

### **Katarzyna Skrzyszewska**

Gdynia Maritime University  
e-mail: k.skrzyszewska@wpit.umg.edu.pl  
ORCID: 0000-0002-2102-0313

### **Anetta Waśniewska**

Gdynia Maritime University  
e-mail: a.wasniewska@wpit.umg.edu.pl  
ORCID: 0000-0003-1824-7039

---

## **THE IMPORTANCE OF STATE AID IN REBUILDING THE SECTOR POTENTIAL USING THE EXAMPLE OF EU MARITIME SHIPPING**

---

## **ZNACZENIE POMOCY PUBLICZNEJ W ODBUDOWANIU POTENCJAŁU SEKTORA NA PRZYKŁADZIE UNIJNEJ ŻEGLUGI MORSKIEJ**

---

DOI: 10.15611/pn.2019.12.11

JEL Classification: L52, R41, R48

**Summary:** Maritime transport is an essential element of economic expansion. The fleet under the national flag enables the diversification of supply routes, and creates opportunities for the development of new areas of economic activity based on sea resources. Despite these obvious advantages the fleet registered under the EU flags is getting smaller. The aim of the article is: (1) an analysis of the importance of national fleets for the EU economy and reasons for the fleet reduction in the national registers, (2) assessment of the effects of the admissible state aid to maritime transport in the EU, (3) identification of factors positively affecting the potential of national fleets. The research was carried out using a critical analysis of literature and an econometric model with many variables explaining the phenomenon using the classical least squares method. The research results indicate that the use of protectionist policy tools does not bring the expected results, and the impact of market factors is more visibly reflected in the size of the fleets registered under the national flags than in the state aid.

**Keywords :** maritime transport, state aid, maritime economy, ship register.

**Streszczenie:** Transport morski jest niezbędnym elementem ekspansji gospodarczej. Flota pod narodową banderą umożliwia dywersyfikację dróg zaopatrzenia, a ponadto stwarza możliwości rozwoju nowych obszarów aktywności gospodarczej opartych na zasobach morza. Mimo to, flota zarejestrowana pod banderami unijnymi jest coraz mniejsza. Celem artykułu jest: (1) analiza znaczenia flot narodowych dla gospodarki unijnej i przyczyn redukcji flot

w narodowych rejestrach, (2) ocena efektów dopuszczalnej w UE pomocy publicznej dla transportu morskiego, (3) wskazanie czynników pozytywnie wpływających na potencjał flot narodowych. Badania zrealizowano, wykorzystując analizę krytyczną literatury oraz model ekonometryczny z wieloma zmiennymi objaśniającymi zjawisko, z wykorzystaniem klasycznej metody najmniejszych kwadratów. Wyniki badań wskazują, że stosowanie narzędzi polityki protekcjonistycznej nie przynosi oczekiwanych rezultatów, a czynniki rynkowe w większym stopniu niż pomoc publiczna znajdują odbicie w wielkości flot zarejestrowanych pod banderami narodowymi.

**Słowa kluczowe:** transport morski, pomoc publiczna, gospodarka morska, rejestr statków.

## 1. Introduction

The common understanding of maritime transport (shipping – in this article both terms will be used interchangeably) limited only to the carriage of goods by sea is a narrow approach that does not fully reflect the role that maritime transport plays in the modern economy. This perception of maritime transport results from its most important function performed in the framework of global trade – cargo movement: 80-85% of all cargo is transported as a part of trade in terms of volume and approximately 70% in terms of value is shipped by seas and oceans (Commission Communication C(2004) 43, 2004; Meersman, Voorde, & Vanelslander, 2009). As far as the European Union is concerned, the importance of maritime transport depends on the directions and the extent of trade. The intra-EU trade is handled by maritime transport only in 40% of its volume, while the external trade – in 90% (Commission Communication C(2004) 43, 2004).

However, understanding shipping only in terms of cargo handling capacity does not reflect the essence and does not indicate the importance of this sector in the modern world. According to the definition of the European Community of Shipowners Association (ECSA), maritime transport is an economic activity involving the following forms of activity: “(...)

- transport of goods by sea;
- transport of persons by sea;
- service and offshore support vessels (ships laying or repairing undersea cables or pipelines; prospecting for oil; conducting oceanographic research; diving assistance; undertaking undersea work; servicing offshore wind farms, oil and gas platforms;
- towage and dredging activities at sea” (Oxford Economics, 2017).

