Do Port State Control Inspections Influence Flag- and Class-hopping Phenomena in Shipping?

Author(s): Pierre Cariou and François-Charles Wolff

Source: *Journal of Transport Economics and Policy*, May 2011, Vol. 45, No. 2 (May 2011), pp. 155-177

Published by: University of Bath

Stable URL: https://www.jstor.org/stable/23072173

Journal of Transport Economics and Policy, Volume 45, Part 2, May 2011, pp. 155–177

Do Port State Control Inspections Influence Flag- and Class-hopping Phenomena in Shipping?

Pierre Cariou and François-Charles Wolff

Address for correspondence: Pierre Cariou, World Maritime University, Citadellsvägen 29, S-201 24 Malmö, Sweden and Euromed Management, Domaine de Luminy BP 921-13288 Marseille Cedex 9, France (pc@wmu.se; Pierre.Cariou@euromed-management.com). François-Charles Wolff, LEMNA, University of Nantes, BP 52231 Chemin de la Censive du Tertre, 44322 Nantes Cedex 3, France; CNAV and INED, Paris, France (francois.wolff@univ-nantes.fr).

The authors would like to thank the reviewers and the editor, Steven A. Morrison, for their helpful comments on an earlier draft. The usual disclaimer applies.

Abstract

The flag of registry and classification society are an integral part of the target factors used by Port State Control (PSC) authorities when deciding on vessels to select for inspection. A shipowner may then have an interest in changing the flag of registry (flag-hopping) and classification society (class-hopping) to avoid future controls. Using data on PSCs collected over six years from 7,500 vessels, we study the relevance of this assumption using bivariate Probit models. Our estimates show that vessels in relatively bad condition are more likely to be subject to flag- and class-hopping and that these phenomena are more likely among vessels which have changed flag and class in the past.

Date of receipt of final manuscript: February 2010

1.0 Introduction

The flag of registry and classification society of a vessel are very often seen as indicators of quality in shipping. They are, for instance, an integral part of Port State Control (PSC) authorities target factors when selecting vessels to inspect.[1] This may thus create incentives for shipowners to change the flag of registry (flag-hopping) and classification society (class-hopping) of their vessels. In this paper we are interested in knowing whether a vessel that has been subject to detention and/or with a high number of deficiencies noted during a PSC occurring in t is more likely to record a change in its flag of registry and/or in its classification society when the next inspection takes place in $t+1$.

Our primary focus is to shed light on the magnitude of these two events using information from 30,578 PSC inspections (7,500 vessels) carried out from 1 January 2002 to 31 August 2008 by countries belonging to the regional Indian Ocean PSC Memorandum of Understanding (MoU). We turn to an econometric analysis to investigate the determinants of the probability of change in the flag of registry and in classification of a vessel and estimate bivariate Probit and dynamic Probit models. We contribute to the existing literature in the two following ways.

First, flag- and class-hopping are assessed in a dynamic way, seen as the consequence of a former PSC, while these phenomena are usually approached in a static way, comparing at date t the performance of a flag of registry and a classification society with the average performance of the category to which they belong. Second, our analysis is carried out at the vessel level. This allows us to consider all changes occurring in flag and class, while most studies only identify flag- and class-hopping when a vessel changes registration from a national to a foreign flag.[2] For instance, if a shipowner from country A chooses a foreign flag of registry from country B in t, and then later transfers the vessel under country C's flag in $t+1$, only one flag change (-hopping) is usually considered while two changes will be recorded when assessed at the vessel level.

The remainder of our paper is organised as follows. Section 2 provides a literature review of the flag- and class-hopping phenomena and highlights why these strategies are commonly used in shipping. In Section 3, our empirical approach explains why vessels in relatively poor condition are

[1] PSC is the inspection of foreign ships in national ports to verify that the condition of the ship and its equipment comply with the requirements of international regulations and that the ship is manned and operated in compliance with these rules.

[2] Or the use of a flag-of-convenience defined as when a vessel flies the flag of a country other than the country of ownership.

more likely to later change their flag of registry or classification society and further presents our econometric strategy. The data for our empirical analysis are described in Section 4 and econometric results are discussed in Section 5. Finally, our concluding comments are gathered in Section 6.

2.0 Literature Review of Flag- and Class-hopping in Shipping

Flag- and class-hopping occur because a ship operator may, for economic reasons, change the vessel's registry from one flag to another and/or from one classification society to another. These economic motivations are multiple and related to potential cost savings generated by the different operational condition for a vessel that is governed by the vessel's flag and class (registration fee, taxation, working conditions, and employability aboard the vessel, and so on).[3] An OECD study on the competitive advantages of non-observance of applicable international rules and standards (OECD/GD(96)4) showed, for instance, that the level of expenditures to comply with basic maritime regulations would range from US$2,750 per day to US$7,500 per day for a twenty-year-old bulk carrier of 30,000 dwt and from US$3,100 per day to US$9,500 per day for a fourteen-year-old product tanker of 40,000 dwt according to the condition applying to a vessel.

Indeed, although flag states, classification societies, ship management companies, banks, insurance companies, and charterers all play a major role in explaining the condition of a ship, light is very often shed on the first two actors. Flag states, as defined by the United Nations Convention on the Law of the Sea (UNCLOS), have, for instance, the overall responsibility for the implementation and enforcement of international maritime regulations[4] for all ships granted the right to fly their flags (Bimco *et al.*, 2007). The focus on flag states has furthermore increased during the last thirty years following the registration of vessels under foreign flags (that is, flags-of-convenience (FOCs)) as:

> 'the administrations of many FOCs would be generally less rigorous in their pursuit of high standards that might conflict with their aim of maximising the number of ships under their registries'. (OECD, 2001, p. 8)

[3]All conditions are not considered in this article but can be found in regular studies carried out mainly by the national shipowners associations which provide extensive comparisons on the cost of flying their national flag of registry in comparison with other flags.

[4]Edited by the International Maritime Organisation as well as the International Labor Organisation and the International Oil Pollution Compensation funds.

The role of classification societies (IACS[5]) is to develop technical standards (that is, rules for the construction of ships), approve design against these standards, conduct surveys during the construction of a vessel and issue certificates, and endorse the vessel's classification certificate for periodic surveys. Their role can even be extended when a country delegates to a classification society statutory surveys and related activities on behalf of flag state administrations. When acting in such capacity, a classification society is a 'recognised organisation' (in this paper we will use this term rather than recognised organisations). Regarding classification societies, a perception exists of a two-tier market between members of the IACS and other classes which are not. For the latter, which are usually smaller, a lack in technical expertise would not give them the possibility to secure sufficient standards of quality and explain why the light is very often shed on them (OECD/GD(96)4, p. 20).

