially from country to country according to four main dimensions (Hofstede 1980). Hofstede's study used a databank of 116,000 IBM employees from 64 different countries. Hofstede's dimensions are the most widely used measure of national cultures (Håvold 2005: 452).

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

be included in decisions and will expect to be able to freely criticise authority (Hofstede 2001).

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

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

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

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

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

4.1.2 What is the relevance of Hofstede's dimensions for safety?

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

in societies with high power distance and high degree of collectivism are more likely to answer what they believe that the management wants to hear.

According to Håvold (2010a), most of cross-cultural research, including that of Hofstede, use the Value-Belief Theory (VBT), when depicting the relationship between culture and actions. According to VBT, values and beliefs held by members of collectives influence the behaviours of individuals, as well as individuals' views on whether certain behaviours are legitimate, acceptable and effective. Following the VBT, national culture influences individual safety values and attitudes, which in turn shape individuals' intentions to behave and subsequently their behaviour (Håvold 2010a).

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

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

Håvold (2005) 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. The average manning level on the ships was 25 people, and most of the vessels were bulk/containerships between 39,000 and 51,000 dwt. Using principal component analysis (PCA), Håvold found a factor structure of 11 factors confirming the factor structures found in previous safety culture studies from other industries. He also conducted a scree test that identified four factors, and chose to use this in the further multivariate analyses of the data material

Using the four factor structure Håvold (2005: 450) conducted regression analyses, and found that the most important factor "Management and employee attitudes to safety and quality" explained 50 % of the variance in the dependent variable "port state control ratio". This is a measure of vessels' actual safety and quality performance, which was external to the survey. This is interesting and promising, as it is seldom that safety culture scales are validated against such external measures of actual safety and quality performance. Thus, such tests are important to check the degree to which safety culture scales actually measure safety relevant dimensions and items.

Håvold also tested whether significant safety cultural differences existed between nationalities, occupations and vessels, as research indicates that these different social units may constitute important sources of culture (Håvold 2005). He found significant differences between nationalities on the most important factor "Management and employee attitudes to safety and quality" and on the factor "safety and quality experience". The former factor includes 11 items:

-"Officers do all they can to prevent accidents on board",

-"X ships can be friendlier to the environment",

-"Officers often discuss safety issues with ratings",

-"Employees are given enough training to do their work tasks safely",

-"Officers are aware of the main safety problems onboard",

-"Everybody always uses helmets during mooring and cargo operations",

-"Onboard X ships safety has improved a lot since I started in the company",

-"All new crewmembers get proper safety training before they start working",

-"I can locate the nearest fire apparatus wherever the fire should break out",

-"There is always an extra person in addition to the mate on the bridge when sailing in low..." and

-"All enclosed spaces are tested with an oxygen analyzer before entered".

As we see, the factor "Management and employee attitudes to safety and quality" is a fairly broad factor, including several different aspects of safety.

Based on the previous finding of Helmreich and Merrit (1998), showing that the Hofstede dimensions of power distance and individualism-collectivism were relevant to safety, Håvold compares the six national groups in his study's scores on the factor "Management and employee attitudes to safety and quality" with these nationalities' scores on the two Hofstede dimensions. The nationalities are: Norwegian, Filipino, British, Croatian, Polish and Indian. He finds that the different scores are very close, and thereby suggests that the differences he has observed between nationalities on the "Management and employee attitudes to safety and quality" perhaps can be attributed to differences in national culture (i.e. the two Hofstede dimensions).

Interestingly, he also matched the nationalities' scores on the "Management and employee attitudes to safety and quality" and the two dimensions of national culture with the following "development indicators":

1) gross national income per capita,

2) number of telephones per 1,000 capita, and

3) number of pc's per 100 capita.

He found correlations between his own factor, Hofstedes' dimensions and the three development level measures.

However, he also suggests that the differences may be produced by the fact that different cultures also may generate different ways of answering surveys. This is an interesting topic that we will return to in Chapter 11.1.

Håvold also examined whether he found significant differences among occupations on the vessels in his study on the factors comprising his safety culture scale. He found significant differences between occupational groups on the factor "knowledge", comprised of four items: officers had more knowledge on company policies and so forth than the other occupational groups.

Examining differences between vessels, Håvold found significant differences on the "Management and employee attitudes to safety and quality" factor. Based on these differences, he suggests that the safety culture of the master and officers were influential of the outcome. Moreover, this difference between vessels could also be attributed to national culture. Håvold (2005: 454) found that three vessels with an all Indian crew had the most positive safety culture, while the vessels with all Norwegian crew showed the least positive safety culture.

4.2 Results from the interviews

Interviewees generally seemed to believe that there are cultural differences between different nationalities on board ships in Norwegian waters, although they stressed that it is difficult to provide empirical documentation of this. They gave several examples of such differences, but stressed that their suggestions merely were hypotheses, based on limited data.

One interviewee stated that what creates dangerous situations at sea is the mixing of various nationalities on board, since it contributes to different safety cultures on board. The understanding and interpretation of the vessel safety culture varies, depending on what kind of "cultural baggage" you bring with you on board. It may lead to misunderstandings and accidents which you wouldn't have seen if everyone had the same safety culture, this interviewee suggested.

Another national cultural aspect highlighted by the interviewees was national groups' relationship to authorities. Northern European seafarers are more used to taking responsibility for themselves and let managers know it, if they think that something is not right. Other nationalities (e.g. Asians and Eastern Europeans) may take an order and do what they are told. It may be more difficult for these national groups to report about critical things to their superiors. It is also likely that these nationalities have strong inhibitions against criticizing decisions of their superiors.

According to one interviewee, the normal response from e.g. Asian crew members to authorities is «No problem, sir» regardless of whether they have understood or not. The reason is their view on authority. In conclusion it, was stated that mixing of cultures on board may create misunderstandings and unsafe situations.

If you for example have a crew of only Norwegian seafarers; everyone assumes that they have an independent responsibility for making sure that they know what to do, and question orders if they do not make sense. If it is something that they do not understand, they take it up with their closest supervisor. Asian seafarers on the other hand can see and understand that something will go wrong, but as long as they are not ordered to do anything else, they will not do anything else. The reason is their respect for authority. However, with a fully Asian crew the supervisor knows that "everything depends on him giving the correct and detailer order", and he will therefore not presuppose that crew members will take individual responsibility in the same way as for instance Norwegian seafarers.

Interviewees also suggested that there are cultural differences between national groups when it comes to how they communicate with others, e.g. letting colleagues know it if something not is right (e.g. if they work unsafe). Some foreign groups (e.g. Asians) may have more inhibitions when it comes to speaking their mind. One interviewee suggested that making an Asian intervene towards a colleague with a different nationality is impossible.

Another cultural difference that was mentioned is "pride in completing the job assignment". Interviewees suggested that some seafarers (e.g. Asian) may find it difficult to tell managers if they are unable to complete their work tasks, and that they need help to do so. This cultural trait concerns pride in completing your job tasks and being capable to do the job. It must be noted here that foreign crew members have other job contracts and they may fear losing their job if "they are unable to do their job". Thus what we perceive as a cultural difference may be the result of different structural conditions.

Some of the interviewees stated that they have heard that Filipino seafarers are safer and more risk averse than Norwegian seafarers. The reason is that they need to stay healthy and keep their job to support their family. It was also mentioned that Filipino seafarers for the same reason may be afraid of losing their job if they do a mistake. Norwegian fishermen were mentioned as a counter example of a less risk averse group by one of the interviewees.

In the reference group meeting, members highlighted the importance of safety culture for safety behaviour and ship accident risk. They especially emphasized that safety culture influences reporting of accidents to authorities. As noted, reference group members suggested that Norwegian ships and shipping companies have better reporting cultures (of accidents to the NMA) than foreign flagged vessels.

4.3 Results from the small-scale survey

We included eight questions aiming to measure national safety culture among our respondents. Unfortunately, the different foreign groups of seafarers in our sample are small: Out of a total of 45 seafarers, 20 are Central/Eastern European, 3 are Western European, 15 are from other Nordic countries, and 7 from other countries. Our survey data can therefore not be used to draw any conclusions about this. Again, however, to inform future research we report the results for three groups: Norwegian (N=121), Other Nordic countries, (N=10), Central/Eastern European Countries and Asian (N=25), stressing that results merely indicate issues for further research.

4.3.1 Deference to authority

The literature study indicated the importance of deference to authority as an indicator of national safety culture. In the survey we therefore rated agreement with three statements to measure this:

- I criticize the decisions of the ship management, if I disagree.
- It is unwise to tell ship management if I have made a mistake or almost had an accident in my work.
- If I am unable to finish my work assignments before deadlines, ship management may think that I do not master my job.

The different national groups' scores on these questions are shown in Figure 4.1. The answer alternative range from 1 (totally disagree) to 5 (totally agree). Each question originally included a sixth answer alternative: do not know/not relevant, which we have removed in our analyses of means. We have excluded captains from the analysis, as these are the most important element of "ship management".

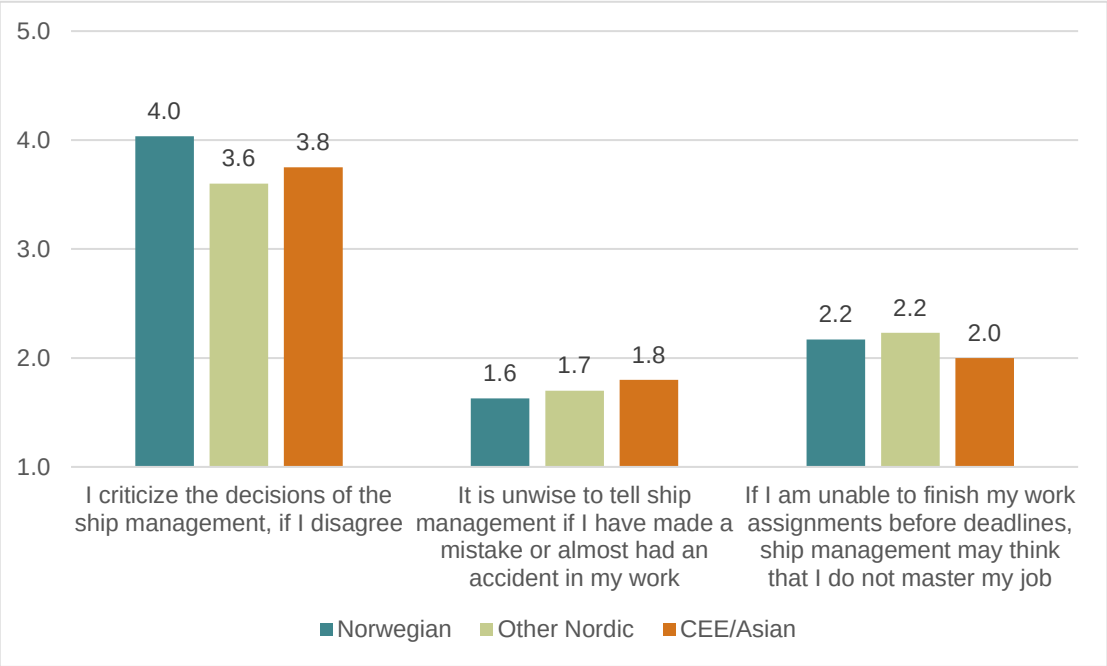


Figure 4.1: Mean scores of national groups on questions measuring national safety culture, focusing on deference to authority. Norwegian (N=121), Other Nordic countries, (N=10), Central/Eastern European Countries and Asian (N=25). Captains are excluded from the analysis.

The differences between the groups when it comes to deference to authority were not significant.

4.3.2 Colleague safety intervention

The survey included the following question: "It is impolite to tell colleagues to work in a different and safer way". As noted, the interviews indicated the importance of foreign seafarers (cultural) inhibitors of colleague safety intervention. We may perhaps use this as an indicator of national safety culture.

The different national groups' scores on this question is shown in Figure 4.2.

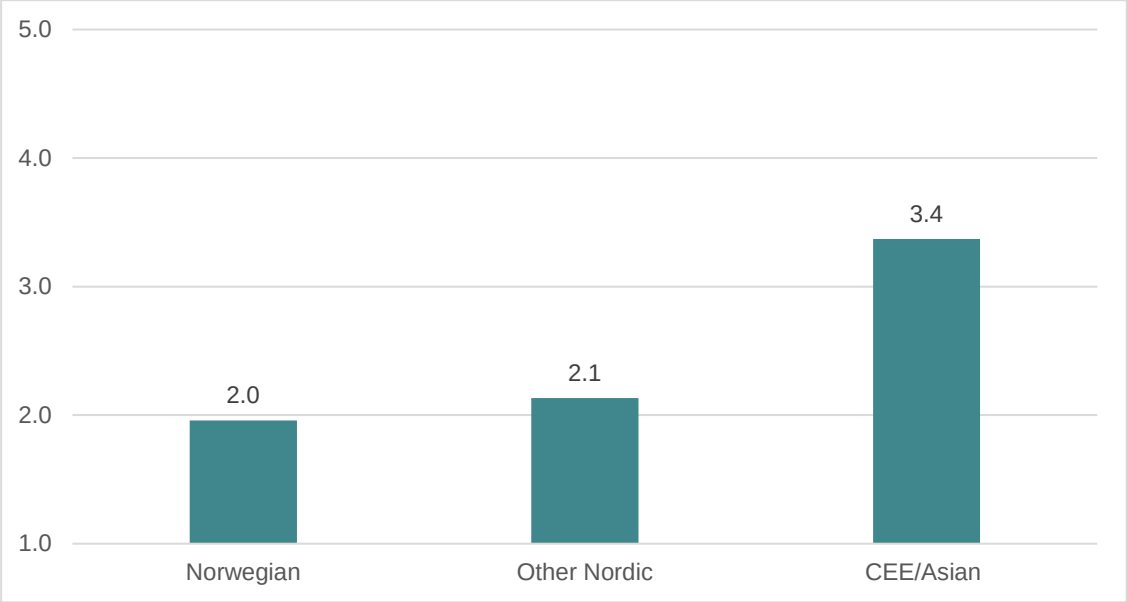


Figure 4.2: Mean scores of national groups on a question measuring national safety culture, focusing on colleague safety intervention, "It is impolite to tell colleagues to work in a different and safer way". The answer alternatives ranged from 1 (totally disagree) to 5 (totally agree). "Do not know/ not relevant" was excluded. Norwegian (N=177), Other Nordic countries, (N=15), Central/Eastern European Countries and Asian (N=27).

Figure 4.2 indicates that respondents from Central/Eastern European countries and Asia find it far more impolite to tell colleagues to work in a different and safer way than Norwegian respondents ($p<.01$). Thus, we may perhaps suppose that the former group's view on this may constrain them from intervening when colleagues work in an unsafe manner. It seems that this is an important aspect of national safety culture that should be examined further in future research. It could also be a result of the fact that these respondents are foreign seafarers on Norwegian operated ships, and that they therefore do not wish to be interfering with colleagues work. Many of them work, however on ships consisting of non-Norwegians.

4.3.3 Which factors influence colleague safety interventions?

In Table 4.1 we show results from a hierarchical, linear regression analysis, where independent variables are included to examine factors predicting respondents' views on colleague safety intervention.

Table 4.1: Linear. Dependent variable: "It is impolite to tell colleagues to work in a different and safer way". The dependent variable varies between 1 (totally disagree) and 5 (totally agree). Standardized beta coefficients.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
Age group	.033	.042	.042	.039	.029	.041	.011
Vessel type (Other=1, General cargo=2)		.265***	.264***	.237***	.166**	.163**	.158**
Position (Other=1, Engine personnel=2)			.013	.008	.005	.008	.019
Manning level				.076	-.037	-.023	-.156*
Nationality (Norwegian/Nordic=1 Central Eastern European/Asian=2)					.275***	.295***	.060
Org. safety culture						-.077	-.047
Register (NOR=1, FOC=2)							.370**
Adjusted R^2	-.004	.062	.058	.058	.106	.107	.140

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

First, we see that respondents' vessel type contributes significantly and positively to respondents' view on colleague safety intervention, meaning that respondents working on board general cargo vessels view colleague safety intervention as more impolite than respondents on other vessels. This is difficult to explain, as we see that the effect of vessel type is sustained when we control for the other variables in Step 7.

Second, we see that respondents' nationality contributes significantly and positively to respondents' view on colleague safety intervention, meaning that Central Eastern European/Asian respondents view colleague safety intervention as more impolite than Norwegian/Nordic respondents, controlled for the other variables in the model. Interestingly, the effect of organisational safety culture is not significant in the model, indicating that respondents' view on colleague safety intervention may be an indicator of national safety culture.

The development in Step 7 is, however, an argument against this. When we take Register into the analysis, we see that nationality ceases to contribute significantly, and that register is the strongest predictor of respondents' views on colleague safety intervention. FOC vessels are generally small multinational communities, where the literature indicates that it is important to avoid conflict. This could explain why register is the most important variable in the analysis.

The Adjusted R^2 value is .140 in Step 7 indicating that the variables in the model explains 14 % of the variation in the dependent variable.

4.4 Summing up

The literature review indicates that nationality could be an important source of culture in the maritime sector, particularly related to the national culture dimensions of "deference to authority" and the "value of the individual versus the group". The research literature on national culture indicates that it influences safety-relevant values, communication styles, methods of conflict resolution, decision making and organisational behaviour. The interviews supported this, indicating the importance of national safety culture for several aspects of maritime safety.

We examined national safety culture in the small-scale survey. We did not find statistically significant differences between the groups on the deference to authority dimension, but the numbers of foreign respondents may have been too small to detect smaller differences. The survey indicates that respondents from Central/Eastern European and Asian countries find it far more impolite to tell colleagues to work in a different and safer way than Norwegian respondents.

We conducted analyses to examine factors predicting respondents' views on colleague safety intervention. When we included Register in the analysis, we saw that nationality ceased to contribute significantly, and that register was the strongest predictor. FOC vessels are generally small multinational communities, where research indicates that it is important to avoid conflict.

5 Communication

In this Chapter we explore the possibility that safety differences between NOR registered vessels and FOC vessels might be caused by differences in the quality of communication among crew. This is achieved by literature review, expert consultation and a small-scale survey of seafarers.

5.1 Results from the literature review

The Norwegian Coastal Administration conducted a survey of maritime user needs related to e-navigation in October and November 2009.[5] A total of 575 respondents participated in the survey, and 486 of these were seafarers and 72 were ashore operators. The majority of respondents were Norwegians or associated with Norwegian ship owners, but some respondents were from Sweden.

The seafarer respondents worked on a range of ship types including cruise-ships, tankers, cargo vessels, offshore supply vessels, fishing vessels and HSC. According to the Norwegian Coastal Administration, each of the operational areas of coastal, regional international and global oceanic transport are represented by at least a third of seafarer respondents each.

Results from the survey indicate that in communications between ships, 81 % of respondents rated language skills as a problem to a high or moderate degree. In ship-shore communications, language skills were rated by 44 % of respondents as a problem to a high or moderate degree. Thus, the Norwegian Coastal Administration conclude that respondents consider language skills to constitute an important challenge in maritime communications.

A survey conducted by the Seafarers International Research Centre (SIRC) at Cardiff University, based on analyses of more than 10,000 crew lists shows that only 1/3 of ships in the survey group were crewed with single nationality crews (Kahveci & Sampson, 2001). Thus, two-thirds of all ship crews are multinational. The authors report that about 25 % of the ships had four or more nationalities.

Flag states require that each ship must have a working language that each employee must speak to a certain standard (Hetherington, Flin, & Mearns, 2006). In order to deal with the mixture of nationalities, the ships in Kahveci and Sampson's study generally used English as the stated common working language. However, research shows that far from all seafarers speak English fluently, and that this may have repercussions for maritime safety.

[5] Results from the Norwegian Coastal Administration's E-navigation user needs survey in 2009 can be found here: http://www.kystverket.no/contentassets/92c2edd53dac4153b37e43b8e5505de4/resultat-e-navigasjon.pdf

Presenting results of their comprehensive ethnographic study aboard fourteen ships, Kahveci & Sampson (2001) mainly focus on the issue of communication and the difficulties arising aboard the ships because of communication problems. Their research shows that on half of the fourteen ships that they studied, the stated working language (English) was a second language for everyone on board. They also give several examples of crew members speaking only in their own language, although this language was incomprehensible to other crew members. They also give examples of crew members with very poor English.

According to the seafarers that they interviewed, the main drawback of mixed nationality crews was communication difficulties. These difficulties affect several aspects of life aboard the ships. Kahveci & Sampson (2001) stress for instance the importance of good communication skills in order to avoid unintended offence, engaging in humour, avoiding social isolation and so forth.

Moreover, they also found that miscommunication may have serious consequences for safety, and give examples to illustrate this, stressing that fluency in a common language underpins almost all social interaction on board multinational vessels, and increases the likelihood of the vessels operating as successful units.

In emergency situations with high cognitive demands it will be difficult to communicate effectively and coherently in a second language (Hetherington, Flin, & Mearns, 2006). Thus we may question the extent to which ratings, officers and harbour personnel in such crews can develop the common shared understanding required to meet the IMOs demand for an effective safety culture on board in which all seafarers "do the right thing at the right time in response to normal and emergency situations". The importance of language as a risk factor is uncertain, and we need more research on this.

5.2 Results from the interviews

We asked the interviewees whether they have the impression that different mother tongues and poor English speaking skills among crew have consequences for safety on vessels in Norwegian waters.

Interviewees stated that this is likely to be a risk factor. It is important that you have a language in which everyone can communicate well, and which everyone is comfortable with. It is difficult to communicate in a language that is not your mother tongue, and this may lead to misunderstandings that may be negative to safety. Moreover, one interviewee also said that people may have inhibitions against asking one extra time to check that they have a correct understanding of what the other person said. It was therefore mentioned that measures aimed at improving the English speaking skills of foreign crew members may be a good way of increasing maritime safety.

When we look at international regulations there is a requirement that the vessel must have a single defined working language. Safety communication should be in this language, which everyone is supposed to understand and be able to make themselves understood in. The maritime industry is global, and thus English is often defined as a working language. The level of English skills is very individual, and it also varies according to countries and regions, depending on factors like e.g. the quality of English education in schools in a country.

Interviewees stated that communication difficulties are sometimes named as a contributing cause in accident investigations. One interviewee stated, however, that communication difficulties can also be reported as a cause in accidents involving only Norwegian seafarers.

It was mentioned that Norwegian authorities do not have a well-developed tool for assessing the level of language skills in foreign crews. Inspectors use their English skills to initiate communication, and they then make a judgement about the language ability of the crew member.

As mentioned, one reference group member stated that research indicates that the composition of different national groups on board have important ramifications for safety culture. It seems that safety culture is better on vessels with crew members from one nationality instead of two nationalities, as a polarization between national groups may arise in the latter case.

5.3 Results from the small-scale survey

We asked respondents: "How many different nationalities work on board your vessel?" Figure 5.1 shows the mixture of nationalities reported by seafarers working on NOR and FOC vessels.