Economic activity conducted as a part of shipping is highly expensive, capital-intensive and time-consuming. The involvement of many business entities in production and delivery of shipping services involves significant economic direct, indirect, induced and catalysed effects. Due to the complexity, multitude and global scope of the economic processes initiated by maritime transport, it is extremely difficult to estimate their dimension for Poland. This is due to the fact that the Polish

commercial fleet is relatively small (currently it accounts for only 0.0056% of global tonnage). In addition, the majority of the fleets belonging to Polish businesses operate under foreign flags (UNCTADstat, 2019). Research on the impact of the EU fleet on the EU economy was carried out by the Oxford Economics Unit at the request of the ECSA.

According to this institution, the direct share of shipping in EU GDP is € 57 billion, and taking into account indirect and induced effects – € 140 billion, and 640,000 people are directly employed in shipping (including jobs generated through indirect and induced effects – 2.1 million people). One job at sea generates around three jobs in other areas of the EU economy, and the investment multiplier for the sector is 2.6 (Oxford Economics, 2017). In addition, earnings from maritime transport services provided to third countries have a positive effect on the current account balance. In addition to measurable economic effects associated with owning a fleet, the following effects are also difficult to quantify: a better negotiating position when concluding commercial contracts, the implementation of which requires sea transport, greater security in the supply of raw materials, strategic products necessary for functioning (both for society and the economy); finally, issues of prestige and issues related to the possibility of ensuring greater military security (Brand, 2007; Haralambides, 1996; Niavis, Papatheochari, Kyratsoulis, & Coccossis, 2017). For centuries, a fleet has been necessary for territorial and economic expansion. Currently, the world's largest economies are the owners of the largest fleets in terms of tonnage. It is also one of the four elements (besides telecommunications, trade liberalisation and standardisation) that enabled the globalisation of economic activity (Baird, 2003; Brand, 2007; Valentine, Benamara, & Hoffmann, 2013).

## **2. State aid as an attempt to stop the degradation of the European fleet**

### **2.1. Essence of changes in shipping at the turn of the 20th and 21st centuries**

The dominance of European countries in terms of their fleet over the countries of other continents began to decrease at the beginning of the 20th century. Until the outbreak of World War I, Great Britain was the hegemon at sea, with nearly half the world tonnage under its flag. However, two world wars changed the balance of power, and although together the fleet of countries that later formed the European Community was still the largest, in the mid-1960s the US became the leader in the size of national fleet. Then countries from the Far East (Japan, South Korea, and China) began to join the owners of the largest fleets (Brand, 2007; Celik & Kandakoglu, 2012; Cullinane, Notteboom, Sanchez, & Wilmsmeier, 2012).

In the 1980s, as a result of the deep crisis in global shipping, caused among others by the huge oversupply of ships, there was a significant decrease in tonnage belonging to member states of the European Community. While the global fleet

decreased by around 5%, the European Community fleet decreased by almost 30% (Brand, 2007). Apart from Belgium, the fleets of all Community countries have decreased, the largest decreases were reported by the Greek and the UK fleets. At the same time, despite increasing its own fleet by one-third, the US share in global tonnage also decreased in favour of four developing countries of South East Asia: China, Hong Kong, Singapore and South Korea.

The oversupply of tonnage concerned equally all shipowners handling international trade. However, what was the main premise for reducing the Community fleets were high operating costs in the areas, where costs are not shaped on the global market (e.g. fuel), but are based on the applicable flag state law (e.g. costs of crews). Sales of ships and transfer of ships from their own register to the third country registers (reflagging) was the main reason for the reduction of the European fleet, the effects of which extended to other sectors of the widely understood maritime economy, and also significantly reduced the competitiveness of the European fleet on the international shipping market (Brand, 2007; Commission Communication (2009/C 132/06), 2009; Commission Communication C(2004) 43, 2004).

## **2.2. Effects of the shipping crisis on European maritime economies**

The crisis in global shipping, in addition to the reduction of individual national fleets of member states of the Community (then the EU), initiated a chain of many negative phenomena:

1. Selling, scrapping and reflagging the EU vessels due to the lack of orders for new vessels resulted in a significant increase in the average age of the Community vessels, which in turn significantly reduced their competitiveness and was associated with higher operating costs.