In the academic literature, the flag- and class-hopping phenomena are usually approached in comparing the performance of a given flag and/or class with other flags or classes, the concept of performance being expressed either in terms of maritime casualties (accidents) or PSC records. For instance, Li and Wonham (1999) analyse twenty years of data from the Lloyd's Casualty database on safety records for thirty-six flags of registry, using various indicators of safety such as the total loss rates (percentage of loss ships among total ships for a flag). According to their study, if safety records would have improved in general, a distinction exists among three distinct groups of flags of registry: flags with less than 0.2 per cent total loss rate (Russia, China, Brazil, Sweden, Hong Kong, Poland, Netherlands, and Australia), flags above 0.75 per cent (South Korea, Panama, Greece, Malta, Saint Vincent, Taiwan, Cyprus, and Honduras), the other flags being in the middle.

Alderton and Winchester (2002) use a similar approach to compare the performance of FOCs in terms of casualty rate for the years 1997–9. They conclude that if observable differences exist in the casualty rates between FOC (mean casualty rates of 3.58) and national flags (1.36), disparities exist within the FOC group itself. For instance, new entrants in the FOC market would be more likely to have higher casualty rates (3.64 per cent) than old FOC members in the FOC market (3.41 per cent), suggesting that the categorisation between FOC and non-FOC flags as inherently unsafe is likely to mask the real situation. Robert and Marlow's (2002) investigation (logistic regression) on casualties in dry bulk shipping from

[5]Since 1968, the ten world's leading societies have joined in the International Association of Classification Societies (IACS) representing around 94 per cent of all commercial tonnage involved in international trade worldwide (http://www.iacs.org.uk/).

1963 to 1996 stress that the risk of foundering would increase with the age of the ship and with the ship's flag of registration and, most importantly, for heavy cargoes (iron ore and scrap steel) and for trading routes to the Far East and from Europe to North America.

Talley's (1999) estimations on the likelihood of ship accident seaworthiness provide another example. Applied to 2,243 accidents that were investigated by the US Coast Guard from 1981 to 1991, and among other attributes such as ship size and type, this author shows that ships classified by the American Bureau of Shipping would be likely to record higher levels of seaworthiness and that a high variance in the safety performance of various classification societies exists.

Investigations conducted by Knapp (2007) on the performance of flags on the blacklist of flags[6] edited by PSC Paris MoU and of non-IACS classification societies using PSC inspections and casualty data also give insights into the phenomena of flag and class-hopping. Regarding the former, and for a flag with more than fifty ships, her estimates stress that blacklisted flags would have a higher probability to be involved in very serious casualties, this being particularly prevalent for vessels flying the Syria, Belize, St Vincent & Grenadine, Lebanon, and Honduras flags of registry. Furthermore, the comparison between IACS and non-IACS classification societies would also stress a higher probability of casualties and detentions for the non-IACS classes: the Romanian Naval, Hellenic, and China Corp classifications having particularly poor records in terms of casualties.

Finally, Hoffman *et al.* (2005) study the determinants of vessel flag, seen as the decision by a national operator to select a foreign flag.[7] They conclude that for a relatively new vessel, classified with a non-IACS member, involved in international trade, operated by shipowners domiciled in developing countries and in countries with positive past safety records, the probability of being foreign flagged would increase.

To summarise, this literature review suggests that both the flag of registry and classification society may play an important role in explaining vessel safety records. Also, vessels registered under a FOC, blacklisted, and with a non-IACS classification society are more likely to be sub-standard, but at the same time, important disparities exist within these general categories. These findings are actually reflected within the target systems used by most PSC authorities to select vessels that should be inspected.

[6] A flag or a classification society is on the blacklist if in terms of detentions over a three-year period and based on binomial calculus, it performs significantly worse than the average (see Paris MoU for more details (http://www.parismou.org/)).
[7] Around 46 per cent of the cases in January 2003.

The Paris MoU is, for instance, considering the flag (blacklist of flags) and classification society (non-EU recognised organisation) of the vessel as well as information on its past detentions and deficiencies to determine those vessels that should be inspected.

3.0 Empirical Strategy

From an empirical viewpoint, one of the main difficulties for this study is related to selection. Indeed, vessels from suspicious flags or classification societies are expected to be inspected more often. Ideally, data on both inspected vessels and non-inspected vessels would be needed to account for this selection issue. However, to the best of our knowledge, we are not aware of such a dataset available to researchers.

In this paper, we wonder whether flag- and class-hopping observed for vessels that have been inspected may be motivated and explained by the will to by-pass the selection criteria (target factors) set up by PSC. To illustrate the relevance of such an assumption, and using the Paris MoU targeting system[8] as an example, let us consider a vessel inspected in t, flying a Paris MoU blacklisted flag (high risk), registered with a non-EU recognised organisation and with ten deficiencies previously detected. When entering the Paris MoU region more than a year later, this vessel will have a target factor equal to forty-eight points (twenty points for the flag, twenty points as it has not entered the region during the last twelve months, three points for the classification society and five points for the number of deficiencies — all other parameters not being considered). Now, if this vessel changes its flag to a white-listed flag (medium risk) and is registered with an EU recognised class, its target factor is reduced to twenty-nine points (four points for the flag, twenty points as it has still not entered the region during the last twelve months, zero points for classification society and five points for deficiencies that remain with the vessel). The immediate consequence is that its probability to be selected for inspection will be strongly reduced.[9]

---

[8]http://www.parismou.org/ParisMOU/Target+Factor/xp/menu.3980/default.aspx

[9]Considering this fictitious example, one could argue that in a way, the aim of PSC is to force shipowners to move from a 'bad' to a 'good' flag or classification societies which can then be seen as a positive outcome. On the other hand, the opposite example could have been taken showing that changing from a 'good' flag to a 'bad' flag or classification society might have a limited impact on the likelihood of being inspected if the initial PSC records were relatively good.

In order to know whether shipowners indeed rely on such a strategy, two elements need to be considered. First, flag- and class-hopping decisions have to be assessed at the vessel level. Indeed, performing an analysis at an aggregated level (only for FOC and non-FOC or for IACS and non-IACS, for instance) would not give the possibility to track most of the changes, as stated previously. Second, the decision to change the vessel flag or class requires a dynamic framework in order to observe a PSC post-decision taken between t and $t+1$ and based on the outcome of a former PSC in t (detention and number of deficiencies).

