

OXFORD ECONOMICS

The economic value of the EU shipping industry

A report for the European Community
Shipowners' Associations (ECSA)

April 2014



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Executive Summary

The EU shipping fleet

- At the start of 2014, the EU controlled fleet (which comprises ships whose ultimate ownership or control lies in an EU country, but which may be flagged in a different country) comprised of 660 million deadweight tonnes, 450 million gross tonnes, and 23,000 vessels. For the purposes of this report, the EU includes the 28 EU countries plus Norway.
- Between the start of 2005 and the start of 2014, the EU controlled fleet expanded by more than 70 per cent in terms of both gross and deadweight tonnage. The number of vessels grew at a much lower rate, reflecting the trend towards larger ships which offer greater economies of scale.
- At the start of 2014, the EU controlled 40 per cent of world gross tonnage and 39 per cent of world deadweight tonnage. This is a slight decrease from 41 per cent in 2005 (on both measures), reflecting that EU shipping companies continue to face strong competitive pressure from other rapidly-growing centres of world shipping, particularly those in Asia and the Middle East.
- Greece has the largest controlled fleet within Europe, equivalent to 36 per cent of gross tonnage, or 43 per cent of deadweight tonnage. Germany represents a further 21 per cent of gross tonnage, or 19 per cent of deadweight tonnage.
- The EU controlled fleet is dominated by three types of vessel: bulkers (28 per cent of gross tonnage), oil tankers (25 per cent) and container ships (25 per cent). The EU controls 60 per cent of the world's container ships in gross tonnage terms.
- Within the EU controlled fleet, the strongest growth between 2005 and 2014 was recorded amongst offshore vessels. The EU's share of the world offshore fleet increased from 28 per cent in 2005 to 37 per cent in 2014 (in gross tonnage terms).

Economic impacts estimated in this study

- This study estimates the economic impact of the shipping industry across three channels: the **direct impact** of the shipping industry itself; the **indirect impact** of shipping firms' expenditure on inputs of goods and services from their EU supply chain (such as port services, ship repairs, insurance, and shipping-related financial and legal services); and the **induced impact** of spending by employees in the shipping industry and its supply chain.

Direct impact

- In 2012, the EU shipping industry is estimated to have directly contributed €56 billion to EU GDP, employed 590,000 people, and generated tax revenues of €6 billion.
- It is estimated that around four-fifths of posts, or 470,000 jobs, are based at sea. It is tentatively estimated that around 40 per cent of these seafarers are EU or EEA nationals.
- Shipping is a high productivity industry: each worker is estimated to have generated €88,000 of GDP, significantly above the EU average of €53,000.
- The skills and experience of seafarers are vital to the smooth functioning of the shipping industry, and are also highly valued by firms in the wider maritime cluster and beyond.
- Indicative estimates suggest there were approximately 38,000 students/cadets in maritime academy – type training in 2012, an 11 per cent increase from 2004.

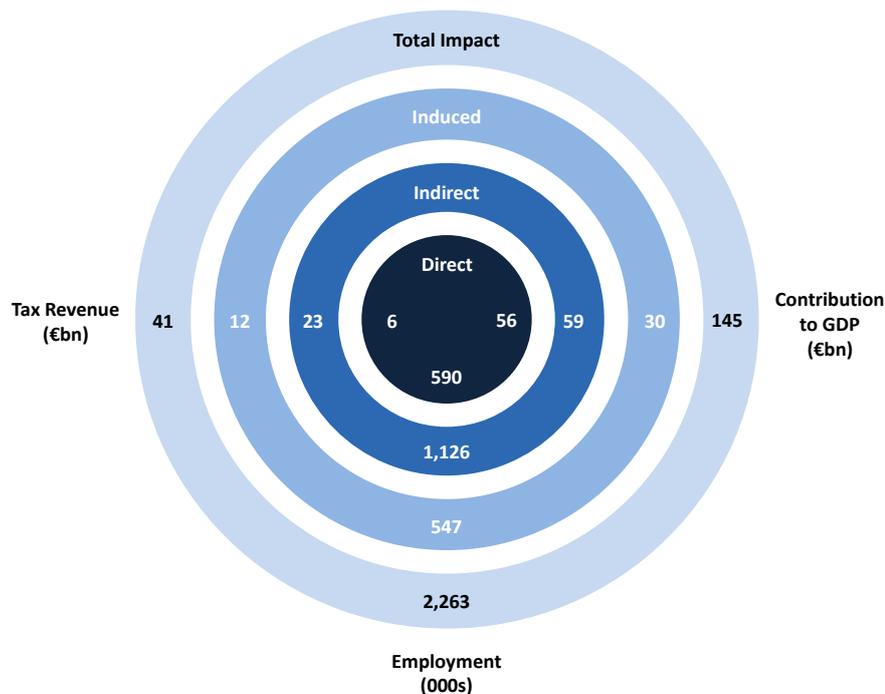
Indirect and induced impacts

- The shipping industry indirectly supported an estimated €59 billion contribution to GDP and 1.1 million jobs through its European supply chain in 2012.
- The spending of wages by those employed in the shipping industry and its supply chain supported an estimated additional €30 billion of GDP and jobs for 550,000 people.

Total economic impact

- Taking all of the impacts together, direct, indirect and induced, the total GDP contribution of the European shipping industry in 2012 is estimated to have been €145 billion.
- For every €1 million the European shipping industry contributes to GDP itself, it creates another €1.6 million elsewhere in the European economy.
- The industry also supported employment for an estimated 2.3 million people and tax revenues estimated at €41 billion.

The total economic impact of the European shipping industry, 2012



Impact of measures adopted under the Community guidelines on state aid to maritime transport

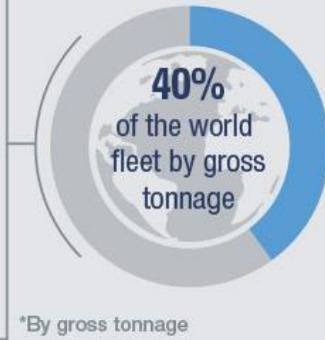
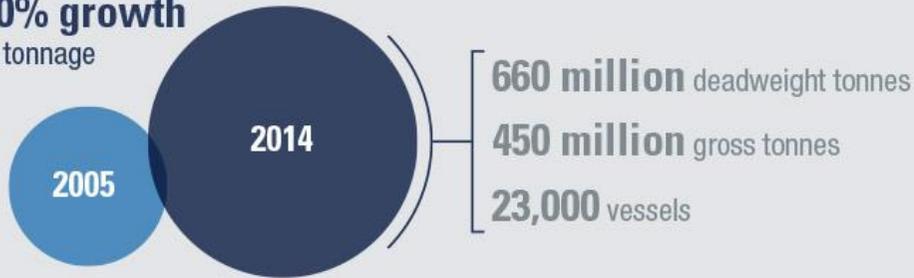
- The shipping industry has a number of unique features which provide a rationale for a more favourable taxation policy than is available to other industries. The industry is, by its very nature, highly mobile and activity can easily be moved to countries which adopt more favourable taxation and regulatory regimes. A healthy and competitive shipping industry forms the core of the wider European maritime cluster and supports development of the EU's international trading linkages. It is also strategically important, for example in ensuring a secure energy supply and in providing capacity to support military operations in times of crisis or in peacekeeping missions.

- Recognising such arguments, and in response to intense international competition from third country shipping registers and global shipping centres, EU governments have introduced a range of state aid measures to support shipping, most notably in the form of tonnage tax and reduced income tax and social security contributions for seafarers. This approach has been guided by policy at the European level through the Commission's guidelines on state aid.
- Based on an illustrative counter-factual scenario using trends in fleet data for nine EU countries, it is tentatively estimated that the total economic contribution of the European shipping industry could have been around 50 per cent lower in 2012, in terms of GVA and employment, if the countries in the analysis had not introduced tonnage tax regimes and other state aid measures.