2. The lack of orders for new ships and the smaller fleet operated by European entrepreneurs led to the significant deterioration of the situation in European shipyards – with regard to design, construction and renovation of vessels in view of new technical and technological solutions (especially at the turn of the 1980s and 1990s) in the world shipbuilding industry. The European shipbuilding industry, as well as ships themselves, began to be less and less competitive.

3. Reduction of jobs for people employed at sea (mostly in Greece and the United Kingdom) and for staff employed onshore to handle shipping as well as complementary industries.

Over time, the third countries had increasingly better ships (more efficient), and the crews were not only cheaper because of lower wages, but also because of lower (or the lack of) personal and social security taxes. Running a business in some of the third countries gave a competitive advantage related to the lack of corporate income taxes.

The above solutions in the third countries and, compared to them, the unfavourable conditions of sailing under the national flags meant that shipowners either began to change the flag for the flags outside the Community or began to change the sector of their economic activity.

Shipping communities at the national and the EU level called for more favourable conditions for the European fleet (the European Community, then the EU), indicating the risk of:

- No impact on the fleet transporting loads to and from Europe, which in the long run may result in the lower quality of transport and its higher costs.
- Loss of the current negotiating position in trade relations with the third countries.
- Loss of jobs at sea and then on land, which as a consequence will cause maritime economies, especially in the field of economic activity to require people with maritime experience (confirmed by relevant diplomas); furthermore, it will force enterprises to close down resulting in the loss of certain sectors or a need to bring specialists from outside the Community/Union (e.g. to support maritime administration, to provide port services, etc.).
- Transferring negative trends in shipping into other sectors of the national economy.
- Loss of revenues and effects of shipping activities that are reflected in the balance of payments due to participation in the internal trade and the cross trade.
- A lower level of economic security (transport by their own fleet independent of the third countries) and, to a certain extent, military security (access to the fleet and experienced seafarers) (Commission Communication C(2004) 43, 2004; Commission of the European Communities, 1989).

In order to stop the chain of events negatively affecting European shipping, the maritime economy and as a consequence also national economies, the European Commission has decided that it is necessary to introduce such solutions and incentives for the Community shipowners that would make them interested in registering ships under the EU flags and hiring crews made up from citizens of the Community.

### **2.3. Public aid dedicated to maritime transport in light of the EU regulations**

Maritime transport was covered by the Community policy relatively late. The global range of activity, a high degree of liberalism and activities largely shaped by the market mechanism meant that for many years some members of the European Community did not want to include shipping in the regulated sphere. It was not until 1974 that the European Court of Justice recognized that all provisions of the Treaty of Rome also apply to maritime transport (Kujawa, 1999). In 1985 a common policy was formulated: Progress towards a Common Transport Policy. Maritime Transport (COM (85) 90 final, L2985, Luxemburg, 14/03/1985), and in 1986, as a complement and finalisation of the common market shipping policy, the so-called shipping package<sup>1</sup>, which aimed to indicate the need for member states to abstain from market deformation and restricting free competition (Kujawa, 1999).

---

<sup>1</sup> Regulation (EEC) No 4055/86 applying the principle of freedom to provide maritime transport between Member States and between Member States and third countries, as last amended by Regulation (EEC) No 3573/90 (OJ No L 353, 17. 12. 1990, p. 16); Regulation (EEC) No 4056/86 laying down detailed rules for the application of Articles 85 and 86 of the Treaty to maritime transport, as last

In view of adverse phenomena and the increasingly difficult situation of shipping companies and other shipping sectors, the first joint document on assistance for shipping companies was created in 1989: A future for the Community shipping industry – measures to improve the operating conditions of Community shipping (COM(89) 266 final, 3. 8. 1989) (Commission of the European Communities, 1989).

It was decided then that it was necessary to introduce such solutions and incentives for the Community shipowners that will make them interested in registering ships under the EU flags and employ crews composed of the citizens of the Community. One such solution was to be the creation of the EU register, in parallel to the existing national registers. The Commission also proposed other solutions aimed at increasing the competitiveness of the EU fleet. One of the directions was also to increase the technical efficiency of the fleet so that Community vessels could be competitive on the international market, and at the same time that, thanks to the reduction of crews, it would be possible for employers to accept higher costs of employing the Community seafarers. The decision was made to rigorously check the third country flag ships calling at the Community ports for strict compliance with all safety, environmental and employment standards and the crew living conditions in accordance with relevant conventions of the International Maritime Organization (IMO) and the International Labour Organization (ILO).

