

# **AN ANALYSIS OF THE STRUCTURAL AND OWNERSHIP CHANGES IN THE WORLD MARITIME FLEET**

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# **AN ANALYSIS OF THE STRUCTURAL AND OWNERSHIP CHANGES IN THE WORLD MARITIME FLEET**

**ALBERT J. ALLEN, JOSELITO K. ESTRADA, AND SALEEM SHAIK**

The objective of this study is to examine global changes in the world maritime fleet by countries and regions using secondary data. To accomplish the objective of this study, descriptive analysis and the shift-share analysis technique were utilized. Results from the study reveal that none of the six major countries of ship registry dominated the registration of all types of vessels in the world fleet. Of the six countries, only Panama and the Bahamas exhibited positive growth in vessel registration between 1997 and 2003. In addition, Panama is the only major ship registry nation that has both a competitive advantage and specialization (positive competitive and allocation effects) in the registration of bulk cargo carriers. The Bahamas, on the other hand, exhibits competitive advantage and specialization in the general cargo and other types of vessels. *Key words:* structure, ownership, country of registration, shift-share analysis, maritime fleet

## **Introduction**

The world maritime fleet is changing to reflect the changes in worldwide economic activities. Globalization has become the new phrase of the moment, but true globalization means that countries must have genuine international cooperation. Creating partnerships and examining methods to determine new ways to work with other nations throughout the world represents the best way to thrive in the global economy (Rosenblatt et al). The world maritime fleet can be used as an indicator of international cooperation among countries. For example in 2002, the world maritime fleet accounted for the largest share of the value (38.4%) and weight (77.7%) of the U.S. international merchandise trade. The size of these values not only reflects the importance of water transportation to the United States competitive position in international trade but also the international interdependence or international cooperation of this country with other nations on a worldwide basis. Thus, it is important to evaluate the changes in the structure and ownership, shipbuilding-tonnage on order, and registry of the world maritime fleet as these factors can have major policy implications for the U.S. as well as its trading partners in the international trade arena. In addition, more knowledge is needed about the maritime fleet market to improve the

economic performance of the global agricultural trade industry particularly that of the U.S. Such knowledge is useful to both market participants and policymakers for reviewing and revising maritime and trade policies to increase agricultural trade on a global basis.

The world maritime fleet is important to U.S. agricultural and foods export markets because the supply of ships in general, and the specific types of ships available can have major impacts on ocean freight rates. Ocean freight costs are an important component of landed prices of grain and other agricultural and food products in foreign countries. This relationship has significant implications for world competition, U.S. exports, and the U.S. competitive position in world agricultural markets (Harris, 1983).

Ocean freight rate differentials between U.S. ports have implications for domestic port use and growth and for domestic transportation requirements for moving agricultural commodities between producing areas and ports. If ocean freight rates are lower in the Pacific versus Gulf ports for moving grain and other products to Asian markets, then the demand for moving grain and other agricultural products through the Pacific ports will increase at the expense of the Gulf ports (Harris, 1983).

## Objective

The general purpose of this paper will be to analyze the supply side of the world maritime fleet for the period 1997-2003 to measure global changes in the world maritime fleet by countries and regions using secondary data. Specific objectives are as follows:

1. To show the changes in the structure and ownership, shipbuilding and country of registration of the world maritime fleet between 1997 and 2003
2. To measure the changes in the structure and ownership, shipbuilding and country of registration for the world maritime fleet and separate the changes into meaningful components using the Esteban-Marquillas shift-share model between 1997 and 2003.

## Methods and Data

To accomplish the objective one of this paper, the paper will be divided into three sections: (1) structure and ownership, (2) shipbuilding and (3) country of registry of the world maritime fleet by major countries. The data to accomplish the objective of this study will come from the electronic version of the *Review of Maritime Transport* published by the *United Nations*

*Conference on Trade and Development or UNCTAD*. The vessel groupings used in this study are found in Appendix Table 16.

A vessel, like any other type of transportation vehicle, carries cargoes, and the revenue it receives for performing this service determines its commercial value. In this study, the unit of measurement is the reported deadweight ton (DWT) by UNCTAD. In some types of cargoes, the deadweight ton is used as a measure of the usefulness of a vessel's cargo-carrying capacity. Deadweight tonnage is the maximum weight in long tons (2,240 lb) of a vessel's cargo, including the weight of its stores, water, and fuel (bunkers). For bulk cargoes of crude oil, ores, coal, and heavy grains, the cargo-carrying capacity of a tanker or bulk carrier is about 90-95 percent of its deadweight tonnage. Hence, the commercial value of tankers and bulk carriers is best determined by their deadweight tonnage. However, the deadweight ton is not an appropriate measure of a vessel in carrying other types of cargoes (Nersesian, 1981).

For example, it is the number of containers that can be carried onboard a container vessel, the cubic feet of refrigerated space in a refrigerated vessel, the number of accommodations or cabins on a passenger vessel, the number of automobiles that can be transported on a car carrier. For light-density cargoes, the critical factor for determining the commercial value of a vessel is the volume of its cargo-carry spaces or holds (Nersesian, 1981).

The method to be used to accomplish objective two of this study will be the shift-share model. The shift-share analysis is a method of separating a change, in our case in the world's maritime fleet between 1997 and 2003 for the shift. However, we will not examine a number of shifts within that period (1997 and 1998, i.e.) into meaningful components for the structure and ownership, shipbuilding, and registry. The short-term rise and fall in the net shift for each country's supply of ships relative to its long-term net shift provides suggestions of life cycle trends (Green and Allaway, 1985).

Using the Esteban-Marquillas shift-share model, the change in a country's maritime fleet will be separated into a world growth effect, an industry mix effect, a competitive effect and an allocative effect. The world growth effect is the amount that a country's (or region's) maritime fleet would have increased (or decreased) had it grown at the same rate as the world's maritime fleet did. The industry mix effect is the amount of change attributable to differences in the initial industry makeup of the country or region relative to the world. A positive (negative) industry mix effect indicates that a country's (region's) fleet of ships was initially relatively more

concentrated in the types of ships whose fleet expanded faster (slower) than the overall world maritime fleet average (Coughlin and Pollard, 2001).

The competitive effect measures a country's economic changes not attributable to the world fleet growth or industry mix effects. The competitive effect shows how much a country deviates from what would be expected if a country's ship growth was due solely to the world expansion of the fleet of ships and the country's industry makeup of ships. In general the competitive effect indicates the quantitative difference between a country's fleet of ships and those of the world caused by the difference in the rate of that country's ships compared with that of the world (Coughlin and Pollard, 2001). The allocation effect is interpreted as a measure of a country's degree of specialization in those ships in which it enjoys a competitive advantage. A positive value means that the country or region has the correct specialization. That is, the country is specialized in the ships in which it has a competitive advantage, and not in ships in which it has a competitive disadvantage (Ray, 1995). While the sign of the allocation component can be either positive or negative, four interpretations can be made, Table 1.

**Table 1. Allocation effect interpretations**

Sign of the Allocation Effect	Sign of the Competitive Effect	Interpretations
+	+	Specialized, competitive advantage
-	-	Specialized, competitive disadvantage
+	-	Not specialized, competitive disadvantage
-	+	Not specialized, competitive advantage

Source: Webb, 1989.