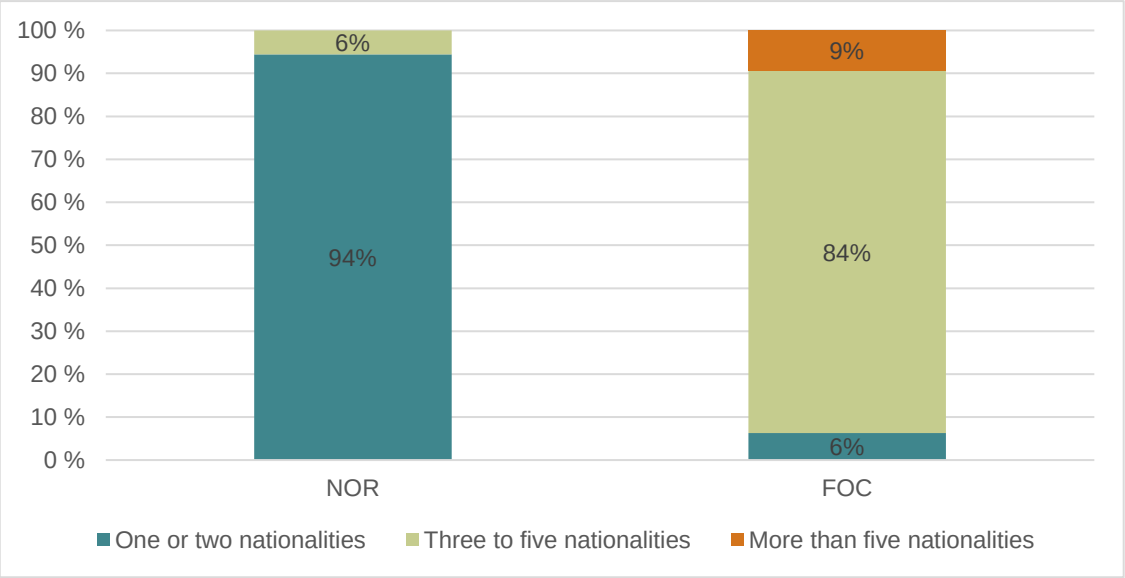


Figure 5.1: Mixture of nationalities reported by seafarers. NOR *(N=180) and Flag of convenience (N=32).*

Figure 5.1 indicates a far greater national diversity reported by seafarers working on board FOC vessels than NOR vessels. The numbers for the seafarers from NIS vessels are fairly similar to those of FOC vessels with two respondents reporting of one or two nationalities, seven reporting of three to five nationalities and one reporting of more than five nationalities.

In Figure 5.2 we present results for respondents' answer to the question "Approximately how many of your colleagues have a nationality that is different to yours?"

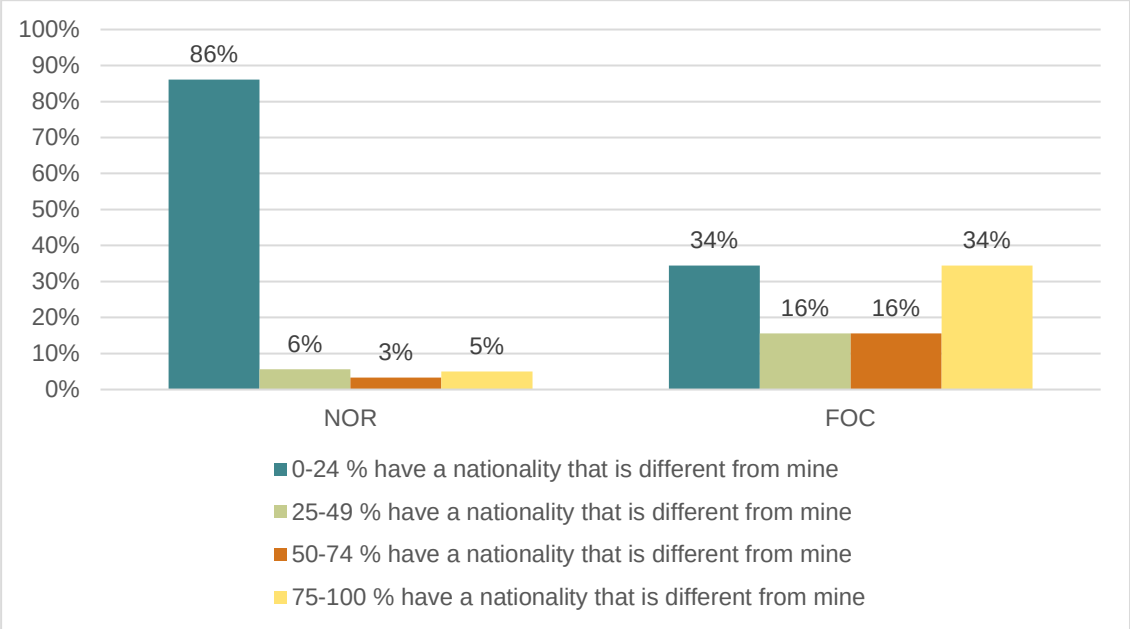


Figure 5.2: Respondents' answer to the question "Approximately how many of your colleagues have a nationality that is different to yours?". NOR (N=180), Flag of convenience (N=32).

Figure 5.2 indicates that respondents on board NOR vessels largely work with people of their own nationality, while half of the respondents on board FOC vessels experience that at least half of their colleagues have a different nationality than their own. A Chi square test shows that these differences are statistically significant at the 1 %-level (P<0.001).

This is also reflected in the working languages used on board NOR and FOC registered vessels. Respondents working on board the FOC vessels all report that English is the working language on board, while only 13 % of the respondents on board NOR vessels report English to be their working language. Eight of the ten respondents on board the NIS vessels report that English is the working language on board.

We asked respondents whether they have experienced language misunderstandings between different nationalities on board (Figure 5.3). We compare NOR vessels with FOC/NIS vessels in these analyses, as the latter registries have large shares of foreign employees and largely English as the working language on board.

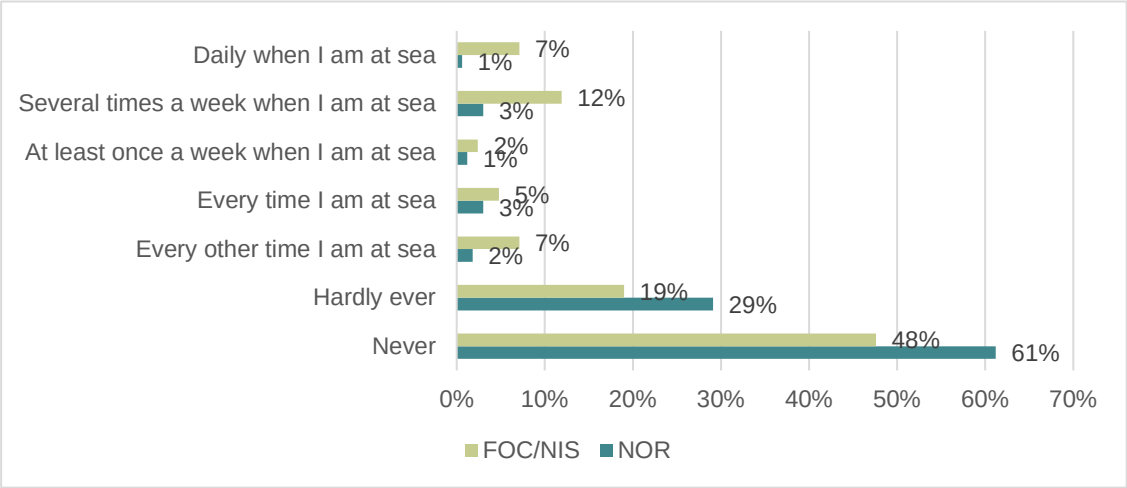


Figure 5.3: Respondents answers to the question: "Have you experienced language misunderstandings between different nationalities on board?" NOR (N=165), FOC/NIS (N=42).

Figure 5.3 indicates that respondents working on board FOC/NIS vessels experience more language misunderstandings, than the seafarers on board NOR vessels in our sample. A Chi square test indicates that the differences are statistically significant at the 1 %-level.

We also asked respondents whether they have experienced unsafe situations due to language misunderstandings between different nationalities on board (Figure 5.4).

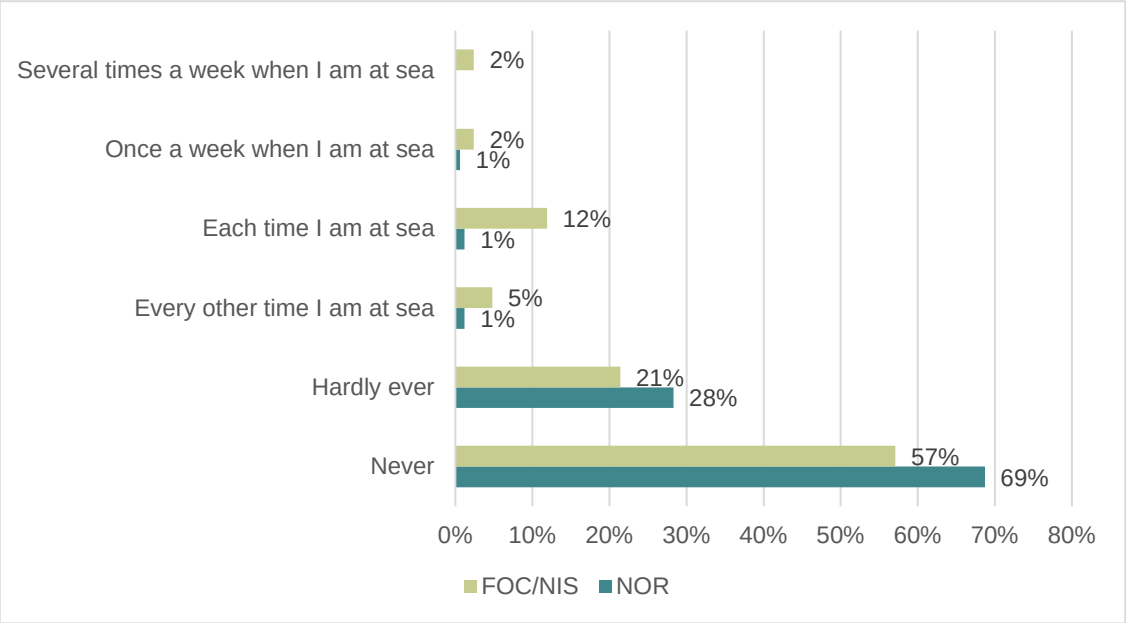


Figure 5.4: Respondents answers to the question: "Have you experienced unsafe situations because of language misunderstandings between different nationalities on board?" NOR (N=166), FOC/NIS (N=42).

Figure 5.4 indicates that respondents working on board FOC/NIS vessels experience more unsafe situations due to language misunderstandings, than the seafarers on board NOR vessels in our sample. A Chi square test indicates that the differences are statistically significant at the 1 %-level.

We also asked respondents whether they have experienced unsafe situations due to "cultural differences" between different nationalities on board (Figure 5.5).

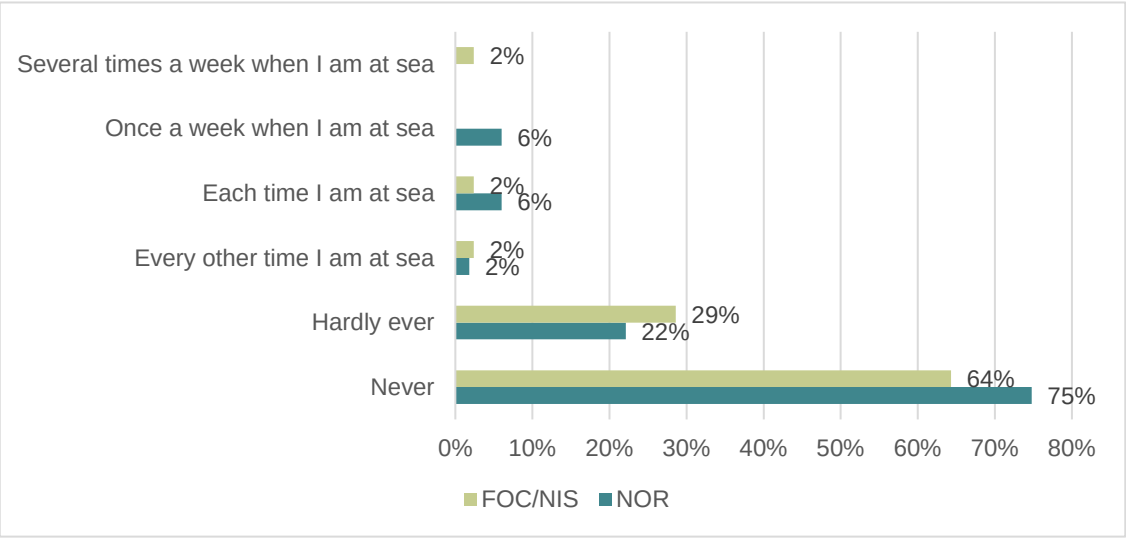


Figure 5.5: Respondents answers to the question: "Have you experienced unsafe situations because of "cultural differences" between different nationalities on board?" NOR (N=163), FOC/NIS (N=42).

It is hard to interpret the results of Figure 5.5. Results are inconclusive, the differences are not statistically significant.

In Table 5.1 below, we compare mean scores for different groups on the variable: "Have you experienced unsafe situations because of language misunderstandings between different nationalities on board?". The minimum value is 1 (Never) and the maximum value is 6 (Several times a week when I am at sea). The mean value is 1.5.

Table 5.1: Means on the variable: "Have you experienced unsafe situations because of language misunderstandings between different nationalities on board?". The minimum value is 1 (Never) and the maximum value is 6 (Several times a week when I am at sea).

Value	Age group	Vessel type	Position/line of work	Manning level	Nationality	Register	Share of coll. with diff. nat.	Org. safety culture
1 Score	Younger than 31 years	Bulk	Captain	1-2 people	Norwegian	NOR	0-24 % different	18-69
	1.6	1.5	1.6	-	1.4	1.4	1.3	1.9
2 Score	31-40	General cargo	Deck personnel	3-4 people	Other Nordic:	NIS	25-49 % different	70-75
	1.5	1.5	1.4	1.7	1.9	3.1	1.6	1.7
3 Score	41-50	Tank vessel	Engine personnel	5-6 people	Central Eastern EU/Asian	FOC	50-74 % different	76-80
	1.4	1.9	1.4	1.4	1.4	1.5	1.9	1.7
4 Score	51-60	Well vessel	Other	7-8 people	-	-	75-100 % different	81-85
	1.3	1.2	1.4	1.5	-	-	2.1	1.3
5 Score	Older than 60 years	Other	-	9-10 people	-	-	-	86-90
	1.7	1.9	-	1.5	-	-	-	1.3
6 Score	-	-	-	11-12 people	-	-	-	-
	-	-	-	-	-	-	-	-
P value	.326	.006	.416	.755	.089	.001	<.001	<.001

Table 5.1 indicates significant differences between vessel types, nationality, register, share of crew with different nationality than "yourself" and organisational safety culture.

5.3.1 Which factors predict respondents' experiences of unsafe situations because of language misunderstanding?

In Table 5.2 we show results from a hierarchical, linear regression analysis, where independent variables are included to examine factors predicting respondents' answer to the question: "Have you experienced unsafe situations because of language misunderstandings between different nationalities on board?". The minimum value is 1 (Never) and the maximum value is 6 (Several times a week when I am at sea). The mean value is 1.5.

Table 5.2: Linear. Dependent variable: "Have you experienced unsafe situations because of language misunderstandings between different nationalities on board?". The minimum value is 1 (Never) and the maximum value is 6 (Several times a week when I am at sea). The mean value is 1.5. Standardized beta coefficients.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Age group	-.078	-.081	-.122*	-.124*	-.123*	-.146**	-.102	-.138**
Vessel type (Other=1, Tank vessel=2)		.089	.081	.088	.088	.030	.022	.031
Position (Other=1, Captain=2)			.135*	.142*	.140*	.061	.064	.043
Manning level				.034	.041	-.217**	-.163*	-.150*
Nationality (Norwegian/Nordic=1 Central Eastern European/Asian=2)					-.013	-.341***	-.250***	-.232***
Register (NOR=1, FOC/NIS=2)						.648***	.584***	.442***
Org. safety culture							-.248***	-.239***
Share of colleagues with different nationality								.252***
Adjusted R^2	.001	.004	.016	.012	.007	.180	.229	.273

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

First, we see that respondents' age contributes significantly and negatively to their answers on the question: Have you experienced unsafe situations because of language misunderstandings between different nationalities on board?". This indicates that, controlled for the other variables the older respondents are, the less likely they are to have experienced unsafe situations because of language misunderstandings.

Second, we see that vessels' manning level contributes significantly (at the 10 %-level) and negatively, indicating that for each increased value on the manning level variable, the value on the unsafe situations because of language misunderstandings decrease with .150 points.

Third, we see that register contributes significantly (at the 1 %-level) and positively, indicating that, controlled for the other variables, respondents on FOC/NIS vessels have .442 points higher score on the unsafe situations because of language misunderstandings variable. This is the most important predictor of unsafe situations because of language misunderstandings among the respondents.

Fourth, we see as expected that the share of colleagues with different nationalities contributes significantly and positively to the dependent variable. This indicates that, controlled for the other variables, the higher shares of colleagues with different nationalities that respondents have, the more unsafe situations because of language misunderstandings they experience. This is the second most important predictor.

Interestingly, we see in Step 8 that the contribution of register remains significant and considerable, when we take in the share of colleagues with different nationalities on board. Although we have seen that the number of nationalities are higher on board NIS and FOC vessel, this variable concerns the share of crew members with different nationality than the respondents, and not the actual number on nationalities on board the ships. It is important to note, however, that these variables are related.

Fifth, we see that nationality contributes significantly (at the 1 %-level) and negatively. This indicates that Central Eastern European/Asian respondents have .232 points lower score than Norwegian/Nordic respondents on the unsafe situations because of language misunderstandings variable, controlled for the other variables in the model.

Finally, in Step 8, we see that the third most important predictor of respondents' answers to the question "Have you experienced unsafe situations because of language misunderstandings between different nationalities on board?" is organisational safety culture. This variable contributes significantly and positively at the 1 %-level. For each increased vale on the organisational safety culture variable, the score on the unsafe situations because of language misunderstandings variable decreases with .252 points. Thus, good organisational safety culture seem to reduce respondents experience of unsafe situations because of language misunderstandings.

The Adjusted R^2 value is .273 indicating that the variables in the model explains about 27 % of the variation in the dependent variable. Most of this is explained by the organisational safety culture variable, register and the share of crew members with a different nationality than yourself.

5.3.2 Correlations between unsafe situations because of language misunderstandings and other safety outcomes

The variable "Unsafe situations because of language misunderstandings" is a safety outcome in itself, as it refers to "unsafe situations". Respondents' definitions of "unsafe" may however vary, and it is therefore interesting to examine the relationship between this variable and other safety outcomes. In Table 5.3 we examine bivariate Pearson correlations between unsafe situations because of language misunderstandings and other safety outcomes.

Table 5.3: Bivariate Pearson correlations between unsafe situations because of language misunderstandings and other safety outcomes.

Variables	Pearson's R	P-value
Has the vessel been involved in a shipping accident (e.g. grounding, collision, contact injury, fire) in the two last years? (1-2) (Captains)	.204	.136
All in all, how do you assess the safety of your work place situation? (1-10)	-.323	<.001

Table 5.3 does not indicate a significant relationship between unsafe situations because of language misunderstandings and shipping accidents. The table does however indicate a significant relationship between unsafe situations because of language misunderstandings and respondents' assessment of the safety of their work place. This variable measures "risk perception". Thus, we may conclude that unsafe situations because of language misunderstandings is correlated to perception of risk on board but not accident involvement.

5.4 Summing up

The literature review indicates that the main drawback of mixed nationality crews is communication difficulties. These difficulties affect several aspects of life aboard the ships. Good communication skills are needed to promote a shared implicit understanding among the crew, avoid unintended offence, avoid social isolation and so forth. More importantly, they are needed to prevent miscommunication, which may have serious consequences for safety. In emergency situations with high cognitive demands it will be difficult to

communicate effectively and coherently in a second language. Interviewees also said that communication difficulties has been assigned as a contributing cause in several accident investigations, although this also applies to accidents on vessels with predominantly Norwegian seafarers.

The small-scale survey indicates a far greater national diversity reported by seafarers working on board FOC vessels than NOR vessels, and half of the respondents on board FOC vessels experience that at least half of their colleagues have a different nationality than their own. Respondents working on board the FOC vessels all report that English is the working language on board, while 13 % of the NOR respondents do.

Results indicate that respondents working on board FOC/NIS vessels experience more language misunderstandings, including more unsafe situations due to language misunderstandings. We conducted analyses to examine the factors influencing respondents experiences of unsafe situations due to language misunderstandings.

Results show that register was the strongest predictor. Respondents working on board FOC/NIS vessels were more inclined to experience unsafe situations because of language misunderstandings than NOR respondents.

Our analyses also showed that the second strongest predictor of experiencing unsafe situations because of language misunderstandings was the share of colleagues with different nationalities. The third most important predictor was organisational safety culture, indicating that good organisational safety culture facilitates good and safe communication.

Finally, bivariate correlation analyses did not find a significant correlation between experience of unsafe situations because of language misunderstandings and shipping accidents. We found a significant relationship between unsafe situations because of language misunderstandings and respondents' assessment of the safety of their work place.

6 Working conditions and fatigue

In this Chapter we explore whether differences in working conditions and fatigue levels among crew on NOR registered vessels versus FOC vessels might have implications for safety. We do this by literature review, expert consultation and a small-scale survey of seafarers.

6.1 Results from the literature review

6.1.1 Working conditions and fatigue in international sea transport

Alderton and Winchester (2002) found that seafarers from the lowest FLASCI scoring flag states (i.e. the new FOCs) had the highest shares of seafarers who were dissatisfied with:

1) Work-loads and working hours.
2) Time for sleep/rest, shore leave, tour lengths.
3) Stress levels.
4) Pay levels, job security, morale generally, support/help with problems.
5) Unfair treatment because of their race, physical abuse from officers, mental abuse.

Alderton and Winchester exemplify how technological changes, e.g. containerization have reduced port turnaround times. While the average port turnaround time in 1970 was 138 hours, it was 23 hours in 1998 (Alderton & Winchester 2002: 37). Additionally, there has been a considerable decrease in manning levels from 1970 to the 1990's, from an average of 40-50 per ship to an average of 20-30. They state that these changes have intensified work and increased stress levels among seafarers aboard vessels, especially among those seafarers from developing countries.

Phillips, Nævestad and Bjørnskau (2015) review the research literature and interview experts to examine fatigue among watch keepers at sea, and among transport operators in road and rail transport. They conclude that data on Norwegian accidents and incidents confirms that fatigue is an important safety risk in the maritime sector, but that we nevertheless lack quantitative data on the prevalence of fatigue among Norwegian operators. They also conclude that the causes of operator fatigue in Norway are rooted in framework, organisational and working conditions, as well as individual characteristics and life outside of work (Phillips et al 2015; cf. Phillips 2015, 2014a-b).

Seafarers share several important work characteristics influencing fatigue, for instance long working hours, sleep disturbances due to for instance motion and noise, and night work (Lützhöft, M., Thorslund, B., Kircher, A., & Gillberg, M. 2007; Allen et al., 2008). Moreover, evidence is accumulating from international studies that fatigue is a problem for many watch keepers at sea. The Bridge Watch keeping Study of the Marine Accident Investigation Branch (MAIB) concludes a third of all the groundings involved a fatigued officer alone on the bridge at night (MAIB 2004).

6.1.2 Working conditions and fatigue in Norwegian short sea cargo

Størkersen et al (2011) list three examples of underlying factors contributing to fatigue, workload and alienation aboard short sea cargo vessels sailing along the coast of Norway.

The first is "the administrative burden", which to some extent is dealt with in both rest and sailing periods. This is primarily a problem experienced by the largely (Norwegian) leading officers aboard, and may thus explain why foreign crew members were less critical to the manning levels (the administrative burden is seen by many as having increased as manning levels have reduced).