As there were no expected results, in 1997 the European Commission announced a new shipping aid program: Community guidelines on State aid to maritime transport (Commission Communication (97/C 205/05), 1997). The document presented a broader spectrum of public aid options directed to enterprises in this sector than before. In contrast to previously adopted solutions, it was now allowed for public aid to offset the operating costs of the EU flag vessels in relation to the open registers for each flag separately.

Efforts made to compensate the costs of operating shipping activities under the flags of the EU member states still did not bring the desired results either, so subsequent attempts were made to expand the scope of public aid. The European Commission announced further programs:

- Community guidelines on State aid to maritime transport, OJ C 013, 17.01.2004 (Commission Communication C(2004) 43, 2004).
- Guidelines on State aid to ship management companies, OJ C 132, 11.06.2009 (Commission Communication (2009/C 132/06), 2009).
- Community guidelines on State aid to maritime transport, OJ C120, 13/04/2017 (Commission Communication (2017/C 120/03), 2017).

---

amended by the Act of Accession of Austria, Finland and Sweden, Regulation (EEC) No 4057/86 on unfair pricing practices in maritime transport, Regulation (EEC) No 4058/86 concerning coordinated action to safeguard free access to cargoes in ocean trades.

The above mentioned documents introduced changes adapting the binding legal regulations to the economic reality, which in the case of maritime transport is characterised by the high dynamics of the changes.

### 3. Potential of the EU fleets with regard to the state aid and selected determinants

#### 3.1. Analysis of amounts allocated for the state aid and the size of the EU fleets

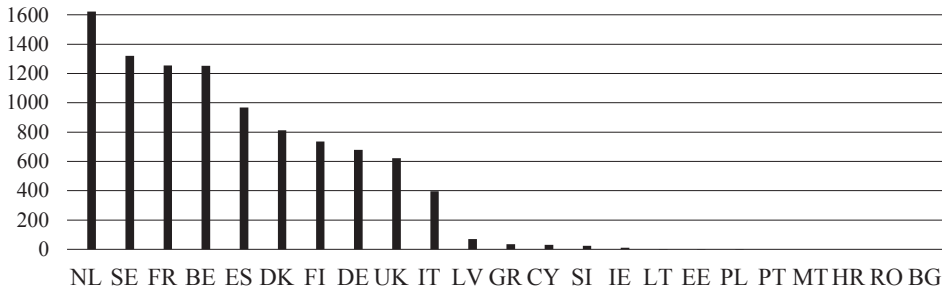
One of the research objectives presented in the article was to assess the effectiveness of the state aid granted to shipping companies operating in the EU member states. Table 1 presents the amounts allocated for assistance in shipping, and lists 23 EU countries with access to the sea.

**Table 1.** State aid to maritime transport spent in million EUR, at current prices

Country	2009	2010	2011	2012	2013	2014	2015	2016
Belgium	296.2	193.6	242.3	130.8	79.6	107.8	55.2	145.9
Bulgaria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cyprus	2.6	2.4	2.6	2.9	4.4	4.5	4.9	5.4
Germany	82.9	139.3	51.2	78.1	94.7	81.0	55.1	96.8
Denmark	87.3	87.3	87.2	131.8	130.9	131.3	134.1	143.2
Estonia	0.1	0.1	0.2	0.2	0.2	0.0	0.0	0.0
Greece	0.0	0.0	0.0	0.0	0.3	13.4	12.3	9.7
Spain	133.5	127.3	116.0	105.4	115.0	112.0	159.5	98.6
Finland	89.4	78.0	79.0	84.5	117.1	97.5	92.4	96.9
France	224.3	184.8	188.2	195.0	99.3	88.7	168.7	106.0
Croatia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ireland	1.4	1.3	1.6	1.6	1.4	1.7	1.2	0.5
Italy	122.6	100.2	31.2	6.0	12.8	47.7	59.2	16.1
Lithuania	0.4	0.1	0.9	0.1	0.1	1.0	0.1	0.1
Latvia	0.5	0.2	0.2	0.0	0.0	20.5	45.7	2.4
Malta	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Netherlands	136.8	185.0	183.5	188.2	226.4	231.8	234.8	235.3
Poland	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Portugal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Romania	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweden	161.6	189.3	198.6	209.2	187.8	162.0	154.6	157.1
Slovenia	10.4	11.9	1.1	0.0	0.1	0.0	0.0	0.0
United Kingdom	116.2	120.4	143.2	127.9	114.2	0.0	0.2	0.1

Source: (European Commission, n.d.).