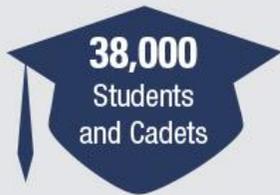
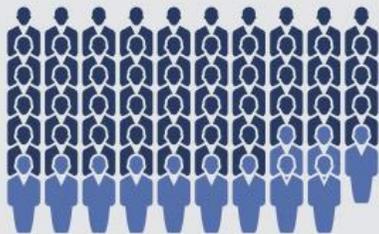
The economic value of the EU shipping industry

The EU controlled shipping fleet in numbers

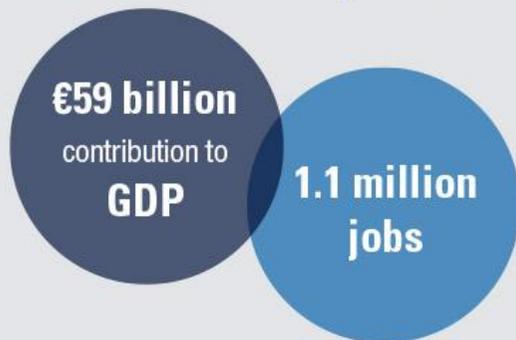
70% growth
in tonnage



Direct economic impact



Indirect impacts



Induced impacts



Total economic impact



For every **€1 million** of GDP the shipping industry creates, another **€1.6 million** is created elsewhere in the EU economy

50% Amount by which the total economic contribution of the EU shipping industry could have been reduced in the absence of EU-approved state aid measures.¹

¹ Based on illustrative counter-factual scenarios for nine EU countries

1 Introduction and definitions of terms used in the study

1.1 Purpose of the study

This report has been prepared for the European Community Shipowners' Associations (ECSA), the trade association representing the national shipowners' associations of the EU and Norway. The study aims to provide an understanding of the economic value generated by the EU shipping industry, both directly and through its interactions with other parts of the economy. As well as analysing the contribution of the industry, the study reviews the recent development of the EU shipping fleet; estimates the impact of state aid measures permitted under the Community guidelines on state aid; and outlines the contribution of maritime academies in training seafarers.

1.2 Geographical coverage

Throughout this document results are reported for the '*EU shipping industry*' which is defined as the industry within the 28 EU member states plus Norway. Where data are presented over time, information for all 29 countries is presented for the entire time period to avoid distortions caused by new member countries joining the EU. In a small number of cases information is only available for the European Economic Area (EEA), which includes Iceland and Liechtenstein, as well as the EU countries and Norway.

1.3 Defining the shipping industry

The brief for the study was to assess the economic contribution of the shipping industry, defined by ECSA as:

- **the transport of goods by sea** (both containerised and non-containerised);
- **the transport of persons by sea** (both on ferries and on cruise ships);
- **service and offshore support vessels**, such as 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; and
- **towage and dredging** activities at sea.

To analyse the economic contribution of the EU shipping industry it is necessary to identify the best possible fit between this preferred definition of the industry, and the categories for which economic data are available.

Eurostat categorises economic activity according to its NACE¹ system. This identifies a number of sectors which include activities that predominantly fall within the preferred definition of the shipping industry set out above (see Table 1.3a). Using these definitions it has been possible to gather information from the Eurostat national accounts and Structural Business Statistics datasets on

¹ Nomenclature statistique des activités économiques dans la Communauté européenne

gross value added and employment in passenger transport, freight transport, and the renting and leasing of water transport equipment.

Wherever possible, the Eurostat data have been complimented with information provided by ECSA members drawn from previous economic impact studies and national sources. Where such figures have been used, they have been adjusted to match the Eurostat categories as closely as possible.

Table 1.3a: Eurostat NACE categories included in this study

NACE code	Category	Includes	Excludes
50.1	Sea & coastal passenger water transport	<ul style="list-style-type: none"> - transport of passengers over seas and coastal waters - operation of excursion, cruise or sightseeing boats - operation of ferries, water taxis etc. 	<ul style="list-style-type: none"> - restaurant and bars on board ships, when provided by separate units - renting of pleasure boats and yachts without crew - renting of commercial ships or boats without crew - operation of “floating casinos”
50.2	Sea & coastal freight water transport	<ul style="list-style-type: none"> - transport of freight over seas and coastal waters - transport by towing or pushing of barges, oil rigs etc. - renting of vessels with crew for sea and coastal freight water transport 	<ul style="list-style-type: none"> - harbour operation and other auxiliary activities such as docking, pilotage, lighterage, vessel salvage - cargo handling - renting of commercial ships or boats without crew
77.34*	Renting & leasing of water transport equipment	<ul style="list-style-type: none"> - renting and operational leasing of water-transport equipment without operator: commercial boats and ships 	<ul style="list-style-type: none"> - renting of water-transport equipment with operator - renting of pleasure boats

* adjusted by Oxford Economics to remove elements relating to inland waterways

Some elements of the preferred definition of the shipping industry cannot easily be identified within the Eurostat classification. This is a particular issue for service and offshore support vessels, for which output and employment are often incorporated within the categories for the type of activity they support (most notably in the energy sector). A similar issue arises in the case of dredging, which is included within Eurostat data for the mining and quarrying sector.

For these sub-sectors it has not been possible to obtain information across all EU countries. Nonetheless, a number of national shipowners’ associations hold information for their own country on offshore support vessels and dredging. This has been included in the estimates of employment and GVA wherever it is available², as indicated in Table 1.3b, below.

Table 1.3b: Countries providing employment and/or GVA data for service and offshore support vessels, and dredging

Sub-sector	Countries for which information available
Service and offshore support vessels	Denmark, France, Italy, Netherlands, Norway, Portugal, UK
Dredging	Belgium, Denmark, Italy, Netherlands, Norway, Spain, UK

² This approach will tend to underestimate the overall size of the EU shipping industry in terms of employment and GVA, since data on service and offshore support activities and dredging, are not available across all countries. Nonetheless, consultation with ECSA members suggests that the countries with the largest amount of activity in these sub-sectors have provided data on their size. We do not, therefore, believe the amount of activity that has not been captured will significantly affect the overall results.

In many cases the time periods data are available for do not precisely correspond to the needs of the project and a degree of estimation has been necessary to generate consistent time series across countries. Details of the sources used are set out at Annex B.

1.4 Gross and deadweight tonnage

There are a number of ways of measuring the size of a country's shipping fleet. Two main measures are used in this study:

- **gross tonnage (GT)** - a measure of volume inside a vessel; and
- **deadweight tonnage (DWT)** – measures how much weight a ship can safely carry. It is the sum of the weights of cargo, fuel, fresh water, ballast water, provisions, passengers and crew.

When looking across the entire European shipping fleet it is not clear which measure is most appropriate: gross tonnage tends to give a greater weighting to passenger, cruise, roll-on roll-off and container vessels. Deadweight tonnage tends to give greater weighting to freight vessels. In some cases data are only available on the basis of one measure, but wherever possible this report includes fleet data based on both measures.

1.5 The channels of economic impact

The economic value of the EU shipping industry is examined across three metrics of impact:

- the **gross value added contribution to GDP** measures the contribution to the economy of each individual producer, industry or sector. It is a measure of output and is aggregated across all industries or firms to form the basis of a country's Gross Domestic Product (GDP), the main measure of the total level of economic activity;
- **employment**, measured on a headcount basis; and
- **tax revenues** flowing to EU governments.

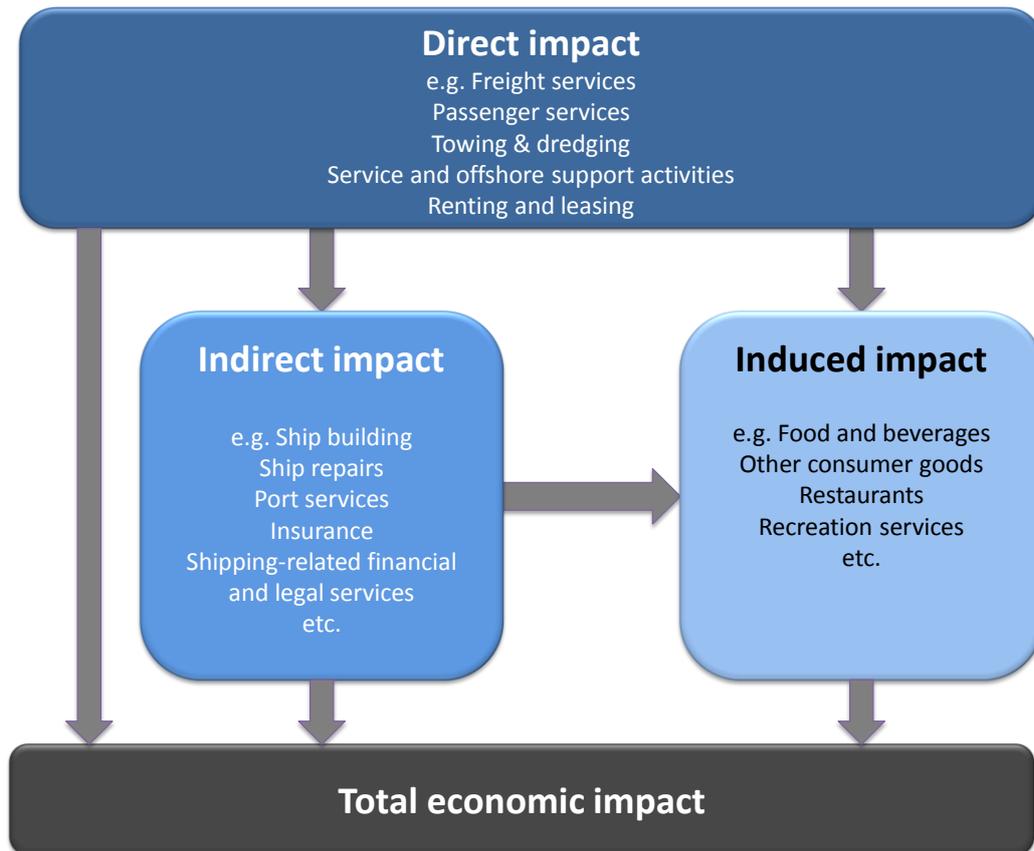
The economic impacts measured in this study are quantified across three channels:

- **direct** impacts reflect the economic contribution of the shipping industry itself;
- **indirect** impacts occur as a result of shipping firms' expenditure on inputs of goods and services from their EU supply chain. Economic activity in this category could include, for example, ship building, ship repairs, port services, insurance, and shipping-related financial and legal services; and
- **induced** impacts arise as employees in the shipping industry and its supply chain spend a proportion of their wages on consumer goods and services. These impacts are first felt at the retail and leisure outlets close to where these employees live, but also ripple out through the supply chains of the businesses selling consumer goods and services.