The second is "de-skilling of the crew" meaning that traditional seamanship skills, although still essential, have lost ground to skills related to IT, technology and law.

The third factor is "sleeping rules", meaning that some rules are followed while others are ignored. Størkersen et al (2011) conclude that fatigue, substantial workload and alienation could increase the probability of operational errors.

According to Størkersen et al (2011) these three underlying factors can be related to the extent of work tasks additional to navigation and sailing, seafarers' perception of the rationale of their tasks, crew size (numbers of navigators, engine crew, sailors), shipping company size, the frequency of (un)loading operations, staff size and equipment on terminals, the contracts of the seafarers, distribution of pilot exemption certificate among navigators, and flag state (i.e. which rules and regulations that apply for ship and personnel).

Størkersen et al found that the Norwegian seafarers in the study were concerned about the existence of different rules concerning manning levels and work periods applying to vessels and crews with different flags in Norwegian waters. They suggested that the different sets of rules may be detrimental to safety. The reason they gave was that when different rules coexist, the rules in general may be viewed as less legitimate.

As foreign seafarers, especially ratings, work for substantially longer work periods, we would think that the high workload aboard the ships will be experienced more acutely by them, and perhaps also as more threatening to safety. However, Størkersen et al found that the foreign groups in the study tended to agree slightly more than the Norwegian crews on the statement "Manning aboard is sufficient to ensure that safety is maintained", although the differences were only statistically significant at the 10 % level (cf. Chapter 6).

Størkersen et al's (2011) report on Norwegian short sea cargo found that tour lengths for foreign crew members were substantially longer than for the Norwegian crew members. Norwegian crew members on Norwegian ships were usually aboard for about four weeks. On the foreign registered ships in their study, officers were aboard for about eight weeks, while other (foreign) crew members were aboard for four to six months at a time. Moreover, they report that on some vessels, it was not unusual that a four months' work period actually lasted for five months, without extra pay for the additional month. Crew members often talked about the accumulation of fatigue during their work periods and foreign crew members were generally more dissatisfied with fatigue. They asserted that their lack of rest was due to small crews and too much work.

It is not surprising that these very different work period lengths between the national groups result in different levels of fatigue, with negative implications for safety. Størkersen et al included several questions on fatigue in their survey, for instance:

1) The mandatory rest period is always met by the bridge personnel on board.
2) The mandatory rest period is always met by personnel on deck on board.
3) The mandatory rest period is always met by the cook.
4) The mandatory rest period is always met by personnel in the engine room.

Results from Størkersen's survey were inconclusive on these questions: the second foreign group scored lower than the Norwegian group, while the first foreign group scored higher on some questions. The same tendencies were evident in respondents' reports of sleep and rest aboard (Størkersen et al 2011: 87-88). However, the numbers in the study were small.

Both foreign groups in Størkersen et al's study stated that they on average (nearly) "agree somewhat" that they are "so tired during working hours that safety is compromised" (3.8 and 3.6 points). The Norwegian crew group disagreed with this statement on average (1.4 points). The relatively similar scores for the two foreign groups (in contrast to the Norwegian) are surprising, given that the first foreign group was fairly in line with the Norwegian group when stating that mandatory rest periods by and large were met by different groups aboard.

6.2 Results from the interviews

6.2.1 Different tour lengths and fatigue

We asked interviewees whether fatigue is an important risk factor. The answer was that weariness and fatigue clearly are problems at sea. Most people care about working within certain limits each day. If you work for 12 – 13 hours a day for several weeks, it starts getting worrisome. We can all handle a hard session for two or three days, but after a long session, you are less alert. Unfortunately we have no good tool to regulate that within our regulations, one interviewee said, i,e, the regulations only stipulate a minimum daily rest of 10 hours –there are no limits as to how long you can stay on board over time.

According to interviewees, the lengths of periods spent on board (tour lengths) and periods spent at home are different for Norwegian and foreign seafarers, based on the different types of vessels that they work on and the kind of transports that the vessels are involved in. The arrangements are generally regulated by the costs of the shipping companies related to seafarers' home journeys and paid leave. While Norwegian seafarers are paid the same wage when they are at home as they are when they are on board, but Filipino seafarers are for instance paid half of their on-board-wage in the periods they are at home.

We asked interviewees about the tour lengths of the Norwegian and foreign seafarers, including potential consequences for safety. Most of the interviewees stated that the foreign seafarers stay on board the vessels for longer periods than the Norwegian seafarers do. This is not just caused by the fact that it is more expensive for shipping companies to pay for foreign seafarers' travels to and from their home country. One interviewee also stated that foreign seafarers are more inclined to stay longer on board when they are offered it, in order to earn more money.

We also asked interviewees whether they believed that foreign seafarers are more fatigued than Norwegian seafarers because they stay on board for longer periods. Interviewees gave different answers. One interviewee suggested that fatigue not is as big a problem for Norwegian seafarers as it is for foreigners, because the latter stay for longer periods on board. The Norwegian seafarers are on board for 4-6 weeks, maybe 8. Eastern Europeans and Asians on the other hand, are on board for 6 and maybe 9 months, and then fatigue becomes a problem, one interviewee stated. Another interviewee disagreed with this, and

said that research finds no negative fatigue effects of long periods at the sea. He said however, that the social aspect of it; being away from friends and family, makes being on board for six months problematic. According to the Maritime labour convention, seafarers shall have a vacation after 12 months on board. Thus they can maximum stay on board for 12 months.

6.2.2 The importance of the watch system for fatigue

One interviewee suggested that the partitioning of the day into work and rest hours is what creates fatigue. Even within Norway there are great variations. What creates fatigue is the accumulation of a daily rest deficit. That usually happens with the 6-6 system, where you only get 4 hours of rest during each off-duty period.

Another interviewee suggested that the type of transport that the vessel is involved in is more important than the length of work periods. The number of port calls is a key variable in this respect, and whether crew members are given the opportunity to rest regularly in order to recover after work. If crew members have stressful work with few possibilities to recover, they are likely to be more fatigued after long periods on board. However, if crew members regularly are able to rest and recover it is less likely that they will be more fatigued after long periods on board, one interviewee suggested.

Finally, we also discussed potential reasons that FOC crew members may perceive port calls as more stressful than NOR crew members. It was suggested that NOR vessel may have more port calls, and that this therefore is a more normal part of crew members work day routine on these vessels. Second, it was also mentioned that these vessels tend to go to different ports, and that it is likely that FOC vessels go to larger ports with more stress and perhaps stricter time limits.

6.2.3 Manning, fatigue and workload

In the reference group meeting we concluded that flag state is a less important predictor of ship accident risk than other causes. We therefore finished the reference group meeting by inviting each member to mention what he or she considers to be the most important explanations to variation in accident risk between ships sailing in Norwegian waters.

Some of the most important factors that were mentioned were fatigue and manning levels. Smaller Norwegian ships have low manning levels, considerable work and time pressure. Reference group members stressed that these factors are more important than flag when it comes to predicting ship accident risk. The crew on the Norwegian ships have low manning levels in relation to task demands. They are therefore likely to be fatigued, which in turn increases the risk of grounding accidents.

Reference group participants pointed to the increase in the administrative burden due to an increase in the formal requirements made by authorities. They questioned the purpose of this, and proposed the implementation of measures to reduce the administrative pressure.

The increase in administrative tasks has not been followed by an increase in available time on board. Thus, crew members have more work tasks, and less time to rest. The level of manning is not adapted to the level of task demands on board. According to reference group members, manning levels are rather determined by economic resources, which in many cases are limited.

According to reference group members, several shipping companies see that the answer to this is to flag out their vessels, as the wage costs of foreign crew members may be about 15 % of the wage costs of Norwegian crew members.

We asked interviewees whether there is a clear connection between manning level and safety. One interviewee said that you cannot categorically say that safety on board increases with the number of people, for example, if there are too many people, they have too little to do and do not remain alert. However, with too few people on board there is a risk in and of itself. So you need to find optimal manning levels.

Fatigue is mentioned in several accident reports, for instance describing people falling asleep on the bridge and then running aground. Fatigue is however hard to document in accident analyses. One interviewee stated that authorities cannot claim that vessels cheat with rest period lists, but that they know that people on board often work more than the rest period lists claim.

6.3 Results from the small-scale survey

6.3.1 Watch schedules and sailing periods

Respondents were asked what kind of watch schedules they have while in regular operations (Figure 7.1).

Figure 7.1 indicates that the 6-6 watch schedules is the most prevalent watch system among our respondents from all positions and lines of work on board, especially among captains. An Anova test of variance indicates that the differences are statistically significant at the 1 %-level.

Respondents were also asked how many weeks they spend on the vessels in their working periods, and how many weeks they spend off their vessels in their leisure time (Figure 7.2).

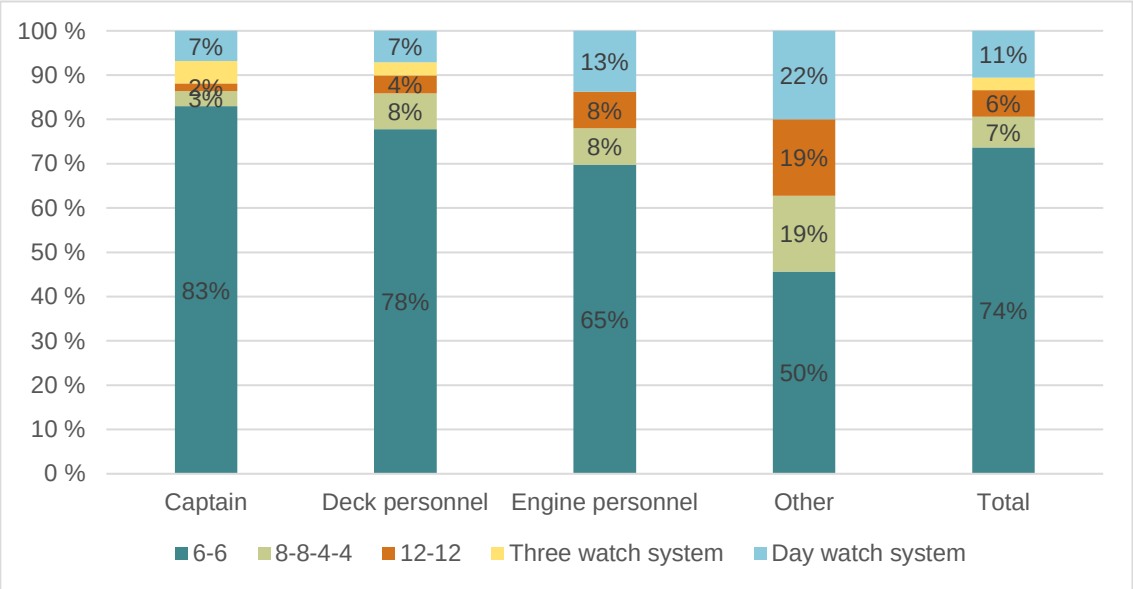


Figure 7.1: Distribution of respondents answers to the question: "What kind of watch schedule do you have while in regular operations?" Captain (N=59), Deck personnel (N=99), Engine personnel (N=26), Other (N=32), Total (N=216).

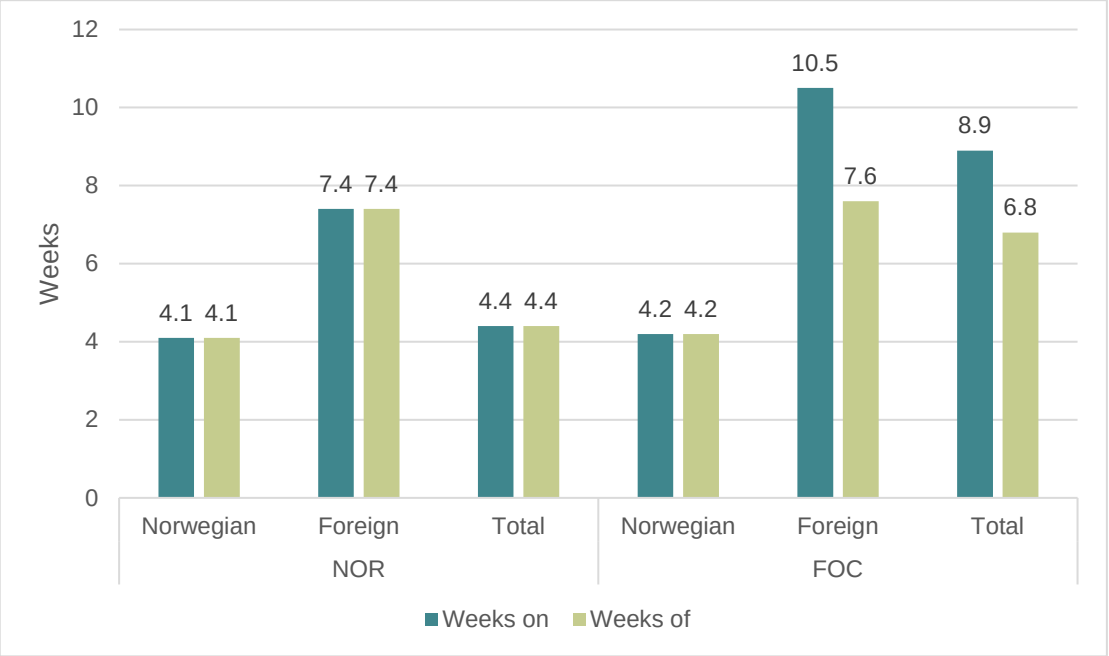


Figure 7.2: Means for weeks spent on vessels in working periods, and weeks spent off vessels in leisure time. Norwegian seafarers (N=168) and foreign seafarers (N=29) on board NOR and FOC vessels. An Anova test of variance indicates that the differences are statistically significant at the 1 %-level.

We see that foreign seafarers generally and especially on board FOC vessels have tours of duty that are significantly longer than those of Norwegian seafarers.

When we compare means for positions/line of work, we especially see considerable differences between deck officers (4.4 weeks for NOR vs 14 weeks for FOC) and deck crew (4.2 weeks for NOR vs. 7.4 weeks for FOC) when we compare NOR and FOC vessels. In this case the differences were not significant.

6.3.2 Rest on board

Respondents were asked to indicate their level of agreement to the following statement: "I get sufficient sleep and rest on board." Table 7.1 compares mean score for different groups on this question. The average score is 4.2.

Table 7.1: Means on the variable "I get sufficient sleep and rest on board". The minimum value is 1 (totally disagree) and the maximum value is 5 (totally agree).

	Age group	Vessel type	Position/line of work	Port calls per week	Manning level	Nationality	Register	Weeks on
1	Younger than 31 years	Bulk	Captain	1-3	1-2 people	Norwegian	NOR	1-3
	4.1	4.2	4.2	4.2	-	4.1	4.2	4.1
2	31-40	General cargo	Deck personnel	4-6	3-4 people	Other Nordic:	NIS	4-6
	4.1	4.2	4.2	4.5	3.8	4.3	3.4	4.1
3	41-50	Tank vessel	Engine personnel	7-9	5-6 people	Central Eastern EU/Asian	FOC	7-9
	4.2	3.4	4.2	4	4.1	4.6	4.6	4.8
4	51-60	Well vessel	Other	10-12	7-8 people	-	-	10-12
	4.3	4.3	4.3	4.3	4.3	-	-	-
5	Older than 60 years	Other	-	13-15	9-10 people	-	-	13-15
	4.5	4.2	-	4.2	4.6	-	-	-
6	-	-	-	>15	11-12 people	-	-	>15
	-	-	-	3.8	-	-	-	4.3
P value	.802	.373	.880	.174	.233	.109	.014	.430

When we compare means for the statement "I get sufficient sleep and rest on board", we see that the only statistically significant differences are between respondents from ships from different registries. Keeping in mind that the number for NIS vessels is very low, we see that NIS respondents get least rest and sleep and that FOC vessel respondents get most rest and sleep on board. The number of respondents in the NIS sample is too small to conclude on this.

6.3.3 Demanding working conditions index

Respondents were asked "How often do you think that the following events happen while you are at sea?":

- 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?

We made an index of responses to these question, on a 7-point scale ranging from Never = 1 to Daily when I am sea = 7, were added together to make an index of "Demanding working conditions". In Table 7.2 below, we compare mean scores for different groups on this summative index. The average score is 6.5 points on the index with scores ranging from 3 to 21.

Table 7.2: Means on the demanding working conditions index. The minimum value is 3 (never) and the maximum value is 21 (daily when I am at sea). The following answer alternatives were available to the respondents: 1) Never, 2) Hardly ever, 3) Every other time I am at sea, 4) Every time I am at sea, 5) Once a week when I am at sea, 6) Several times a week when I am at sea, 7) Daily when I am at sea, 8) Do not know/not relevant.

Value	Age group	Vessel type	Position/line of work	Port calls per week	Manning level	Nationality	Register	Org. safety culture
1	Younger than 31 years	Bulk	Captain	1-3	1-2 people	Norwegian	NOR	18-69
Score	6.4	6.1	7.5	5.8	-	6.5	6.4	9.3
2	31-40	General cargo	Deck personnel	4-6	3-4 people	Other Nordic:	NIS	70-75
Score	7.4	6.3	5.9	6.4	8.1	7.6	10.1	7.3
3	41-50	Tank vessel	Engine personnel	7-9	5-6 people	Central Eastern EU/Asian	FOC	76-80
Score	6.5	7.4	6.9	7.4	6.5	5.5	6.1	6.8
4	51-60	Well vessel	Other	10-12	7-8 people	-	-	81-85
Score	6	6.8	6.2	6.7	6.2	-	-	6.2
5	Older than 60 years	Other	-	13-15	9-10 people	-	-	86-90
Score	5.3	7	-	6.5	6	-	-	5.1
6	-	-	-	>15	11-12 people	-	-	
Score	-	-	-	6.8	-	-	-	
P value	.185	.562	.019	.574	.234	.138	.001	.000

Table 7.2 indicates significant differences between respondents with different positions/lines of work, different ship registries and between respondents with different scores on the organisational safety culture variable. Results indicate that captains, respondents working on board NIS vessels, and respondents with low organisational safety culture scores experience the most demanding working conditions. The number of respondents in the NIS sample is too small to conclude on this.

6.3.4 Which factors predict demanding working conditions?

In Table 7.3 we show results from a hierarchical linear regression analysis, where independent variables are included to examine respondents' demanding working conditions. The dependent variable varies between 3 (never) and 21 (daily when I am at sea).

Table 7.3: Linear regression. Dependent variable: demanding working conditions index. The dependent variable varies between 3 (never) and 21 (daily when I am at sea). See Table 7.2 for response scale.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Age group	-.130*	-.132*	-.218***	-.214***	-.204***	-.206***	-.209***	-.143**
Vessel type (Other=1, Tank vessel=2)		.047	.068	.065	.037	.036	.021	.010
Position (Captain=1, Other=2)			-.288***	-.281***	-.262***	-.264***	-.241***	-.259***
Port calls				.027	.008	.016	-.006	-.060
Manning level					-.124*	-.140*	-.234**	-.158*
Nationality Norwegian/Nordic=1 Central Eastern European/Asian=2)						.036	-.129	-.007
Register (NOR=1, FOC=2)							.249*	.188
Org. safety culture								-.412***
Adjusted R2	.012	.009	.007	.080	.076	.085	.091	.233

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

First, we see that respondents' age contributes significantly and negatively to their responses on the demanding working conditions index. This indicates that, controlled for the other variables in the model, for each value on the age group variable, the value on the index decreases with .143 points.

Second, we see that that respondents' positions/lines of work contributes significantly and negatively to their responses on the demanding working conditions index. This indicates that, controlled for the other variables in the model, being a captain makes you more prone to experience demanding working conditions

Third, not surprisingly, we see that manning levels contribute significantly and negatively to their responses on demanding working conditions index. This means that for each value on the manning levels variable, the value on the index decreases with .158 points, controlled for the other variables in the model,

Fourth, in Step 7, we see that Register contributes positively, but only at the 10 % level, indicating that FOC vessel respondents experiences of demanding working conditions. This variable ceases to contribute significantly in Step 8, when we take in organisational safety culture.

Finally, we see in Step 8 that the most important predictor of respondents' experiences of demanding working conditions is organisational safety culture. This variable contributes significantly and positively at the 1 %-level.

Moreover, when organisational safety culture was taken into the analysis in Step 8, the Adjusted R^2 value rose to .233 indicating that the variables in the model explains about 23 % of the variation in the dependent variable. The majority of this is explained by the organisational safety culture variable, as the Adjusted R^2 value in Step 7 was .091.

6.3.5 Safety-compromising fatigue

Respondents were asked: "Sometimes I am so tired during working hours that safety is compromised". In Table 7.4 we compare mean score for different groups on this variable.

Table 7.4: Means on the variable "Sometimes I am so tired during working hours that safety is compromised" The minimum value is 1 (totally disagree) and the maximum value is 5 (totally agree). The minimum value is 1 (totally disagree) and the maximum value is 5 (totally agree).

Value	Age group	Vessel type	Position/line of work	Port calls per week	Manning level	Nationality	Register	Weeks on
1	Younger than 31 years	Bulk	Captain	1-3	1-2 people	Norwegian	NOR	1-3
Score	2.2	1.9	2	2	-	2.1	2	2.2
2	31-40	General cargo	Deck personnel	4-6	3-4 people	Other Nordic:	NIS	4-6
Score	2.5	2.3	2.3	1.9	2.3	2.1	2.2	2
3	41-50	Tank vessel	Engine personnel	7-9	5-6 people	Central Eastern EU/Asian	FOC	7-9
Score	2	2.9	2.1	2.2	2	2.3	2.4	2.9
4	51-60	Well vessel	Other	10-12	7-8 people	-	-	10-12
Score	2	2	1.7	2.3	2.1	-	-	-
5	Older than 60 years	Other	-	13-15	9-10 people	-	-	13-15
Score	1.2	2	-	1.8	2	-	-	-
6	-	-	-	>15	11-12 people	-	-	>15
Score	-	-	-	2.4	-	-	-	1.4
P value	.016	.167	.076	.313	.666	.706	.321	.125

Table 7.4 indicates significant differences between age groups and positions/line of work when it comes to safety-compromising fatigue. Older seafarers are less tired than young. Deck personnel are more tired than others. It also seems that tank vessel personnel and FOC personnel are more tired than NOR personnel and that seafarers working 7-9 weeks on are more tired than those working less weeks on. The result for those working more than 15 weeks on is difficult to explain.

6.3.6 Which factors predict safety-compromising fatigue?

In Table 7.5 we show results from a hierarchical, linear regression analysis, where independent variables are included to examine factors predicting respondents' safety-compromising fatigue.

Table 7.5: Linear. Dependent variable: "Sometimes I am so tired during working hours that safety is compromised". The dependent variable varies between 1 (totally disagree) and 5(totally agree). Standardized beta coefficients.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Age group	-.162	-.171**	-.145**	-.138*	-.136*	-.139*	-.149**	-.146**
Vessel type (Other=1, Tank vessel=2)		.122*	.109	.104	.085	.079	.070	.078
Position (Other=1, Deck personnel=2)			.136*	.137*	.139*	.130*	.134*	.151**
Port calls				.077	.070	.093	.080	.071
Manning level					-.067	-.106	-.160*	-.161*
Nationality (Norwegian/Nordic=1 Central Eastern European/Asian=2)						.099	.015	.034
Register (NOR=1, FOC=2)							.144	.176
Weeks on								-.136*
Adjusted R2	.021	.030	.043	.044	.043	.045	.048	.059

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

First, we see that respondents' age contributes significantly and negatively to respondents' safety-compromising fatigue, indicating that the older seafarers are, the less safety-compromising fatigue they experience.