The richest countries of the European Union spent the largest amounts on the state aid – Scandinavia and then Belgium, the Netherlands and Germany. The state aid was relatively small in Southern Europe and the UK (Table 1., Figure 1).

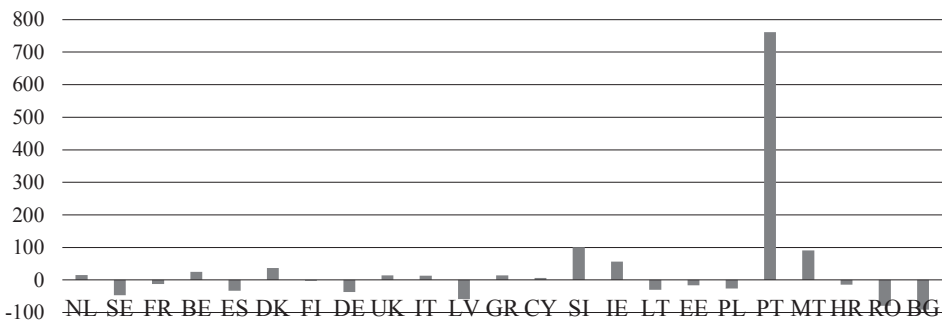


**Fig. 1.** Total state aid to maritime transport spent in million EUR, at current prices, 2009-2016

Source: Table 1.

The least money for this purpose was allocated by the countries of Central and Eastern Europe, while in the Baltic States these amounts were small (up to EUR 50 million in the case of Latvia in 2015), the rest of the countries allocated money for the state aid to shipping sporadically, small amounts (e.g. Poland) or did not support its sea transport at all. Considering the size of individual fleets, it turns out that the leading European ship owners are not those from the countries with the highest state aid, but island countries (Table 1, Figure 1.).

Figure 2 shows the changes that were recorded in tonnage (in DWTs) registered under the national flags of EU member states over the period 2009-2016.



**Fig. 2.** Changes in tonnage of vessels registered under EU flags, 2009-2016 [%]

Source: (UNCTADstat., 2019).

Portugal was the unquestionable leader of the increase in the registered tonnage, which during the period considered did not allocate any funds to state aid for maritime



transport. Slovenia, the second in terms of changes in the registered tonnage, spent only EUR 23.5 million on public aid (representing 1.5% of the expenditure of the Netherlands – the leader of public aid). Malta, the third in this ranking, as well as Portugal, did not allocate any means of public funding to maritime transport. A comparison of the amount of state aid expenditure with the effects (in terms of changes in tonnage registered under the national flag) indicates the lack of relation between the amount of state aid allocated to maritime transport and the tonnage increase under the national flag.

The question then arises – what has a greater impact than the state assistance on the competitiveness of the European flag fleet? The authors attempted to answer this question on the basis of statistical data and with the use of econometric methods.

### 3.2. Research methodology

Organisational and economic interrelationships occurring in maritime transport have a multidimensional character. Therefore, for the purpose of the article, which is aimed at identifying the elements of the maritime economy that to the greatest extent influence the size of the fleet registered under the national flag, the econometric model was used. Its general form is described by the following equation:

$$y_i = \alpha_0 + \alpha_1 x_{j1} + \alpha_2 x_{j2} + \dots + \alpha_k x_{jk} + \varepsilon_i; \quad i = 1, 2, \dots, n,$$

where:  $y_i$  –  $i$ -th observation of the explanatory variable;  $x_{ji}$  –  $i$ -th observation of the  $j$ -th explanatory variable;  $\varepsilon_i$  – random element;  $\alpha_0, \alpha_1, \alpha_2, \dots, \alpha_k$  – unknown structural parameters of the model (Maddala, 2013).

In the vector-matrix notation this equation can be also written in the following way:

$$y = Xa + e,$$

where:  $y$  – vector of the observation of the explanatory variable;  $X$  – matrix of the observation of explanatory variables;  $a$  – vector of structural parameters estimation;  $e$  – residuals vector.