Our calculations of these impacts are on a *gross* basis. They therefore make no allowance for what the people and other resources deployed by the shipping industry and its suppliers would have contributed to the economy if the industry did not exist³.

³ This is a standard procedure in the analysis of the economic impact of individual industries.

Figure 1.5: The economic impact of the EU shipping industry



Some studies of this type also assess 'catalytic effects', whereby the shipping industry creates positive spillovers that enhance output and productivity in other sectors. This report includes analysis of the contribution of maritime academies, but other types of catalytic effect are beyond the scope of this work.

1.6 Report structure

The remainder of the report is structured as follows:

- **Section 2** analyses the evolution of the EU shipping fleet;
- **Section 3** presents the assessment of the economic impact of the EU shipping industry;
- **Section 4** estimates the impact of the state aid measures on the EU shipping industry; and
- **Section 5** reviews the contribution of maritime academies.

2 The evolution of the EU shipping fleet

Key points

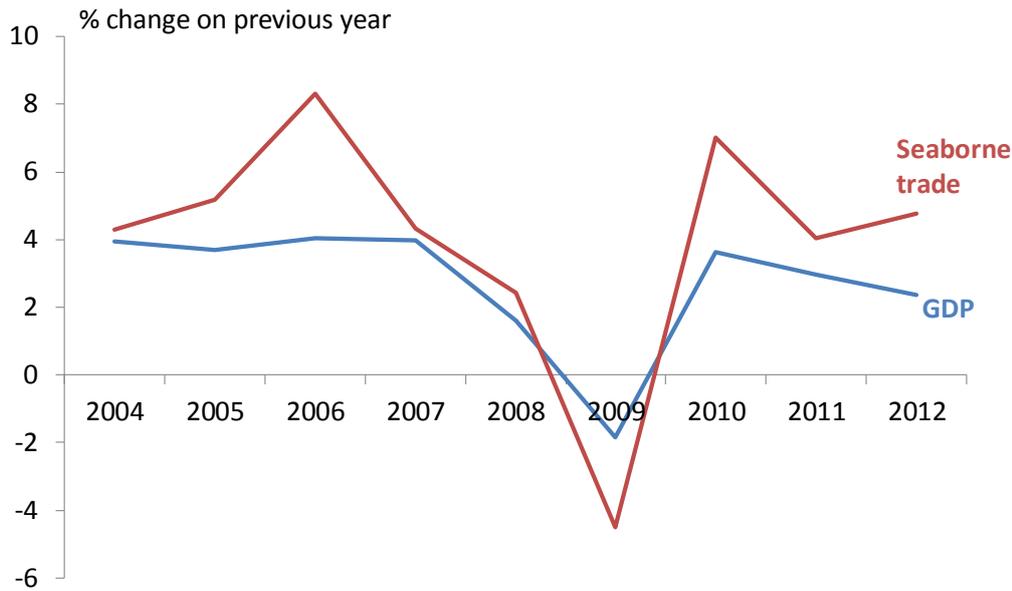
- At the start of 2014, the EU controlled fleet (which comprises ships whose ultimate ownership or control lies in an EU country, but which may be flagged in a different country) comprised of 660 million deadweight tonnes, 450 million gross tonnes, and 23,000 vessels. For the purposes of this report, the EU includes the 28 EU countries plus Norway.
- Between the start of 2005 and the start of 2014, the EU controlled fleet expanded by more than 70 per cent in terms of both gross and deadweight tonnage. The number of vessels grew at a much lower rate, reflecting the trend towards larger ships which offer greater economies of scale.
- At the start of 2014, the EU controlled 40 per cent of world gross tonnage and 39 per cent of world deadweight tonnage. This is a slight decrease from 41 per cent in 2005 (on both measures), reflecting that EU shipping companies continue to face strong competitive pressure from other rapidly-growing centres of world shipping, particularly those in Asia and the Middle East.
- Greece has the largest controlled fleet within Europe, equivalent to 36 per cent of gross tonnage, or 43 per cent of deadweight tonnage. Germany represents a further 21 per cent of gross tonnage, or 19 per cent of deadweight tonnage.
- The EU controlled fleet is dominated by three types of vessel: bulkers (28 per cent of gross tonnage), oil tankers (25 per cent) and container ships (25 per cent). The EU controls 60 per cent of the world's container ships in gross tonnage terms.
- Within the EU fleet, the strongest growth between 2005 and 2014 was recorded amongst offshore vessels. The EU's share of the world offshore fleet increased from 28 per cent in 2005 to 37 per cent in 2014 in gross tonnage terms.

2.1 Context

Global GDP recorded average annual growth of 3.9 per cent between 2004 and 2007, before recession took hold in 2008 in 2009 (Figure 2.1a). Global GDP growth has recovered since 2010, although has not returned to pre-recession rates. This reflects the slow pace of recovery in developed economies, particularly within the EU, and, more recently, slower growth in developing economies.

Over the last decade, seaborne trade has tended to grow more strongly than GDP, reflecting the increasingly globalised nature of production and consumption, particularly as developed country firms have outsourced production to lower cost manufacturing centres in Asia. Nonetheless, the pattern of growth in seaborne trade has tended to broadly follow that of GDP. The rate of growth in trade volumes fell sharply in 2008 and 2009, but has since rebounded.

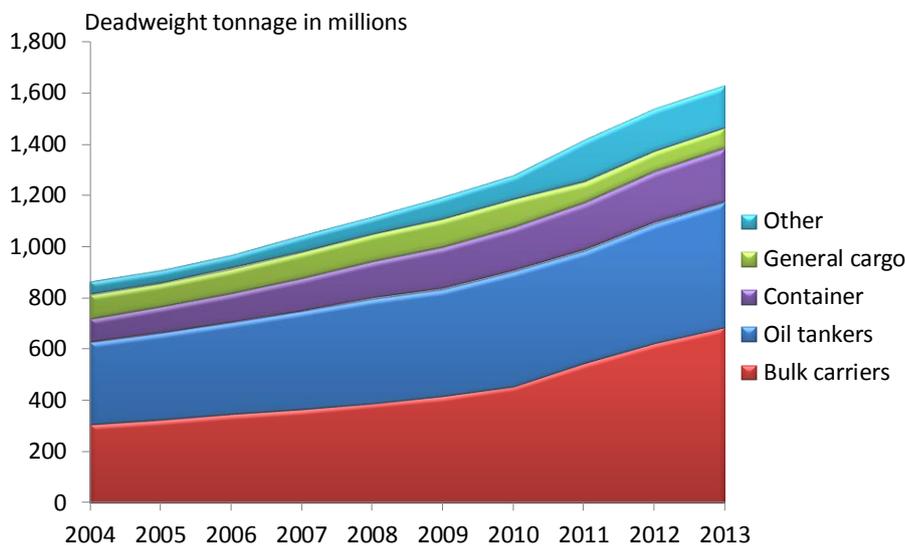
Figure 2.1a: World GDP and seaborne trade flows⁴, 2004 to 2012



Source: Oxford Economics, UNCTAD

The global merchant fleet increased by 78 per cent between 2004 and 2013 (in deadweight tonnage terms, Figure 2.1b), and within this total, bulk carriers and container ship tonnage more than doubled. The “other” category comprises all other propelled sea-going merchant vessels of at least 100 gross tonnes, including cruise ships, ferries and vessels supporting the offshore energy sector⁵.