As a preliminary step, we consider that each vessel is inspected every year. We denote respectively by F_t and C_t the flag and the classification society of the vessel in t, before inspection in $t+1$. Using the following timeline representation, our main interest lies in the transition from F_t to F_{t+1} and from C_t to C_{t+1}. Specifically, we study whether the outcome of the PSC in t (like the number of deficiencies) affects $\Pr(F_t = F_{t+1})$ and $\Pr(C_t = C_{t+1})$:

```
   PSC_t                    PSC_{t+1}                  PSC_{t+2}    time
---+------------------------+--------------------------+------->
 {F_t, C_t}             {F_{t+1}, C_{t+1}}          {F_{t+2}, C_{t+2}}
```

Given that we use data on repeated inspections for each vessel, we have in fact to rely on a restrictive assumption concerning the pattern of inspections over time. We suppose that the time elapsed between two inspections does not depend on the vessel's past PSC records, and focus instead on potential changes between two inspections (whatever the time span is). Nevertheless, it should be noted that this assumption is unlikely to hold, as shown by the two following timelines which concern, respectively, a vessel in good condition (case 1) and a vessel in poor condition (case 2).

Case 1

```
   PSC_t                                          PSC_{t+2}       time
---+----------------------------------------------+----------->
 {F_t, C_t}                       {F_{t+1} = F_t, C_{t+1} = C_t}
```

Case 2

```
   PSC_t        PSC_{t+1}                            PSC_{t+2}      time
---+------------+------------------------------------+---------->
 {F_t, C_t} {F_{t+1} = F_t, C_{t+1} = C_t}   {F_{t+2} ≠ F_{t+1}, C_{t+2} ≠ C_{t+1}}
```

In the case of a vessel with good past records in t (case 1), there is no incentive for the shipowner to change either the flag or classification society of the vessel ($F_t = F_{t+1}$ and $C_t = C_{t+1}$), and the next inspection will occur only in $t+2$. In the second case, which concerns a vessel in relatively bad condition, if the shipowner keeps the same flag and classification society after the first inspection in t, the target factor for the vessel is high and the next inspection (PSC_{t+1}) is likely to occur soon. Now, if following a $t+1$ inspection, the shipowner changes in an accurate way both the flag and classification society of the vessel, the time before the next inspection which occurs in $t+2$ might be longer.

Another limitation stems from the fact that vessels in relatively poor condition are likely to be over-represented in our sample as they will be subject to more inspections. At the same time, the strategic behaviour that we have previously illustrated is expected to have a reverse effect, making the extent of a potential oversampling difficult to estimate. To limit this drawback, we consider a sufficiently long period of time (eight years) to achieve a fair balance between vessels in relatively bad and in good condition.

Given these shortcomings, our empirical analysis has to be viewed as a preliminary attempt to shed light on the magnitude of the flag- and class-hopping phenomena in shipping, respectively measured through $\Pr(F_t \neq F_{t+1})$ and $\Pr(C_t \neq C_{t+1})$. Let YF_t be a variable which is equal to one when $F_t \neq F_{t+1}$ and 0 otherwise, and $YC_t = 1$ when $C_t \neq C_{t+1}$ and 0 otherwise. We suppose that there exists two latent (unobserved) variables, YF_t^* and YC_t^*, such that $YF_t = 1$ when $YF_t^* > 0$ and 0 otherwise, and $YC_t = 1$ when $YC_t^* > 0$ and 0 otherwise. We rely on the following model structure:

$$\begin{cases} YF_t^* = \theta_F n_t + X_t\beta_F + \varepsilon_F \\ YC_t^* = \theta_C n_t + X_t\beta_C + \varepsilon_C \end{cases}, \tag{1}$$

with n_t the number of deficiencies in t, X_t a set of other vessel characteristics, θ_F, θ_C, β_F, and β_C the associated coefficients to estimate, and ε_F and ε_C two residuals. We assume that the random perturbations follow a bivariate normal distribution function such that $(\varepsilon_F, \varepsilon_F) \sim N(0, 0, 1, 1, \rho)$, with ρ the coefficient of correlation between the two error terms. The corresponding model is thus a bivariate Probit model which is estimated using a maximum likelihood method (see Greene, 2008). As we have repeated observations, standard errors are corrected using a clustering method.

In doing so, our model provides a dynamic approach of the flag- and class-hopping phenomena and offers a way to investigate whether PSC records in t play a significant role in the decision by a shipowner to implement flag- and class-hopping strategies between t and $t+1$, a decision that will be observed when the inspection takes place in $t+1$.

4.0 Data and Descriptive Statistics

The initial sample comes from 35,261 PSC inspections on 12,229 vessels carried out from 1 January 2002 to 31 August 2008 by countries belonging to the Indian Ocean regional MoU.[10] Every PSC boarding generates a detailed inspection report containing the following information: ship's name, International Maritime Organisation (IMO) vessel number, flag of registry, recognised organisation, vessel type, gross tonnage, deadweight tonnage, year built, type of inspection, date of inspection, date of detention, date of release from detention, place of inspection, inspecting authority, and nature of deficiencies.

Out of the 12,229 vessels, 4,683 have only been inspected once over the period and will not be considered in our final sample (as we focus on changes in characteristics between two inspections t and $t+1$). Thus, the final sample is then made of 7,547 vessels that have been subjected to at least two inspections, which corresponds to 30,578 inspections. The average number of inspections per vessel is 4.05.

In addition to the number of deficiencies or detentions, we consider information on the flag of registry for the nine first most important flags in the sample, which amounts to 67.4 per cent of all inspections. The remaining flags (see Appendix A) are aggregated in an 'Others' category. A similar approach was taken for the first ten ship's type and for the first nine most important classification societies[11] that respectively represent 95.3 per cent and 92.8 per cent of inspections. The detailed composition of the other categories is again described in Appendix A. For the 30,578 inspections under consideration, Table 1 provides descriptive statistics of the main variables.

Our two dependent variables are changes in flag of registry and in classification societies between two successive inspections. We therefore only consider changes in the status of a vessel between two successive inspections, which leads to dropping the 'last' inspection for each vessel. For instance, a vessel inspected three times (in t, $t+1$, and $t+2$) generates only two observations and this reduces our sample to 23,031 observations.