The thus calculated vector of structural parameters estimation of a linear model with the use of the classical model of the least squares has the following form:

$$a = (X^T X)^{-1} X^T y.$$

The estimation of the structural parameters of the model enables identifying the interdependences occurring among variables. In order to check the dependences related to the size of the fleet registered under the flag of a given country in the period 2007-2016 (explanatory variable) using the classical method of least squares, the explanatory variables given in Table 1 were adopted. The analysis was performed for 23 coastal states belonging to the European Union.

**Table 2.** Explanatory variables used in the econometric model

Explanatory variable	Explanatory variable description
$X_1$	Short sea shipping – gross weight of goods transported to/from main ports
$X_2$	Short sea shipping – gross weight of goods transported to main ports
$X_3$	Short sea shipping – gross weight of goods transported from main ports
$X_4$	Passengers embarked and disembarked in all ports
$X_5$	Gross weight of goods transported to/from main ports
$X_6$	Gross weight of goods transported to main ports
$X_7$	Gross weight of goods transported from main ports
$X_8$	Number of vessels in the main ports
$X_9$	Gross tonnage of vessels in the main ports

Source: (Eurostat, 2019).

The data for 2007-2016 used to build models came from EUROSTAT. In order to eliminate explanatory variables, which negligibly influence the model, the method of analysing correlation coefficients on the relevance level equal to 0.10 was used. The correlation coefficients were calculated on the basis of the data from 10 years for each analysed country separately (in total 23 correlation vectors were obtained between the explanatory variable and potential explanatory variables, and 23 matrices of correlation coefficients between explanatory variables, one for each analysed country). Then, on the basis of the readings of distribution from t-Student tables, the critical value of the linear correlation coefficient was calculated and the elimination of variables, which did not satisfy any assumptions, was performed. On the basis of the other variables, econometric models were created for each country separately. Furthermore, the value of the coefficient of residuals variance ( $V_e$ ) as well as the coefficient of determination ( $R_e$ ) and indetermination ( $\phi_e$ ) were calculated. The results of the calculations are presented in Table 3.

The coefficient of determination is in the range [0,1] and shows which part of the explanatory variable is explained by the model. It is worth emphasising that the higher the value of the coefficient of determination, the better match of the model. The coefficient of indetermination shows what part of explanatory variables variance was not explained by the model. The higher its value is, the lesser its match. At the same time it is assumed that for the analysis other explanatory variables, which have greater influence on the analysed phenomenon, should be used (Aczel, 1989).

The best match of the model to explanatory variables which were used in the description of economic interrelationships with regard to shipping was obtained for Denmark, Malta and Romania. Their determination coefficient exceeded 90%. In the case of 11 analysed countries the value of the matching coefficient was in the range from 80% to 89%. High indicators of the model mismatch with regard to the data

**Table 3.** Values of the coefficient of residuals variance, the coefficient of determination, the coefficient of indetermination and variables in the model for each analysed country

Country	Ve (%)	R2	$\phi^2$	Explanatory variable
Belgium	7.85	0.54	0.46	X <sub>9</sub>
Bulgaria	29.67	0.86	0.14	X <sub>7</sub> , X <sub>8</sub>
Croatia	9.15	0.17	0.83	X <sub>6</sub>
Cyprus	2.01	0.80	0.20	X <sub>4</sub>
Denmark	4.95	0.93	0.07	X <sub>5</sub> , X <sub>6</sub> , X <sub>8</sub>
Estonia	10.74	0.80	0.20	X <sub>9</sub>
Finland	4.09	0.80	0.20	X <sub>1</sub> , X <sub>3</sub> , X <sub>9</sub>
France	8.91	0.22	0.78	X <sub>9</sub>
Germany	11.20	0.66	0.34	X <sub>4</sub> , X <sub>3</sub> , X <sub>6</sub>
Greece	4.77	0.80	0.20	X <sub>4</sub>
Ireland	8.45	0.84	0.16	X <sub>3</sub>
Italy	10.23	0.67	0.33	X <sub>2</sub>
Latvia	32.77	0.79	0.21	X <sub>4</sub>
Lithuania	6.00	0.89	0.11	X <sub>4</sub>
Malta	8.34	0.93	0.07	X <sub>4</sub> , X <sub>6</sub>
Netherlands	6.91	0.77	0.23	X <sub>8</sub>
Poland	22.37	0.47	0.53	X <sub>2</sub>
Portugal	49.21	0.83	0.17	X <sub>6</sub>
Romania	18.74	0.91	0.09	X <sub>2</sub> , X <sub>6</sub>
Slovenia	24.87	0.66	0.34	X <sub>4</sub>
Spain	5.09	0.89	0.11	X <sub>7</sub>
Sweden	10.95	0.83	0.17	X <sub>2</sub> , X <sub>3</sub> , X <sub>8</sub>
United Kingdom	5.77	0.85	0.15	X <sub>7</sub>