Figure 2.1b: World merchant fleet by type of ship, 2004 to 2013



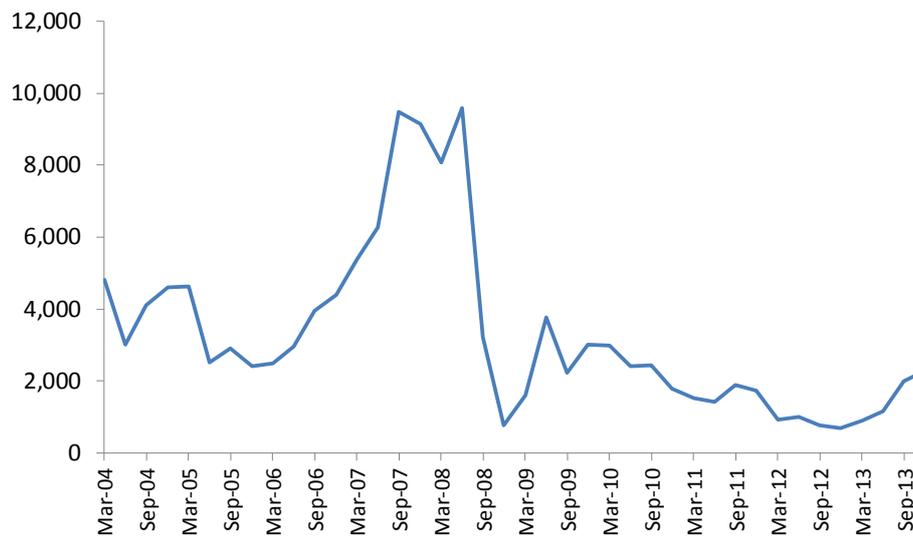
Source: UNCTAD

⁴ World seaborne trade based on UNCTAD series for total goods loaded, in millions of metric tonnes

⁵ Although the “other” category recorded the strongest growth rate between 2004 and 2013, this result should be treated with caution due to a change in the definition of the underlying data series from 2011 onwards.

The impacts of the 2008-09 recession, combined with steady and continuous growth in the global fleet have led to an industry-wide challenge of over-capacity, which has put pressure on freight rates. By way of illustration, Figure 2.1c shows the Baltic Dry Index which measures the cost of moving major raw materials by sea, as assessed by a panel of shipbroking houses around the world, on a per tonne and a daily hire basis, and across a range of routes. The Index suggests global shipping rates fell by 85 per cent between the final quarter of 2004 and the final quarter of 2012 (although some of this fall was subsequently reversed as conditions improved during 2013).

Figure 2.1c: Baltic Dry Index, quarterly values from March 2004 to December 2013



Source: Baltic Exchange, Reuters

In addition to sharp falls in freight rates, shipping companies have faced significant increases in fuel prices. Based on the benchmark Rotterdam 380 centistoke measure, marine fuel costs increased from an average of \$234 per tonne in 2005 and to \$640 per ton in 2012⁶. Fuel costs can account for 50 to 60 per cent of operating costs⁷, and so can have a significant impact on profitability.

⁶ Source: UNCTAD Review of Maritime Transport, 2013

⁷ World Shipping Council (2008) *Record fuel prices place stress on ocean shipping*, quoted in UNCTAD Review of Maritime Transport, 2013

2.2 What is the EU fleet?

There are three main ways of measuring the EU fleet, each with its own merits and drawbacks.

Firstly, the **'controlled'** or **'beneficially owned' fleet** includes ships whose ultimate ownership or control lies in an EU country, but which may be flagged in a different country. It is imperfect as a measure of economic activity since the country of ownership or control (to which dividends and profits flow) does not necessarily align with where the direct operational activity and employment associated with the fleet takes place. Whilst imperfect, some data are available to assess the size of the EU fleet in terms of the number of vessels and tonnage on this basis.

Secondly, the **'operated' fleet** comprises ships operated by companies (or legal entities) based in the EU, which have substantive shore establishments within the EU, and which are subject to EU laws and taxation. The operated fleet includes ships operated under EU flags, plus non-EU flagged ships operated by EU shipping companies. The shore establishments may be a company's headquarters, but they may also be the European or national subsidiary of the company in question. Nonetheless, they are the centre of commercial management of the business that takes decisions on day-to-day operations and employment, even if all or part of their shareholding is abroad.

The operated fleet is likely to align most closely with the industry's economic impact in terms of gross value added and employment, as discussed in the next section of the report. However, only very limited data are currently available to measure the size of the EU operated fleet.

Finally, the **'flag' fleet** comprises ships operating under the flag of an EU country. Flagging is an embodiment of the legal principle that every ship should belong to a state. Flag country is important since it determines which country's jurisdiction a ship and its crew falls under in terms of legal matters. The cost of complying with a flag state's legal and regulatory requirements is just one of a wide range of factors that may influence a shipowner's choice of flag state. Other factors include the type of vessel (some countries have registry practices tailored to specific sectors); a flag state's reputation for upholding safety and other standards; the provision of naval protection; and marketing considerations. A flag state, or a group of potential flag states, may also be specified by a ship's charter, financing organisation, or insurer.

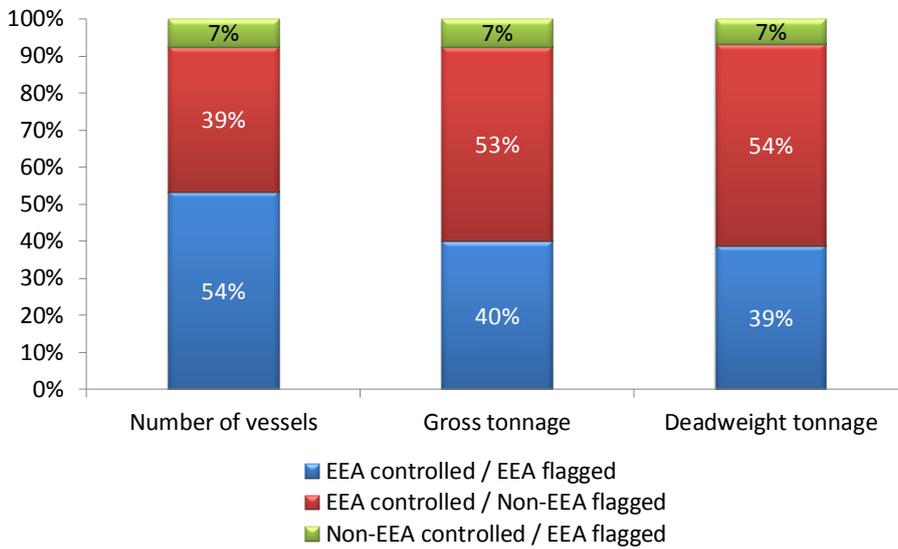
There may be some link between country of flag and the location of economic benefit due to reasons of cultural closeness or geographic proximity, but in many cases there may be little or no link. Nonetheless, the registration process creates very good data sets, which go back over 30 years in some cases.

The EU controlled fleet is the main focus of the analysis in this report. This definition has been chosen as the preferred measure of the EU fleet because it provides the best balance between data availability and alignment with economic impact.

Figure 2.2 presents information on the country of control and flag of the EEA fleet. In terms of gross and deadweight tonnage, around 40 per cent is both EEA controlled and EEA flagged. In terms of the number of vessels, the proportion of the fleet that is both controlled and flagged in an EEA country is slightly higher at 54 per cent.

Just over half of the fleet in terms of gross and deadweight tonnage is controlled from EEA countries, but operates under a non-EEA flag. Seven per cent of the fleet is EEA flagged, but controlled in a non-EEA country.

Figure 2.2: The EEA fleet by control and flag, 2013

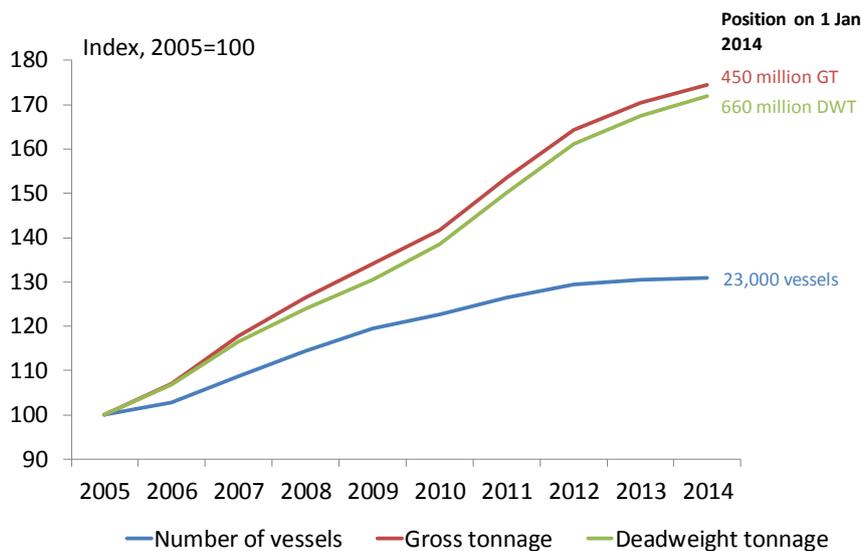


Source: Clarkson Research Services Ltd., ECSA

2.3 The EU controlled fleet

The EU controlled fleet has grown strongly since 2005 (the earliest year for which data are available on a consistent basis for all EU countries). Between the start of 2005 and the start of 2014, the fleet expanded by 74 per cent in gross tonnage terms, and by 72 per cent in terms of deadweight tonnage (Figure 2.3a). Growth in the number of vessels was much lower, at 31 per cent, reflecting the trend for shipping companies to invest in larger vessels that offer greater economies of scale. It should be noted that this analysis includes all 28 EU countries and Norway for the entire duration of the time series. The growth trend shown is not, therefore, influenced by the accession of Bulgaria, Romania and Croatia to the EU during the period shown.