In addition, the numbers for each shift-share component have been converted into percentages (Morales and Stallmann, 2000). To do this the absolute values of all four components were summed. Each component was then divided by this sum and multiplied by 100 to get the percentage contribution of each component to the change in structure, shipbuilding or registry. The absolute values may not always total 100 due to rounding. The larger the absolute value of the component, the larger is the impact of that component on a specific sector of the world maritime fleet. These values are found in the appendix tables at the end of this paper.

The shift-share analysis is an accounting tool to separate a change in a country's fleet of ships into potentially meaningful components. The shift-share model, however, does not provide an economic explanation as to why a country's fleet of ships grew at a faster or slower rate than the world average but it does provide basic information on market performance. Thus, the analysis can be utilized for planning to identify potential ship markets and to screen existing fleet opportunities by the world shipping public.

## Results

This section of the paper is divided into three subsections: (1) structure and ownership of changes in the world maritime fleet; (2) shipbuilding-tonnage on order; and major open registry fleets. Each subsection begins with a descriptive analysis of the aforementioned items.

Following the descriptive analysis of each subsection, the changes due to the shift-share analysis are then discussed. The changes due to the shift-share analysis are discussed by each component in the following order: the world growth effect, the industry mix effect, the competitive effect and the allocation effect.

### *Structure and Ownership Changes in World Maritime Fleet*

Comparisons of changes in the structure and ownership of the world maritime fleet by main country groups between 1997 and 2003 are shown in Table 2.

**Table 2. Structure and Ownership of the Merchant Fleet by Main Country Groups, 1997 and 2003**

<b>Fleet, 1997</b>	World (Million DWT)	DMEC (Million DWT)	MORC (Million DWT)	DC (Million DWT)	CCEE (Million DWT)	SCA (Million DWT)
<b>Fleet, 1997</b>						
Total	775.9	202.6	361.0	149.8	24.4	26.0
Oil Tankers	272.0	83.9	136.5	42.4	3.9	3.3
Bulk Carriers	281.0	52.9	145.9	57.8	7.8	11.3
General Cargo	103.9	19.8	37.5	27.9	8.8	8.3
Container-ships	56.1	20.7	20.7	9.9	0.4	1.7
Other	62.9	25.3	20.4	11.8	3.5	1.4
<b>Fleet, 2003</b>						
Total	844.2	217.1	398.4	171.3	16.0	28.3
Oil Tankers	304.4	96.4	147.8	52.7	3.0	4.6
Bulk Carriers	300.1	50.6	163.8	62.3	3.4	12.1
General Cargo	97.2	19.8	33.1	28.3	6.5	8.2
Container-ships	82.8	28.0	36.8	14.9	0.4	2.2
Other	59.7	22.3	16.9	13.1	2.7	1.2
<b>Chg 97-03</b>						
Total	68.3	14.5	37.4	21.5	-8.4	2.3
Oil Tankers	32.4	12.5	11.3	10.3	-0.9	1.3

Bulk Carriers	19.1	-2.3	17.9	4.5	-4.4	0.8
General Cargo	-6.7	0.0	-4.4	0.4	-2.3	-0.1
Container-ships	26.7	7.3	16.1	5.0	0.0	0.5
Other	-3.2	-3.0	-3.5	1.3	-0.8	-0.2
<b>%Chg</b>						
Total	8.8	7.2	10.4	14.4	-34.4	8.8
Oil Tankers	11.9	14.9	8.3	24.3	-23.1	39.4
Bulk Carriers	6.8	-4.3	12.3	7.8	-56.4	7.1
General Cargo	-6.4	0.0	-11.7	1.4	-26.1	-1.2
Container-ships	47.6	35.3	77.8	50.5	0.0	29.4
Other	-5.1	-11.9	-17.2	11.0	-22.9	-14.3

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries;  
DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia;  
DWT=Deadweight Tons

These data indicate that the total world maritime fleet increased almost nine percent from 1997 to 2003. On a country group basis, Developing Countries (DC) had the largest increase from 1997 to 2003 or a 14 percent increase while the Countries of Central and Eastern Europe (CCEE) had the largest decline (-34.4%). These results suggest that countries in the world as a whole and by major country groups, except the CCEE country group, saw an economic opportunity to invest in more ship tonnage to accommodate demands for the movement of goods by ships.

Most of the ownership in terms of major types of ships occurred in the containership markets. For example, the world maritime fleet of containerships increased almost 48 percent from 1997 to 2003. On a main country basis, Major Open Registry Countries (MORC) had the largest percentage increase in ownership of containerships deadweight tonnage from 1997 to 2003. This group of countries had a 77 percent increase in the volume of tonnage in these types of ships from 1997 to 2003. Also, results reveal that Developing Countries had almost a 51 percent increase in the volume of tonnage in containerships. These results may imply that there was an increase in the demand for value-added products movements by countries in the world.

*The World Growth Effect:* Table 3 shows the comparisons of changes in the types of ships in the maritime fleets by main country groups relative to the total world fleet. These data indicate that the country groups as a whole did well relative to the world fleet. For example, the MORC country group's fleet grew at the largest rate than the rest of the country groups. The MORC country fleet was almost 38 million deadweight tons greater than the world fleet. This group's growth rate was followed by DMEC at almost 18 million deadweight tons. These results indicate that if the fleet in the MORC and DMEC country groups had grown like the world fleet almost

38 and 18 more million deadweight tons of tonnage would have been added to the world maritime fleet.

**Table 3. Change in Structure and Ownership of the World Maritime Fleet due to the world growth effect by country groups and by type of ships between 1997 and 2003**

Type of Ships	DMEC (Million DWT)	MORC (Million DWT)	DC (Million DWT)	CCEE (Million DWT)	SCA (Million DWT)	Total (Million DWT)
Oil Tankers	7.4	12.0	3.7	0.3	0.3	23.7
Bulk Carriers	4.7	12.8	5.1	0.7	1.0	24.3
General Cargo Carriers	1.7	3.3	2.5	0.8	0.7	9
Containerships	1.8	1.8	0.9	0.0	0.1	4.6
Other Ships	2.2	1.8	1.0	0.3	0.1	5.4
Total	17.8	31.7	13.2	2.1	2.2	67

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia; DWT= Deadweight Tons. Source: Obtained from Appendix Tables 1-5.

*The Industry Mix Effect:* The industry mix effect is shown in Table 4. Results indicate that the total industry mix effect is positive for the DMEC and MORC country groups. These results suggest that the DMEC and MORC country groups concentrated their fleet mixture in relatively fast growth than the world did. The total industry mix was negative for the DC, CCEE, and SCA country groups. These results suggest that countries in these groups added less in tonnage than they would have if their economic structure were identical to the fleets in the world.