Second, we see that position/line of work contributes negatively and significantly at the 5 %-level to safety-compromising fatigue. This means that if you are deck personnel, you are more likely to be fatigued in manners that may compromise safety, when the other variables in the model are controlled for.

Third, we see that manning level contributes negatively and significantly at the 10 %-level, indicating that for each value on the manning level variable, the level of safety-compromising fatigue decreases, controlled for the other variables.

Finally the number of weeks spent on board ("weeks on") contributes negatively and significantly at the 10 %-level, indicating that for each increasing value on the "weeks on" variable, there is a slight reduction in respondents' safety-compromising fatigue. This is unexpected.

The Adjusted R^2 value in Step 8 is .059, indicating that the variables in the model explains about 6 % of the variation in the dependent variable.

6.3.7 Stress and pressure

Respondents were asked the question: "Sometimes I feel pressured to continue working, even if it is not perfectly safe" and "Unsafe situations are likely to arise when we are at dock because of stress and time pressure". These two variables were combined into a "Stress and pressure" index. In Table 7.6, we compare mean score for different groups on this variable.

Table 7.6: Means on the Stress and pressure index (comprising responses to "Sometimes I feel pressured to continue working, even if it is not perfectly safe" and "Unsafe situations are likely to arise when we are at dock because of stress and time pressure".) The minimum value on the summative index is 1 (totally disagree) and the maximum value is 10 (totally agree).

Value	Age group	Vessel type	Position/line of work	Port calls per week	Manning level	Nationality	Register	Organ. safety culture
1 Score	Younger than 31 years	Bulk	Captain	1-3	1-2 people	Norwegian	NOR	>70
	4.2	4	4.1	4.4	-	3.8	3.8	6.1
2 Score	31-40	General cargo	Deck personnel	4-6	3-4 people	Other Nordic:	NIS	70-75
	4.4	4.5	4.1	3.5	5.1	4.7	5	4.7
3 Score	41-50	Tank vessel	Engine personnel	7-9	5-6 people	Central Eastern EU/Asian	FOC	76-80
	4.3	5.6	4	3.8	3.7	4.9	4.9	4
4 Score	51-60	Well vessel	Other	10-12	7-8 people	-	-	81-85
	3.6	3.5	3.8	4.5	4.1	-	-	3.1
5 Score	Older than 60 years	Other	-	13-15	9-10 people	-	-	86-90
	3.3	3.7	-	3.4	4.3	-	-	3.3
6 Score	-	-	-	>15	11-12 people	-	-	-
	-	-	-	4.4	-	-	-	-
P value	.128	.038	.940	.158	.165	.057	.016	.000

Table 7.6 indicates significant differences between vessel types when it comes to stress and pressure, indicating the highest level of stress and pressure on board tank vessels. It also seems that Central Eastern EU/Asian seafarers perceive more stress and pressures than Norwegian seafarers, and that seafarers on board FOC and NIS vessels perceive more stress and pressure. Finally, we see an interesting relationship between stress and pressure and organisational culture: seafarers with low safety culture scores report of higher levels of stress and pressure and vice versa.

6.3.8 Which factors predict stress and pressure?

In Table 7.7 we show results from a hierarchical, linear regression analysis, where independent variables are included to examine factors predicting respondents' stress and pressure.

Table 7.7: Linear regression analysis of predictors of the dependent variable: Stress and pressure index. Standardized beta coefficients.

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Age group (1=other, 2=31-40 years)	-.113	-.122*	-.123*	-.119*	-.119	-.125*	-.140**	-.043
Vessel type (Other=1, Tank vessel =2)		.124**	.124*	.122*	.120	.105	.092	.071
Position (Other=1, Deck personnel =2)			-.006	-.004	-.004	-.035	-.026	-.044
Port calls per week				.037	.035	.097	.077	.030
Manning level					-.008	-.129	-.209**	-.105
Nationality (Norwegian/Nordic=1, Central Eastern European/Asian=2)						.264***	.122	.315***
Register (NOR=1, FOC=2)							.219*	.114
Org. safety culture								-.527***
Adjusted R2	.008	.018	.013	.010	.005	.049	.057	.287

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

First, we see that respondents' age contributes significantly and negatively to respondents' reported stress and pressure, indicating that the older seafarers are less stressed, controlled for the other variables in the model. Age does, however, not contribute significantly in Step 8, where we include organisational safety culture.

Second, vessel type contributes significantly and positively in Step 2-4. We dichotomized the vessel type variable into 1) "other vessel types" and 2) "Tank vessels" after conducting a comparison of means indicating that crews on tank vessels were more stressed and pressed. Results in Step 2-4 is in accordance with this.

Interestingly, the vessel variable ceases to be significant when we take in the manning level variable in Step 5, indicating that manning level could explain tank vessel respondents' perception of stress and pressure. We see that the manning level variable, as expected contributes negatively and significantly (at the 5 %-level) to respondents reports of stress and pressure in Step 7. This indicates that for each increasing value on the manning level variable, respondents' level of stress and pressure decreases. This variable ceases, however, to be significant in Step 8, where we include organisational safety culture.

Fourth, nationality contributes positively and significantly at the 1 %-level in Step 8, indicating that when we control for the other seven variables in the model, seafarers from Central/Eastern Europe and Asia report of higher levels of stress and pressure than Seafarers from Norway/Nordic countries. The fact that register contributes significantly and positively in Step 7 is probably an indication of the same, as the majority of the FOC respondents are seafarers from Central/Eastern Europe and Asia.

Finally, organisational safety culture is the strongest predictor of respondents reported levels of stress and pressure, contributing negatively and significantly (at the 1 %-level).

The increase in the Adjusted R^2 value in Step 8 indicates the importance of the organisational safety culture variable as a predictor of stress and pressure. The Adjusted R^2 value was 0.057 in Step 7, indicating that this model explained 5.7 % of the variance in the stress and pressure index. The value was .287 in Step 8, when organisational safety culture was included in the analysis, indicating that the model explained 28.7 % of the variance in the stress and pressure index.

6.3.9 Sailing conditions

The respondents were asked to respond to indicate their agreement with two statements about the conditions under which they sail:

- We often sail in waters with high traffic density
- The waters we sail in often have challenging weather conditions

Before we see the results, it is important to note that these statements refer to subjective concepts, "high traffic density" and "challenging weather conditions". It is possible that the interpretations of these concepts vary systematically between the groups that we compare, and we may therefore conclude that the results of these variables must be interpreted with caution.

In Table 7.8 we compare mean score for different groups on the first variable.

Table 7.8: Means on the variable: "We often sail in waters with high traffic density"
The minimum value is 1 (totally disagree) and the maximum value is 5 (totally agree). The average score is 3.7.

Value	Age group	Vessel type	Position/line of work	Nationality	Register
1	Younger than 31 years	Bulk	Captain	Norwegian	NOR
Score	3.6	3.9	3.9	3.6	3.6
2	31-40	General cargo	Deck personnel	Other Nordic:	NIS
Score	3.8	3.7	3.6	3.7	3.3
3	41-50	Tank vessel	Engine personnel	Central Eastern EU/Asian	FOC
Score	3.6	4.1	4.1	4.1	4.1
4	51-60	Well vessel	Other	-	-
Score	3.8	3.4	3.3	-	-
5	Older than 60 years	Other	-	-	-
Score	3.4	3.5	-	-	-
P value	.822	.259	.073	.239	.178

Table 7.8 indicates that the only variable with significant differences between sub groups is position/line of work. Here engine personnel have the highest score, while "other" personnel have the lowest score. Differences on this variable is however only significant at the 10 %-level.

In Table 7.9 we compare mean score for different groups on the variable: "The waters we sail in often have challenging weather conditions". The minimum value is 1 (totally disagree) and the maximum value is 5 (totally agree). The average score is 3.9 points.

Table 7.9: Means on the variable: "The waters we sail in often have challenging weather conditions" The minimum value is 1 (totally disagree) and the maximum value is 5 (totally agree).

Value	Age group	Vessel type	Position/line of work	Nationality	Register
1	Younger than 31 years	Bulk	Captain	Norwegian	NOR
Score	3.5	4.1	4.2	3.9	3.8
2	31-40	General cargo	Deck personnel	Other Nordic:	NIS
Score	4.2	4.1	3.9	3.5	4.2
3	41-50	Tank vessel	Engine personnel	Central Eastern EU/Asian	FOC
Score	4.1	4.7	4	4.4	4.5
4	51-60	Well vessel	Other	-	-
Score	4.1	3.3	3.6	-	-
5	Older than 60 years	Other	-	-	-
Score	3.8	4.5	-	-	-
P value	.017	.000	.168	.063	.015

Figure 7.9 shows that the sub groups on the variables age, vessel type, nationality and register have statistically different scores on the variable "The waters we sail in often have challenging weather conditions". Respondents between 31-40 years agree the most. Tank vessel respondents agree the most among the vessel types, with a very high score. Finally, we see that Central Eastern EU/Asian respondents and FOC respondents agree the most with the statement.

6.3.10 Dedicated watch on the bridge

Respondents were also asked "When do you have a dedicated watch on the bridge?" (Figure 6.3). Respondents could tick off several answer alternatives, and thus the bars are not mutually exclusive. Each bar represents the share of respondents who ticked off the alternative in question.

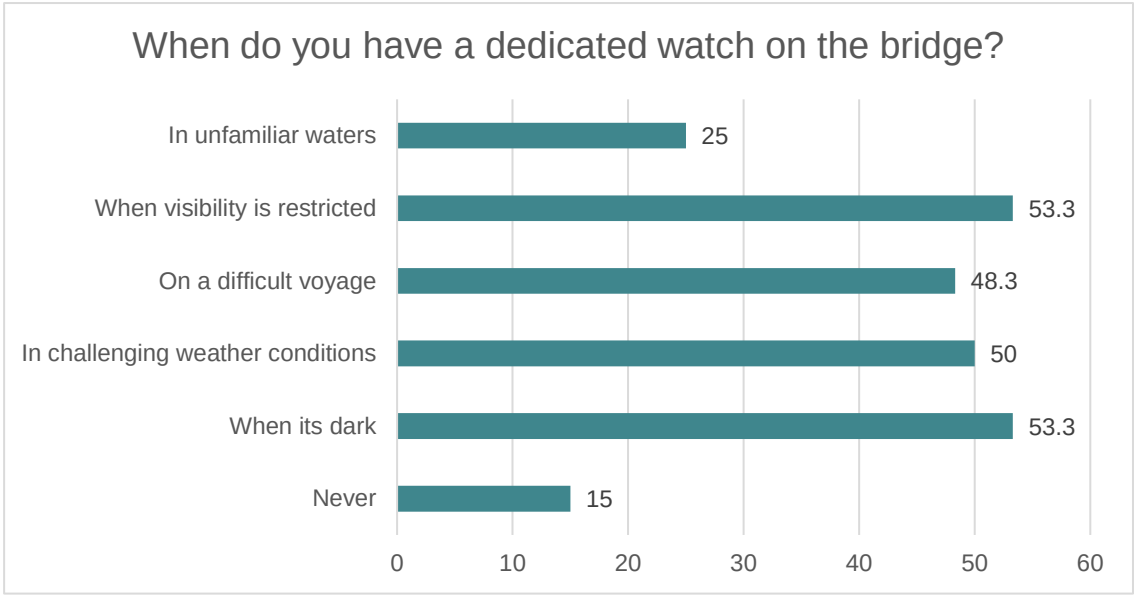


Figure 6.3: "When do you have a dedicated watch on the bridge?" Each bar represents the share of respondents who ticked off the alternative in question. Per cent. Captains (N=60).

We see that 15 % of the respondents answered never. As this is a dichotomous variable, we have conducted a logistic regression to examine the factors which predict this outcome (i.e. "never"). Table 6.2 presents the results. Odds ratios (exp (B)) are presented and they indicate the risk, or the odds, of never having a dedicated watch on the bridge when the independent variable increases with one value, when the effect of the other independent variables in the step is controlled for. The units in the analysis are the captains in our sample, and thereby also individual ships.

Table 6.2: Logistic regression. Dependent variable: "We never have a dedicated watch on the bridge" (dichotomized: 0=never , 1=Other value) Units in the analysis are captains/ ships (N=60). Odds ratios (exp (B))

Variables	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Vessel age	.914	.810	.814	.768	.760	.735
Vessel size		7.512**	.5.572**	26.914**	31.824**	32.207**
Vessel type (Well/bulk vessel=0, Other= 1)			.369	.639	.787	.809
Manning level				.535	.508	.528
Port calls					.768	.759
Register (FOC=0, NOR=1)						1.416
Vessel age						
Nagelkerke R^2	.008	.214	.250	.323	.348	.349

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

Table 6.2 shows that vessel size has a high positive value, especially when manning level is taken into the analysis in Step 4. This means that the larger the ships are the more likely they are to have a dedicated watch on the bridge, controlled for the other variables in the model. The effect of this variable is significant at the 5 % level.

The vessel type variable was dichotomized, when we saw that well vessel (30 %) and bulk vessels (31 %) had high shares who answered that they never had a dedicated watch on the bridge.

The Nagelkerke R^2 indicates the amount of variance in the dependent variable that is explained by the independent variables in the models. In step 6 the Nagelkerke R^2 is 0.349 which indicates that the independent variables explain 35 per cent of the variance in the dependent variable.

6.4 Summing up

According to the literature review, data on Norwegian accidents and incidents indicate that fatigue is an important safety risk in the maritime sector. Our analyses indicates that vessels' manning levels influence respondents experiences of demanding working conditions and their inclination to be fatigued in manners that may compromise safety.

Reference group members stressed that fatigue and manning level are among the most important factors influencing maritime safety in Norwegian waters. They suggested that the small Norwegian vessels sailing along the coast of Norway have low manning level, considerable work and time pressure. They also suggested that these working conditions may lead to fatigue and groundings.

Respondents were asked the question: "Sometimes I am so tired during working hours that safety is compromised". We found that deck workers were more inclined to experience safety-compromising fatigue, while older seafarers, seafarers on vessels with higher manning level and seafarers who spend longer periods on board were less inclined to report about safety-compromising fatigue. Neither registry, nor nationality influenced safety-compromising fatigue.

We made a "Work pressure and stress" index of the perceived work pressure variable, and the variable "Unsafe situations are likely to arise when we are at dock because of stress and time pressure". Analyses indicate that seafarers from Central/Eastern Europe and Asia report of higher levels of stress and pressure than seafarers from Norway/Nordic countries. Organisational safety culture was the strongest predictor of respondents' reported levels of stress and pressure, indicating that good safety culture reduces stress and press.

7 Rules, implementation and enforcement

7.1 Results from the literature review

7.1.1 International Maritime Organisation (IMO) and ILO[6]

The United Nations has two agencies that are key to developing international regulations applying to the maritime sector: the International Maritime Organisation (IMO) and the International Labour Organisation (ILO). IMO is the United Nations' specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution from ships. IMO measures cover all aspects of international shipping, including ship design, construction, equipment, manning level, operation and disposal. IMO had per December 2015 a total of 171 member states, and it develops regulations applying to safety, the environment, technical co-operation, legal issues and security. The most important IMO Conventions are:

- International Convention for the Safety of Life at Sea (SOLAS) – which covers safety at sea. The SOLAS convention is the most important treaty regulating safety for merchant ships, dealing with the seaworthiness of vessels, defining standards for fire safety measures, carriage of navigational equipment, the construction of ships and lifesaving appliances (Zwinge 2011). It is primarily the responsibility of the flag states to enforce this convention, but it can also be enforced in port state controls.
- Standards of Training, Certification and Watchkeeping Convention (STCW) – covering training and professional standards for seafarers. This convention prescribes minimum standards for crew qualification and training, e.g. requirements for certification of masters and other officers, including key principles for keeping engineering and navigational watches. The primary enforcement responsibility lays on the flag state, although port states also may control that vessels operate in accordance with the convention (Zwinge 2011).
- International Convention for the Prevention of Pollution from Ships (MARPOL) – addressing environmental concerns. This is the most important convention regarding prevention of the marine environment (Zwinge 2011).

7.1.2 International Labour Organisation (ILO)

The main aims of the ILO are to promote rights at work, encourage decent employment opportunities, enhance social protection and strengthen dialogue on work-related issues. ILO develops standards concerning working environment and workers' rights. ILO had 186 member states per December 2015, and is comprised by governments, employers and trade unions.

[6] Sources: http://www.imo.org/en/About/Pages/Default.aspx, http://www.ilo.org/global/about-the-ilo/lang--en/index.htm and http://www.itfseafarers.org/ITI-IMO-ILO.cfm

The most important agreements developed by ILO are:

- Declaration of Fundamental Rights at Work (1998) enshrines the right of workers to organise and bargain effectively, as well as freedom from discrimination
- Maritime Labour Convention (2006), which sets minimum standards to ensure satisfactory conditions of employment for the world's seafarers. It brings together and updates over 65 other ILO maritime labour instruments, while introducing a system of certification and inspection to enforce it.
- Work in Fishing Convention.

There has been an academic debate on the effectiveness of IMO and ILO rules for maritime safety in recent years (Knudsen & Hassler 2011). This debate has come forth as a result of and concern two key tendencies. The first is that marine accidents have declined markedly worldwide over the last decades. The second is that, in the same period IMO has both developed several different conventions regulating maritime safety and laid down considerable efforts in order to safeguard their implementation.

According to Knudsen and Hassler (2011), some authors (e.g. Knapp & Franses 2009) argue that this development suggests that countries' ratifications of IMO conventions gradually have led to decreasing ship accident rates. In contrast, Knudsen and Hassler (2011) argue that the implementation of IMO conventions is "gravely deficient", as neither flag state implementation, nor port state control prevent vessels with serious safety deficiencies from continuing to sail. We will not conclude in this debate, but rather present the different control mechanisms that are available and consider the arguments of the different sides in the debate.

7.1.3 Flag state implementation and enforcement

Ships are not subjects of international law, it is instead the flag state that bears the duty to comply with international law (Zwinge 2011). Vessel construction, maintenance and upgrades required by IMO conventions is the responsibility of the flag state. When conventions are developed by the IMO, they must be implemented by member states to take effect, i.e. ratified and incorporated into national laws. Additionally, the conventions must be enforced (by the flag states) (Zwinge 2011: 309). Effective enforcement implies that the flag stat detects violations first, and then ensures compliance through judicial or administrative intervention.

However, the quality of this process varies substantially between flag states, showing how choice of flag state may have consequences for safety (Zwinge 2011). We could perhaps assume that shipping companies not focusing primarily on maritime safety would choose flag states that are more lenient on safety issues and the flag state control in general. Ship owners can easily move their ships to a less stringent flag states, and this process of "re-flagging" undermines the effective operation of flag state jurisdiction (Zwinge 2011). Miller, Hotte & Sumaila (2014) state that too many flag states disregard their obligations, often being referred to as "flags of non-compliance" (FoNCs) (cf. Zwinge 2011). Research indicates that FoNCs are more common among vessels that have been involved in large scale oil spills (Miller et al 2014).

According to Knudsen and Hassler (2011: 201), the main safety challenge in shipping is poor implementation of international safety rules: "Inadequate implementation is what one needs to focus on". The main reasons they give for inadequate implementation are:

1) IMO implementation is not an IMO activity. It is up to flag states to implement conventions, and they often fail, unless implementation is delegated to first rate classification societies. If this is not done, the remaining "safety barrier": port state control, also often fails,
2) IMO decision making provides a high output of new decisions with little regard for lagging implementation capacity,
3) Complex rules may lead to unpredicted, unintended interactions effects causing faulty implementation,
4) Accident risk is concentrated in coastal or narrow waters where littoral states guard their rights, and
5) Risk cannot be eliminated, but after big accidents, political pressures generate more rules (Knudsen & Hassler 2011: 202).

7.1.4 Port state control

As a consequence of failing flag state implementation and poor control from some classification societies, IMO and associations of port states has created the system of port state control (PSC), referring to it as a "safety net", developed to catch what the flag state implementation is unable to detect (Knudsen & Hassler 2011: 203). The rationale behind PSC is that maritime safety not should be used as a competitive tool by ship owners, i.e. by flagging out to "FoNCs" in order to save costs (Cariou, Mejia & Wolff 2009). Moreover, many ships never actually visits ports of its flags state (the few landlocked flag states do not even have ports), and several flag states lack resources to control their fleet. The "safety net" comprised by PSC is both based on random sample controls and targeting of the most deficient ships based on previous records (Knudsen & Hassler 2011). In PSCs ships can be detained when severe deficiencies are identified and forced to stay in the port until the deficiencies are rectified (Liang 2011).

There are nine regional Memoranda of Understanding (MOUs) on port state control, covering virtually all of the world's seas. The 1982 Paris MOU states that each port authority has to inspect at least 25 per cent of the ships (Zwinge 2011). One of the objectives of MOUs is to set criteria for inspection, referred to as "target factors", defining what priorities vessels from different countries should be given in PSCs in the regions (Cariou et al 2009). According to Cariou et al (2009: 848), three main types of information are considered when choosing vessels for port state control: 1) vessel characteristics: type and age, 2) performance of the flag of registry, classification society and ship owner, and 3) records from previous inspections for a specific vessel. The MOUs measure flag state performances (the Paris MOU was first to do this), and each year, so called black/grey/white lists are published. The black list performs worse than average, while the white list performs better than average. The white list has become the industry's benchmarking standard for flag state performance (Perepelkin, Knapp, Perepelkin & Pooter 2010).

Although consensus may exist in MOUs on which factors that are important in selecting vessels for inspection, few studies have examined the weight that are given to these factors (Cariou et al 2009). Examining the factors predicting detention of vessels and the number of deficiencies found in port state controls, Cariou et al (2009) concludes that the inspecting authority was a key factor in explaining detentions. This result is interesting, as one of the objectives of PSCs is to apply uniform standards across the states conducting PSC.

Discussing PSC criteria for detention, Li (1999) states that the quality of a ship is reflected in its safety management in general, completeness of certificates, efficiency of life saving, fire-fighting appliances, radio, navigation, anti-pollution, propulsion and auxiliary machinery, loading lines compliance, competency of crew, and quality of food and accommodation (Li 1999: 138). Deficiencies in these areas will cause the ship to be detained. As mentioned, Li (1999) found that the detention rate of vessels from FOCs in port state controls was 19.8 ‰, which is nearly four times more than the world average of 5.71 ‰.

Knapp and Frances (2007) measure the effect on port state inspections on the probability of casualty, and estimate the magnitude of improvement areas for targeting substandard vessels. Their study is based on data from 183 819 inspection from six MOUs in the period 1999-2004 and casualty data from 6291 cases concerning 6005 ships. The authors excluded irrelevant casualties caused by extreme weather conditions, war and so forth. They found that the following factors and characteristics increased the risk of casualties: general cargo vessels, age (for very serious casualties), smaller vessels, withdrawal of classification, change of ownership (presumably to a second hand ownership market where less money is spent on safety). It is important to note that the authors did not find that change of flag significantly predicted casualty risk. Moreover, the authors also found that inspections had a strong negative effect on the probability of a very serious casualty.