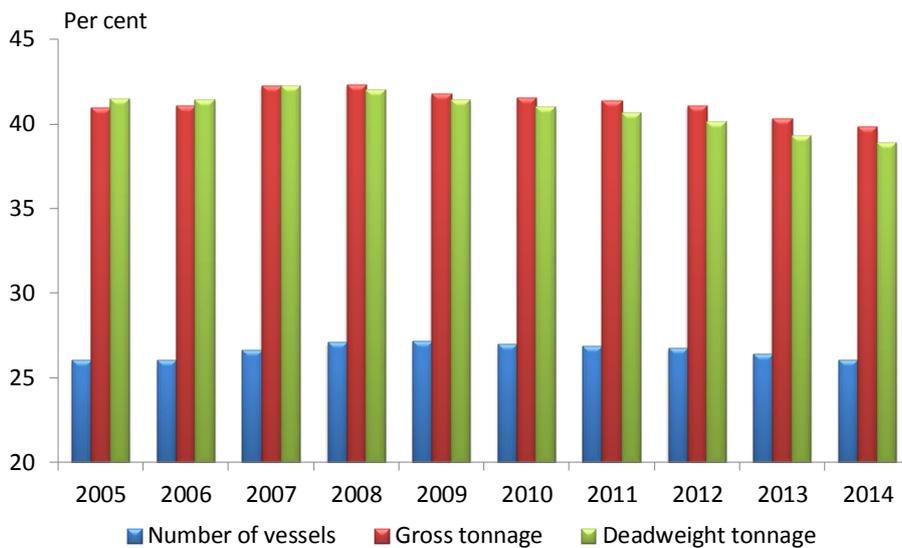
Figure 2.3a: The evolution of the EU controlled fleet, 1 January 2005 to 1 January 2014



Source: Clarkson Research Services Ltd.

The world fleet has also grown over the last decade, and at a slightly higher rate than the EU fleet, reflecting that other centres of world shipping, particularly in Asia and the Middle East, continue to expand rapidly. As a result, the EU controlled share of the global fleet has declined slightly from 41 per cent in 2005 to 40 per cent in 2014 in gross tonnage terms, or to 39 per cent by deadweight tonnage (Figure 2.3b). Nonetheless, the EU controls 26 per cent of the world's vessels, the same proportion as in 2005. The fact that the EU controlled share of the number of vessels has remained constant whilst its share of tonnage has decreased slightly reflects that growth elsewhere has been particularly concentrated on very large vessels.

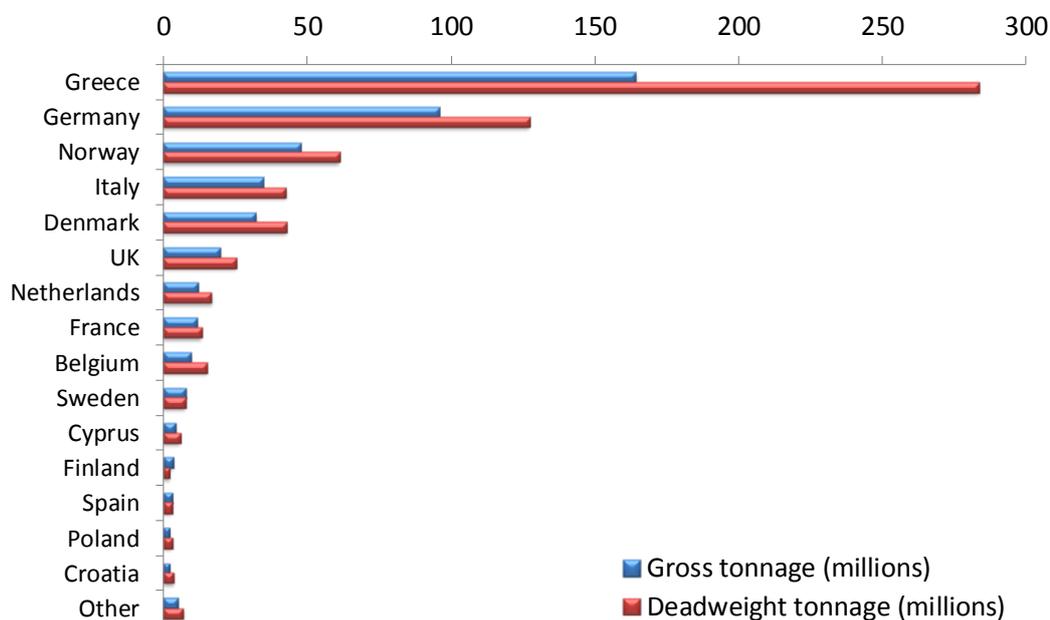
Figure 2.3b: The EU controlled fleet as a proportion of the world fleet, 1 January 2005 to 1 January 2014



Source: Clarkson Research Services Ltd.

Within Europe, Greece has the largest controlled fleet, comprising 164 million gross tonnes, or 284 million deadweight tonnes (Figure 2.3c). This is equivalent to 36 per cent and 43 per cent of the total EU controlled fleet respectively. Germany represents a further 21 per cent of EU controlled gross tonnage, or 19 per cent of deadweight tonnage.

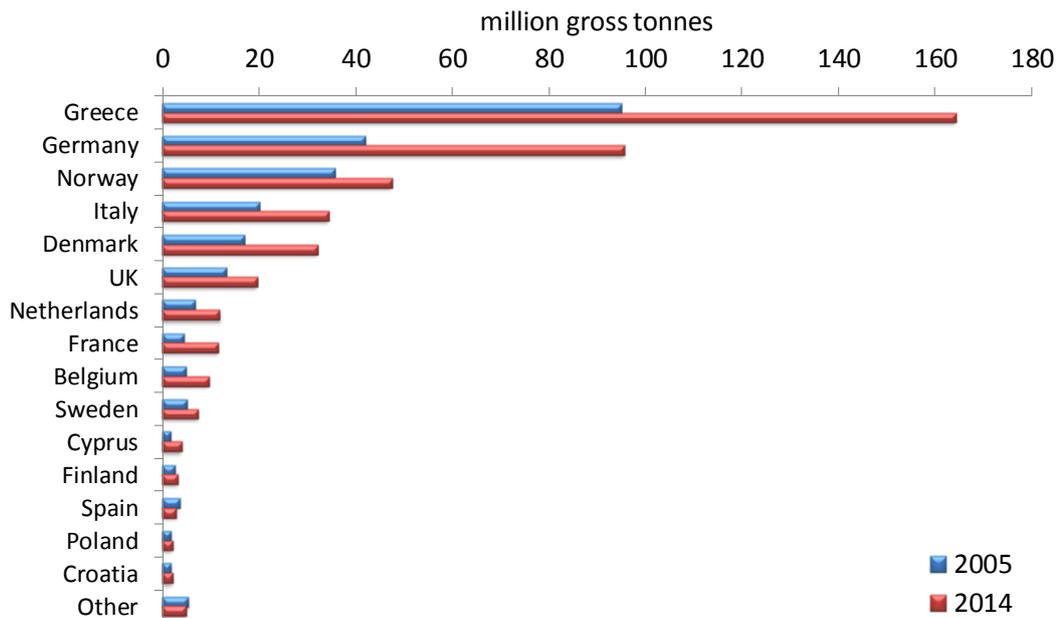
Figure 2.3c: The EU fleet by country of control, 1 January 2014



Source: Clarkson Research Services Ltd.

The rate of growth in the Greek controlled fleet between 2005 and 2014 was broadly in line with the EU average (73 per cent in gross tonnage terms, Figure 2.3d). The growth rate in Germany, however, was even stronger at 128 per cent over this period. In proportionate terms, the French and Belgian controlled fleets also grew more quickly than the EU average, by 169 and 96 per cent respectively.