[10]In August 2008, the countries were: Australia, Bangladesh, Djibouti, Eritrea, Ethiopia (observer), India, Iran, Kenya, Maldives, Mauritius, Mozambique, Myanmar, Oman, Seychelles, South Africa, Sri Lanka, Sudan, Tanzania, and Yemen.

[11]The nine classifications societies are nine of the ten IACS members.

Table 1
Description of the Sample

Variables	*Distribution (in %)*
Age at PSC inspection	
0–4	14.7
5–9	21.1
10–14	17.3
15–19	15.3
20–24	18.2
25+	13.4
Flag of registry	
Panama	28.3
Liberia	6.8
Hong Kong, China	6.5
Bahamas	4.8
Cyprus	4.4
Singapore	4.7
Russian Federation	3.4
Malta	4.3
Greece	3.2
Others	33.7
Type of ship	
Bulk carrier	49.8
General cargo/multi-purpose ship	16.6
Oil tanker	8.9
Containership	8.6
Chemical tanker	3.1
Vehicle carrier	3.2
Woodchip carrier	1.8
Refrigerated cargo carrier	1.2
Ro-ro cargo ship	1.2
Gas carrier	1.0
Others	4.7
Classification societies	
Nippon Kaiji Kyokai	31.7
Lloyd's Register	14.8
Det Norske Veritas	9.1
American Bureau of Shipping	8.6
Germanischer Lloyd	8.0
Bureau Veritas	8.0
Russian Maritime Register of Shipping	4.8
China Classification Society	3.7
Korean Register of Shipping	4.0
Others	7.3
Year of inspection	
2002	14.9
2003	14.7
2004	16.7
2005	15.4
2006	15.1
2007	13.4
2008	9.9
Number of observations	30,578

Source: Indian MoU 2002–8.

Table 2
Frequency of Changes in Flag and Classification Societies

Panel A. Measured between two consecutive inspections

	Change in classification societies		
Change in flag	*No*	*Yes*	*All*
No	86.3% ($N=19{,}883$)	4.2% ($N=957$)	90.5% ($N=20{,}840$)
Yes	6.9% ($N=1{,}582$)	2.6% ($N=609$)	9.5% ($N=2{,}191$)
All	93.2% ($N=21{,}465$)	6.8% ($N=1{,}566$)	100.0% ($N=23{,}031$)

Panel B. Measured at the vessel level

	At least one change in classification societies		
At least one change in flag	*No*	*Yes*	*All*
No	67.9% ($N=5{,}124$)	6.9% ($N=517$)	74.7% ($N=5{,}641$)
Yes	15.6% ($N=1{,}177$)	9.7% ($N=729$)	25.3% ($N=1{,}906$)
All	83.5% ($N=6{,}301$)	16.5% ($N=1{,}246$)	100.0% ($N=7{,}547$)

Source: Indian MoU 2002–8.

At the vessel level (Panel A in Table 2), and provided that a vessel may have changed flag or classification registry several times during the entire period, no change occurs both in the flag and in the classification society between two consecutive inspections in 86.3 per cent of the cases. Conversely, in 2.6 per cent of the cases, a change in both flag and class has occurred. Interestingly, changes in flag appear to be more frequent than changes in classification society, the proportions being 9.5 per cent and 6.8 per cent, respectively.

We then wonder whether the same vessels are subjected to flag- and/or class-hopping over the period (Panel B in Table 2). For that purpose, we calculate the probability for a vessel to have changed either its flag or classification society from 2002 to 2008. It appears that the proportions for flag- (25.3 per cent) and class-hopping (16.5 per cent) are higher than at the vessel level. For 67.9 per cent of the vessels, there is no change in both the flag of registry and classification society, while a change in both outcomes occurs for 9.7 per cent of the vessels. According to the data, 21.9 per cent of the inspected vessels have changed their flag only once during the period (and respectively 13.1 per cent for classification society), while 3.4 per cent of them (respectively also 3.4 per cent) have changed their flag more than twice.[12]

Finally, we analyse the main characteristics of vessels characterised by flag- and/or class-hopping (Table 3). Looking first at flag-hopping, it is more likely to occur among vessels between ten and twenty years of age (respectively 10.1 per cent and 10.2 per cent in the category), having Malta (15.0 per cent), Cyprus (14.2 per cent), and Greece (12.9 per cent) as flag of registry, refrigerated cargo carriers (19.1 per cent), bulk carriers (10.7 per cent) and oil tankers (10.6 per cent), and with Bureau Veritas (12.1 per cent), 'Others' (11.6 per cent), and Det Norske Veritas (11.0 per cent) as classification societies.

Turning then to class-hopping, this phenomenon is more likely to occur among vessels that are more than twenty-five years old (13.1 per cent), registered in Malta (9.6 per cent), 'Others' (9.0 per cent) and Cyprus (8.3 per cent), general cargo/multi-purpose ship (9.5 per cent), oil tanker (8.5 per cent), refrigerated cargo carriers (7.5 per cent), and Ro-ro cargo ship and, registered with 'Others' (25.9 per cent), American Bureau of Shipping (8.3 per cent), and Bureau Veritas (7.9 per cent) classification societies.[13]

Finally, we look at the relationship between the number of deficiencies in t and the occurrence of flag- and class-hopping. We find a positive correlation between the condition of a vessel (expressed in terms of number of deficiencies) and its likelihood to change flag and classification society. The corresponding coefficients of correlation are respectively equal to 0.043 and 0.079 and are significant at the 1 per cent level. Furthermore, the positive association is more important when the number of deficiencies denoted in t is more than five.

Although purely descriptive, these preliminary results are consistent with the idea that shipowners would be more likely to change the flag and class of their vessel when it is in relatively poor condition (PSC outcome). In what follows, we further investigate the relevance of this conjecture by turning to an econometric analysis of the determinants of changes in flag and classification society between two inspections.

[12]By definition, the probability that a vessel experiences a change in flag/classification society several times over the period increases with the number of inspections. For instance, the proportion of vessels having experienced at least two changes in flag is 2.6 per cent for vessels inspected three times ($N = 1{,}599$), 4.1 per cent with four inspections ($N = 1{,}136$), 6.5 per cent with five inspections ($N = 816$), 7.0 per cent with at least six inspections ($N = 1{,}635$).

[13]Although the proportion of vessels from the 'Others' category concerned with class-hopping is important, it has to be kept in mind that about 93 per cent of vessels were classified by the nine most important groups.