Knapp and Frances examine the potential for improving PSCs. They conclude that about 36 % of the vessels eligible for inspections were not identified as problematic by inspection authorities and were not targeted. About 7 % of the eligible vessels were targeted but were not involved in casualties. A total of 43 % of the eligible vessels belonged to a group where inspections were effective in decreasing casualty risk (especially for the very serious), and the effect was estimated to be a 5 % reduction in the casualty risk per inspection. About 5 % of the eligible vessels were targeted correctly but had a casualty, indicating that enforcement could be improved. Moreover, another 5 % were not targeted, but had a casualty, indicating an area where targeting of vessels could be improved.

In conclusion Knapp and Frances (2007) found that PSC inspections are fairly effective in their purpose of targeting substandard ships and increasing maritime safety, although their results indicate a potential for improvement that should involve both improving inspections and targeting.

Finally, it is important to remember that one of the main weaknesses of port state controls is that substandard ships cannot be inspected before they reach a port (Zwinge 2011). Coastal states do therefore have some rights to conduct coastal state control, requesting information from potential polluters. Physical inspection can only be conducted in case of discharge or if the vessel refuses to give requested information (Zwinge 2011).

7.1.5 Control by classifying organ

The tasks of operationalizing the demands on flag states from international maritime conventions are often transferred to classification societies. However, too many flag states actually disregard their obligations, for instance by not seeking the assistance of classification societies to help them translate the requirements of IMO conventions into practice (Knudsen and Hassler 2011: 2013). Moreover, Hoffman et el (2005) suggest that it is commonly recognized that stiff competition in the classification/certification market has led to the emergence of certain classification societies that are willing to cut corners in order to satisfy clients.

Classification societies often work on behalf of shipping companies, flag states and maritime insurers to operationalize requirements in IMO conventions. As noted flag states are responsible for vessel construction, maintenance and upgrades. Flag states often transfer this responsibility to classification societies, and thus the classification societies in practice become responsible for ship quality (Knudsen & Hassler 2011). The main challenge with this is that the quality of classification societies varies substantially, and that only a few are excellent.

Moreover, they also cite research documenting that classification society inspectors find the convention language very abstract and inaccessible, forcing them to develop their own interpretations of the rules

Li (1999) gives an example of the performance of classification societies, measured by means of detention rates, based on data from the US Coast Guard.

142 *K.X. Li / Transportation Research Part E 35 (1999) 135–143*

Table 4
Performance of Classification Society (1995–1997) [a]

Name	Abbreviation	Inspection	Detention	Rate (%)	Score [b]
Det Norske Veritas	DNV	3519	27	0.77	0
American Bureau of Shipping	ABS	3009	29	0.96	0
Nippon Kaiji Kyokai	NKK	4649	59	1.27	0
Lloyd's Register	LR	4753	62	1.30	0
Reigistro Italiano Navale	RINA	443	7	1.58	0
Germanischer Lloyd	GL	1628	29	1.78	0
Korean Register of Shipping	KRS	555	11	1.98	0
Bureau Veritas	BV	1860	38	2.04	1
Bulgarski Koraben Registar	BKR	38	1	2.63	1
China Classification Society	CCS	457	21	4.60	1
China Corporation Register	CR	99	5	5.05	2
Polski Rejestr Statkow	PRS	263	14	5.32	2
Croatian Register of Shipping	CRS	91	6	6.59	2
Maritime Register of Shipping	RC	798	65	8.15	2
Registrul Naval Roman	RNR	51	10	19.61	4
Hellenic Register of Shipping	HR	43	11	25.58	5
Total and average		22,256	395	1.77	1.25

[a] Source: The US Coast Guard (1998).
[b] The scores are based on the US Coast Guard detention rates: score 0 for detention rates <2%, score 1 for ⩾2–5%, score 2 for ⩾5–10%, score 3 for ⩾10–15%, score 4 for ⩾15–20%, score 5 for ⩾20%.

Figure 9.1: The performance of classification societies, measured by means of detention rates, based on data from the US Coast Guard. Source: Li 1999: 142. Reproduced from Transport Research Part E.

The figure shows substantial differences in the detention rates of the different classification societies, supporting the abovementioned assertion that certain class societies that are willing to cut corners in order to satisfy clients.

7.2 Results from the interviews

7.2.1 National implementation and enforcement

We asked respondents whether they have the impression that the national implementation and enforcement of safety rules work adequately, not just in the case of Norway, but also for other flag states. Generally, interviewees did not perceive of lacking implementation as a central safety challenge.

Norway is early to adopt international rules on maritime safety. Interviewees agreed that Norway is well functioning when it comes to implementation and enforcement of maritime safety rules, although some interviewees had critical comments on some points. One interviewee stated that it is difficult to improve national implementation and enforcement in flag states, because these issues concern the national sovereignty of the flag state.

One interviewee stated that much has happened with IMO's task of following up flag states in the last ten years, and that flag states cooperate better on controlling each other through bilateral agreement. When you implement nationally, it is based on your interpretation and your understanding According to IMO every flag state's implementation shall be controlled every five years. This is largely done bilaterally. International rules have a control regime, which is bilateral flag state inspections, and there is a much higher focus on everyone checking on everyone. It is more difficult to avoid now than it was 10 years ago, if you do not implement. We have built up competence on evaluating others, this interviewee said.

Additionally, the European Maritime Safety Agency (EMSA) was mentioned as a very positive development. EMSA inspects flag states' implementation and enforcement. ESA uses EMSA to evaluate Norway's implementation every 5 years. The basis of this evaluation is the EU directive implementing the STCW convention and other conventions like SOLAS, MARPOL, MLC. Moreover, EMSA also evaluates countries outside of the EU "third countries". EMSA recently concluded that the Philippines need to get things in place according to the STCW convention. The existence of a supranational agency like EMSA evaluating third countries is a sign that the world has progressed, this interviewee concluded.

EMSA was started in 2003, and it has particularly showed its relevance in the last 6-7 years. EMSA is a factor that has changed the situation when it comes to flag state implementation. Avoiding regulations have become more difficult for flag states. Flag states do not decline evaluation, because that will decrease the standing of their flag and their certificates. Ten years ago that was a much larger problem.

Given the focus of Størkersen et al's (2011) interviewees on different work period and manning level rules for Norwegian and foreign flagged vessels in Norwegian waters, we asked the interviewees to what extent flag states have different manning level rules. The international rules on this, based on the STCW code and the associated IMO guidelines provide the same manning level rules, and the different flag states must implement and enforce these rules. It is up to each flag state, however, to make detailed rules and provisions based on the international rules. Moreover, it is important to note the international rules regulating this applies to the minimum functions that vessels must safeguard, and not the exact number of crewmembers that vessels must employ. It was also noted that it is difficult to compare the manning level on vessels sailing under different flags, because they often operate in different segments in the market, with different needs and functions on board.

7.2.2 Port state control

The interviewees who had views on the Norwegian port state control (PSC) regime found this to be well functioning. Norway is part of the Paris Memoranda of Understanding (MOU) area for PSC, and the criteria for choosing ships for inspection are defined in this MOU. Norwegian port state authorities are obliged through the Paris MOU to inspect a "fair share" of vessel each year. This number is defined to be 544 vessel per year in the Paris MOU. In 2015, 570 vessels were inspected in Norwegian port state controls.

A new risk based PSC inspection regime was introduced in 2011. In the new risk based inspection system, vessels and flag states are given points and based on their score, they are distributed to one of three categories (see below). A central principle in this new risk based regime is that it turns the attention to the high risk vessels, focusing less on the other vessels. Some of the criteria underlying the ship risk profile is flag, age of vessel, cargo, PSC history of the vessel.

Annex 7 "Ship Risk Profile"[7] to the "Paris Memorandum of Understanding on Port State Control" states that the risk profiles of vessels are based on the following principles:

> 1) All ships in the information system are assigned either as high, standard or low risk based on generic and historic parameters.
>
> 2) Each criterion has a weighting which reflects the relative influence of each parameter on the overall risk of the ship.
>
> 3) High Risk Ships (HRS) are ships which meet criteria to a total value of 5 or more weighting points.
>
> 4) Low Risk Ships (LRS) are ships which meet all the criteria of the Low Risk Parameters and have had at least one inspection in the previous 36 months.
>
> 5) Standard Risk Ships (SRS) are ships which are neither HRS nor LRS.
>
> 6) A ship's risk profile is recalculated daily taking into account changes in the more dynamic parameters such as age, the 36 month history and company performance. Recalculation also occurs after every inspection and when the applicable performance tables for flag and R.O.s are changed.

One interviewee stated that the Paris MOU works very well. One drawback is to what extent flag states comply with the number of PSCs that they are required to conduct. Norway has only managed this in the last 6-7 years. There are probably many countries who do not manage to conduct enough PSCs. The inspections are very thorough and we are spreading knowledge of what we have found to other flag states, this interviewee said. There is a very good electronic system for sharing this this knowledge and a good system for classifying vessels based on risks. PSC inspectors can search for vessels and follow them for a week. Also, Norway cooperates very well within the Paris MOU. EMSA plays a role in this.

The Paris MOU provides an annual evaluation of flag states. New FOCs like St Kitt and Nevis, Togo and Congo are among the worst performers in this evaluation. Established FOCs like Panama are on the good performers in this evaluation, and Panama is subsequently on the "White list" of the Paris MOU.

7.2.3 Classification society

As mentioned, we finished the reference group meeting by inviting each member to mention what he or she considers to be the most important explanations to variation in accident risk between ships sailing in Norwegian waters. One of the important factors that was mentioned in this respect to explain the technical condition and accident risk of vessels was classification societies.

[7] Cf: https://www.parismou.org/system/files/Annex%207.pdf

The classification societies were originally established in order to provide the maritime insurance companies with independent knowledge about the technical state of vessels and their safety level. This knowledge would provide the basis for vessels' insurance premiums. The classification certificates determine the insurance policies.

Vessels are classified in accordance with international requirements by different classification societies. The quality and the price of the classifications vary, and some reference group members suggested that shipping companies with poor economy may choose a more affordable classification society in order to save money.

There are several indications that classification societies to different extents adhere to international requirements when they are classifying vessels. Research indicates strong correlations between quality of the classification society, the technical state of the vessel and detainments related to port state controls. According to reference group members, classification societies focus less on vessel inspections than on system revisions in accordance with standards ISO 900 and ISO 14000.

7.3 Summing up

The United Nations has two agencies that are key to developing international regulations applying to the maritime sector: IMO and ILO. These agencies produce rules applying to most aspects of maritime safety. According to the literature review, the main safety challenge in shipping is poor implementation of international safety rules, stating that the quality of this process varies substantially between flag states. Interviewees did not view poor implementation as important for maritime safety.

The interviewees who had an opinion on this, did however not consider failing flag state implementation and enforcement to be an important challenge. It was stated that this was a far bigger challenge among various flag states ten years ago than it is today. Interviewees agreed that implementation and enforcement of maritime safety rules are functioning well in Norway. The interviewees who had views on the Norwegian port state control regime found this to be well functioning. Interviewees praised the new risk-based PSC inspection regime, which was introduced in 2011.

8 Measures

This Chapter addresses the third aim of our study, which is to discuss potential measures to increase maritime safety further. We present measures aimed at the main two safety challenges that we identify related to internationalisation in maritime transport: 1) Newly emerging flags of convenience and 2) Communication problems related to language difficulties and cultural differences. In describing these measures, we draw on our results from the literature review and expert consultations.

8.1 Improving inspection of vessels

Our research indicates that ships flying newly emerging FOCs do have a higher risk than traditional maritime nations, second registers and established FOCs. Roberts, Marlow and Jaremin (2012) conclude that it is important to monitor ship casualties and crew fatalities in newly emerging and rapidly expanding flags of convenience.

In the following, we will discuss different ways of improving inspection of vessels in manners that would facilitate better enforcement of international regulations on maritime safety. These measures will not only be aimed at improving the safety of newly established FOC vessels, but all vessels in general.

8.1.1 Increased Coastguard inspections

Zwinge (2011) states that one of the mean weaknesses of port state controls is that substandard ships cannot be inspected before they reach a port. Coastal states do therefore have some rights to conduct coastal state control, requesting information from potential polluters. Physical inspection can only be conducted in case of discharge or if the vessel refuses to give requested information (Zwinge 2011).

One of the interviewees suggested that increased coastguard control of vessels in Norwegian waters and better cooperation between the coastguard and the NMA is a measure that could be considered to increase maritime safety further. He stated that the Coastguard and the NMA have cooperated in some inspections, and underlined that he believed that it had an enormous preventive effect. The coastguard is ready to cooperate, he said.

Both he and another interviewee referred to the US Coastguard as an example of a well-functioning maritime inspectorate. The US Coastguard is effectively the US National Maritime Authority. It is also one of the five armed forces of the United States.[8]

The interviewee who referred to the US Coastguard as a good example, stated that the following measures can be used to influence safety at sea: 1) regulations, 2) control mechanisms and 3) fines. We have good set of regulations, he said, but compliance is a problem.

[8] http://www.uscg.mil/top/missions/MaritimeSafety.asp

The control mechanisms are not good enough, he said, as it is difficult to know what vessel crews do when they are at sea. This interviewee stated that we would have had an entirely different regime with the Coastguard performing more frequent inspections at sea. It is hard to stop those who do not comply if you do not catch them in the act. This suggestion could be discussed further, but it would require increased allocation of funds to the Coastguard, and perhaps increased authority to inspect foreign flagged vessels.

8.2 Improving inspection of flag states

8.2.1 IMO inspection of flag states

Today, international flag state inspections are conducted through bilateral agreements, for example: Norway assesses Russia. However, inspections by smaller flag states may not always be taken seriously by larger flag states . The EU's Agency EMSA, on the other hand, carries the weight of the EU behind it, and would be regarded as a considerable actor when carrying out inspections. However, one interviewee suggested IMO would carry even more weight, so the authority of IMO should be expanded to include inspection of flag states.

In order to do this, IMO needs a mandate for controlling and following up on the implementation and enforcement in each country the way that EMSA does when they inspect flag state implementation and enforcement. The rationale behind this suggestion is that the information that each flag state reports to IMO on paper does not necessarily reflect the facts. Thus, IMO should also carry out inspections in each flag state. The interviewees who were asked about this measure did not find it realistic, because IMO lacks the international legal basis to do this, and the financing as well. They doubted whether the proposal would be achievable in practice.

8.2.2 IMO responsibility for implementation and enforcement

An even more radical suggestion, raised by Knudsen and Hassler (2011), is to give IMO responsibility for implementation and enforcement within the flag states. Organisational factors, language difficulties and conventional ambiguities creates opportunities for discretion in national implementation. For one thing, the textual interpretation of conventions and language makes it hard to predict how conventions will be enforced from country to country. Moreover, the enforcement of maritime convention is a local practice being carried out by inspectors and coastguard officials with several duties, where the enforcement of IMO conventions often competes with other assignments. Limited resource may mean that only a selection of IMO rules are focused on in inspections. Then which rules do they prioritize in this situation? According to Knudsen and Hassler (2011: 204), rules that are easy to enforce or those that are perceived as the most important are chosen.

In order to validate their assumptions on the flaws of port state controls, Knudsen and Hassler (2011: 204-206) seek empirical data containing: 1) Reports of time pressure or insufficient time to carry out inspections as intended, 2) Reports of diverging practices from one port or coastal state to another, 3) Complaints from ship owners or classification societies about the way inspections are conducted. They find empirical evidence supporting all these issues, using the Baltic sea as an empirical case, and argue that they are symptoms of a major structural inadequacy in the IMO system as a whole.

According to Knudsen and Hassler (2011), the link between national administrations and IMO is unfortunately weak, leading to poor implementation of IMO conventions by flag

states. They therefore suggest three key measures to improve the national implementation and enforcement of maritime safety rules. The most important involves a redesign of the system implementing IMO conventions, whereby IMO takes over the key implementation functions from the member states, in order to ensure uniform procedures.

We asked interviewees whether they thought that it was a good idea. Most of the interviewees who were asked about this were negative, and they found it totally unrealistic, stating that countries never will give up their sovereignty to implement and enforce rules. It was also stated that the different flag states have different needs, and the rules must be adapted to the different countries. One interviewee thought it was a good idea, but also found it unrealistic.

8.2.3 Uniform education of all PSC inspectors

The second measure Suggested by Knudsen and Hassler (2011) to improve the national implementation and enforcement of maritime safety rules is retraining of all personnel carrying out inspections all over the world, and that these should be employed by the IMO rather than the member states. A specialized college level education would be needed. The authors stress that funding and cost to member states would be the same, and that one could fight potential corruption by breaking inspectors' local ties.

Interviewees gave different answers when they were asked whether they thought that uniform education of all PSC inspectors is a good idea. It was for instance mentioned that flag states face difference challenges. One interviewee thought it was a good idea, but stated that the common education should be based on MOU areas. This seems close to the existing arrangement. As noted, a measure to harmonise PSC inspectors is already in place, as Norwegian PSC inspectors must undergo a one-week course in Lisbon. This course is common for all port state inspectors in the Paris MOU area.

8.2.4 Continued development of supranational inspection agencies like EMSA

According to IMO, every flag state's implementation shall be controlled every five years. International rules have a control regime, which is bilateral flag state inspections. one interviewee stated that today there is a lot of focus on mutual checks, such that controls are more difficult to avoid now than 10 years ago for those who do not implement.

Additionally, the EMSA inspects flag states' implementation and enforcement. Moreover, EMSA also evaluates countries outside of the EU "third countries". The existence of a supranational agency like EMSA evaluating third countries is a sign that the world has progressed, one interviewee concluded.

The fact that EMSA also inspects third countries (outside the EU) is promising, and it seems that EMSA is one of the few supranational agencies which has an authority to inspect flag states. Thus, EMSA represents a positive development in the maritime industry.

8.2.5 A risk-based PSC regime

As noted, Knapp and Frances (2007) examine the potential for improving PSCs (i.e. the pre 2007 PSCs). They conclude that about 36 % of the vessels eligible for inspections were not identified as problematic by inspection authorities and were not targeted. About 7 % of the eligible vessels were targeted but were not involved in casualties. A total of 43 % of the eligible vessels belonged to a group where inspections were effective in decreasing casualty

risk (especially for the very serious), and the effect was estimated to be a 5 % reduction in the casualty risk per inspection. About 5 % of the eligible vessels were targeted correctly but had a casualty, indicating that enforcement could be improved. Moreover, another 5 % were not targeted, but had a casualty, indicating an area where targeting of vessels could be improved. In conclusion Knapp and Frances (2007) found that PSC inspection are fairly effective in their purpose of targeting substandard ships and increasing maritime safety, although their results indicate a potential for improvement that should involve both improving inspections and targeting.

Perepelkin, Knapp, Perepelkin & Pooter (2010) analyze the method for developing the PSC black, grey and white lists of flag state performance, and presents its major shortcomings. They mainly criticise the current (i.e. pre 2010) method for measuring flag state performance for simply focusing on the number of detentions and the number of inspections of a given flag. They therefore suggest a new method of estimating flag performance, which also incorporates past deficiency information and casualty information. They also suggest that in the future, further variables measuring the quality of a flag can be added to the flag performance estimate, e.g. type of ship, age.

Based on the interviews, it seems that such a new system for scoring vessel quality and safety to some extent was introduced in 2011, when the new risk-based PSC inspection regime came into place. In the system vessels and flag states are given points that relate to their risk, and their inspection ratio and priority is based on their score. A central principle in this new risk-based regime is that it turns the attention to the high risk vessels, focusing less on the other vessels. Criteria for the ship risk profile include flag state, age of vessel, cargo type, and PSC history.

According to the new risk-based PSC regime, all ships in the information system are assigned either as high, standard or low risk based on generic and historic parameters.[9] Each criterion has a weighting which reflects the relative influence of each parameter on the overall risk of the ship. High Risk Ships (HRS) are ships which meet criteria to a total value of 5 or more weighting points. Low Risk Ships (LRS) are ships which meet all the criteria of the Low Risk Parameters and have had at least one inspection in the previous 36 months. Standard Risk Ships (SRS) are ships which are neither HRS nor LRS. A ship's risk profile is recalculated daily taking into account changes in the more dynamic parameters such as age, the 36 month history and company performance.

The interviewees who had opinions about the PSCs stated that the Paris MOU works very well. The inspections are very thorough and we are spreading knowledge of what we have found to other flag states. There is a very good electronic system for sharing this this knowledge and a good system for classifying vessels based on risks. PSC inspectors can search for vessels and follow them for a week. Also, we cooperate very well within the Paris MOU. EMSA plays a role in this.

Several interviewees answered that they think that port state controls, involving frequent controls of high-risk vessels is the best measure against high risk flag states. It is impossible to do something with the flag states itself, as this may be a post box administered by a lawyer office. Thus, it is important to focus on the vessels and ensures that they have the required standard.

One of the interviewees who was asked what measures he thought should be aimed at the flag states with the highest risk, stated that the PSCs and the marked regulates this. He said that if you end up far down on the Paris MOU ranking list, the flag state will quickly

[9] Annex 7 "Ship Risk Profile" to the "Paris Memorandum of Understanding on Port State Control".

become less attractive, when competing for assignments around the world. The capacity of the world's fleet is now so large that you can choose among the top 10 or 5 on the list. Others don't get assignments. He also said that we now see, in connection with in-flagging of foreign flagged vessels to NIS, that it is easier for them to get work with NIS flags because NIS is a quality register.

The PSCs can probably be improved even more. To what extent are for instance PSCs based on volunteerism and the priorities of each flag state? Are flag states able to manage the PSC volume they should, and do they have the necessary resources? Two of the interviewees said that Norway and the other Paris MOU member states continuously work on improving the PSC system, and cooperate very well with each other. Often the rules are improved.

8.3 Improving sanctioning opportunities

The third measure Suggested by Knudsen and Hassler (2011) to improve the national implementation and enforcement of maritime safety rules is that vessels that have broken the rules or which have been detained should pay fines. They state that this was also suggested in an OECD report from 1996. Today, there are no punishment (i.e. fines) for ships that have been found to have flaws in inspections. Zwinge (2011: 310) states that: "There seems to no immediate consequences in international law if a flag state neglects to exercise effective jurisdiction and control over its vessels(...)". Thus, there seems to be a need for effective sanctions.

We asked interviewees whether detained ships should be forced to pay fines until they remedy their faults. This is not done in port state controls today. Vessels may be forced to pay fines if they pollute, but not because of faults causing detainment. One interviewee suggested that fines for serious faults could be considered. Another interviewee stated that fines not is a good solution, as it could lead to corrupt port state control inspectors, especially in some parts of the world.

8.4 Increasing communication (English) skills

Given that research shows that English skills and communication vary substantially between groups on vessels, and that communication is important for safety, it may be relevant to consider stricter language requirements and controls in the maritime sector. Kahveci and Sampson (2001: 59) suggest that ensuring a minimum level of fluency in English (or other relevant working language) when recruiting officers and ratings may an important way of ensuring good communication aboard. Thus, perhaps shipping companies should engage in language training programs for seafarers, resulting in exams ensuring a certain level of language skillsCommunication is an important safety challenge on ships employing multinational crews. We therefore asked interviewees whether it is realistic to require a certain level of English speaking skills and perhaps a test of the crew members, and perhaps also English courses given by shipping companies. Interviewees agreed that this is a good and relevant measure. If you mix national and cultural differences with communication difficulties, the result may easily be misunderstandings. Interviewees also stated that communication is a considerable problem between vessels' bridges. It was also stated that cultural differences is just as an important cause of misunderstandings as language difficulties.