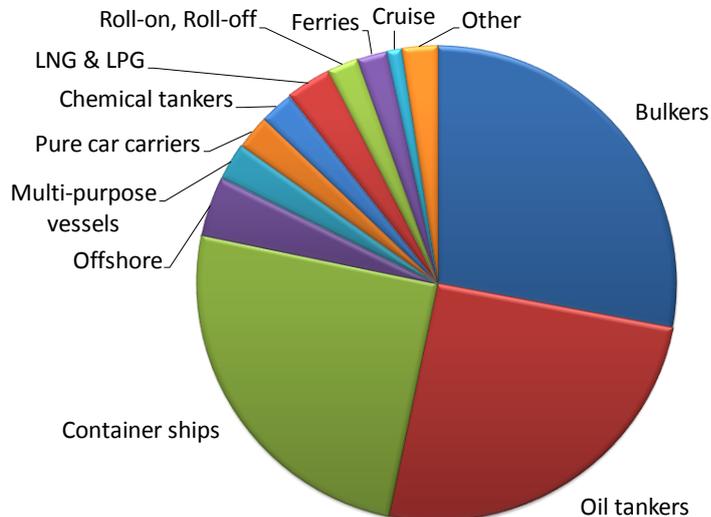
Figure 2.3d: The EU fleet by country of control, 1 January 2005 and 1 January 2014



Source: Clarkson Research Services Ltd.

The EU controlled fleet is dominated by three types of vessel (Figure 2.3e): bulkers (28 per cent of EU controlled gross tonnage), oil tankers (25 per cent) and container ships (25 per cent).

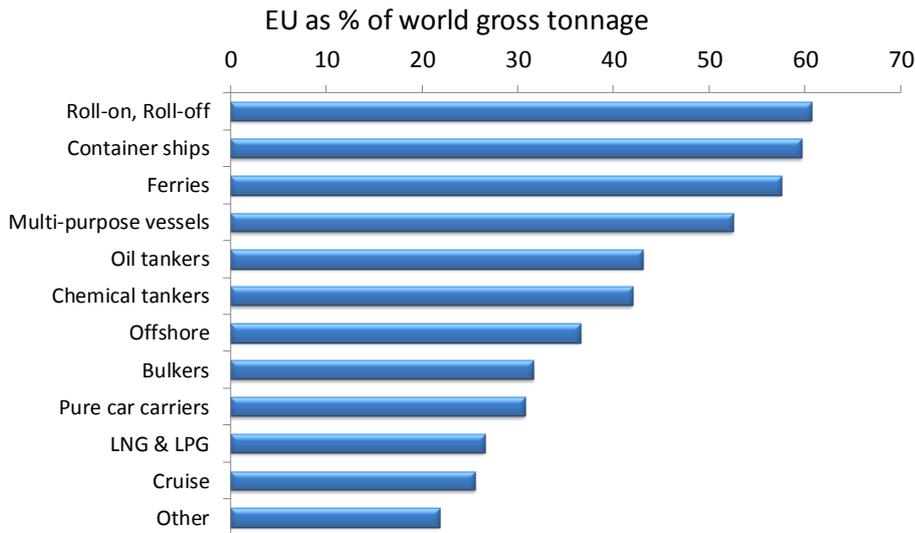
Figure 2.3e: The EU controlled fleet by type of vessel, by gross tonnage, 1 January 2014



Source: Clarkson Research Services Ltd.

As discussed above, the EU controlled fleet represents 40 per cent of the world’s gross tonnage. In some types of vessel, however, the EU controlled share is much higher (Figure 2.3f). Most notably, the EU controls 60 per cent of the world’s container ships. Although smaller in terms of their significance within the EU fleet, EU countries control 61 per cent of roll-on roll-off vessels, 57 per cent of ferries and 52 per cent of multi-purpose ships.

Figure 2.3f: The EU controlled share of the world fleet, 1 January 2014

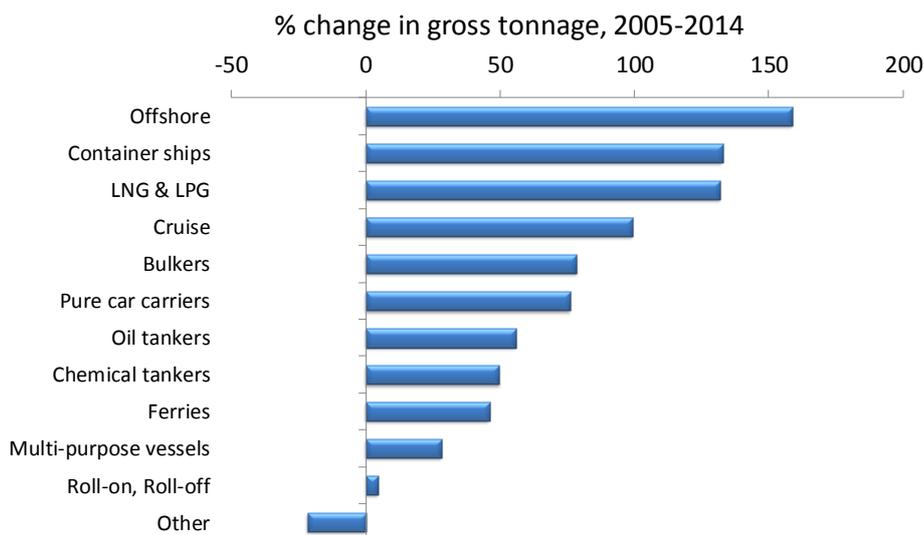


Source: Clarkson Research Services Ltd.

The strongest growth rate between 2005 and 2014 was recorded amongst offshore vessels (Figure 2.3g). The global offshore industry has also grown strongly over this period, but the EU's share of the world fleet nonetheless increased from 28 per cent in 2005 to 37 per cent in 2014 (in gross tonnage terms). This sector is particularly important in terms of economic impact because it is more labour-intensive than many other sub-sectors, and many of the jobs created are high-skill, high-value positions.

The EU controlled fleet of container ships, LNG & LPG tankers, and cruise ships also achieved particularly strong growth over the period: gross tonnage increased by around 100 per cent or more for each of these types of vessel.

Figure 2.3g: Growth in the EU controlled fleet by type of vessel, 1 January 2005 to 1 January 2014



Source: Clarkson Research Services Ltd.

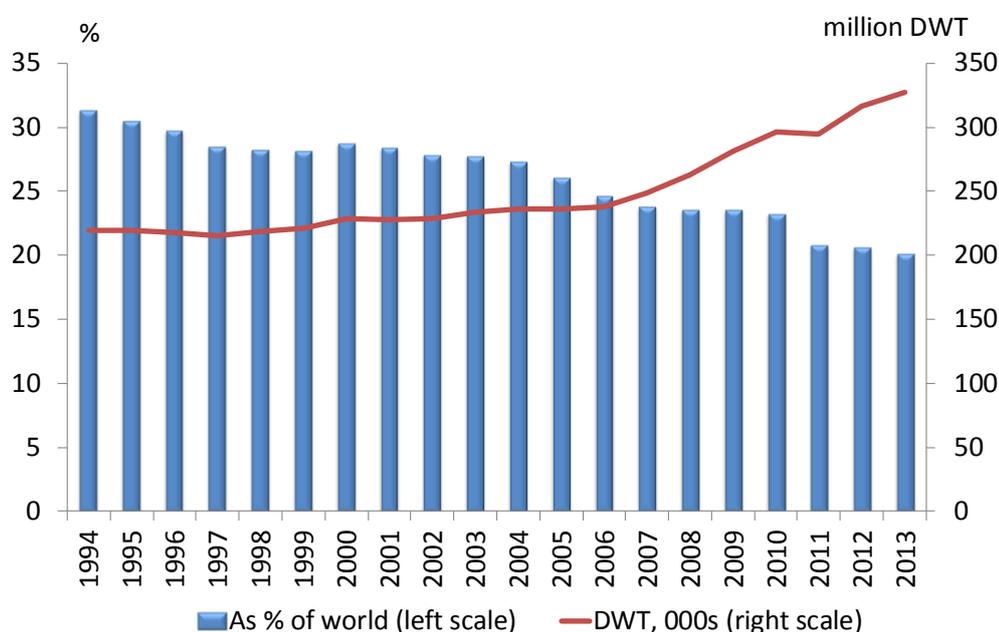
2.4 The EU flagged fleet

Although less closely aligned to economic impact than the controlled fleet, information on the flagged fleet is available for a much longer period (this is particularly useful when considering how policy changes may have affected the attractiveness of flying the flag of an EU Member State on vessels managed by European shipowners, for example). As with the analysis of the controlled fleet, the chart and commentary below is based on a fixed definition of the EU and Norway, so the trends apparent in the time series are not affected by the accession of countries to the EU during the period⁸.

The red line in Figure 2.4a plots the evolution of deadweight tonnage operating under an EU flag since 1994. On this basis, little growth was recorded during the 1990s and early 2000s (deadweight tonnage increased by just nine per cent between 1994 and 2006). Since then, the EU flagged fleet has expanded more quickly, by 38 per cent between 2006 and 2013. Nonetheless, this was well below the 69 per cent expansion in the world fleet recorded over the same period and the EU flagged share of the world fleet has continued to decline. In 2013, 20 per cent of the world fleet was operated under the flag of an EU country.