Table 3
Description of the Sample, by Change in Flag of Registry and Change in Classification Societies

	Change in flag of registry		*Change in classification societies*	
Variables	*No*	*Yes*	*No*	*Yes*
Age at PSC inspection				
0–4	92.5	7.5	95.9	4.1
5–9	90.9	9.1	95.3	4.7
10–14	89.9	10.1	93.2	6.8
15–19	89.0	11.0	93.0	7.0
20–24	90.1	9.9	92.5	7.5
25+	90.8	9.2	86.9	13.1
Flag of registry				
Panama	92.5	7.5	94.5	5.5
Liberia	89.2	10.8	93.8	6.2
Hong Kong, China	89.9	10.1	94.3	5.7
Bahamas	90.2	9.8	94.4	5.6
Cyprus	85.8	14.2	91.7	8.3
Singapore	92.7	7.3	97.1	2.9
Russian Federation	97.8	2.2	96.8	3.2
Malta	85.0	15.0	90.4	9.6
Greece	87.1	12.9	95.2	4.8
Others	89.8	10.2	91.0	9.0
Type of ship				
Bulk carrier	89.3	10.7	93.1	7.0
General cargo/multi-purpose ship	91.0	9.0	90.5	9.5
Oil tanker	89.4	10.6	91.5	8.5
Containership	92.1	7.9	96.3	3.7
Chemical tanker	92.8	7.2	95.5	4.5
Vehicle carrier	97.2	2.8	98.2	1.8
Woodchip carrier	97.6	2.4	99.0	1.0
Refrigerated cargo carrier	80.9	19.1	92.5	7.5
Ro-ro cargo ship	91.3	8.8	92.7	7.3
Gas carrier	97.2	2.8	98.1	2.0
Others	92.7	7.3	94.0	6.0
Classification societies				
Nippon Kaiji Kyokai	91.6	8.4	96.1	3.9
Lloyd's Register	89.6	10.5	93.8	6.2
Det Norske Veritas	89.0	11.0	92.6	7.4
American Bureau of Shipping	89.7	10.3	91.7	8.3
Germanischer Lloyd	89.6	10.4	95.1	4.9
Bureau Veritas	87.9	12.1	92.1	7.9
Russian Maritime Register of Shipping	97.1	2.9	97.0	3.1
China Classification Society	94.1	5.9	96.0	4.0
Korean Register of Shipping	90.1	9.9	95.5	4.5
Others	88.4	11.6	74.1	25.9
Number of observations	20,840	2,181	21,465	1,566

Source: Indian MoU 2002–8.

5.0 Econometric Results

We now consider the bivariate Probit model presented in Section 3 to estimate the determinants of the probability of flag- and class-hopping. In a preliminary step, we only control for age at inspection, flag of registry, type of ship, classification society, and year of inspection. As shown in Table 4, a positive coefficient of correlation (0.559) between the residuals of each equation is found, which is significant at the 1 per cent level.[14] As expected, the unobserved factors mainly related to the vessel's condition have a similar influence on the two outcomes under consideration (flag- and class-hopping).

Results from the bivariate specification concerning flag-hopping (columns 2–4, Table 4) show that older vessels are more likely to be subject to flag-hopping. Compared to the reference category (less than five years old), the different age dummies all have a positive and significant influence. The mean probability is increased by about three percentage points for vessels older than ten years.[15] The probability of a change in flag between two inspections in t and $t+1$ is higher when the initial flag of registry is from Malta (+2.8 per cent) or Cyprus (+1.7 per cent).

Conversely, the probability is lower when the vessel is initially registered with the Russian Federation flag (−4.7 per cent), and to a lesser extent with Singapore (−1.8 per cent) and Panama (−1.9 per cent). Refrigerated cargo carriers, bulk carriers, and oil tankers are more subject to flag-hopping, while vehicle carriers and woodchip carriers are less so. Finally, vessels registered with the Russian Maritime Register of Shipping and the China Classification Society are less often subject to flag-hopping.[16]

Then, turning to the class-hopping phenomenon (columns 5–7, Table 4), the main striking element is that all coefficients for classification societies are now significant at the 1 per cent level and negative. Since the nine classification societies identified are the nine largest ones, this suggests that class-hopping affects relatively more vessels registered in smaller classification societies. Again, this is in line with our expectations. Our estimates also show that older vessels are more likely to experience a change in classification society between two inspections. Similar conclusions hold

[14]In Table 4, we report the various estimates from the bivariate Probit model and include marginal effects obtained from univariate Probit models. Indeed, in the bivariate model, there is no single conditional mean function (Greene, 2008). We can get marginal effects for either $YF|YC$ or $YC|YF$.

[15]When introducing the continuous age variable in the regression, we obtain a coefficient equal to 0.038, with a t-value of 4.64. The assumption of a continuous increase in flag-hopping with age is not supported and we find that a quadratic profile better fits the data, with a concave age profile (the peak being at eighteen years).

[16]We also find a negative effect for the Nippon Kaiji Kyokai classification society, the corresponding coefficient being, however, only significant at the 10 per cent level.

Table 4
Bivariate Probit Estimates of the Probability of Change in Flag of Registry and in Classification Societies