In the 1997-2003 time period, ships in the DC country groups suffered a structural disadvantage of 2.0 million deadweight tons of ships compared to the world fleet. This structural disadvantage decreased to 1.4 million deadweight tons of ships in the CCEE groups

**Table 4. Change in Structure and Ownership of the World Maritime Fleet due to the industry mix effect by country groups and by type of ships between 1997 and 2003**

Type of Ships	DMEC (Million DWT)	MORC (Million DWT)	DC (Million DWT)	CCEE (Million DWT)	SCA (Million DWT)	Total (Million DWT)
Oil Tankers	2.6	4.2	1.3	0.1	0.1	8.3
Bulk Carriers	-1.1	-2.9	-1.2	-0.2	-0.2	-5.6
General Cargo Carriers	-3.0	-5.7	-4.3	-1.3	-1.3	-15.6
Containerships	8.0	8.0	3.8	0.2	0.7	20.7
Other Ships	-3.5	-2.8	-1.6	-0.2	-0.2	-8.3
Total	3.0	0.8	-2.0	-1.4	-0.9	-0.5

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry



countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia; DWT= Deadweight Tons  
Source: Obtained from Appendix Tables 1-5.

*The Competitive Effect:* Data in Table 5 document the overall competitive position of the DMEC, MORC, CCEE country groups' maritime fleet was negative with respect to the world maritime fleet but positive in the country groups DC and SCA. Bulk carriers, containerships, and other ships had negative or declining trends in the country group DMEC. In the DEMC country group, oil tankers and general cargo carriers had positive values indicating competitive advantage. However, oil tankers and general cargo carriers combined were not enough to offset the large declines in bulk carriers and smaller declines in containerships and other ships.

Oil tankers grew at faster rates in country group DC than any other country group in the study. For example, oil tankers grew 6.5 million deadweight tons in the country group DC while containerships grew at a faster rate in the MORC country group than any other group during study period.

**Table 5. Change in Structure and Ownership of the World Maritime Fleet due to the competitive effect by country groups and by type of ships between 1997 and 2003**

Type of Ships	DMEC (Million DWT)	MORC (Million DWT)	DC (Million DWT)	CCEE (Million DWT)	SCA (Million DWT)	Total (Million DWT)
Oil Tankers	2.1	-4.6	6.5	-3.0	2.5	3.5
Bulk Carriers	-8.2	2.7	0.2	-0.9	0.0	-6.2
General Cargo Carriers	1.7	-2.6	1.6	-0.6	0.2	0.3
Containerships	-1.8	7.9	0.3	-0.8	-0.3	5.3
Other Ships	-1.1	-3.5	2.0	-0.4	-0.2	-3.2
Total	-7.3	-0.1	10.6	-5.7	2.2	-0.3

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia; DWT=Deadweight Tons  
Source: Obtained from Appendix Tables 1-5.

*The Allocation Effect:* Country groups relative to the world maritime fleet show the allocation effects in Table 6 for the maritime fleet. Except for the country groups DMEC and MORC, the allocation effects are negative for the country groups DC, CCEE, and SCA. The largest negative effect occurred in CCEE and SCA. In the country group CCEE the allocation effect had a negative value of 3.2 million deadweight tons, exceeding the SCA value. The negative allocation effect is indicative of a poor distribution of the maritime fleet by these country groups. A positive allocation effect could have been obtained if the country groups CCEE, SCA, and DC

had a better distribution of their maritime fleet, or if they had specialized in the competitively advantaged ships rather than in the competitively disadvantaged ships.

**Table 6. Change in Structure and Ownership of the World Maritime Fleet due to the allocation effect by country groups and by type of ships between 1997 and 2003**

Type of Ships	DMEC (Million DWT)	MORC (Million DWT)	DC (Million DWT)	CCEE (Million DWT)	SCA (Million DWT)	Total (Million DWT)
Oil Tankers	0.4	-0.4	-1.3	1.6	-1.6	-1.3
Bulk Carriers	2.3	5.3	0.4	-4.0	0.0	4.0
General Cargo Carriers	-0.5	0.6	0.6	-1.1	0.3	-0.1
Containerships	-0.7	-1.6	0.0	0.6	0.0	-1.7
Other Ships	-0.6	1.1	-0.1	-0.3	0.1	0.2
Total	0.9	5.0	-0.4	-3.2	-1.2	1.1

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia; DWT=Deadweight Tons

Source: Obtained from Appendix Tables 1-5.

Data in Table 6 further indicate that the country groups DMEC and MORG specialized in the ships that were competitively advantage rather those ships that were not competitively advantaged. This result suggest that in the DMEC and MORG country groups, individuals and businesses emphasized those ships in which they did relatively well and did not emphasized those in which they did relatively poorly.

### ***Shipbuilding-Tonnage on Order***

Table 7 provides information on the maritime shipbuilding-tonnage on order between 1997 and 2003. Data indicate that countries in the world increased the total amount of shipbuilding-tonnage on order from 1997 to 2003 by over 46 percent. This result implies that stakeholders in the world maritime industry anticipate increased demands for the movement of products among countries via ocean going carriers. The largest total increase in shipbuilding-tonnage on order from 1997 to 2003 occurred in the SCA country group. This country group percentage increased by 152 percent. The largest percentage decline (-69.4%) in total amount of shipbuilding-tonnage on order occurred in the CCEE countries. This result could imply that these countries do not have the financial resources to invest in the new ships or that they do not

anticipate much usage of ocean going vessels to support the continued trade among their trading partners.

Data in Table7 further show that countries in the world increased their percentages of shipbuilding-tonnage on order by almost 66 percent for oil tankers from 1997 to 2003 followed closely by containerships (65%) in the anticipation of the continued large movements of oil and other petroleum products and value-added products. These values were heavily influenced by the large percentage increases in the shipbuilding-tonnage on order by the SCA country group for oil tankers (12,858%) and containerships (598%). Also, DMEC countries increased the amount of shipbuilding-tonnage on order for oil tankers (almost 133%) and the MORC countries increased by over 104 percent for containerships during the study period.

**Table 7. Shipbuilding-Tonnage on Order 1997 and 2003**

<b>Fleet, 1997</b>	World (000 DWT)	DMEC (000 DWT)	MORC (000 DWT)	DC (000 DWT)	CCEE (000 DWT)	SCA (000 DWT)
Total	81,227	21,969	43,581	9,499	1,299	1,461
Oil Tankers	36,649	9,642	20,334	4,364	350	12
Bulk Carriers	22,466	4,062	14,153	2,176	407	1,064
General Cargo Carriers	4,935	1,894	1,808	570	289	262
Containerships	9,266	3,439	3,918	1,607	69	117
Other	7,911	2,932	3,368	782	184	6
<b>Fleet, 2003</b>	World (000 DWT)	DMEC (000 DWT)	MORC (000 DWT)	DC (000 DWT)	CCEE (000 DWT)	SCA (000 DWT)
Total	118,755	40,043	60,721	13,909	398	3,684
Oil Tankers	60,716	22,445	28,936	7,683	97	1,555
Bulk Carriers	30,522	7,163	20,032	2,588	41	698
General Cargo Carriers	4,408	1,800	1,547	583	223	254
Containerships	15,266	4,535	8,009	1,905	-	817
Other	7,843	4,100	2,197	1,150	37	360
<b>Chg 97-03</b>	World (000 DWT)	DMEC (000 DWT)	MORC (000 DWT)	DC (000 DWT)	CCEE (000 DWT)	SCA (000 DWT)
Total	37,528	18,074	17,140	4,410	-901	2,223
Oil Tankers	24,067	12,803	8,602	3,319	-253	1,543
Bulk Carriers	8,056	3,101	5,879	412	-366	-366
General Cargo Carriers	-527	-94	-261	13	-66	-8
Containerships	6,000	1,096	4,091	298	-69	700
Other	-68	1,168	-1,171	368	-147	354
<b>%Chg</b>	World	DMEC	MORC	DC	CCEE	SCA
Total	46.2	82.3	39.3	46.4	-69.4	152.2
Oil Tankers	65.7	132.8	42.3	76.1	-72.3	12,858.3