Several interviewees stated that such measures already exist, but that the rules on this not are compulsory. The seafarer education already includes education in English. Moreover, interviewees gave several examples of shipping companies that provide courses in English for their employees after experiencing accidents or incidents caused by misunderstandings and language difficulties. Some shipping companies already have such English tests as their own procedures. Staffing policies can also be implemented to avoid misunderstandings because of language problems and cultural differences. One interviewee mentioned a big shipping company which chose to only hire Filipino crew members in order to avoid language misunderstandings.

8.5 Summing up

The third aim of the present study is to discuss potential measures to increase maritime safety further. We limit our consideration of measures to the main safety challenges that we identified related to internationalisation in maritime transport: 1) Newly emerging flags of convenience and 2) Communication problems related to language difficulties and cultural differences. The measures are as follows.

1) Improving inspection of vessels through Increased Coastguard inspections at sea. This would require increased allocation of funds to the Coastguard.
2) Improved inspection of flag states, through a) IMO inspection of flag states, b) IMO responsibility for implementation and enforcement, c) Uniform education of all PSC inspectors, d) Continued development of supranational inspection agencies like EMSA and e) A risk based PSC regime. We conclude that the two latter measures should be strengthened and developed further.
3) Improving sanctioning opportunities by fining vessels that have broken the rules or which have been detained. Although this is a good idea, it could lead to corrupt port state control inspectors, especially in some parts of the world.
4) Increasing communication (English) skills Given that research shows that English skills and communication abilities vary substantially between groups on vessels, and that communication is important for safety, it may be relevant to consider stricter language requirements, education and control in the maritime sector.

In conclusion, we particularly recommend three of these measures 1) Continued development of supranational inspection agencies like EMSA, 2) Further development of the new risk based PSC regime, and 3) Increasing communication (English) skills.

9 Questions for future research

9.1 Safety management systems

The ISM Code requires vessel operators to implement an ISM Code-compliant Safety Management System (SMS). The 2010 amendments to the ISM Code focus heavily on the identification and assessment of risk.

According to the Sydney-based law firm "HWL Ebsworth Lawyers", the 2010 revisions to the ISM code can be summed up as follows:[10]

- Provides for pro-active risk assessment, with the obligation now to assess all risks and establish safeguards and to show in the SMS how these risks were identified.
- Imposes a requirement for masters to "periodically" review their vessel's SMS and report deficiencies to shore based management, which AMSA has interpreted to mean "a complete review of the system both ashore and afloat at least annually" .
- Requires that procedures for corrective action include measures to prevent recurrence.
- Sets an annual requirement for mandatory internal safety audits.
- Introduces a need for the company to assess the effectiveness of its SMS in accordance with established procedures.

In conclusion, we see that the shipping companies and masters have a considerable responsibility when it comes to maintaining an updated and comprehensive SMS, focusing on proactive and regularly updated risk assessments, procedures and corrective actions.

Nævestad et al (2015) maps the prevalence of work-related accidents in road, sea and air (light helicopter inland) transport, and examines risk factors related to these accidents, focusing especially on work-related risk factors. One of the data sources used by Nævestad et al (2015) is reports from the Accident Investigation Board for maritime transport in Norway (AIBN). All AIBN reports concerning maritime accidents and incident taking place between 01.01. 2009 and 01.01.2014 published by January 2015 were included in the analysis. The number of accident reports from the period is 48.

Lack of complete, written risk assessments was the most frequently occurring risk factor in the AIBN reports. The AIBN maritime defines risk assessments in a relatively broad sense (report 2013/03):

[10]The first bullet point was removed from the list by the author, as it refers to a technical definition of "major non conformity". Confer their website for the entire list of 2010 amendments to the ISM code: http://www.hwlebsworth.com.au/latest-news-a-publications/publications/transport/shipping-and-trade/item/391-new-amendments-to-the-ism-code-in-force-from-1-july-2010.html

> "Risk assessment is often used as a generic term for planning, risk analysis and risk evaluation. The objective of risk assessment is to uncover hazards and identify undesirable incidents, analyse and evaluate risk, establish an overview of all risks, assess them in relation to what is deemed to be acceptable (acceptance criteria), propose risk reduction measures and consider alternative solutions."

The AIBN frequently finds risk assessments to be non-existent or underdeveloped, for instance through not taking local contexts sufficiently into account. Risk assessment is the cornerstone in what AIBN road refers to as *safety management systems (SMS)*, consisting of three elements. Taken together, these three processes summarize an ideal of how transport operators should relate to risk and how they should work with safety management. We formulate these normatively in the following:

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

In the accidents described in the AIBN-reports, it is often concluded that one or several of these processes have failed. In the maritime sector, safety management systems are e.g. required by the HSE regulations applying for people working aboard ships.

When asked, the interviewees did not think that the quality of safety management systems differ between NOR and FOC vessels. One interviewee stated that most vessels have the required SMS, and that some vessels sometimes have SMS's going above and beyond the requirements stipulated.

Nevertheless there is a need for future research to assess the importance of formal and documented risk assessments for safety. Although accident investigations often conclude that proper risk assessments would have identified the relevant risks, there are no data to show that vessels which have not been involved in accidents tend to carry out formal risk assessments in in line with the requirements. More research is needed on this issue.

9.2 Training, competence and experience

Seafarers are generally trained and educated in their home countries, and assembled internationally through networks of agencies and management companies to work on board (Liang 2011). The IMO ensures that seafarers from different countries receive training and competence to a relatively high and universal level through the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) (1978).[11]

[11] http://www.imo.org/en/OurWork/HumanElement/TrainingCertification/Pages/Default.aspx

The IMO has also developed a series of model courses to be used by maritime training institutions worldwide. The IMO provides suggested curricula, course timetables and learning objectives to assist instructors develop training programmes to meet the STCW Convention standards for seafarers. Moreover, the STCW convention also requires ratifying parties (i.e. nations) to provide information to allow others to check the validity and authenticity of seafarers' certificates of competency.

Interviewees perceived that seafarers generally have the basic competence required, but that they sometimes see some differences among different seafarer nationalities. It was suggested that education in "new maritime countries" are not as good as it is in established maritime nations.

The Philippines was mentioned as an example of a country with a good maritime education by one interviewee. Another interviewee stated a Filipino seafarer on a Norwegian vessel makes enough to repay the extended family (perhaps 20-30 people) for their help with his maritime education and to keep the extended family going. The extended family gets together and chooses the most apt person to be a seafarer, and then they finance the maritime education of this person. The Filipino maritime schools are quite selective; with only about 10 % of candidates graduating, according to our source. But if the family member graduates, the extended family is secured economically.

The tendency of ship owners in traditional maritime nations of flagging out vessels employing foreign crews involves a transfer of maritime competence in these countries to third countries. Thus, several European countries (e.g. Greece, UK) require recruitment of a minimum level of national seafarers on board. According to the rules of the Greek flag for instance, it is required that ship owners must employ at least one Greek deck or engineer officer cadet at each ship, which is in excess of the crew requirements, (Mitroussi 2008).

The importance of national and local competence for maritime safety was highlighted by Størkersen et al's (2011) study of Norwegian short sea cargo. The Norwegian seafarers who were interviewed in the study were worried about the increasing tendency of flagging out Norwegian vessels. The seafarers argued that foreign crew members taking over from Norwegians in Norwegian short sea cargo would be negative to safety as:

1) Norwegian seafarers have the best (local) knowledge on Norwegian waters, and how to sail there under varying circumstances,
2) Norwegian is the working language in Norwegian short sea cargo transport,
3) Certificates such as e.g. the pilot exemption certificate may be issued in other countries, and it is thus difficult to assess the actual competence related to such documents that have been issued abroad,
4) Safe maritime transport requires proper seamanship, and this competence may vanish from Norway if Norwegian seafarers disappear,
5) Seafarers will disappear from the occupation if they perceive job security as low, and this will reduce their concentration and loyalty when performing their job (Størkersen et al 2011: 58).

All vessels with a length of 70 metres or more are subject to compulsory pilotage when operating in waters within the baselines. However, the compulsory pilotage requirement can be met by either employing a pilot or by use of a Pilot Exemption Certificate.

The Pilot Exemption Certificates ("Farledsbevis")[12] is an example of a unique competence on Norwegian waters. In 2011, there were 2800 valid pilot exemption certificates, qualification for which now require a theoretical and practical test (Det Norske Veritas 2012). Compulsory pilotage is set down in the Compulsory Pilotage Regulations, which specify the vessels and the waters in which compulsory pilotage are required.

Based on Størkersen et al's (2011) study, where seafarers stressed the unique competence of Norwegian seafarers, we also asked interviewees whether they think that Norwegian seafarers have a better competence than foreign seafarers when it comes to sailing in Norwegian waters. Interviewees answered that the maritime industry is international, and that the closest comparison would be with aviation. There are international regulations (i.e. the STCW convention) for training and minimum standards.

One interviewee said that we base our training and certification on the same minimum standards as other flag states and have nearly no special Norwegian standards. Thus 99 % of the competence requirements is the same in Norway and the 169 other countries who are signatories to the STCW convention through the UN organisation IMO. Ideally all other countries should meet the requirements to training, competence, and certification, so nationality should have no influence on safety.

According to the safety management systems, both the ship owner and captain are responsible for making sure that those who perform a job are qualified. This follows from the ISM code requirements to safety management systems. At least this is how it is theoretically. It helps make sure that crew nationality should not have any consequences for safety

When discussing competence and education, some interviewees stated some foreign seafarers may lack the experience with sailing along the Norwegian coast. Norwegian waters provide a particular challenge in its coastal waters: fjords are challenging, along with narrow sounds, bad weather and geographical/topographical challenges. Not everyone from other parts of the world are prepared for that. This is an important competence which is not taught in the maritime education, or covered in STCW requirements. A seafarer lacking this experience may have more difficulties facing the challenges of coastal navigation than seafarers who have this experience. One important difference, however is that Norwegian waters have very little traffic.

Interviewees stressed, though, that t experience is more important than nationality, and that there are several examples of foreign vessels and crews which sail regularly along the coast of Norway. Moreover, it was also mentioned that crews with experience from coastal navigation in general, although it is not from Norway, are fairly well equipped to deal with the challenges posed by Norwegian waters.

Finally, one respondent stated the competence of Norwegian seafarers generally has been very high, but that the number of Norwegian seafarers is decreasing. This is negative for the development of Norwegian maritime knowledge.

As mentioned, we finished the reference group meeting by inviting each member to mention what he or she considers to be the most important explanations to variation in accident risk between ships sailing in Norwegian waters. One of the important factors that was mentioned in this respect was the experience and competence of seafarers.

Reference group members suggested that the average age of Norwegian seafarers has decreased in the recent decades. This means that leading officers on Norwegian vessels

[12] http://www.kystverket.no/en/EN_Maritime-Services/Pilot-Services/Compulsory-pilotage/

generally have less experience and competence than they used to have. They suggested that the lacking experience and competence may compromise safety in some situations.

It was also mentioned that it probably is difficult to conduct research to examine the safety effects of decreased experience and competence, but that these factors are emphasized as important by people in the business. It was also mentioned that although the education of Norwegian and foreign seafarers is the same, Norwegian seafarers have, in contrast to foreign, a long experience with sailing in the complex waters along the coast of Norway. Future research should examine whether and how national and local seafarer competence on challenging coastlines and weather conditions are required for safe operations (e.g. sailing along the coast of Norway).

9.3 Technology and equipment

The literature study indicates a relationship between vessel quality and safety, suggesting that the new FOCs with the highest ship accident risk, also have a low vessel quality, as indicated by detention rates in port state controls. Results also indicate a relationship between vessel age and safety and quality, although results are not consistent.

Accordingly, the studies presented in Chapter 3, focusing on detention rates and causalities indicate that new FOCs may have higher shares of detained vessels than other flags (e.g. Li 1999; Alderton & Winchester 2002). Li (1999) concludes that the detention rates of FOCs is four times above world average, and that detention rates are closely related to ship casualties. Thus, quality and safety is closely related.

Moreover, vessel characteristics is one of the key dimensions in Alderton and Winchester's (2002) FLASCI scores, which is a broad multidimensional safety measure related to flag states. They also found correlations between seafarers' perception of whether their vessel was in poor safety condition and in poor state of repair and the FLASCI score. This also indicates that vessels scoring low on safety performance measures, also score low when it comes to the standard of technology and equipment, seemingly with ramifications for safety.

Vessel age is an important factor influencing quality and safety. Li (1999) found for instance that the six FOC fleets with the highest risk all were more than 20 years old, with the exception of Cyprus. Cariou et al (2009) conclude that most important factors predicting detention of vessels in port state controls was age of vessel. Contrary to this, Roberts et al (2012) did not find vessel age to be an important predictor of casualty rates. Of 11 studied risk factors influencing the probability of dry bulk casualty, Roberts et al (2012) conclude that the strongest independent predictors of foundering and crew fatalities was flag state.

We asked interviewees whether they believed that there are differences in between vessels' age and the quality of technology and equipment when we compare the Norwegian fleet with the foreign registered ships sailing in Norwegian waters. The most prevalent answer among interviewees was that they did not know. Vessels' safety standard is to a greater extent dependent on the business or subsector that the ship is operating within, and how much the transport buyer is able to pay for safety. Interviewees also said that here is great internal variation in the safety standard of both Norwegian flagged ships and FOC ships. In the reference group meeting, it was mentioned that Norwegian shipping companies often flag out their newest vessels, while older vessels are kept in the NOR registry.

In the small-scale survey, numbers were unfortunately too small for comparing vessel characteristics of FOC and NOR vessels. Respondents were asked to rate their agreement with the statement: "Lacking maintenance and poor equipment has led to unsafe situations on my vessel".

In the small-scale survey, numbers were unfortunately too small for comparing vessel characteristics of FOC and NOR vessels. Respondents were asked to rate their agreement with the statement: "Lacking maintenance and poor equipment has led to unsafe situations on my vessel". In Table 9.1 we compare mean score for different groups on this variable. The minimum value is 1 (totally disagree) and the maximum value is 5 (totally agree). The average score is 1.9.

Table 9.1: Means on the variable "Lacking maintenance and poor equipment has led to unsafe situations on my vessel". The minimum value is 1 (totally disagree) and the maximum value is 5 (totally agree).

Value	Age group	Vessel type	Year the vessel was built	Vessel size	Position/line of work	Manning level	Nationality	Register
1 Score	Younger than 31 years	Bulk	Before 1980	Less than 500 dwt	Captain	1-2 people	Norwegian	NOR
	1.9	2	2.4	1.9	1.7	-	1.7	1.7
2 Score	31-40	General cargo	1980-85	500-3000 dwt	Deck personnel	3-4 people	Other Nordic:	NIS
	1.8	2.2	2.3	1.8	2.1	2.1	2	1.7
3 Score	41-50	Tank vessel	1986-1991	More than 3000 dwt	Engine personnel	5-6 people	Central Eastern EU/Asian	FOC
	2.1	2.7	1.7	2.6	2	1.8	3	2.9
4 Score	51-60	Well vessel	1992-1997	-	Other	7-8 people	-	-
	1.9	1.6	1.8	-	1.7	1.7	-	-
5 Score	Older than 60 years	Other	1998-2003	-	-	9-10 people	-	-
	1.5	1.8	1.8	-	-	2.7	-	-
6 Score	-	-	2004-2009	-	-	11-12 people	-	-
	-	-	2	-	-	-	-	-
7 Score	-	-	2010-2015	-	-	11-12 people	-	-
	-	-	1.4	-	-	-	-	-
P value	.727	.051	.045	.013	.366	.033	.000	.000

Table 9.1 indicates significant differences between vessel types, vessel sizes, manning level, registry and nationality on the question "Lacking maintenance and poor equipment has led to unsafe situations on my vessel". Respondents on older vessels and on bigger vessels agree more with the statement. The same do respondents who are parts of crews of 9-10 people, who are Central Eastern EU/Asian and who work on board FOC vessels.

9.4 Manning levels

Shipping is a truly global industry (Alderton & Winchester 2002). For a vessel operator, choice of flag is one of the most important business decisions they make (Hoffman, Sanchez & Talley 2005). Shipping companies' choice of flags to their vessels is dependent on which aspects of the framework conditions that they find important, the industry and the type of vessels that they are involved with.

In their survey, Bergantino & Marlow (1998) found that the most important factors behind flagging out decisions were: 1) savings in crew costs (26 % of shipping companies which had flagged out gave this as a reason), 2) escaping from bureaucratic control under their own national flag (17 %), 3) availability of skilled labour (13 %), and reductions in compliance costs (12 %) (Bergantino & Marlow in Fan et al 2014: 351). Hoffman et al (2005) found that older vessels were more likely to be nationally flagged, that crewing cost was an important reason for flying foreign flags, and that a determining factor for a vessel to be foreign flagged was that it trades internationally.

Some shipping companies choose to stay in national registers, for instance because of the expertise of the flag state and good communication possibilities. Størkersen et al (2011: 56) gives an example of a shipping company that chose to register their vessels in the Norwegian Ordinary Ship Register (NOR). This company explained their choice of registration with the fact that they were involved in demanding operations requiring high expertise and that communication with customers was especially important. They also stressed that they were not economically disadvantaged for two reasons: 1) NOR ships do not have to pay pilot fee as foreign ships are obliged to do, and 2) the "net wage arrangement" for employers hiring Norwegian seafarers provides a certain compensation for the Norwegian wage level. We expand on this below.

The most important framework condition influencing the competitive abilities of transport companies is the level of wages (Hovi & Hansen 2011). The need to compete is hugely influential in recruitment in shipping, and explains the intense competition for jobs and widely differential wage levels among multinational crews on board modern ships (Liang 2011).[13] According to Llácer (2003: 520), annual crew costs from a typical North European closed register can be the double or even four times higher than those of an open register, depending on crew selection. Following Mitroussi (2008: 1046), crew cost differences between selected EU flags and lower costs open registry vessels range from +22 % to +333 %.

The net wage arrangement ensures that Norwegian shipping companies hiring Norwegian seafarers get a refund of the taxes, employer fees and national insurance fees that they pay the government for their Norwegian seafarers. Per December 2015 the refund was limited to NOK 198 000 per employee. The purpose of the net wage arrangement is to ensure equal competition between Norwegian and foreign ships and the existence of Norwegian seafarers.

In Norway the NMA defines the "safety manning" of vessels based on the international rules regulating manning of vessels. The safe manning document gives the minimum crew

[13] As noted, a representative study of nationalities employed in shipping companies found that 24 % of the crew members were from the Philippines, 9 % were from Russia, 8 % were from Ukraine, 5 % from China, 5 % from India, 4,5 % from Turkey, 4 % from Indonesia, 4 % from Poland, 3 % from Myanmar, 2 % from Germany, while 31 % were from "other" nations (Ellis and Sampson 2008, in Liang 2011: 7).

size and minimum qualifications required for sailing from A to B. It is important to remember that the definition of the safe manning only applies to the number of people and functions required to sail. Usually, there are also operational tasks which must be done on board ships while sailing, for instance related to preparing for loading/unloading, maintenance, administrative tasks and so forth. If vessels choose to only have a safe manning, it is likely that they will be understaffed when it comes to safety critical functions.

The "operational manning" is the manning level chosen by the shipping companies, based on their considerations of the needs of their vessels, additional to sailing. It is the responsibility of the shipping company to staff vessels properly, i.e. in a way that facilitates the execution of all functions on board The operational manning must of course not be lower than the "safety manning" defined by the NMA. The ship owner can require additional manning and higher qualifications. A general problem mentioned by interviewees, however, is that shipping companies may perceive the safety manning as the defined standard.

We asked interviewees whether they believed that the manning level on Norwegian and foreign flagged vessels is different. The first answer we got generally was that there are international rules on the manning level of vessels. One interviewee underlined that internationally, you have the IMO 1047 principles for safe manning, and all flag states are required to follow it. The rules are not difficult to interpret, so there is no reason to believe that interpretations should give room for big differences between flag states. However, some flag states may not be as good at following up on this as others. Norwegian authorities sometimes get reports of concern, where seafarers for instance say that they have one less man when sailing under a certain flag.

Second, some interviewees had the impression that the manning levels are higher on board FOC and NIS vessels. The reason is that these vessels companies are allowed to pay foreign seafarers according to the (lower) wage levels in their home countries. Some interviewees said that perhaps the FOC manning level is higher because of lower wages, but they stressed that they had no data to support that.

Interviewees also stated that Norwegian authorities have started to liberalise some of the restrictions of the NIS fleet lately, allowing some NIS vessels to sail between Norwegian ports. This liberalization generally applies to ferries, and some vessels that also go to Northern European ports. As a consequence of the liberalization, about 30 vessels changed flag from FOC to NIS.

When these vessels changed flag to the NIS registry, Norwegian authorities asked to see safe manning documents, and found that the foreign flag state authorities had defined approximately the same safety manning as themselves. In conclusion, they found that Norway and the FOCs flags in question were quite similar when it comes to their definitions of safe manning. Rather, they found that on some vessels Norwegian authorities had defined smaller crew or qualifications in the safe manning documents.

Respondents were asked several question about the manning level on board their vessels. Unfortunately, numbers are too small to allow us to compare the manning level on FOC/NIS vessels with that of NOR vessels. In order to avoid counting the same vessels several times, we must filter our data according to a unique vessel identity. We use the captains in the sample for this purpose. When we only compare the means for the captains in our sample we are left with 50 NOR captains and 10 FOC or NIS captains. This sample is too little for comparison. We may note, however, that the manning level on FOC (avg: 8.9) and NIS (avg: 6.7) vessels are higher than on NOR (avg: 5.4) vessels, when we also take vessel size into account. But as noted, we cannot generalize this result because of the small sample. More research is needed.

The most prevalent vessel types among our respondents are bulk and general cargo vessels. In Figure 9.1, we therefore compare respondents mean scores for these vessels on two statements:

- We usually have a larger crew than the vessel's safety manning specifies
- Manning on board is sufficient to ensure that safety is maintained

We compare respondents on bulk and general cargo vessels registered in NOR or FOC. The answer alternatives range from 1 (=totally disagree) to 5 (totally agree). The sixth answer alternative "do not know/not relevant" was removed.

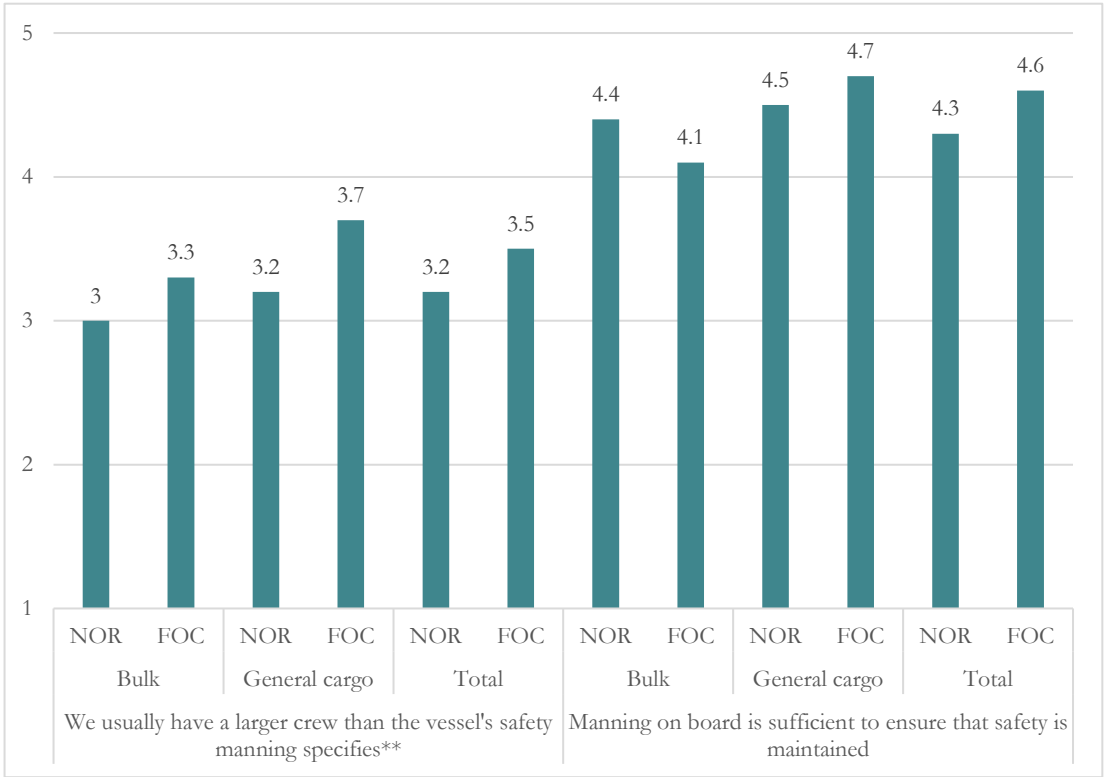


Figure 9.1: Respondents mean scores on two statements: "We usually have a larger crew than the vessel's safety manning specifies" and "Manning on board is sufficient to ensure that safety is maintained" Bulk and general cargo vessels registered in NOR or FOC.