	Change in flag between t and t+1			*Change in classification societies between t and t+1*		
Variables	*coef.*	*t-test*	*marginal effect (%)*	*coef.*	*t-test*	*marginal effect (%)*
Constant	−1.355***	(16.20)		−1.073***	(10.55)	
Age at PSC inspection						
0–4	Ref.			Ref.		
5–9	0.103**	(2.52)	+1.7	0.060	(1.14)	+0.6
10–14	0.207***	(4.74)	+3.5	0.279***	(5.08)	+3.5
15–19	0.214***	(4.73)	+3.6	0.250***	(4.46)	+3.0
20–24	0.177***	(3.98)	+2.9	0.247***	(4.53)	+3.0
25+	0.223***	(4.36)	+3.8	0.435***	(7.19)	+6.2
Flag of registry						
Panama	−0.121***	(3.47)	−1.9	−0.058	(1.34)	−0.6
Liberia	0.037	(0.71)	+0.5	−0.007	(0.11)	−0.1
Hong Kong, China	0.025	(0.48)	+0.4	−0.024	(0.37)	−0.2
Bahamas	−0.041	(0.71)	−0.5	−0.133*	(1.90)	−1.3
Cyprus	0.098**	(1.74)	+1.7	0.012	(0.16)	+0.3
Singapore	−0.135**	(2.06)	−1.8	−0.367***	(4.27)	−3.0
Russian Federation	−0.432***	(2.59)	−4.7	−0.035	(0.15)	+0.1
Malta	0.164***	(2.91)	+2.8	0.019	(0.28)	+0.2
Greece	0.047	(0.70)	+0.8	−0.268***	(2.87)	−2.3
Others	Ref.			Ref.		
Type of ship						
Bulk carrier	0.284***	(4.46)	+4.5	0.353***	(4.28)	+3.8
General cargo/ multi-purpose ship	0.173**	(2.55)	+2.9	0.327***	(3.85)	+4.2
Oil tanker	0.240***	(3.31)	+4.2	0.311***	(3.43)	+4.2
Containership	0.112	(1.46)	+1.7	0.080	(0.76)	+0.8
Chemical tanker	0.085	(0.94)	+1.5	0.101	(0.82)	+1.2
Vehicle carrier	−0.398***	(3.35)	−4.4	−0.276*	(1.91)	−2.0
Woodchip carrier	−0.402**	(2.21)	−4.6	−0.361	(1.43)	−3.0
Refrigerated cargo carrier	0.658***	(5.15)	+15.1	0.410***	(2.59)	+6.2
Ro–ro cargo ship	0.152	(1.19)	+2.5	0.206	(1.36)	+2.5
Gas carrier	−0.454**	(2.37)	−5.0	−0.142	(0.68)	−1.3
Others	Ref.			Ref.		
Classification societies						
Nippon Kaiji Kyokai	−0.098*	(1.74)	−1.3	−0.944***	(16.51)	−8.3
Lloyd's Register	−0.077	(1.33)	−1.1	−0.803***	(14.38)	−5.8
Det Norske Veritas	−0.011	(0.17)	−0.2	−0.656***	(10.43)	−4.8
American Bureau of Shipping	−0.068	(1.06)	−1.0	−0.585***	(9.08)	−4.4
Germanischer Lloyd	0.046	(0.67)	+0.7	−0.783***	(10.77)	−5.2
Bureau Veritas	0.048	(0.77)	+0.7	−0.645***	(10.28)	−4.7

Table 4
Continued

	Change in flag between t and t + 1			*Change in classification societies between t and t + 1*		
Variables	*coef.*	*t-test*	*marginal effect (%)*	*coef.*	*t-test*	*marginal effect (%)*
Classification societies						
Russian Maritime Register of Shipping	−0.578***	(4.06)	−6.0	−1.305***	(8.61)	−5.9
China Classification Society	−0.404***	(4.37)	−4.7	−1.056***	(11.71)	−5.4
Korean Register of Shipping	−0.047	(0.64)	−0.7	−0.982***	(11.05)	−5.3
Others	Ref.			Ref.		
Coefficient of correlation (*t*-test)	0.559 (36.15)					
Number of observations (number of vessels)	23,031 (7,547)					
Log likelihood	−11,613.4					

Source: Indian MoU 2002–8.
Bivariate Probit model, estimated by a maximum likelihood method. Absolute values of *t* statistics are in parentheses, standard errors being corrected for clustering at the vessel level. Significance levels are respectively 1 per cent (***), 5 per cent (**), and 10 per cent (*). Marginal effects are obtained from univariate Probit models. The bivariate model also includes a set of year-specific dummies.

among vessels registered in Singapore and Greece, bulk carriers, general cargo/multi-purpose ship, oil tankers, and refrigerated cargo carriers.

To further investigate the potential effect of PSC outcomes on flag- and class-hopping, we then introduce two sets of additional explanatory variables related to deficiencies and detention. As these two covariates are strongly correlated, we include them separately in the bivariate Probit models. We first estimate regressions respectively with any deficiencies and number of deficiencies observed in t (models 1A and 1B), then in t and in $t-1$ (models 2A and 2B).[17] Similar regressions with any detention in t (and in t and in $t-1$) are estimated (models 3 and 4).[18] The corresponding results are presented in Table 5.

Concerning flag-hopping, the probability to observe a change in flag between t and $t+1$ is positively correlated with both the presence of deficiencies and the number of deficiencies detected in t (columns 2–4). In

[17]Including both deficiencies (detentions) in t and in $t-1$ reduces the size of the sample, since the model has to be estimated on the subsample of vessels being inspected at least three times from 2002 to 2008.
[18]Note that detention is a dichotomous variable. In a dynamic perspective, it could be argued that it matters to control for the number of detentions. We have then constructed a cumulative index of detentions, but the number of vessels concerned with multiple detentions is low.

Table 5

Bivariate Probit Estimates of the Probability of Change in Flag of Registry and in Classification Societies

	Change in flag between t and t + 1			Change in classification societies between t and t + 1		
Basic covariates: age, flag, type, organisation, year	*coef.*	*t-test*	*marginal effect (%)*	*coef.*	*t-test*	*marginal effect (%)*
(1A) basic covariates + any deficiency in t	0.066***	(2.68)	+1.07	0.079***	(2.77)	+0.90
(1B) basic covariates + number of deficiencies in t	0.015***	(5.80)	+0.24	0.014***	(5.28)	+0.16
(2A) basic covariates + any deficiencies in t	0.057**	(2.30)	+0.93	0.070	(2.46)	+0.79
+ any deficiencies in $t-1$	0.093***	(3.42)	+1.48	0.086	(2.79)	+1.02
(2B) basic covariates + number of deficiencies in t	0.016***	(4.62)	+0.22	0.014***	(4.08)	+0.14
+ number of deficiencies in $t-1$	0.007**	(1.80)	+0.09	0.014***	(3.69)	+1.42
(3) basic covariates + detention in t	0.108**	(2.37)	+1.72	0.150***	(3.20)	+1.90
(4) basic covariates + detention in t	0.102**	(1.79)	+1.46	0.158***	(2.71)	+1.85
+ detention in $t-1$	0.097**	(1.70)	+1.41	0.170***	(2.74)	+2.03

Source: Indian MoU 2002–8.

Estimates from bivariate Probit models, estimated by a maximum likelihood method. Absolute values of t statistics are in parentheses, standard errors being corrected for clustering at the vessel level. Significance levels are respectively 1 per cent (***), 5 per cent, (**) and 10 per cent (*). Marginal effects are obtained from univariate Probit models.

both cases, this effect is significant at the 1 per cent level (models 1A and 1B). In the same vein, the lagged value of either any deficiency or number of deficiencies (observed in $t-1$) is also positive. In the former case, the probability of flag-hopping is increased by 1.48 percentage point (model 2A), but the relationship is only significant at the 10 per cent level for the lagged number of deficiency (model 2B). This pattern tends to confirm that shipowners are more likely to change flag when the vessel is a relatively bad vessel, characterised by a 'permanent' presence of deficiencies. Interestingly, we also find a positive correlation between the probability of changing flag and the fact that the vessel is detained in t (model 3), although the current and lagged detentions are only significant at the 10 per cent level when being simultaneously introduced (model 4).