Bulk Carriers	35.9	76.3	41.5	18.9	-89.9	-34.4
General Cargo Carriers	-10.7	-5.0	-14.4	2.3	-22.8	-3.1
Containerships	64.8	31.9	104.4	18.5	-100.0	598.3
Other	0.9	39.8	-34.8	47.1	-79.9	5,900.0

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia; DWT= Deadweight Tons

*The World Growth Effect:* Table 8 provides information on the world growth effect of shipbuilding-tonnage on by country groups and by types of ships. These data indicate that the country groups' shipbuilding-tonnage on order grew at faster rates than the world shipbuilding-tonnage on order did. The MORC group led the way with almost 20.7 million deadweight tons followed by DMEC with about 10.2 million deadweight tons. These results indicate that if the shipbuilding-tonnage on order had grown like the shipbuilding-tonnage on order of the world almost 20.7 and 10.2 more deadweight tons of ships-tonnage on order would have been built or ordered by the country groups MORC and DMEC, respectively, from 1997 to 2003.

**Table 8. Change in Shipbuilding-Tonnage on Order of the World Maritime Fleet due to the world growth effect by country groups and by type of ships between 1997 and 2003**

Type of Ships	DMEC (000 DWT)	MORC (000 DWT)	DC (000 DWT)	CCEE (000 DWT)	SCA (000 DWT)	Total (000 DWT)
Oil Tankers	4,454.7	9,934.6	2,016.2	161.7	5.5	16,572.7
Bulk Carriers	1,876.7	6,538.9	1,005.3	188	491.6	10,100.5
General Cargo Carriers	875.1	835.3	263.3	133.5	121.0	2,228.2
Containerships	1,588.9	1,810.2	742.5	31.9	54.1	4,227.6
Other Ships	1,354.6	1,556.1	361.3	85.0	2.8	3,359.8
Total	10,150.0	20,675.1	4,388.6	600.1	675.0	36,488.8

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia; DWT= Deadweight Tons

Source: Obtained from Appendix Tables 6-10.

On a type of ship basis, the top three were oil tankers, bulk carriers, and containerships. These values indicate that the country groups total deadweight tons grew at faster rates than the rest of the world. Oil tankers had the largest world growth rates in the DMEC, MORC, and DC country groups.

*The Industry Mix Effect:* Table 9 shows the industry mix effects on the shipbuilding-tonnage on order during the study period. Results indicate that the total industry mix is negative for the country groups DMEC, CCEE, and SCA. These results suggest that shipbuilding-tonnage on order for those country groups were less than they would have been if their economic structure were identical to the shipbuilding-tonnage on order of the world.

The DMEC country group suffered a structural disadvantage of 262 thousand deadweight tons of shipbuilding-tonnage on order compared to the world. This structural disadvantage decreased to 212 thousand for CCEE and almost 238 thousand for SCA country group.

In the country groups MORC and DC, shipbuilding-tonnage on order grew at faster rates than the world average. This result suggests that the country groups MORC and DC concentrated their shipbuilding-tonnage on order in relatively fast grow ships, as reflected by the positive industry mix effect, than the world did.

**Table 9. Change in Shipbuilding-Tonnage on Order of the World Maritime Fleet due to the Industry mix effect by country groups and by type of ships between 1997 and 2003**

Type of Ships	DMEC (000 DWT)	MORC (000 DWT)	DC (000 DWT)	CCEE (000 DWT)	SCA (000 DWT)	Total (000 DWT)
Oil Tankers	1,877.1	3,958.5	849.6	68.1	2.3	6,755.6
Bulk Carriers	-420.1	-1,463.8	-225.1	-42.1	-110.0	-2,261.1
General Cargo Carriers	-1,077.3	-1,028.4	-324.2	-164.4	-149.0	-2,743.3
Containerships	638.0	726.8	298.1	12.8	21.7	1,697.4
Other Ships	-1,279.8	-1,585.0	-368.0	-86.6	-2.8	-3,322.2
Total	-262.1	608.1	230.4	-212.2	-237.8	126.4

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia; DWT= Deadweight Tons

Source: Obtained from Appendix Tables 6-10.

Oil tankers and containerships, together, contributed greatly to the positive industry mix in the country group MORC. In that country group, oil tankers and containerships grew at almost four million-deadweight tons and 727 thousand deadweight tons, respectively. In the DC country group, as with the MORC, the oil tankers and containerships together contributed the positive industry mix although at a smaller scale.

*The Competitive Effect:* The competitive effect is shown in Table 10. Results reveal that the overall competitive position of country groups' shipbuilding-tonnage on order was positive with respect to the world shipbuilding-tonnage on order. The SCA country group had the largest positive competitive effect value at 93.6 million deadweight tons. This result implies that this country group had a huge competitive relatively to other country groups and the world. In the SCA country group oil tankers were the largest contributor to the country group's competitive advantage. The second leading country group contributing to the positive competitive effect was the DMEC. This group shipbuilding-tonnage grew at faster rates than the world average did. For example, shipbuilding-tonnage grew over 9.2 million deadweight tons in the study period. Like the SCA, oil tankers were the leading contributor to the competitive effect of this country group.

Data in Table 10 further reveal that the overall competitive position of MORC and CCEE was negative with respect to shipbuilding-tonnage on order. This result implies that the MORC and CCEE country groups did not have not competitive advantage like the country groups SCA and DMEC. Therefore, these country groups might need to put more emphasis on oil tankers to improve their competitive position in the shipbuilding-tonnage on order segment of the world maritime fleet market.

**Table 10. Change in Shipbuilding-Tonnage on Order of the World Maritime Fleet due to the competitive effect by country groups and by type of ships between 1997 and 2003**

Type of Ships	DMEC (000 DWT)	MORC (000 DWT)	DC (000 DWT)	CCEE (000 DWT)	SCA (000 DWT)	Total (000 DWT)
Oil Tankers	6,652.6	-4,594.4	445.1	-808.6	84,328.2	86,022.9
Bulk Carriers	2,459.9	319.5	-204.3	-121.8	-2.3	2,451.0
General Cargo Carriers	76.3	-99.5	74.8	-9.6	6.8	48.8
Containerships	-824.1	1,971.8	-500.7	-244.1	889.2	1,292.1
Other Ships	870.7	-1,439.3	443.3	-100.0	8,396.5	8,171.2
Total	9,235.4	-3,841.9	258.2	-1,284.1	93,618.4	97,986.0

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia; DWT= Deadweight Tons

Source: Obtained from Appendix Tables 6-10.

*The Allocation Effect:* The allocation effects are shown in Table 11 for the shipbuilding-tonnage on order in selected country groups relative to the shipbuilding-tonnage on order in the world maritime fleet market. Except for the country group MORC, the overall allocation effects are

negative with respect to the shipbuilding-tonnage on order in the world maritime fleet market. The largest negative allocation effects occurred in the SCA and DMEC country groups. In the SCA country group the allocation effect had a negative value of almost 92 million deadweight tons. The negative allocation effect is indicative of a poor distribution of shipbuilding-tonnage on order by the SCA country group. A positive allocation effect could have been obtained if the SCA shipbuilding-tonnage on order had a better distribution of ships-tonnage on order, or if the SCA country group had specialized in the competitively advantaged shipping sectors rather than in the competitively disadvantage shipping sectors.