Figure 9.1 indicates that respondents from FOC vessels of both types (bulk and general cargo) and FOC vessel respondents in general are somewhat more inclined to agree with the statement "We usually have a larger crew than the vessel's safety manning specifies". An Anova test of variance indicates that the differences are statistically significant at the 5 %-level.

When it comes to the question "Manning on board is sufficient to ensure that safety is maintained", we see that NOR vessel respondents working on board bulk vessels agree more than FOC respondents, while it is the other way around on general cargo vessels. Differences are not statistically significant.

Respondents were asked about the average number of port calls per week. Unfortunately, numbers are too small to allow us to compare the number of port calls of FOC vessels with that of NOR vessels. In order to avoid counting the same vessels several times, we filter our data according to a unique vessel identity. When we only compare the means for the captains in our sample we are left with 50 NOR captains and 7 FOC captains. This sample is too little for comparison. We may note, however, that the number of port calls per week for NOR vessels (14) is higher than that of FOC vessels (10.4), but as noted, we cannot generalize this result because of the small sample. More research is needed.

10 Study limitations

In this short Chapter, we draw attention to the following study limitations, which should be borne in mind when interpreting the results.

1) Small samples. The most important methodological challenge with the present study is the small survey samples. The survey included in this report was originally meant to consolidate the findings from literature review and expert interviews, and as such is based on the responses of a small sample of seafarers (N = 222). Analysis of the responses gave rise to some findings that are unique and potentially important, but because it was meant only to consolidate other findings the survey design is not robust enough to be able to draw solid conclusions.

When interpreting results, it is crucial to remember that the samples for several key variables are small, for instance for foreign seafarers and NIS and FOC vessels. This influences our abilities to draw conclusions; it is for instance less likely to find statistically significant differences with small samples on key variables. We must also remember, that with small samples in key groups, respondents may not be representative. These reservations are important to bear in mind when looking at the results of the small-scale survey. We must be very careful when it comes to generalizing results.

We recommend therefore that the small-scale survey be explored by a more extensive survey and robustly designed sampling method. It would be important in such a survey that samples are both representative of crewing populations, and large enough enable solid conclusions to be drawn when comparing the responses of crew on Norwegian versus foreign-registered vessels (i.e. give sufficient statistical power).

2) *Respondents from different countries have different points of reference.* The seafarers may refer to different baselines, and their survey answers may have different anchoring. If safety standards vary substantially between different nationalities or cultures, respondents' evaluative judgments are based on different expectations to the safety commitment of their managers and their colleagues, and the safety level of their businesses.

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

4) *Awareness of comparison.* Seafarers may be aware that they would be compared to other national groups, and respond correspondingly. In the presentation of the survey it was stated that a central purpose was to compare nationalities and flag states. Respondents had to report their nationality and vessels register in the survey, and the survey included one question on the competence of Norwegian and foreign seafarers.

5) *The need to use underdeveloped survey items.* This line of research is at an early stage, and so we needed to develop many of the questions for this survey. There is a need to develop these items further in order to test for psychometric robustness.

6) *National culture and reporting*. Measuring safety culture and reporting culture by means of surveys (i.e. self-reports) is in one sense paradoxical, as giving straightforward answers is dependent on a culture which encourages the communication of negative issues (i.e. a good reporting culture). A previous study of safety culture in construction in Denmark, UK and The Netherlands found that Eastern European migrant workers generally rated their managers more positively than employees who were born in the respective countries. The study suggests that Eastern European migrant workers' deference to authority may explain this.

Deference to authority is as a trait of national culture that may explain over-reporting of positive results. It may perhaps also explain under-reporting of negative results. One of the interviewees suggested that deference to authority will influence how foreign seafarers answer the survey, stating that "for the foreign seafarers, the survey is an authority". In line with this, Størkersen et al (2011) found that the foreign respondents that they interviewed were less critical when answering their quantitative survey than they were in the preceding qualitative interviews. Although these questions are interesting, it is impossible for us to conclude on this. These hypotheses should therefore be examined further in future research.

7) Structural incentives for "laying low"? The answers foreign seafarers give in surveys may also be influenced by structural features; e.g. time limited job contracts that are renewed regularly. In international shipping, ratings may be hired on a contract basis from one assignment to another, and the staffing agency may have information on the employment history of each seafarer. Such arrangements may provide foreign seafarers with structural incentives for "laying low" when answering the survey. It is impossible for us to conclude on this. These hypotheses should therefore be examined further in future research.

As noted, we have also pointed out a typographical error on one of the survey response scales in the Engligh language version of the survey. There are good grounds to believe that this did not influence responses, and this is explained fully in the main body of the report (cf. Chapter 2.5.2).

One final limitation we wish to point out is that we were unable to compare risk factors specifically for vessels flying *newer* FOCs, which our analyses suggest have higher safety risks, versus vessels flying other flag types. Future studies carrying out this comparison may find larger differences in risk factors than we found by comparing FOC or FOC/NIS with NOR-registered vessels.

11 Conclusion

The aims of the study were to:

1) Examine safety outcomes of increasing internationalisation in (Norwegian) maritime transport, by comparing the safety performance of nationally flagged vessels (NOR) and vessels flying FOCs.
2) Discuss the importance of potential risk factors, comparing nationally flagged vessels (NOR) and vessels flying FOCs.
3) Discuss potential measures to increase maritime safety further.

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

1) Literature review of 20 studies relevant to one of our aims.
2) Qualitative interviews with 10 sector experts
3) Small-scale survey with 222 seafarers
4) Reference group meeting.

A literature review shows that it is difficult to draw any clear conclusions about the importance of flag state for accidents, as existing studies point in different directions, often emphasizing other risk factors (e.g. ship type and age) as more important. Results indicate, however, that ships flying newer flags of convenience do seem to have a higher risk. Qualitative interviews support our conclusion that flag state is only one of several risk factors affecting maritime safety outcomes, and results from the small-scale survey are inconclusive when it comes to assessing this. In conclusion, we question the utility of flag state as an indicator of vessel safety.

We compare nationally flagged vessels (e.g. Norwegian Ordinary Ship Register) with FOC vessels on six different factors with the potential to influence safety. We find that communication in particular could be a risk factor on FOC vessels. These vessels generally have multinational crews, and our results indicate that these are more likely to experience unsafe situations because of language misunderstandings. Differences in national safety culture could also confound communication problems.

It is important to note, however, that although communication difficulties seem to be a risk factor on FOC vessels, we have indications that FOC vessels perform better than nationally flagged vessels on other factors influencing safety. Qualitative data suggested that manning levels, as well as the related problem of fatigue, influenced safety more than flag state per se, and some interviewees had the impression that manning level levels are actually *higher* on board FOC and NIS vessels than NOR vessels. The reason for this is that FOC and NIS vessels may pay foreign seafarers according to the lower wage levels in their home countries. In the small-scale survey, we asked respondents about manning levels on their vessels. Although, numbers are too small to allow for comparison, it is possible that manning levels on board FOC vessels could be larger than they are on NOR vessels. Our data is insufficient, and we need more research to be able to conclude on this.

Reference group members stressed that fatigue and manning levels are among the most important factors influencing maritime safety in Norwegian waters. They suggested that the small Norwegian vessels sailing along the coast of Norway have low manning levels, considerable work pressure and scarce time. They also suggested that these working

conditions may lead to fatigue which may be negative to safety. More research is needed to examine this.

The small-scale survey also suggests that manning levels are important for safety, as analyses indicate that vessels' manning level influence respondents experiences of demanding working conditions and their inclination to be fatigued in manners that may compromise safety.

We discussed measures aimed at the main safety challenges that we identified related to internationalisation in maritime transport: 1) Newly emerging flags of convenience and 2) Communication problems related to language difficulties and cultural differences.

We conclude that three measures should be strengthened and developed further:

1) Continued development of supranational inspection agencies like EMSA. The EU agency EMSA carries more weight than individual flag states carrying out inspections through bilateral agreements.
2) Further development of the new risk based PSC regime. The new risk based PSC regime turns the attention to the high risk vessels, focusing less on the other vessels, and it uses several criteria for screening vessels.
3) Increasing communication (English) skills. Given that research shows that English skills and communication abilities vary substantially between groups on vessels, and that communication is important for safety, it may be relevant to consider stricter language requirements, education and control in the maritime sector.

We have also discussed the impact of other risk factors than those highlighted above. Our data have, however, not been sufficient to evaluate these, and more research is therefore needed on the following risk factors:

1) Technology and equipment
2) Failing implementation and enforcement
3) Fatigue and working conditions
4) Safety management system
5) Training, competence and experience.

Finally, we underline that results must be interpreted with the certain methodological weaknesses in mind, mostly concerning the small-scale survey. Although originally designed to consolidate interview and literature findings, the survey gave some interesting findings in itself. The main problems to be remembered when reviewing the survey findings are sample and group sizes, and in some cases underdeveloped survey items.

There is also some uncertainty about the validity of differences among respondents of different nationality. Respondents from different countries may have different points of reference, differential experiences with and trust in surveys, differential perceptions of the need to respond to surveys in socially desirable ways. There may also be broader national cultural differences influencing reporting. These potential limitations present an interesting challenge for future research comparing survey responses of different nationalities.

One final limitation we wish to point out is that we were unable to compare risk factors specifically for vessels flying *newer* FOCs, which our analyses suggest have higher safety risks, versus vessels flying other flag types. Future studies carrying out this comparison may find larger differences in risk factors than we found by comparing FOC or FOC/NIS with NOR-registered vessels.

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Appendixes

Appendix 1: Overview of publications from the literature review

Appendix 2: Interview guide

Appendix 3: Small-scale survey

Appendix 4: Information about the survey

Appendix 1: Overview of publications from the literature review

Table S.1: Publications focusing on safety outcomes of internationalisation in maritime transport (1. Aim), potential risk factors (2. Aim) and measures (3. Aim).

Author/year/ country	Focus (ship and/or crew)	Relevance	1) Safety outcomes estimated?	2) Risk factors suggested?	3) Measures discussed?
Phillips, Nævestad & Bjørnskau (2015) (Norway)	Fatigue among watch keepers at sea. Literature study and interviews with experts.	Low to aim 1, high to aim 2 and medium to aim 3.	No. But, the study attempts to evaluate safety outcomes of fatigue, which varies according to crew nationality.	Yes, fatigue is discussed and related to nationality.	Yes, but only related to fatigue, and not directly related to nationality.
Nævestad, Caspersen, Hovi, Bjørnskau & Steinsland (2014). (Norway)	Sailed distance, (un)loaded tonnes, ship accidents and ship accident risk of Norwegian operated ships of different flags	High to aim 1, medium to aim 2 and low to aim 3.	Yes, ship accident risk per sailed km in 2012 is estimated for Norwegian operated ships with Norwegian and foreign flags.	This is not a primary focus of the study, but several risk factors are suggested and discussed to explain the differences.	No.
Roberts, Marlow & Jaremin (2012) (United Kingdom)	Ship and personnel accidents on ships flying three different groups of flag states	High to aim 1, high to aim 2 and high to aim 3.	Yes, ship casualties (1970-2005) and crew fatalities (1980-2005) are estimated for three groups of flag states.	Yes, discusses 12 risk factors, although they do not discuss organisational or cultural factors.	Yes, regulatory authorities should focus on newer flags of convenience.
Størkersen, Bye & Røyrvik (2011) (Norway)	Operational and work related issues in short sea cargo shipping. Focus on differences between crew nationalities and ships' flag states.	Medium to aim 1, high to aim 2 and medium to aim 3.	Not on ship accident risk or crew injury risk, but on other items measuring safety outcomes	Yes, related to fatigue, use of procedures, violations .	Some issues related to different flag state rules and different competence among national groups are discussed.
Zwinge (2011)	Discusses inadequate flag State implementation and enforcement, and possible counter measures.	Low to aim 1, medium to aim 2 and high to aim 3.	No, but the premise is that some open registers are substandard, because of lacking implementation and enforcement.	Yes, but only focus on lacking implementation and enforcement of international conventions.	Yes, to non-recognise a vessel's flag in case the flag State consistently violates its duties to control its vessels.
Llácer 2003	A presentation of the origin, development and consolidation of open registers, and a discussion of measures against non-compliance.	Low to aim 1, medium to aim 2 and high to aim 3.	No, but the premise is that some open registers are substandard, because of lacking implementation and enforcement.	Yes, but only focus on lacking implementation and enforcement of international conventions.	Yes, this study discusses ways of eradicating substandard registers.
Liang (2011)	Anthropological discussion of labour market and working conditions of multinational seafarers on container vessels	Low to aim 1, high to aim 2 and medium to aim 3.	No.	Yes, gives a thick description of working conditions, culture ("collective obedience") and labour market conditions with potential impact on safety	Not directly, but the paper focuses on specific labour market and work conditions that could influence safety.
Knudsen & Hassler (2011) (Sweden)	Focus on ship safety and the system of implementation and enforcement of maritime conventions.	Medium to aim 1, medium to aim 2 and high to aim 3.	No, but focuses on the development in maritime safety and differences between states.	Yes, but this is mostly related to differences in national implementation and enforcement of IMO-conventions.	Yes. Discusses challenges and potential solutions to implantation of IMO-conventions

Author/year/ country	Focus (ship and/or crew)	Relevance	1) Safety outcomes estimated?	2) Risk factors suggested?	3) Measures discussed?
Cariou, Mejia & Wolff 2009	Focus on the determinants of the number of deficiencies and of the probability of detention in port state controls	High to aim 1, high to aim 2 and high to aim 3.	Yes, measured as port state control detention rates.	Yes, detention are correlated with the age of inspected vessels (40%), the recognised organisations (31%) and the place where the inspection occurs (17%)	Differences in detention rates amongst various inspecting authorities are explained by differences in the characteristics of vessels calling in a specific country rather than by the PSC regimes.
Burgherr (2007)	Global overview of accidental oil spills from all sources (> or =700t) for the period 1970-2004.	High to aim 1, medium to aim 2 and meduium to aim 3.	Yes, spill number and volumes were higher in FOC countries compared with other country groups	Yes, bivariate analysis of risk factors. Rules out vessel age.	Yes, suggests that the improvements over time are caused by a set of initiatives and regulations implemented by governments, international organisations and the shipping industry
Knapp & Frances 2007	Study of 183 819 port state control inspections from various PCS regimes 1999-2004, analyzing factors that may predict detention	High to aim 1, medium to aim 2 and high to aim 3.	Yes, measured as port state control detention rates.	Yes, but they find that port state control regimes are more important predictors of detention than risk factors like age, size, flag, class or owner as perceived by the industry and regulators.	Yes, harmonization of port state control.
Håvold (2005) (Norway)	Safety culture among crew members of ships in a Norwegian shipping company	Medium to aim 1, high to aim 2 and medium to aim 3.	The safety culture scale is validated against port state control inspection rates.	Yes, safety culture, national culture and safety outcomes are discussed.	No, but the findings on different national safety culture could inspire different management and regulation styles dependent on employee nationality.
Lamvik & Ravn (2004) (Norway)	Examination of how national culture influences working practice and HSE on drilling rigs in the North Sea and in South East Asia	Medium to aim 1, high to aim 2 and medium to aim 3.	Yes, present numbers for lost time injuries, but these are for oil rigs and not ships.	Yes, the importance of national culture for work practice and safety is discussed.	Yes, to some extent, as the paper invites to a process of reflection upon practice and learning.
Alderton & Winchester (2002) (United Kingdom)	The safety level of different flag states. Focus on ships and flag states.	High to aim 1, high to aim 2 and high to aim 3.	Yes, presents a new and broad flag state conformance index to measure the safety level of flag states and crew	Yes, the index includes and is analysed in light of risk factors and relevant working environment items.	Yes, the new index will provide a better measure that can be employed in port state controls.
Hansen, Nielsen & Frydenberg (2002)(Denmark)	Occupational accidents aboard Danish merchant ships in international trade. Focus on crew members 'risk.	High to aim 1, high to aim 2 and medium to aim 3.	Yes, estimates risk of different types of occupational accidents. Compares Danes and foreigners.	Yes, it examines risk factors related to the different accident types.	Yes, based on the identified risk factors, different measures are suggested.

Author/year/ country	Focus (ship and/or crew)	Relevance	1) Safety outcomes estimated?	2) Risk factors suggested?	3) Measures discussed?
Kahveci & Sampson (2001) (United Kingdom)	Ethnographic study on fourteen ships with multinational crews	Low to aim 1, high to aim 2 and medium to aim 3.	No.	Indicates that language and communication problems on ships may have potential safety consequences.	Not directly, but he paper could inspire measures to study and improve ship communication
Hofstede 2001	Dimensions of national culture in different countries.	Low to aim 1, medium to aim 2 and low to aim 3.	No.	Does not focus on safety, but provides a thorough discussion of national culture, that other research has examined the safety outcomes of.	No.
Li (1999) (United Kingdom)	Open ship registers and new principles for classifying ships with high risk. Focus on safety and quality ships and flag states	High to aim 1, high to aim 2 and high to aim 3.	Yes. Compares the safety (loss rate) and quality (port state control detention rate) of ships from different flag states.	Yes, focuses on some factors influencing safety, like ships' age, port state control, classification societies.	Yes, argues that flag state is an deficient indicator and suggests a new score system on ship quality to spot risky ships in port state control.
Helmreich and Merrit (1998)	Effects of professional, national and organisational cultures on individual attitudes, values and team interactions in aviation and medicine.	Low to aim 1, medium to aim 2 and low to aim 3.	No.	Provides a thorough discussion of consequences of professional, national and organisational culture, including potential safety consequences.	No.

Appendix 2: Interview guide

I) Introduksjon

Transportøkonomisk institutt gjennomfører en undersøkelse som heter Safe Foreign Transport, som er finansiert av Forskningsrådets Transikk program. Prosjektet startet i januar 2013 og varer ut april 2016.

Prosjektets hovedmål er å vurdere om økningen av utenlandske aktører som transporterer gods på veg og sjø i Norge har effekt på ulykkesrisiko, og bidra med kunnskap som norske myndigheter kan bruke for å utvikle risikoreduserende tiltak.

Vi har tidligere gitt ut rapporter om trafikkarbeid og risiko. Nå jobber vi med en sluttrapport som skal gi svar på tre spørsmål:

1) hva er sikkerhetskonsekvensene av internasjonalisering til sjøs?
2) Hva er betydningen av ulike risikofaktorer og sikkerhetsutfordringer?
3) Hvilke tiltak kan myndighetene iverksette for å møte disse?

Vi bruker følgende metoder for å svare på spørsmålene:

A) Litteraturstudie,
B) Ekspertintervjuer
C) Liten spørreundersøkelse.

Det er selvfølgelig frivillig å delta og du kan trekke deg fra undersøkelsen når du ønsker. Informasjonen du gir oss behandles anonymt. Det du sier skal ikke kunne knyttes til deg. Vi kommer til å referere til deg som «sektorekspert» i rapporten. Vi er ikke ute etter din arbeidsplass «offisielle syn» på saken, men dine egne erfaringer og tanker.

Du får fremstillingen til gjennomlesning, slik at du kan kommentere og rette opp i eventuelle feil før rapporten publiseres. I tillegg understreker vi at hensikten med intervjuene er å supplere informasjonen fra de andre datakildene vi bruker i studien og gjøre oss oppmerksomme på ulike sammenhenger og hypoteser vi kan studere videre. Vi oppmuntrer derfor de vi intervjuer til å «tenke høyt» basert på sin egen erfaring og kunnskap.

II) Ulykker og risiko

1) Har du inntrykk av at skip fra ulike flaggstater har ulik risiko for skipsulykker i norske farvann?
2) Synes du at flaggstat er en meningsfull indikator på ulykkesrisiko?
3) Har du inntrykk av at skip fra ulike operatørstater har ulik risiko for skipsulykker i norske farvann?
4) Har du inntrykk av at mannskap fra ulike land har ulik risiko for skader?

III) Risikofaktorer og sikkerhetsutfordringer

I det følgende skal vi gå gjennom en del risikofaktorer som har blitt undersøkt i forskningen på internasjonalisering og sikkerhet til sjøs, og så skal jeg spørre deg hvorvidt disse forholdene kan være aktuelle på skip i norske farvann, og i så fall hvordan de kan ha konsekvenser for sikkerhet. Hvis du ikke har synspunkter på eller kunnskap om et tema, hopper vi over det og går til neste.

5) Nasjonal sikkerhetskultur:

- Tror du at det finnes kulturelle forskjeller mellom grupper av mannskap med ulik nasjonalitet på skip i norske farvann?
- Hva går disse forskjellene i så fall ut på?
- Og har slike forskjeller konsekvenser for sikkerhet, tror du?

6) Kommunikasjon

- Har du inntrykk av at ulike morsmål mellom mannskapsgrupper og dårlige engelskkunnskaper har konsekvenser for sikkerhet i norske farvann?

7) Kompetanse og opplæring:

- Har du inntrykk av at mannskapsgrupper med ulike nasjonaliteter har ulik opplæring og kompetanse?
- Har dette konsekvenser for sikkerhet?
- Har norske sjøfolk bedre kompetanse enn utenlandske til å seile i norske farvann?

8) Lange arbeidsperioder og fatigue

- Kan du si noe om forskjeller i arbeidsperioder for norske og utenlandske sjøfolk?
- Hva skyldes de ulike lengdene og hva er konsekvensene, tror du?

9) Sikkerhetsstyringssystemer

- Har du kunnskap om sikkerhetsstyringssystemer: 1) risikoanalyser, 2) prosedyrer og 3) opplæring) på ulike skip og om kvaliteten på dem eventuelt varierer?
- Årsaker til variasjon på kvalitet?

10) Arbeidsforhold og bemanning

- I hvilken grad er det ulik bemanning på skip som seiler under norske og utenlandske flagg?

11) Konkurranse

- I hvilken grad konkurrerer norske og utenlandske skip på det samme markedet?
- Har dette konsekvenser for sikkerheten?

12) Teknologi og utstyr

- Er det forskjeller i skipenes alder, teknologi og utstyr, når man sammenlikner den norske flåten med de utenlandskregistrerte skipene som også seiler i norske farvann?-
- Har dette konsekvenser for sikkerhet?