Source: own calculations based on EUROSTAT.

assumed in the analysis were found for France and Croatia, where the coefficient of indetermination for these models had the value of 78% and 83%, respectively. This means that in the case of France and Croatia, the determinants selected for investigations of the fleet size are not of key importance.

The most frequent factors affecting the size of the fleet registered under the flag of a given country include determinant X<sub>4</sub> (passengers embarked and disembarked in all ports), which occurred in seven countries and X<sub>6</sub> (gross weight of goods transported to main ports), chosen for the model in six cases, however only in Finland variable X<sub>1</sub> (short sea shipping – gross weight of goods transported to/from main ports).

It is important to note that not all explanatory variables influence so strongly the econometric model explaining the formation of an explanatory variable. Therefore,

a measure of relative relevance of variable  $X_i$  on variable  $Y$  was used to calculate the so-called relevance coefficient:

$$b_i = \frac{\bar{x}_i}{\bar{y}} a_i,$$

where:  $\bar{x}_i$  – arithmetic mean of the  $i$ -th explanatory variable;  $\bar{y}$  – arithmetic mean of the explanatory variable;  $a_i$  – value of the parameter estimation for the  $i$ -th explanatory variable (Nowak, 1994).

The calculation results are presented in Table 4.

**Table 4.** Values of relevance coefficients of the explanatory variable

Country	Relevance coefficients								
	$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$	$X_7$	$X_8$	$X_9$
Belgium									1.3669
Bulgaria							2.9488	1.5557	
Croatia						0.1969			
Cyprus				0.1073					
Denmark					1.6169	0.9218		0.1053	
Estonia									0.6189
Finland	0.7188				0.0041				2.0817
France									0.4556
Germany				5.1273	0.3894	1.3932			
Greece				0.6495					
Ireland			1.8439						
Italy		1.6985							
Latvia				2.4313					
Lithuania				1.1140					
Malta				2.4499		0.1881			
Netherlands								0.8687	
Poland		1.2947							
Portugal						11.5069			
Romania		2.0945				0.6010			
Slovenia				1.1808					
Spain							0.6770		
Sweden		2.9737	1.4623					1.1599	
United Kingdom							1.5361		

Source: own calculations based on EUROSTAT.

Relevance coefficients make it possible to assess which of the variables has a stronger impact on the value of the explanatory variable in absolute terms. It is assumed that it is the one with the higher value. The highest value of the relevance factor in Portugal was for determinant  $X_6$  (gross weight of goods transported to the main ports) and the lowest value in Denmark for factor  $X_8$  (number of vessels in the main ports).

#### 4. Conclusion

The steps taken by the European Commission to equalise opportunities for the European shipowners on the global maritime transport market have brought little results so far. The unfavourable trend of decreasing the role of the European fleet on the global market that started in the mid-1980s has not ceased. Although the support tools proposed by the European Commission are being used, especially by the richest EU countries, the amounts spent on this economic activity do not translate directly into the size of the national fleets owned. As a result of research the following conclusions were formulated:

- There is no simple relationship between the measures that were introduced to equalize the level of costs incurred by the European states and the size of the national fleets.
- The size of the national fleet is determined more by the demand for services performed by maritime transport than by the volume of the dedicated state aid.
- Among the countries with the largest national fleet, significant factors were, *inter alia*, the volume of trans-shipments to and from the ports of a given country and the number of passengers boarding and disembarking in the ports of a given country.

To sum up, the market conditions determining the size of the fleet registered under the national flag turned out to be more important than the protectionist policy tools.