Oil tankers by far are largest contributors to the negative allocation effect. For example, this sector contributes largely to negative allocation effect of SCA country group. This result implies that the SCA country is not specialized in the correct types of ships but it has a competitive advantage, as reflected in the positive competitive effects found in Table 10. This result could further imply that the SCA country group specialized in the building of ships that it was competitively disadvantaged. This means that the SCA country group needs to reevaluate the shipbuilding sectors that it has emphasized, particularly the oil tanker sector, so that changes can be made to turn the negative allocation effect into a positive value. This, in turn, should enable the SCA country group to deemphasize the oil tanker sector for which it has a very negative allocation effect value.

**Table 11. Change in Shipbuilding-Tonnage on Order of the World Maritime Fleet due to the allocation effect by country groups and by type of ships between 1997 and 2003**

Type of Ships	DMEC (000 DWT)	MORC (000 DWT)	DC (000 DWT)	CCEE (000 DWT)	SCA (000 DWT)	Total (000 DWT)
Oil Tankers	-181.4	-156.7	8.1	325.7	-82,793.1	-82,797.4
Bulk Carriers	-815.4	484.5	-164.0	-390.2	-745.2	-1,630.3
General Cargo Carriers	32.0	31.6	-0.9	-25.5	13.2	50.4
Containerships	-306.8	-417.9	-241.9	130.5	-265.0	-1,101.1
Other Ships	322.5	297.2	-68.6	-45.4	-8,042.4	-7,536.7
Total	-949.1	238.7	-467.3	-4.9	-91,832.5	-93,015.1

NOTE: DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia; DWT= Deadweight Tons

Source: Obtained from Appendix Tables 6-10.

## Major Open Registry Fleets

All vessels are registered in a nation and are owned by an individual or a company incorporated in the nation of registry. An individual may own the stock of a ship-owning company, the stock may be owned by another corporate entity, or the stock may be owned by a combination thereof. By definition, all vessels are under the jurisdiction of the maritime authority of the nation of registry and are bound to abide by its laws and regulations. Since the degree of control exercised by sovereign nations varies greatly, there is a distinction made between a vessel registered under a national flag or under a flag of convenience/necessity. National flag vessels are usually under greater control by government maritime agencies than vessels under flags of convenience/necessity (Nersesian, 1981).

Table 12 provides data on the changes in the tonnage of the major open registry fleets between 1997 and 2003. Data reveal that Panama had the largest overall percentage increase (33.6%) in the volume of ships registered under its flag of registry while Liberia had the largest percentage decline (-24.8%) during the study period. This result implies that ship owners felt that it was much more feasible to register their vessels under Panama's flag than any other country's flag of registry. Except for general cargo vessels, all major types of vessels registered under the flag of Panama increased from 1997 to 2003. The largest increase occurred in the containership sector. This sector's registration increased by 46.3 percent from 1997 to 2003.

**Table 12. Tonnage of Major Open Registry Fleets, 1997 and 2003**

Registry, 1997	Total (000 DWT)	Oil Tankers (000 DWT)	Bulk Carriers (000 DWT)	General Cargo Carriers (000 DWT)	Containerships (000 DWT)	Other Ships (000 DWT)
Panama	126,161	37,152	60,372	11,320	11,272	6,045
Liberia	90,916	48,088	28,067	3,703	4,001	7,057
Cyprus	32,750	6,390	17,827	5,747	1,969	817
Malta	33,714	15,598	12,795	4,059	625	637
Bahamas	36,267	19,624	7,203	6,503	912	2,025
Bermuda	7,384	4,142	1,943	226	548	525
Total	327,192	130,994	128,207	31,558	19,327	17,106
Registry, 2003	Total (000 DWT)	Oil Tankers (000 DWT)	Bulk Carriers (000 DWT)	General Cargo Carriers (000 DWT)	Containerships (000 DWT)	Other Ships (000 DWT)
Panama	168,508	51,667	81,208	11,313	16,493	7,827
Liberia	68,413	34,276	15,762	3,678	9,514	5,183
Cyprus	32,097	6,080	19,427	3,486	2,739	365
Malta	36,649	15,613	17,183	3,061	539	253
Bahamas	44,123	24,778	8,336	6,051	2,130	2,828
Bermuda	6,293	1,864	3,598	205	401	225
Total	356,083	134,278	145,514	27,794	31,816	16,681



Chg 97-03	Total (000 DWT)	Oil Tankers (000 DWT)	Bulk Carriers (000 DWT)	General Cargo Carriers (000 DWT)	Containerships (000 DWT)	Other Ships (000 DWT)
Panama	42,347	14,515	20,836	(7)	5,221	1,782
Liberia	(22,503)	(13,812)	(12,305)	(25)	5,513	(1,874)
Cyprus	(653)	(310)	1,600	(2,261)	770	(452)
Malta	2,935	15	4,388	(998)	(86)	(384)
Bahamas	7,856	5,154	1,133	(452)	1,218	803
Bermuda	(1,091)	(2,278)	1,655	(21)	(147)	(300)
Total	28,891	3,284	17,307	(3,764)	12,489	(425)
%Chg	Total	Oil Tankers	Bulk Carriers	General Cargo Carriers	Containerships	Other Ships
Panama	33.6	39.1	34.5	-0.1	46.3	29.5
Liberia	-24.8	-28.7	-43.8	-0.7	137.8	-26.6
Cyprus	-2.0	-4.9	9.0	-39.3	39.1	-55.3
Malta	8.7	0.1	34.3	-24.6	13.8	-60.3
Bahamas	21.7	26.3	15.7	-7.0	133.6	39.7
Bermuda	-14.8	-55.0	85.2	-9.3	-26.8	-57.1
Total	8.8	2.5	13.5	-11.9	64.6	-2.5

NOTE: DWT= Deadweight Tons

*The World Growth Effect:* Table 13 provides data on the world growth effect of ship registration under the major open registries from 1997 to 2003. These data indicate that the volume of ships registered in the major open registry countries expanded greater than those of the world registry fleet. The registration of vessels under the major open flags of registry relatively to world registry of vessels increased by 11.1 million deadweight tons in Panama; 8.0 million deadweight tons in Liberia; Cyprus 2.9 million deadweight tons; almost 3.0 million deadweight tons in Malta; 3.2 million deadweight tons in the Bahamas; and 651 thousand deadweight tons in Bermuda.

Oil tankers and bulk carriers registrations grew at faster rates than the general cargo carriers, containerships, and other ships. The registration of oil tankers and bulk carriers increased by almost 11.6 million deadweight tons and 11.3 million deadweight tons, respectively. These results indicate that if vessel registrations had grown like the registrations of the world fleet 11.6 and 11.3 more deadweight tons of ships would have been registered in oil tankers and bulk carriers, respectively.