13) Implementering og håndhevelse

- I hvilken grad foreligger det ulike regler på skip som seiler under ulike flagg i norske farvann, f.eks. som gjelder bemanning?
- Har dette konsekvenser for sikkerhet?

IV) Syn på nåværende regulering av maritim sikkerhet

14) Nasjonal implementering og håndhevelse

- Synes du at den nasjonale implementeringen og håndhevelsen av internasjonale sikkerhetsregler fungerer godt nok?
- Hvorfor/hvorfor ikke? –og hva bør gjøres?

15) Havnestatskontroller

- Synes du at havnestatskontrollene fungerer godt nok til å luke ut skip med høy risiko?
- Hva bør evt. gjøres for å forbedre dette?
- I hvilken grad nektes skip med høy risiko å gå inn i norske havner i dag?

16) Klasseselskap

Kvaliteten på klasseselskapene varierer sterkt.

- Har dette konsekvenser i norske farvann?
- Går det skip fra de dårligste klasseselskapene i norske farvann?
- Kan det forhindres?

V) Syn på mulige framtidige tiltak

17) Internasjonal implementering og håndhevelse

- Er det en god ide om IMO overtar implementering og håndheving fra flaggstater. (lik utdanning av inspektører til havnestatskontroll)

18) Tiltak mot flaggstatene med høyest risiko

- Hvilke tiltak bør settes inn mot flaggstatene med høyest risiko?
  - Bøter til skip som blir holdt igjen.

19) Tiltak for å sikre god kommunikasjon

Kommunikasjon er en viktigs sikkerhetsutfordringen på skip med flere nasjonaliteter.

- Er det realistisk å kreve et bestemt nivå av engelskkunnskaper (og test?) av mannskapene og at evt. rederiene skal gi opplæring?
- I hvilken grad gjøres dette av rederier og i nasjonal opplæring i dag?

Appendix 3: Small-scale survey

Spørreskjema om sikkerhetskultur og sikkerhet til sjøs

Med finansiering fra Norges Forskningsråd gjennomfører Transportøkonomisk Institutt en undersøkelse om sikkerhet og sikkerhetskultur på land og sjø.

Undersøkelsen på landsiden er gjennomført, nå er turen kommet til sjøtransporten. Undersøkelsen retter seg mot de ansatte om bord. For å få et best mulig resultat er det viktig at så mange som mulig besvarer spørsmålene.

Transportøkonomisk institutt (TØI) går i undersøkelsen inn på sikkerhetskultur og andre forhold som kan påvirke sikkerhet til sjøs (feks. arbeidstid, trøtthet, kommunikasjon, stress, kompetanse og bemanning). Undersøkelsen går ut til alle rederier som er medlemmer av Fraktefartøyenes Rederiforening (Kystrederiene). **Spørsmålene skal besvares av alle som arbeider om bord på skip**.

Undersøkelsen fokuserer ikke på personer, skip eller rederier. Resultatene rapporteres kun som gjennomsnittsverdier på gruppenivå. Hensikten med denne delen av prosjektet er å kartlegge sikkerhet og sikkerhetskultur i fraktefarten, og vurdere betydningen av nasjonalitet for sikkerhet blant mannskap og mellom skip. Det tar om lag 15-20 minutter å svare på undersøkelsen.

Det er frivillig å delta. Opplysningene behandles konfidensielt. Den tekniske gjennomføringen av spørreskjemaundersøkelsen foretas av MiPro. Forskerne får utlevert data fra MiPro uten tilknytning til e-post/IP-adresse.

På forhånd takk! Spørsmål eller kommentarer kan rettes til: Tor-Olav Nævestad, Transportøkonomisk institutt, e-post: ton@toi.no.

	Spørsmål	**Svaralternativer**
1) Bakgrunnsspørsmål		
1	Kjønn	
2	Hva er din nåværende stilling?	1) Kaptein 2) Dekksoffiser 3) Dekksmannskap 4) Maskinsjef 5) Maskinoffiser 6) Maskinmannskap 7) Forpleining 8) Lærling 9) Annet

	Spørsmål	**Svaralternativer**
3	Hvilken fartøystype tilhører fartøyet du nå jobber på?	1) Bulk 2) Stykkgods 3) Tank 4) Brønnbåt 5) Supply båt 6) Stand by fartøy 7) Ankerhåndteringsfartøy 8) Annet, spesifiser
4	Hvor mange jobber på fartøyet?	
5	Hvor mange personer jobber i rederiet, omtrent?	
6	Hva er størrelsen på fartøyet du er på nå?	1) Mindre enn 500 dwt 2) 500-3000 dwt 3) Mer enn 3000 dwt
7	I hvilket skipsregister er fartøyet ditt registrert?	1) NOR 2) NIS 3) Antigua & Barbuda 4) Bahamas 5) Bermuda 6) Gibraltar 7) Kypros 8) Hong Kong Liberia 9) Marshall Islands 10) Panama 11) Singapore 12) Annet, spesifiser……
7	I hvilket land ligger rederiet hvor du er ansatt?	…..
	Omtrent hvor mange ansatte er det i rederiet du jobber i?	….
8	Hvor mange års erfaring har du fra sjømannsyrket?	1) Mindre enn ett år 2) 1-3 år 3) 4-10 år 4) 11-15 år 5) Mer enn 15 år

	Spørsmål	**Svaralternativer**
9	Hva er din nasjonalitet?	1) Norsk 2) Annet nordisk land 3) Annet land fra det vestlige Europa 4) Annet land fra sentral/øst Europa 5) Asia 6) Amerika 7) Annet land enn de øvrige kategorier
10	Hva er din alder?	1) Yngre enn 31 år 2) 31-40 3) 41-50 4) 51-60 5) Eldre enn 60 år
SIKKERHETSKULTUR MED GAIN-INDEKS		
Spørsmål om sikkerhet i bedriften. Her følger noen spørsmål om sikkerhet i bedriften. På en skala fra 1-5 der 1 er helt uenig og 5 helt enig, hvordan stiller du deg til følgende påstander?		
1) Ledelsens innstilling til og fokus på sikkerhet: Fartøysledelsen/rederiet		
1	Fartøysledelsen oppdager mannskap som ikke arbeider på en sikker måte	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
2	Fartøysledelsen gir ofte ros til mannskap som arbeider sikkert	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
3a	Fartøysledelsen er klar over de viktigste sikkerhetsproblemene vi har om bord	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
3b	Rederiet er klar over de viktigste sikkerhetsproblemene vi har om bord	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
4	Fartøysledelsen stanser farlige arbeidsoppdrag og aktiviteter	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
5a	Fartøysledelsen betrakter sikkerhet som svært viktig i alle arbeidsoppdrag og aktiviteter om bord	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
5b	Rederiet betrakter sikkerhet som svært viktig i alle arbeidsoppdrag og aktiviteter om bord	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
2) Ansattes innstilling til og fokus på sikkerhet		
6	Mine kolleger om bord gjør alt de kan for å unngå uønskede hendelser og ulykker	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig

	Spørsmål	**Svaralternativer**
7	Mine kolleger om bord rapporterer vanligvis om alle sikkerhetsmessige mangler og farlige situasjoner som de opplever i arbeidet	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
3) Rapporteringskultur og reaksjoner på hendelsesrapportering		
8	Det finnes rutiner (prosedyrer) om bord slik at jeg kan rapportere om sikkerhetsmessige mangler eller avvik	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
9	Etter at en ulykke eller et uhell har skjedd om bord blir det tatt forholdsregler slik at dette ikke skal skje igjen	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
10	Alle feil og mangler som blir rapportert blir utbedret i løpet av kort tid	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
11	Alle om bord har nok av muligheter til å komme med forslag vedrørende sikkerhet	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
4) Trening/opplæring i sikkerhetstenkning		
12	Alle ombord får tilstrekkelig opplæring til å arbeide på en sikker måte	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
13	Alle nyansatte får tilstrekkelig opplæring for de arbeidsoppgavene de skal gjøre	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
14	Alle om bord blir informert om enhver endring som kan påvirke sikkerheten	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
5) Generelle sikkerhetsspørsmål i den aktuelle organisasjon		
15	Sikkerheten på dette fartøyet er bedre enn på andre fartøy	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
16	Sikkerheten om bord er generelt godt ivaretatt	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
Nasjonalitet, språk, kommunikasjon og sikkerhet		
1	Hvor mange nasjonaliteter arbeider om bord på ditt fartøy (fra Sjøfartsdirektoratet/Safetec)	1) Én eller to nasjonaliteter 2) Tre til fem nasjonaliter 3) Flere enn fem nasjonaliteter
2	Omtrent hvor stor andel av kollegene dine har en annen nasjonalitet enn deg selv?	1) 0-24 % har annen nasjonalitet, 2) 25-49 % har annen nasjonaliet. 3) 50-74 % har annen nasjonalitet, 4) 5) 75-100 % av kollegene har annen nasjonalitet

	Spørsmål	**Svaralternativer**
3	Hvilket arbeidsspråk benyttes på ditt fartøy? (fra Sjøfartsdirektoratet/Safetec)	1) Norsk 2) Engelsk 3) Annet, spesifiser….
4	Forekommer det språklige misforståelser mellom ulike nasjonaliteter om bord?	1) Aldri 2) Nesten aldri 3) Annenhver gang jeg er ute 4) Hver gang jeg er ute 5) En gang i uka når jeg er ute 6) Flere ganger i uka når jeg er ute 7) Daglig når jeg er ute 8) Vet ikke/ikke relevant
5	Opplever du farlige situasjoner på grunn av språklige misforståelser mellom ulike nasjonaliter om bord?	1) Aldri 2) Nesten aldri 3) Annenhver gang jeg er ute 4) Hver gang jeg er ute 5) En gang i uka når jeg er ute 6) Flere ganger i uka når jeg er ute 7) Daglig når jeg er ute 8) Vet ikke/ikke relevant
6	Har du i ditt arbeid opplevd farlige situasjoner på grunn av «kulturelle forskjeller» mellom ulike nasjonaliteter?	1) Aldri 2) Nesten aldri 3) Annenhver gang jeg er ute 4) Hver gang jeg er ute 5) En gang i uka når jeg er ute 6) Flere ganger i uka når jeg er ute 7) Daglig når jeg er ute 8) Vet ikke/ikke relevant
7	Blanding av flere nasjonaliteter på skip har negative konsekvenser for sikkerheten	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
8	Utenlandskflaggede skip i norske farvann har dårligere sikkerhet enn norskregistrerte skip	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig
9	Kan du begrunne svaret ditt med et eller flere stikkord	……

Bemanning, fatigue

	Spørsmål	**Svaralternativer**
1	Hvilken type vaktordning har du når dere er i vanlig operasjon? (Sjøfartsdirektoratet/safetec)	1) 6-6 2) 8-8-4-4 3) 12-12 4) Trevaktsystem 5) Dagvaktsordning 6) Annet, spesifiser
2	Hvilken type seilingsperiode/skiftordning har du? (Sjøfartsdirektoratet/safetec)	1) Uker 2) Måneder 3) Kontrakt
3	Hvor mange uker er du på, og hvor mange uker er du av? (Sjøfartsdirektoratet/safetec)	…….. …..
4	Hvor mange måneder er du på og hvor mange måneder er du av? (Sjøfartsdirektoratet/safetec)	…….. ……
5	Vennligst spesifiser total bemanning ombord	…..
6	Vi har til vanlig flere i besetningen enn det som er fastsatt i sikkerhetsbemanningen for fartøyet (Sjøfartsdirektoratet/safetec)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
7	Bemanningen om bord er tilstrekkelig til at sikkerheten ivaretas (Sjøfartsdirektoratet/safetec)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
8	Hvor ofte tror du at arbeidstiden din overskrider arbeids- og hviletidsreglene?	1) Aldri 2) Nesten aldri 3) Annen hver gang jeg er ute 4) Hver gang jeg er ute 5) En gang i uka når jeg er ute 6) Flere ganger i uka når jeg er ute 7) Daglig når jeg er ute 8) Vet ikke hva reglene sier
9	Hvor ofte arbeider du mer enn 16 timer i løpet av et døgn? (Sjøfartsdirektoratet/safetec. Med endrede svaralternativer)	1) Aldri 2) Nesten aldri 3) Annen hver gang jeg er ute 4) Hver gang jeg er ute 5) En gang i uka når jeg er ute 6) Flere ganger i uka når jeg er ute 7) Daglig når jeg er ute 8) Vet ikke hva reglene sier

	Spørsmål	**Svaralternativer**
10	Hvor ofte blir du avbrutt under din frivakt? (Sjøfartsdirektoratet/safetec. Med endrede svaralternativer)	1) Aldri 2) Nesten aldri 3) Annen hver gang jeg er ute 4) Hver gang jeg er ute 5) En gang i uka når jeg er ute 6) Flere ganger i uka når jeg er ute 7) Daglig når jeg er ute 8) Vet ikke hva reglene sier
11	Hvor ofte er det mulig, ut fra bemanningen om bord, å ha to navigatører på bro? (Sjøfartsdirektoratet/safetec. Med endrede svaralternativer)	1) Kontinuerlig 2) I en kortere periode (under fire timer) 3) Aldri uten å bryte hviletidsbestemmelser 4) Aldri, vi har kun én navigatør om bord
12	Når har dere dedikert utkikk på broa? (Sjøfartsdirektoratet/safetec)	1) Alltid 2) Når det er mørkt 3) Vanskelige værforhold 4) Vanskelig seilas 5) Nedsatt sikt 6) Ukjent farvann
13	Den pålagte hviletiden overholdes alltid av bropersonellet om bord (Størkersen et al 2011)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
14	Den pålagte hviletiden overholdes alltid av dekkspersonellet om bord (Størkersen et al 2011)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
15	Jeg får tilstrekkelig søvn og hvile om bord (Størkersen et al 2011)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
16	Det hender at jeg er så trøtt i arbeidstiden at det går på sikkerheten løs (Størkersen et al 2011)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
17	Bemanningen om bord er tiltstrekkelig til at sikkerheten ivaretas (Størkersen et al 2011)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
18	Omtrent hvor mange timer i løpet av en vanlig uke bruker du hviletiden til arbeidsoppgaver?	Fritekst antall timer
19	Her om bord jobber vi mer enn det som står oppført i arbeidsplanen	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
	Økonomi, effektivitet, konkurranse og sikkerhet	
1	Det hender at jeg føler meg presset til å fortsette å jobbe, selv om sikkerheten kan være truet (Størkersen et al 2011)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant

	Spørsmål	**Svaralternativer**
2	Konkurransen mellom rederiene gjør at vi av og til må bryte sikkerhetsrutinene (Størkersen et al 2011)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
3	Rederiet prioriterer alltid sikkerhet fremfor økonomi	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
4	Fartøysledelsen prioriterer alltid sikkerhet fremfor økonomi	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
5	Mannskapet prioriterer alltid sikkerhet fremfor økonomi	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
	Alder og kvalitet på utstyr og fartøy	
1	På mitt fartøy har manglende vedlikehold og dårlig utstyr/teknologi ført til farlige situasjoner (Omformulert fra Sjøfartsdirektoratet/Safetec)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
2	Hvilket år omtrent er fartøyet bygd?	1) Før 1980 2) 1980-1985 3) 1986-1991 4) 1992-1997 5) 1998-2003 6) 2004-2009 7) 2010-2015
	Havneanløp, tidspress	
1	Omtrent hvor mange havneanløp har fartøyet du jobber på i løpet av en vanlig uke?	Fritekst: antall
2	Det oppstår gjerne farlige situasjoner når vi ligger til havn på grunn av stress og tidspress	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
3	Hvor ofte blir vaktskiftet ditt utsatt på grunn av arbeidsoperasjoner, eksempelvis havneanløp? (Sjøfartsdirektoratet/safetec. Med endrede svaralternativer)	1) Aldri 2) Nesten aldri 3) Annen hver gang jeg er ute 4) Hver gang jeg er ute 5) En gang i uka når jeg er ute 6) Flere ganger i uka når jeg er ute 7) Daglig når jeg er ute 8) Vet ikke hva reglene sier
	Kompetanse, nasjonalitet og sikkerhet	
1	Norske sjøfolks kompetanse gjør dem bedre i stand til å seile i norske farvann enn andre	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant

	Spørsmål	**Svaralternativer**
2	Det er ofte høy trafikktetthet i farvann vi vanligvis seiler i	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
3	Det er ofte utfordrende værforhold i farvann vi vanligvis seiler i	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
	Nasjonal kultur	
1	Det forekommer situasjoner hvor det er nødvendig å utsette seg for fare for å få jobben gjort (Størkersen et al 2011)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
2	Det å ta opp sikkerhetsforhold blir sett på som unødvendig mas av mannskapet om bord (Størkersen et al 2011)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
3	Jeg kritiserer gjerne fartøysledelsens beslutninger, dersom jeg er uenig	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
4	Det er min egen skyld, hvis jeg blir skadet i arbeidet	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
5	Det er uklokt å si fra til fartøysledelsen dersom jeg har gjort en feil, eller nesten opplevd en ulykke i arbeidet	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
6	Det er uhøflig å si til kolleger at de bør arbeide på en annen og sikrere måte	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
7	Dersom jeg ikke klarer å utføre en arbeidsoppgave til tidsfristen, kan fartøysledelsen tenke at jeg ikke mestrer jobben min	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) Vet ikke/ikke relevant
	Mål på sikkerhetsnivå	
1	Har du i løpet av de to siste årene blitt skadet mens du arbeidet om bord?	1) nei, 2) ja, en liten skade som jeg ikke krevde medisinsk bistand, 3) ja, en skade som krevde medisinsk bistand, 4) ja, en skade som krevde medisinsk bistand og sykemelding
2	Har fartøyet vært involvert i skipsulykker (for eksempel: grunnstøting, kollisjon, brann, kontaktskade) i løpet av de to siste årene?	1) Ja, 2) nei
3	Ble personskaden rapportert til Sjøfartsdirektoratet?	1) Ja, 2) Nei, 3) Vet ikke
4	Ble skipsulykken rapportert til Sjøfartsdirektoratet?	1) Ja, 2) Nei, 3) Vet ikke

	Spørsmål	**Svaralternativer**
5	I hvilken grad bekymrer du deg når du tenker på risikoen forbundet med arbeidet om bord? (Størkersen et al 2011)	1) Svært bekymret, 2) noe bekymret, 3) verken/eller, 4) Lite bekymret, 5) ikke bekymret, 6) vet ikke/ikke relevant
6	Alt i alt, hvordan vil du vurdere sikkerheten i din arbeidssituasjon? (Størkersen et al 2011)	Svært dårlig 1 2 3 4 5 6 7 8 9 Svært bra 10
	Risikoanalyser og prosedyrer	
1	Hvem deltar i risikovurderinger av arbeidsoperasjoner på ditt fartøy? (Sjøfartsdirektoratet/safetec.)	1) Landorganisasjonen 2) Fartøysledelsen 3) De som skal utføre arbeidet 4) Alle om bord på fartøyet 5) Andre 6) Vet ikke/ikke relevant
2	På dette fartøyet har vi arbeidsbeskrivelser/prosedyrer som beskriver farene ved ulike arbeidsopprag	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
3	Det å bryte prosedyrene får sjelden konsekvenser om bord (Størkersen et al 2011)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
4	Jeg benytter aldri skrevne prosedyrer i arbeidet om bord (Størkersen et al 2011)	1) helt uenig, 2) ganske uenig, 3) verken enig eller uenig, 4) ganske enig, 5) helt enig, 6) vet ikke/ikke relevant
	Tusen takk for at du tok deg tid til å svare på spørsmålene!	
	Har du kommentarer til undersøkelsen?	

Appendix 4: Information about the survey

Survey on safety culture and safety at sea

The Institute of Transport Economics is conducting a survey on safety culture and safety at sea and in land based transport.

The survey on land based transport has now been completed, and the time has come to look at sea transport. The survey is aimed at employees on ships. In order to ensure a high quality, it is important that as many ship employees as possible answer the survey.

The Institute of Transport Economics examines safety culture and other factors that may influence maritime safety (e.g. working hours, fatigue, communication, stress, competence and manning). The survey is distributed to all shipping companies which are members of Fraktefartøyenes rederiforening (Kystrederiene). **The questions in the survey must be answered by people working on ships.**

The survey does not focus on individuals, vessels or shipping companies. The results are only reported as mean scores at group levels. The purpose of this part of the survey is to map safety and safety culture in short sea cargo transport, and to examine whether nationality influences safety among crew members and vessels. You will need 15-20 minutes to answer the survey.

Participation is voluntary. The information is treated confidentially. The technical implementation of the survey is conducted by MiPro. The researchers obtain data from MiPro without information about IP-adresses or e-mails.

Thank you very much in advance! Questions or comments can be directed to: Tor-Olav Nævestad, Institute of Transport Economics, e-mail: ton@toi.no.

Spørreskjema om sikkerhetskultur og sikkerhet til sjøs

Med finansiering fra Norges Forskningsråd gjennomfører Transportøkonomisk Institutt en undersøkelse om sikkerhet og sikkerhetskultur på land og sjø.

Undersøkelsen på landsiden er gjennomført, nå er turen kommet til sjøtransporten. Undersøkelsen retter seg mot de ansatte om bord. For å få et best mulig resultat er det viktig at så mange som mulig besvarer spørsmålene. Vi ber derfor om at rederiene videreformidler lenken til spørreskjemaet til alle sine ansatte. Det arbeides med å oversette spørreskjemaet til engelsk, men i første omgang sendes den norske versjonen.

Transportøkonomisk institutt (TØI) går i undersøkelsen inn på sikkerhetskultur og andre forhold som kan påvirke sikkerhet til sjøs (feks. arbeidstid, trøtthet, kommunikasjon, stress, kompetanse og bemanning). Undersøkelsen går ut til alle rederier som er medlemmer av Fraktefartøyenes Rederiforening (Kystrederiene). **Spørsmålene skal besvares av alle som arbeider om bord på skip**.
Undersøkelsen fokuserer ikke på personer, skip eller rederier. Resultatene rapporteres kun som gjennomsnittsverdier på gruppenivå. Hensikten med denne delen av prosjektet er å kartlegge sikkerhet og sikkerhetskultur i fraktefarten, og vurdere betydningen av nasjonalitet for sikkerhet blant mannskap og mellom skip. Det tar om lag 15-20 minutter å svare på undersøkelsen.

Det er frivillig å delta. Opplysningene behandles konfidensielt. Den tekniske gjennomføringen av spørreskjemaundersøkelsen foretas av MiPro. Forskerne får utlevert data fra MiPro uten tilknytning til e-post/IP-adresse.

På forhånd takk! Spørsmål eller kommentarer kan rettes til: Tor-Olav Nævestad, Transportøkonomisk institutt, e-post: ton@toi.no.

Institute of Transport Economics (TØI)
Norwegian Centre for Transport Research

Established in 1964, the Institute of Transport Economics is an interdisciplinary, applied research centre with approximately 70 professionals. Its mission is to develop and disseminate transportation knowledge that has scientific quality and practical application.

A private, non-profit foundation, TØI receives basic funding from the Research Council of Norway. However, the greater part of its revenue is generated through contract research. An important part of its activity is international research cooperation, mostly in the form of projects under the Framework Programmes of the European Commission.

TØI participates in the Oslo Centre for Interdisciplinary Environmental and Social Research (CIENS) located near the University of Oslo. See www.ciens.no

TØI covers all modes of transport and virtually all topics in transportation, including road safety, public transport, climate change and the environment, travel behaviour, tourism, land use and urban planning, decision-making processes, freight and travel demand, as well as general transport economics.

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