#### References

- Aczel, A. D. (1989). *Complete Business Statistics*. Homewood, IL: Irwin Professional Publishing.
- Baird, A. J. (2003). Global Strategy in the Maritime Sector: Perspectives for the Shipping and Ports Industry. Retrieved from [http://scholar.google.pl/scholar\\_url?url=http://www.oea.org/cip/english/docs/ecommittee/past\\_meetings/ordinary\\_meetings/3meeting\\_mexico03/4\\_global\\_seg\\_maritime\\_sector.doc&hl=pl&sa=X&scisig=AAGBfm1zK0IfTpRZ4hqaJ4-z9WdJ6EhMQ&nossl=1&oi=scholar](http://scholar.google.pl/scholar_url?url=http://www.oea.org/cip/english/docs/ecommittee/past_meetings/ordinary_meetings/3meeting_mexico03/4_global_seg_maritime_sector.doc&hl=pl&sa=X&scisig=AAGBfm1zK0IfTpRZ4hqaJ4-z9WdJ6EhMQ&nossl=1&oi=scholar)
- Brand, A. E. (2007). *Elements of shipping*. New York: Routledge.
- Celik, M., & Kandakoglu, A. (2012). Maritime policy development against ship flagging out dilemma using a fuzzy quantified SWOT analysis. *Maritime Policy & Management*, 39(4), 401-421. Retrieved from <https://doi.org/10.1080/03088839.2012.689876>

- Commission Communication (97/C 205/05). (1997). *Community guidelines on State aid to maritime transport*.
- Commission Communication (2009/C 132/06). (2009). *Communication from the Commission providing guidance on State aid to ship management companies*. Official Journal of the European Union (C 132/6).
- Commission Communication (2017/C 120/03). (2017). *Communication from the Commission updating the annex to Commission Communication C(2004) 43 – Community guidelines on State aid to maritime transport*. Official Journal of the European Union (C 120/10).
- Commission Communication C(2004) 43. (2004). *Community guidelines on State aid to maritime transport*.
- Commission of the European Communities (89) 266 final. (1989). *A future for the Community shipping industry: Measures to improve the operating conditions of Community shipping*.
- Cullinane, K., Notteboom, T., Sanchez, R., Wilmsmeier, G. (2012). Costs, revenue, service attributes and competition in shipping. *Maritime Economics & Logistics*, 14(3), 265-273. <https://doi.org/10.1057/mel.2012.7>
- European Commission. (n.d.). *State aid scoreboard 2018*. Retrieved from [https://ec.europa.eu/competition/state\\_aid/scoreboard/index\\_en.html](https://ec.europa.eu/competition/state_aid/scoreboard/index_en.html)
- Eurostat. (2019). Retrieved from <https://ec.europa.eu/eurostat/data/database>
- Haralambides, H. E. (1996). *The economic impact of shipping on the national economy*. Retrieved from [https://www.researchgate.net/publication/267700072\\_THE\\_ECONOMIC\\_IACT\\_OF\\_SHIPPING\\_ON\\_THE\\_NATIONAL\\_ECONOMY](https://www.researchgate.net/publication/267700072_THE_ECONOMIC_IACT_OF_SHIPPING_ON_THE_NATIONAL_ECONOMY)
- Kujawa, J. (1999). *Wspólna polityka żeglugowa Unii Europejskiej*. Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego.
- Maddala, G. S. (2013). *Ekonometria*. Warszawa: WN PWN.
- Meersman, H., Voorde, E. van de Vanelslander, T. (2009). *Future challenges for the port and shipping sector*. London: Informa Law.
- Niavis, S., Papatheochari, T., Kyriatsoulis, T., Coccossis, H. (2017). Revealing the potential of maritime transport for 'Blue Economy' in the Adriatic-Ionian Region. *Case Studies on Transport Policy*, 5(2), 380–388. Retrieved from <https://doi.org/10.1016/j.cstp.2017.03.002>
- Nowak, E. (1994). *Zarys metod ekonometrii. Zbiór zadań*. Warszawa: PWN.
- Oxford Economics. (2017). *The economic value of the EU shipping industry. 2017 update. A report for the European Community Shipowners' Associations (ECSA)*. London: Oxford Economics Ltd.
- UNCTADstat. (2019). Retrieved from <https://unctadstat.unctad.org/EN/>
- Valentine, V. F., Benamara, H., & Hoffmann, J. (2013). Maritime transport and international seaborne trade. *Maritime Policy & Management: The Flagship Journal of International Shipping and Port Research*, 40(3), 226-242. <http://dx.doi.org/10.1080/03088839.2013.782964>