**Table 13. Change in Tonnage of Major Open Registry Fleets due to the world growth effect between 1997 and 2003**

Country	Oil Tankers (000 DWT)	Bulk Carriers (000 DWT)	General Cargo Carriers	Containerships (000 DWT)	Other Ships (000)	Total (000 DWT)

			(000 DWT)		DWT)	
Panama	3,281	5,331	1,000	995	534	11,141
Liberia	4,246	2,478	327	353	623	8,027
Cyprus	564	1,574	507	174	72	2,891
Malta	1,377	1,130	358	55	56	2,976
Bahamas	1,733	636	574	81	179	3,203
Bermuda	365	172	20	48	46	651
Total	11,566	11,321	2,786	1,706	1,510	28,889

**NOTE:** DWT= Deadweight Tons

Source: Appendix Tables 11-15.

*The Industry Mix Effect:* The industry mix effect is shown in Table 14. Results indicate that the overall industry mix effect is positive but equal to zero. These results suggest that vessel registrations in the major open registry countries would have been the same if the economic structure were identical to the vessel registrations in the world.

In Panama, registrations of vessels under the flag of this country grew at faster rates than the world average. This result suggests that the owners of vessels concentrated their efforts in registering their vessels in relatively fast growth countries of registry in the study period, as reflected by the positive industry mix effect, than the ship owners of the world.

The registration of bulk carriers and containerships contributed greatly to the positive industry mix in Panama. In that country, bulk carriers and containerships grew at 2.8 and almost 6.3 million deadweight tons, respectively. However, the registrations of oil tankers, general cargo carriers, and other ships decreased by almost 2.4 million deadweight tons, 2.4 million deadweight tons, and 684 thousand deadweight tons, respectively. This result suggests that the registration of these ships in Panama grew less in those sectors than they would have if their economic structure were identical to the world fleet registrations.

**Table 14. Change in Tonnage of Major Open Registry Fleets due to the industry mix effect between 1997 and 2003**

Country	Oil Tankers (000 DWT)	Bulk Carriers (000 DWT)	General Cargo Carriers (000 DWT)	Containerships (000 DWT)	Other Ships (000 DWT)	Total (000 DWT)
Panama	-2,349	2,819	-2,350	6,289	-684	3,725
Liberia	-3,041	1,311	-769	2,232	-798	-1,065
Cyprus	-404	832	-1,193	1,098	-92	241
Malta	-986	597	-843	349	-72	-955
Bahamas	-1,241	336	-1,350	509	-229	-1,975

Bermuda	-262	91	-47	306	-59	29
Total	-8,283	5,986	-6,552	10,783	-1,934	0

**NOTE:** DWT= Deadweight Tons

Source: Appendix Tables 11-15.

*The Competitive Effect:* Table 15 shows the change in tonnage of major open registry fleets due to the competitive effect. Results show that the overall competitive position of the tonnage of major open registry fleets was positive relatively to the registration of the world maritime fleet in Panama and the Bahamas. These positive values indicate that owners registering their vessels in those countries were competitively advantaged over those ship owners that did not register their vessels in the countries.

Data further document that, except for containerships, the registrations of oil tankers, bulk carriers, general cargo carriers, and other ships in Panama grew at faster rates than the world average. For example, oil tankers grew almost 18.5 million deadweight tons and bulk carriers at almost 10.4 million deadweight tons.

In Liberia, bulk carriers had the largest negative competitive value resulting in the largest competitive disadvantage relatively to other major open registry countries and the world. This result implies that owners that registered their vessels in this country were competitively disadvantaged as a result of these registrations.

**Table 15. Change in Tonnage of Major Open Registry Fleets due to the competitive effect between 1997 and 2003**

Country	Oil Tankers (000 DWT)	Bulk Carriers (000 DWT)	General Cargo Carriers (000 DWT)	Containerships (000 DWT)	Other Ships (000 DWT)	Total (000 DWT)
Panama	18,467	10,388	1,444	-1,364	2,108	31,043
Liberia	-11,367	-20,427	987	3,930	-1,144	-28,021
Cyprus	-965	-581	-866	-494	-905	-3,811
Malta	-325	2,747	-412	-1,561	-1,019	-570
Bahamas	3,449	317	174	1,477	799	6,216
Bermuda	-1,700	2,074	19	-399	-211	-217
Total	7,559	-5,482	1,346	1,589	-372	4,640

**NOTE:** DWT= Deadweight Tons

Source: Appendix Tables 11-15.

*The Allocation Effect:* The allocation effects are shown in Table 16 for the change in tonnage of major open registry fleets relative to world registrations of vessels in the study period. Panama, Liberia, and Bermuda had the largest overall negative values for the registrations of

vessels. These results imply that a poor distribution of vessels registered in these countries by owners. To improve this distribution of vessels registered under the flags of these countries, ship owners need to specialize in the registration of more competitively advantaged ships than what they are doing now.

Data in Table 16 document further that ship owners that registered bulk carriers and other ships specialized in competitively advantaged sectors rather than in the competitively disadvantaged ships such as oil tankers, general cargo carriers, and containerships. These results suggests that during the study period ship owners deemphasized those types of ships in which they did relatively well and emphasized those ships which they did rather unsuccessfully.

**Table 16. Change in Tonnage of Major Open Registry Fleets due to the allocation effect between 1997 and 2003**

Country	Oil Tankers (000 DWT)	Bulk Carriers (000 DWT)	General Cargo Carriers (000 DWT)	Containerships (000 DWT)	Other Ships (000 DWT)	Total (000 DWT)
Panama	-4,884	2,298	-101	-699	-176	-3,562
Liberia	-3,650	4,334	-570	-1,002	-555	-1,443
Cyprus	495	-226	-710	-9	473	23
Malta	-51	-86	-102	1,071	651	1,483
Bahamas	1,213	-156	150	-848	54	413
Bermuda	-682	-681	-13	-102	-76	-1,554
Total	-7,559	5,483	-1,346	-1,589	371	-4,640

**NOTE:** DWT= Deadweight Tons

Source: Appendix Tables 11-15.

## Summary and Conclusions

The objective of this study was to measure global changes in the world maritime fleet by countries and regions using secondary data. To accomplish the objective of this study, descriptive analysis and the shift-share analysis technique were used. Shift-share analysis is a technique that analyzes shift in industrial growth across regions. This method breaks down a change in market share to its basic components (Campbell and Abe, 1983). Data for this study were obtained from the Review of Maritime Transport published by the United Nations Conference on Trade and Development or UNCTAD.

Results from this study indicate that the total world maritime fleet increased almost nine percent from 1997 to 2003. On a country group basis, Developing Countries (DC) had the largest increase from 1997 to 2003 or a 14 percent increase while the Countries of Central and Eastern Europe (CCEE) had the largest decline (-34.4%). These results suggest that countries in the world as a whole and by major country groups, except the CCEE country group, saw economic opportunities to invest in more ship tonnage to accommodate demands for the movement of goods by ships.

Results from the study further reveal that none of the six major countries of ship registry dominated the registration of all types of vessels in the world fleet. Of the six countries, only Panama and the Bahamas exhibited positive growth in vessel registration between 1997 and 2003. In addition, Panama is the only major ship registry nation that has both a competitive advantage and specialization (positive competitive and allocation effects) in the registration of bulk cargo carriers. The Bahamas, on the other hand, exhibits competitive advantage and specialization in the general cargo and other types of vessels.