Results for class-hopping (columns 5–7) also stress a positive correlation between any deficiency (model 1A), number of deficiencies (model 1B) and detention (model 3) in t and the probability of recording a change in the classification society between two successive inspections. Also, the lagged values of any deficiency/number of deficiencies and detention in $t-1$ (models 2A and 2B) are strong predictors of class-hopping (at the 1 per cent level).

To conclude, our results are in accordance with the idea that vessels in bad condition are more likely to change either their flag or their classification society, meaning that shipowners account for past PSC outcomes when deciding the flag and class for their vessels.

Finally, we investigate whether our previous results still hold when controlling for state dependence. In order to know whether a vessel already subject to flag- and class-hopping is more likely to be later subject to another change, we estimate dynamic ordered Probit models in which the lagged value of the dependent variable (either change in flag or in classification society) is introduced as an additional covariate in the regression. Given the complexity of the bivariate specification, we neglect the possibility that the two random perturbations may be correlated and re-estimate separately the following two dynamic models:

$$\begin{cases} YF_t^* = YF_{t-1} + \theta_F n_t + X_t \beta_F + \varepsilon_F \\ YC_t^* = YC_{t-1} + \theta_C n_t + X_t \beta_C + \varepsilon_C \end{cases}, \tag{2}$$

with YF_{t-1} and YC_{t-1} the lagged values respectively for flag- and class-hopping. We further decompose the error term ε_F (respectively ε_C) and express it as a function of a vessel fixed effect ϑ_F (respectively ϑ_C) and a pure random perturbation ξ_{Ft} (respectively ξ_{Ct}). The main difficulty in estimating such a model is related to the so-called initial condition problem (Heckman, 1981), since the initial state YF_{t-1} (YC_{t-1}) and the vessel fixed effects ϑ_F (ϑ_C) are likely to be correlated. This implies that the lagged value cannot be treated as exogenous.

Table 6
Dynamic Probit Estimates of the Probability of Change in Flag of Registry and in Classification Societies

	Change in flag between t and t + 1		*Change in classification societies between t and t + 1*	
Variables	*coef.*	*t-test*	*coef.*	*t-test*
Constant	−1.870***	(12.51)	−1.862***	(9.84)
Change in flag between $t-1$ and t	0.270***	(4.26)		
Change in flag in $t=1$	−0.002	(0.04)		
Change in class between $t-1$ and t			0.769***	(8.64)
Change in class in $t=1$			0.183**	(2.01)
Number of deficiencies	0.007	(1.45)	−0.002	(0.30)
Mean number of deficiencies	0.034***	(3.86)	0.041***	(4.01)
Number of observations (number of vessels)	11,613 (2,451)		11,613 (2,451)	
Log likelihood	−2,809.2		−2,062.6	

Source: Indian MoU 2002–8.
Dynamic Probit models, estimated by the conditional approach of Wooldridge (2005). Absolute values of t statistics are in parentheses. Significance levels are respectively 1 per cent (***), 5 per cent (**), and 10 per cent (*). The dynamic models also control for age (six dummies), flag (ten dummies), type (ten dummies), and organisation (ten dummies).

To consider these elements, we rely on the parametric approach described in Wooldridge (2005).[19] This consists of estimating an augmented random effects Probit model in which in addition to the lagged value of the dependent variable, we also control for the first-period value of the dependent variable and the time-average values of the other exogenous covariates. Estimates of the dynamic Probit model were respectively computed for flag- and class-hopping, and we focus on vessels inspected at least five times over the last seven years to be able to account for state dependence. The number of deficiencies and the mean number of deficiencies are also considered, to account for the current condition of a specific vessel.[20] The different sets of estimates are presented in Table 6.

[19]See Wooldridge (2005) for a detailed description of the methodology. Note that there are different strategies to estimate a dynamic Probit model, as shown in Heckman (1981) and Wooldridge (2005). Heckman (1981) suggests, for instance, relying on a linear auxiliary equation to explain the probability of the dependent variable in the first period. However, the main drawback of this approach is the need of appropriate instruments, that is, variables expected to have an influence on the first-period choice only. As there is clearly no such variable in our dataset, we chose instead the conditional approach of Wooldridge.

[20]We also estimated the same dynamic models with detention and time-average value of detention instead of deficiencies which nonetheless does not affect the coefficients of the lagged value of the dependent variable (change in flag and change in classification society).

The main result of the dynamic models is that a strong state dependence exists in both flag- and class-hopping. The probability for a vessel to experience a change in flag between two inspections is indeed much higher when the vessel has already been subject to a change in the past. A similar pattern holds for class-hopping. As they stand, our findings suggest that these phenomena are mainly restricted to very specific vessels which are in relatively poor condition, the mean number of deficiencies in the regression being significant.[21]

6.0 Concluding Comments

After more than twenty-five years of existence, PSCs have grown in importance so that nowadays they are commonly used by policy makers as well as private operators. This paper is a first attempt to show how the PSC outcomes, expressed in terms of detention or number of deficiencies, may also be used by shipowners when deciding on the future flag of registry and/or the classification society of their vessels.

Despite limitations coming from potential selection bias, our estimates from data on PSCs collected over six years on 7,500 vessels confirm most of the expected results. First, vessels in relatively bad condition (detention or high number of deficiencies) are more likely to be characterised by a change either in their flag or in their classification society at the next inspection. Second, a strong state dependence in both flag- and class-hopping exists and indicates that changes are more likely to occur for vessels that were already subject to former changes.

Our interpretation is that given the importance of PSC inspections, the result of their actions (detention and deficiencies detected) are nowadays considered by shipowners when deciding on the flag or on the classification society of their vessels. At first sight, this result could be seen as rather encouraging as it stresses the effectiveness of PSC, forcing shipowners to move from relatively bad to good flags or classes. However, our findings merely suggest that PSC actions give rise to opportunistic behaviour among shipowners operating relatively bad vessels.

The fact that vessels which had already changed flags and classes several times in the past are subject to more changes in the future is a very interesting result. From a public policy point of view, this suggests that this criterion should be considered in targeting systems when identifying vessels to inspect.