The reduction in the EU *flagged* share of the world fleet since 2005 is more pronounced than the slight decline in the EU *controlled* share of the world fleet over this period (as shown in Section 2.3). To the extent that changes in the EU's share of the world fleet reflect policy measures, this may suggest that policies such as tonnage tax have been relatively effective at keeping shipowners in Europe, but other factors that determine choice of flag, such as the service levels of maritime authorities, have been less effective in stabilising the share of the European flagged fleet.

Figure 2.4a: The EU flagged fleet by deadweight tonnage, 1994 to 2013

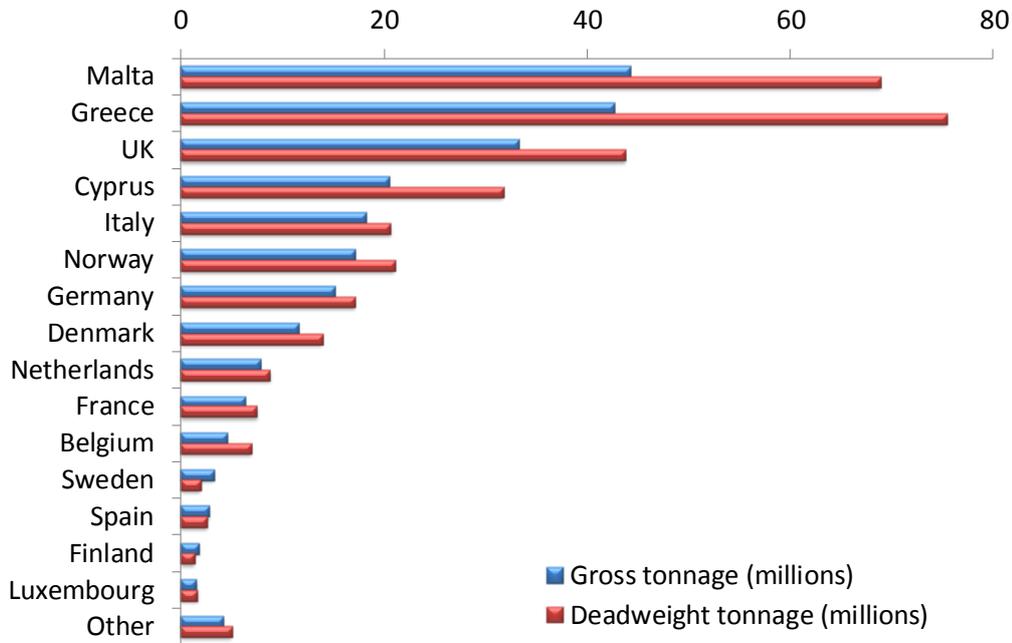


Source: UNCTAD

⁸ To enable a consistent comparison over a longer time period, the series shown in Figure 2.4a excludes Slovakia in all years. Slovakia accounted for 46,000 DWT in 2013

Within Europe, there is a large degree of consistency between the largest flagged fleets and the largest controlled fleets (as shown in Section 2.3). The main exception to this is Malta, which accounts for 19 per cent of the EU flagged fleet by gross tonnage, or 21 per cent by deadweight tonnage (Figure 2.4b). In contrast, Malta does not appear in the top 15 countries for the EU controlled fleet. This reflects that while Malta has a large amount of tonnage registered to its flag, much smaller amounts are under the control of Maltese operators or owners. Similarly, Cyprus has a much higher rank in terms of flagged fleet than for controlled fleet.

Figure 2.4b: The EU fleet by country of flag, 2013⁹

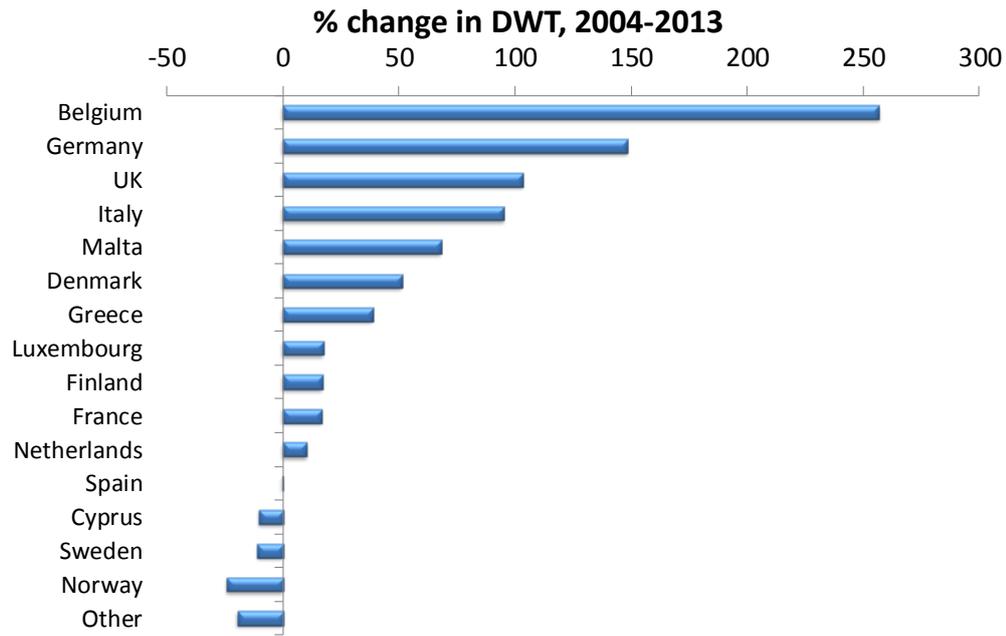


Source: UNCTAD

The strongest growth in terms of flagged fleets between 2004 and 2013 occurred in Belgium, which has seen extensive 're-flagging' following the introduction of tonnage tax in 2002 (Figure 2.4c). Germany and the UK also saw their flagged fleets more than double over this period, and Italy saw an increase of 95 per cent.

⁹ UK includes Isle of Man

Figure 2.4c: Growth in the flagged fleets of EU countries, 2004-2013

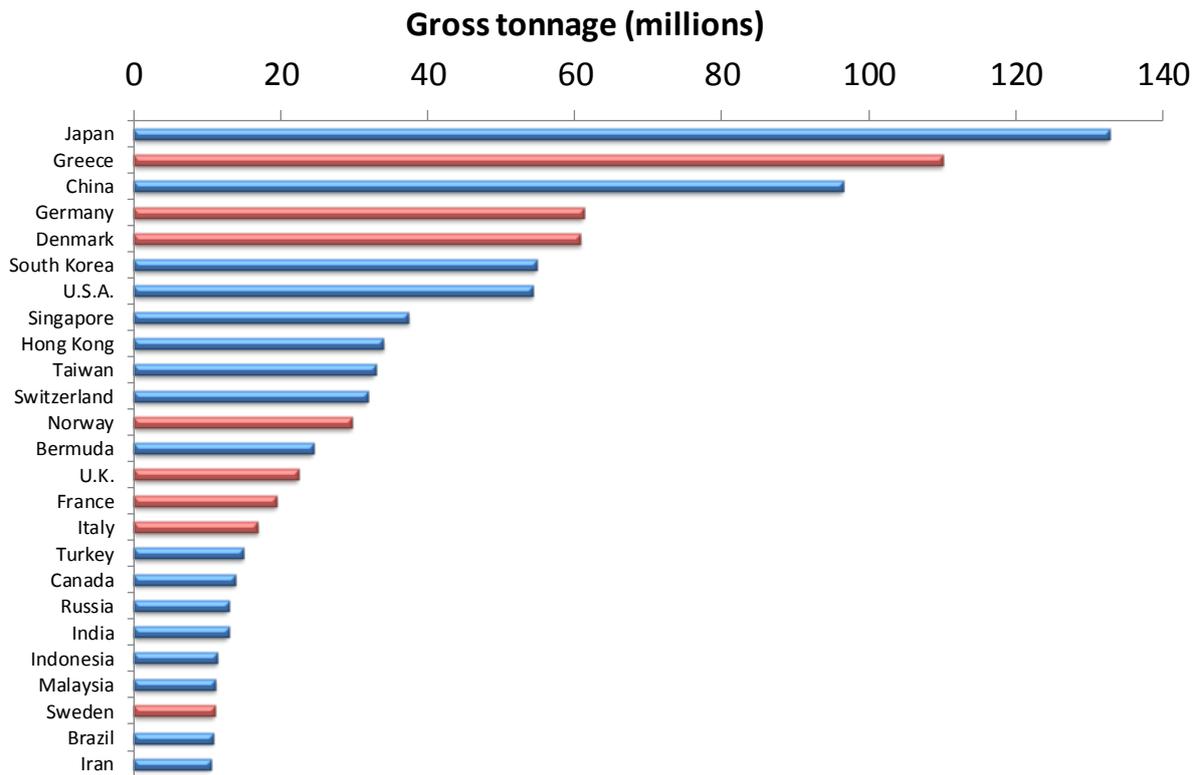


Source: UNCTAD

2.5 The EU operated fleet

Very few data were available to the study to analyse the EU operated fleet. Nonetheless, the EU plays a prominent role in the world fleet by this measure. Eight of the top 25 largest operated fleets in the world belong to EU countries (Figure 2.5). Within this, Greece, Germany and Denmark fall within the top five largest operated fleets in the world.