The results from this can serve as a guide to policy makers, exporters/importers, port officials, ship owners and managers, and users of ships. In addition, knowing the changes in the types of vessels in the world maritime fleet between 1997 and 2003 and the performance of the maritime fleet in the world provide valuable data and information in assessing the opportunity for developing a competitive advantage or in redesigning strategies for managing or completely eliminating competitive disadvantages in world maritime market by types of vessels and by major country categories.

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Appendix Table 1. Shift-Share Analysis: Structure and Ownership of Oil Tankers

Country Group	World Growth Effect (Million DWT)	Industry Mix Effect (Million DWT)	Competitive Effect (Million DWT)	Allocation Effect (Million DWT)	Total (Million DWT)
DMEC	7.4	2.6	2.1	0.4	12.5
MORC	12.0	4.2	-4.6	-0.4	11.3
DC	3.7	1.3	6.5	-1.3	10.3
CCEE	0.3	0.1	-3.0	1.6	-0.9
SCA	0.3	0.1	2.5	-1.6	1.3
Percent Values	%	%	%	%	%
DMEC	59	21	17	3	100
MORC	57	20	22	2	101
DC	29	10	51	10	100
CCEE	7	2	59	32	100
SCA	6	2	56	36	100

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia

Appendix Table 2. Shift-Share Analysis: Structure and Ownership of Bulk Carriers

Country Group	World Growth Effect (Million DWT)	Industry Mix Effect (Million DWT)	Competitive Effect (Million DWT)	Allocation Effect (Million DWT)	Total (Million DWT)
DMEC	4.7	-1.1	-8.2	2.3	-2.3
MORC	12.8	-2.9	2.7	5.3	17.9
DC	5.1	-1.2	0.2	0.4	4.5
CCEE	0.7	-0.2	-0.9	-4.0	-4.4
SCA	1.0	-0.2	0.0	0.0	0.8
Percent Values	%	%	%	%	%
DMEC	29	7	51	14	100
MORC	54	12	11	22	100
DC	75	17	2	6	100
CCEE	12	3	15	70	100
SCA	79	18	0	2	100

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia

Appendix Table 3. Shift-Share Analysis: Structure and Ownership of General Cargo Carriers

Country Group	World Growth Effect (Million DWT)	Industry Mix Effect (Million DWT)	Competitive Effect (Million DWT)	Allocation Effect (Million DWT)	Total (Million DWT)
DMEC	1.7	-3.0	1.7	-0.5	0.0
MORC	3.3	-5.7	-2.6	0.6	-4.4
DC	2.5	-4.3	1.6	0.6	0.4
CCEE	0.8	-1.3	-0.6	-1.1	-2.3
SCA	0.7	-1.3	0.2	0.3	-0.1
Percent Values	%	%	%	%	%
DMEC	25	43	25	7	100
MORC	27	47	21	5	100
DC	28	48	18	7	100
CCEE	20	35	17	28	100
SCA	30	52	8	10	100

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia

Appendix Table 4. Shift-Share Analysis: Structure and Ownership of Containerships

Country Group	World Growth Effect (Million DWT)	Industry Mix Effect (Million DWT)	Competitive Effect (Million DWT)	Allocation Effect (Million DWT)	Total (Million DWT)
DMEC	1.8	8.0	-1.8	-0.7	7.3
MORC	1.8	8.0	7.9	-1.6	16.1
DC	0.9	3.8	0.3	0.0	5.0
CCEE	0.0	0.2	-0.8	0.6	0.0
SCA	0.1	0.7	-0.3	0.0	0.5
Percent Values	%	%	%	%	%
DMEC	15	65	15	6	100
MORC	9	41	41	8	100
DC	17	76	6	1	100
CCEE	2	9	50	39	100
SCA	13	56	29	3	100

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia



Appendix Table 5. Shift-Share Analysis: Structure and Ownership of Other Ships

Country Group	World Growth Effect (Million DWT)	Industry Mix Effect (Million DWT)	Competitive Effect (Million DWT)	Allocation Effect (Million DWT)	Total (Million DWT)
DMEC	2.2	-3.5	-1.1	-0.6	-3.0
MORC	1.8	-2.8	-3.5	1.1	-3.5
DC	1.0	-1.6	2.0	-0.1	1.3
CCEE	0.3	-0.5	-0.4	-0.3	-0.8
SCA	0.1	-0.2	-0.2	0.1	-0.2
Percent Values	%	%	%	%	%
DMEC	30	47	15	8	100
MORC	19	31	38	12	100
DC	22	35	42	1	100
CCEE	22	34	25	19	100
SCA	21	34	34	11	100

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia

Appendix Table 6. Shift-Share Analysis: Shipbuilding-Tonnage on Order-Oil Tankers

Country Group	World Growth Effect (000 DWT)	Industry Mix Effect (000 DWT)	Competitive Effect (000 DWT)	Allocation Effect (000 DWT)	Total (000 DWT)
DMEC	4,454.7	1,877.1	6,652.6	-181.4	12,803.0
MORC	9,934.6	3,958.5	-4,594.4	-156.7	8,602.0
DC	2,016.2	849.6	445.1	8.1	3,319.0
CCEE	161.7	68.1	-808.6	325.7	-253.0
SCA	5.5	2.3	84,328.2	-82,793.1	1,543.0
Percent Values	%	%	%	%	%
DMEC	34	14	51	1	100
MORC	52	22	25	1	100
DC	61	26	13	0	100
CCEE	12	5	59	24	100
SCA	0	0	50	50	100

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia

Appendix Table 7. Shift-Share Analysis: Shipbuilding-Tonnage on Order-Bulk Carriers

Country Group	World Growth Effect (000 DWT)	Industry Mix Effect (000 DWT)	Competitive Effect (000 DWT)	Allocation Effect (000 DWT)	Total (000 DWT)
DMEC	1,876.7	-420.1	2,459.9	-815.4	3,101.0
MORC	6,538.9	-1,463.8	319.5	484.5	5,879
DC	1,005.3	-225.1	-204.3	-164.0	412.0
CCEE	188	-42.1	-121.8	-390.2	-366.0
SCA	491.6	-110.0	-2.3	-745.2	-366.0
<b>Percent Values</b>	%	%	%	%	%
DMEC	34	8	44	15	100
MORC	74	17	4	6	100
DC	63	14	13	10	100
CCEE	25	6	16	53	100
SCA	36	8	0	55	100

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia

Appendix Table 8. Shift-Share Analysis: Shipbuilding-Tonnage on Order-General Cargo Carriers

Country Group	World Growth Effect (000 DWT)	Industry Mix Effect (000 DWT)	Competitive Effect (000 DWT)	Allocation Effect (000 DWT)	Total (000 DWT)
DMEC	875.1	-1,077.3	76.3	32.0	-94.0
MORC	835.3	-1,028.4	-99.5	31.6	-261.0
DC	263.3	-324.2	74.8	-0.9	13.0
CCEE	133.5	-164.4	-9.6	-25.5	-66.0
SCA	121.0	-149.0	6.8	13.2	-8.0
<b>Percent Values</b>	%	%	%	%	%
DMEC	42	52	4	2	100
MORC	42	52	5	2	100
DC	40	49	11	0	100
CCEE	40	49	3	8	100
SCA	42	51	2	5	100