[21]But the current number of deficiencies is no longer significant.

References

Alderton, T. and N. Winchester (2002): 'Flag States and Safety: 1997–1999', *Maritime Policy and Management*, 29(2), 151–62.

Bimco, Intercargo, International Chamber of Shipping, International Shipping Federation, Intertanko (2007): *Shipping Industry Guidelines on Flag State Performance*. Available on-line at http://www.marisec.org/flag-performance/.

Greene, W. H. (2008): *Econometric Analysis*, 6th edn, Prentice Hall, New Jersey.

Heckman, J. J. (1981): 'The Incidental Parameters Problem and the Problem of Initial Conditions in Estimating a Discrete Time — Discrete Data Stochastic Process', in Manski, C. F. and D. McFadden (eds.), *Structural Analysis of Discrete Data with Econometric Applications*, MIT Press, Cambridge.

Hoffman, J., R. J. Sanchez, and W. K. Talley (2005): 'Determinants of Vessel Flag', in Cullinane, K. (ed.), *Research in Transportation Economics 12*, ch. 6, pp. 173–219, Elsevier. Available on-line at http://www.parismou.org/.

Knapp, S. (2007): *The Econometrics of Maritime Safety — Recommendation to Enhance Safety at Sea*, Doctoral Thesis, Erasmus University, Rotterdam.

Li, K. X. and J. Wonham (1999): 'Who is Safe and Who is at Risk: A Study of 20-year-record on Accident Total Loss Indifferent Flags', *Maritime Policy and Management*, 26(2), 137–44.

OECD (2001): *The Cost to Users of Substandard Shipping*, SSY Consultancy & Research. Available on-line at http://ntl.bts.gov/lib/24000/24400/24466/1827388.pdf.

OECE (1996): *Competitive Advantages Obtained by some Shipowners as a Result of Non-observance of Applicable International Rules and Standards*, OECD/GD(96)4.

Robert, S. and P. B. Marlow (2002): 'Casualties in Dry Bulk Shipping (1963–1996)', *Marine Policy*, 26, 437–50.

Talley, W. (1999): 'Determinants of Ship Accident Seaworthiness', *International Journal of Maritime Economics*, 1(2), 1–14.

Wooldridge, J. (2005): 'Simple Solutions to the Initial Conditions Problem in Dynamic, Nonlinear Panel Data Models with Unobserved Heterogeneity', *Journal of Applied Econometrics*, 20, 39–54.

Appendix A

Construction of the Explanatory Variables

Flag of registry

Nine categories Panama; Liberia; Hong Kong and China; Bahamas; Cyprus; Singapore; Russian Federation; Malta; and Greece.

Reference category Others, which includes Saint Vincent and the Grenadines; China; Marshall Islands; Norway; Korea, Republic of; Philippines; Antigua and Barbuda; Malaysia; Isle of Man (UK); India; Netherlands; Japan; Thailand; United Kingdom (UK); Turkey; Korea, Democratic People's Republic; Denmark; Italy; Taiwan, China; Azerbaijan; Bermuda

(UK); Vanuatu; Germany; Cayman Islands (UK); Iran; Cambodia; Indonesia; France; Sweden; Bangladesh; Belize; United Arab Emirates (UAE); Sri Lanka; Papua New Guinea; Saudi Arabia; Vietnam; Egypt; Croatia; Georgia; Switzerland; Myanmar; Comoros; Kuwait; Netherlands Antilles; Tonga; Jordan; Qatar; Belgium; Syrian Arab Republic; Gibraltar (UK); Turkmenistan; Mongolia; Ethiopia; Pakistan; Bolivia; Lebanon; United States of America; São Tomé and Príncipe; New Zealand; Bahrain; Ukraine; Dominica; Saint Kitts and Nevis; Honduras; Algeria; Sudan; Barbados; Luxembourg; Mauritius; Ireland; Portugal; Samoa; Seychelles; Ghana; Sierra Leone; Slovakia; Bulgaria; Maldives; Fiji; Eritrea; Brazil; Morocco; Tuvalu; Jamaica; South Africa; Tunisia; Spain; Lithuania; Chile; Colombia; Cook Islands; Tanzania; Dominican Republic; Kiribati; Namibia; Somalia; Costa Rica; and Nigeria. This category also includes vessels listed as being registered under unspecified 'Other' flags.

Type of ship

Ten categories Bulk carrier; General cargo/multi-purpose ship; Oil tanker; Containership; Chemical tanker; Vehicle carrier; Woodchip carrier; Refrigerated cargo carrier; Ro-ro cargo ship; and Gas carrier.

Reference category Others, which includes livestock carrier; offshore service vessel; combination carrier; passenger ship; tugboat; NLS tanker; heavy load carrier; special purpose ship; Ro-ro passenger ship; MODU & FPSO; fishing vessel; high speed passenger craft; high speed cargo craft. This category also includes vessels listed under unspecified 'Other types of ship'.

Classification societies (recognised organisations)

Nine categories Nippon Kaiji Kyokai; Lloyd's Register; Det Norske Veritas; American Bureau of Shipping; Germanischer Lloyd; Bureau Veritas; Russian Maritime Register of Shipping; China Classification Society; and Korean Register of Shipping.

Reference category Others, which includes Registro Italiano Navale; Indian Register of Shipping; China Corporation Register of Shipping; International Register of Shipping; Korea Classification Society; International Naval Survey Bureau; Hellenic Register of Shipping; Polski Rejestr Statkow; Croatian Register of Shipping; Biro Klasifikasi Indonesia; Turkish Lloyd; Viet Nam Register of Shipping; Register of Shipping, Albania; Isthmus Bureau of Shipping; Honduras International Surveying and Inspection Bureau; Panama Register Corporation; Panama Maritime Documentation Services; Panama Shipping Registrar Inc.; Global Marine Bureau; Panama

Maritime Surveyors Bureau Inc.; RINAVE Portuguesa; Bulgarski Koraben Registar; Shipping Register of Ukraine; INCLAMAR; Honduras Maritime Inspection; Panama Bureau of Shipping; Belize Register Corporation; Ceskoslovensky Lodin Register; Seefartsaht Helsinki; Honduras Bureau of Shipping; Russian River Register; Marconi International Marine Company Ltd.; Registro Internacional Naval S.A.; and Compania Nacional de Registro e Inspeccion de Naves. This category also includes vessels listed under 'Other', 'No Class', and 'Class Withdrawn'.