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia

Appendix Table 9. Shift-Share Analysis: Shipbuilding-Tonnage on Order-Containerships

Country Group	World Growth Effect (000 DWT)	Industry Mix Effect (000 DWT)	Competitive Effect (000 DWT)	Allocation Effect (000 DWT)	Total (000 DWT)
DMEC	1,588.9	638.0	-824.1	-306.8	1,096.0
MORC	1,810.2	726.8	1,971.8	-417.9	4,091.0
DC	742.5	298.1	-500.7	-241.9	298.0
CCEE	31.9	12.8	-244.1	130.5	-69.0
SCA	54.1	21.7	889.2	-265.0	700.0
<b>Percent Values</b>	%	%	%	%	%
DMEC	47	19	25	9	100
MORC	37	15	40	8	100
DC	42	17	28	14	100
CCEE	8	3	58	31	100
SCA	4	2	72	22	100

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia

Appendix Table 10. Shift-Share Analysis: Shipbuilding-Tonnage on Order- Other Ships

Country Group	World Growth Effect (000 DWT)	Industry Mix Effect (000 DWT)	Competitive Effect (000 DWT)	Allocation Effect (000 DWT)	Total (000 DWT)
DMEC	1,354.6	-1,279.8	870.7	322.5	1,168.0
MORC	1,556.1	-1,585.0	-1,439.3	297.2	-1,171.0
DC	361.3	-368.0	443.3	-68.6	368.0
CCEE	85.0	-86.6	-100.0	-45.4	-147.0
SCA	2.8	-2.8	8,396.5	-8,042.4	354.0
<b>Percent Values</b>	%	%	%	%	%
DMEC	34	35	22	8	100
MORC	32	32	30	6	100
DC	29	30	36	6	100
CCEE	27	27	32	14	100
SCA	0	0	51	49	100

**NOTE:** DMEC = Developed market economy countries; MORC= Major open registry countries; DC= Developing Countries; CCEE= Countries of Central and Eastern Europe; SCA= Socialist Countries of Asia

Appendix Table 11. Shift-Share Analysis: Tonnage of Major Open Registry Fleets-Oil Tankers

Country	World Growth Effect (000 DWT)	Industry Mix Effect (000 DWT)	Competitive Effect (000 DWT)	Allocation Effect (000 DWT)	Total Effect (000 DWT)
Panama	3,281	(2,349)	18,467	(4,884)	14,515
Liberia	4,246	(3,041)	(11,367)	(3,650)	(13,812)
Cyprus	564	(404)	(965)	495	(310)
Malta	1,377	(986)	(325)	(51)	15
Bahamas	1,733	(1,241)	3,449	1,213	5,154
Bermuda	365	(262)	(1,700)	(682)	(2,278)
Percent Values	%	%	%	%	%
Panama	11	8	64	17	100
Liberia	19	14	51	16	100
Cyprus	23	17	40	20	100
Malta	50	36	12	2	100
Bahamas	23	16	45	16	100
Bermuda	12	9	56	23	100

Appendix Table 12. Shift-Share Analysis: Tonnage of Major Open Registry Fleets-Bulk Carriers

Country	World Growth Effect (000 DWT)	Industry Mix Effect (000 DWT)	Competitive Effect (000 DWT)	Allocation Effect (000 DWT)	Total Effect (000 DWT)
Panama	5,331	2,819	10,388	2,298	20,836
Liberia	2,478	1,311	(20,427)	4,334	(12,305)
Cyprus	1,574	832	(581)	(226)	1,600
Malta	1,130	597	2,747	(86)	4,388
Bahamas	636	336	317	(156)	1,133
Bermuda	172	91	2,074	(681)	1,655
Percent Values	%	%	%	%	%
Panama	26	14	50	11	100
Liberia	9	5	72	15	100
Cyprus	49	26	18	7	100
Malta	25	13	60	2	100
Bahamas	44	23	22	1123	100
Bermuda	6	3	69		100

Appendix Table 13. Shift-Share Analysis: Tonnage of Major Open Registry Fleets-General Cargo Carriers

Country	World Growth Effect (000 DWT)	Industry Mix Effect (000 DWT)	Competitive Effect (000 DWT)	Allocation Effect (000 DWT)	Total Effect (000 DWT)
Panama	1,000	(2,350)	1,444	(101)	(7)
Liberia	327	(769)	987	(570)	(25)
Cyprus	507	(1,193)	(866)	(710)	(2,261)
Malta	358	(843)	(412)	(102)	(998)
Bahamas	574	(1,350)	174	150	(452)
Bermuda	20	(47)	19	(13)	(21)
Percent Values	%	%	%	%	%
Panama	20	48	30	2	100
Liberia	12	29	37	21	100
Cyprus	15	36	26	22	100
Malta	21	49	24	6	100
Bahamas	26	60	8	7	100
Bermuda	20	48	19	13	100

Appendix Table 14. Shift-Share Analysis: Tonnage of Major Open Registry Fleets-Containerships

Country	World Growth Effect (000 DWT)	Industry Mix Effect (000 DWT)	Competitive Effect (000 DWT)	Allocation Effect (000 DWT)	Total Effect (000 DWT)
Panama	995	6,289	(1,364)	(699)	5,221
Liberia	353	2,232	3,930	(1,002)	5,513
Cyprus	174	1,098	(494)	(9)	770
Malta	55	349	(1,561)	1,071	(86)
Bahamas	81	509	1,477	(848)	1,218
Bermuda	48	306	(399)	(102)	(147)
Percent Values	%	%	%	%	%
Panama	11	67	15	7	100
Liberia	5	30	52	13	100
Cyprus	10	62	28	0	100
Malta	2	11	51	35	100
Bahamas	3	17	51	29	100
Bermuda	6	36	47	12	100

Appendix Table 15. Shift-Share Analysis: Tonnage of Major Open Registry Fleets-Other Ships

Country	World Growth Effect (000 DWT)	Industry Mix Effect (000 DWT)	Competitive Effect (000 DWT)	Allocation Effect (000 DWT)	Total Effect (000 DWT)
Panama	534	(684)	2,108	(176)	1,782
Liberia	623	(798)	(1,144)	(555)	(1,874)
Cyprus	72	(92)	(905)	473	(452)
Malta	56	(72)	(1,019)	651	(384)
Bahamas	179	(229)	799	54	803
Bermuda	46	(59)	(211)	(76)	(300)
Percent Values	%	%	%	%	%
Panama	15	20	60	5	100
Liberia	20	26	37	18	100
Cyprus	5	6	59	31	100
Malta	3	4	57	36	100
Bahamas	14	18	63	4	100
Bermuda	12	15	54	19	100

Appendix Table 16. Vessel groupings used in the study.

Vessel Groups	Constituent ship types
Oil tankers	Oil tankers
Bulk carriers	Ore and bulk carriers, ore/bulk/oil carriers
General cargo carriers	Refrigerated cargo, specialized cargo, ro-ro cargo, general cargo (single-and multi-deck), general cargo/passenger
Containerships	Fully cellular
Other ships	Oil/chemical tankers, chemical tankers, other tankers, liquefied gas carriers, passenger ro-ro, passenger, tank barges, general cargo barges, fishing, offshore supply, and all other types
Total all ships	Summation of all the above-mentioned vessel types

Source: Review of Maritime Transport, 2003.