Figure 2.5: Merchant fleet by operator domicile – 25 largest countries by gross tonnage, 1 July 2013



Source: IHS Fairplay

3 The economic impact of the EU shipping industry

Key points

- In 2012, the EU shipping industry is estimated to have directly contributed €56 billion to GDP, employed 590,000 people, and generated tax revenues of €6 billion.
- It is estimated that around four-fifths of posts, or 470,000 jobs, are based at sea. It is tentatively estimated that around 40 per cent of these seafarers are EU or EEA nationals.
- Shipping is a high productivity industry: each worker is estimated to have generated €88,000 of GDP, significantly above the EU average of €53,000.
- The shipping industry indirectly supported an estimated €59 billion contribution to GDP and 1.1 million jobs through its European supply chain in 2012. The spending of wages by those employed in the shipping industry and its supply chain supported an estimated additional €30 billion of GDP of and jobs for 550,000 people.
- Taking these effects together, the total GDP contribution of the European shipping industry in 2012 is estimated to have been €145 billion. The industry also supported employment for an estimated 2.3 million people, and tax revenues estimated at €41 billion.
- For every €1 million the European shipping industry contributes to GDP itself, it creates another €1.6 million elsewhere in the European economy.

3.1 Direct impacts

3.1.1 Approach to estimating direct impacts

To estimate the industry's direct impact it is necessary to collect data that corresponds as closely as possible to the definition of the shipping industry discussed in Section 1.3. Where possible, the study draws on information provided by ECSA members based on previous economic impact studies and national sources. For other countries, information has been drawn from the Eurostat national accounts and Structural Business Statistics datasets on gross value added and employment.

In many cases the data available do not precisely correspond to the needs of the project and a degree of estimation has been necessary to ensure consistency across countries, and to generate time series that cover both 2004 and 2012. Details of the sources used for each country are set out at Annex B.

3.1.2 Direct contribution to employment

ECSA members have provided detailed employment data for the following countries: Belgium, France, Germany, Italy, the Netherlands, Norway, Portugal, Spain, and the UK. Comparison of Eurostat data and this more detailed country-specific information suggests the Eurostat figures tend to underestimate total employment in the shipping industry. It is difficult to be certain of the precise reasons for this, but our research and consultation with national experts and Eurostat suggests the most likely reason is that the Eurostat data do not capture some proportion of workers who work on ships, many of whom may not be subject to income tax in the EU state from which their vessel is managed.

As a result, for those countries for which detailed national figures are not available, it has been necessary to estimate this ‘missing’ section of the workforce using a combination of GVA statistics and productivity data.

Overall, it is estimated that the European shipping industry directly employed 590,000 people in 2012. This means that shipping employs more people than travel agents and tour operators; forestry and logging; and air transport (Table 3.1.2).

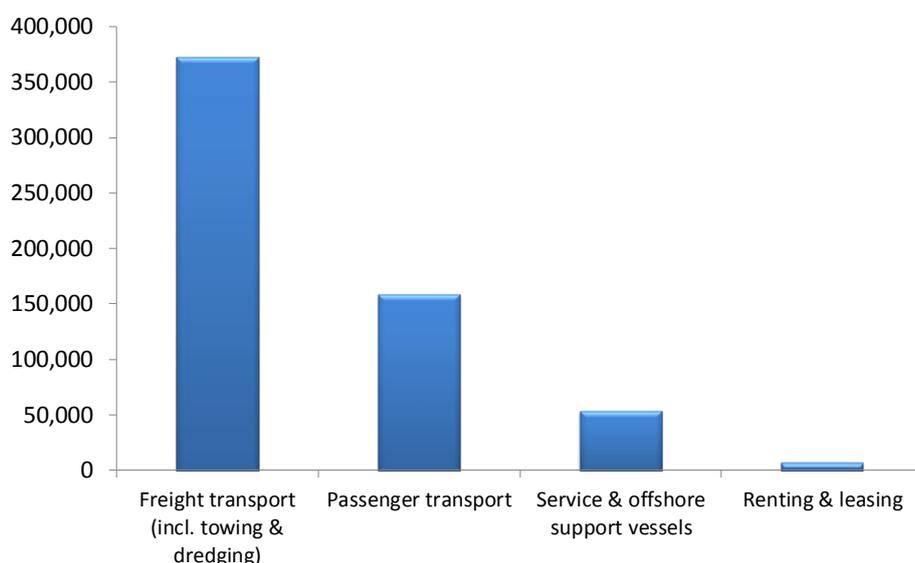
Table 3.1.2: Direct employment in the EU and Norway – shipping and comparator industries, 2012

Industry	Employment (000s)
Paper manufacturing	653
Pharmaceutical manufacturing	598
Shipping	590
Travel agents and tour operators	533
Forestry and logging	502
Air transport	425

Source: Eurostat, Oxford Economics

Within the total shipping employment figure, 63 per cent of workers are involved in freight transport (including towing and dredging); 27 per cent are involved in passenger transport; and 9 per cent work in service and offshore support activities. Just under 7,000 people are employed in renting and leasing, equivalent to one per cent of employment (Figure 3.1.2a).

Figure 3.1.2a: Direct employment in the EU shipping industry by sub-sector, 2012

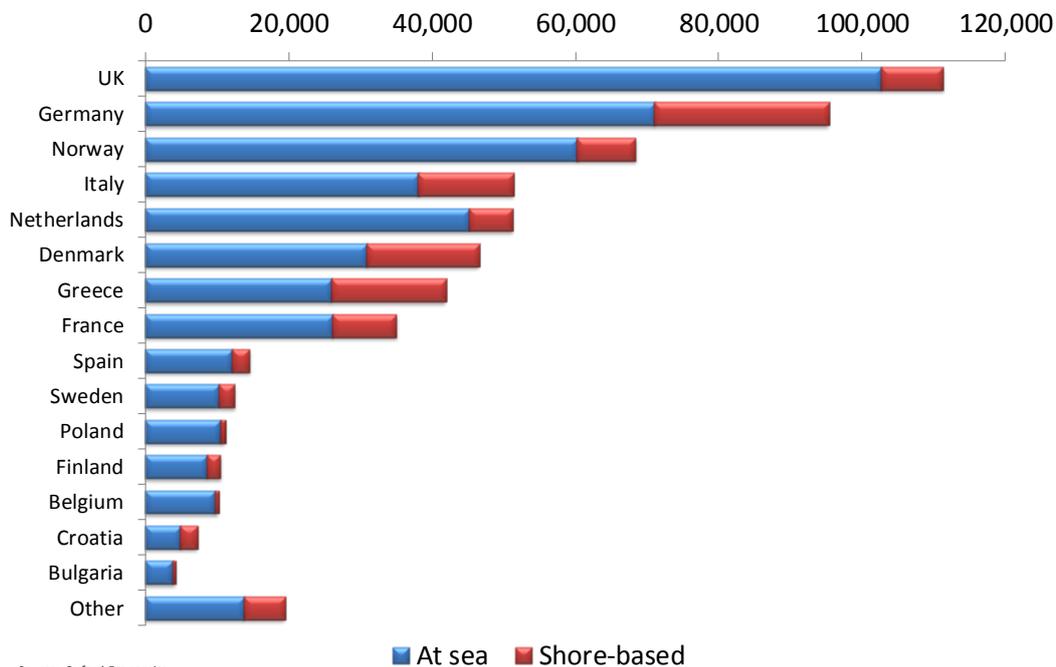


Source: Oxford Economics

A proportion of employment in the freight, passenger, and services and offshore support sub-sectors comprises seafarers who generally work at sea. This element of employment in these sub-sectors has been estimated using information provided by national associations and ECSA. For countries where no such data are available, the number of workers at sea has been estimated using the average split of land-based and sea-based employment in the countries for which data are available. It is assumed that all of the employment in the renting and leasing sub-sector is

shore-based. On this basis it is estimated that around four-fifths of European shipping industry employment consists of positions at sea (Figure 3.1.2b).

Figure 3.1.2b: Total employment in the EU shipping industry by place of work, 2012^{10,11}



Source: Oxford Economics

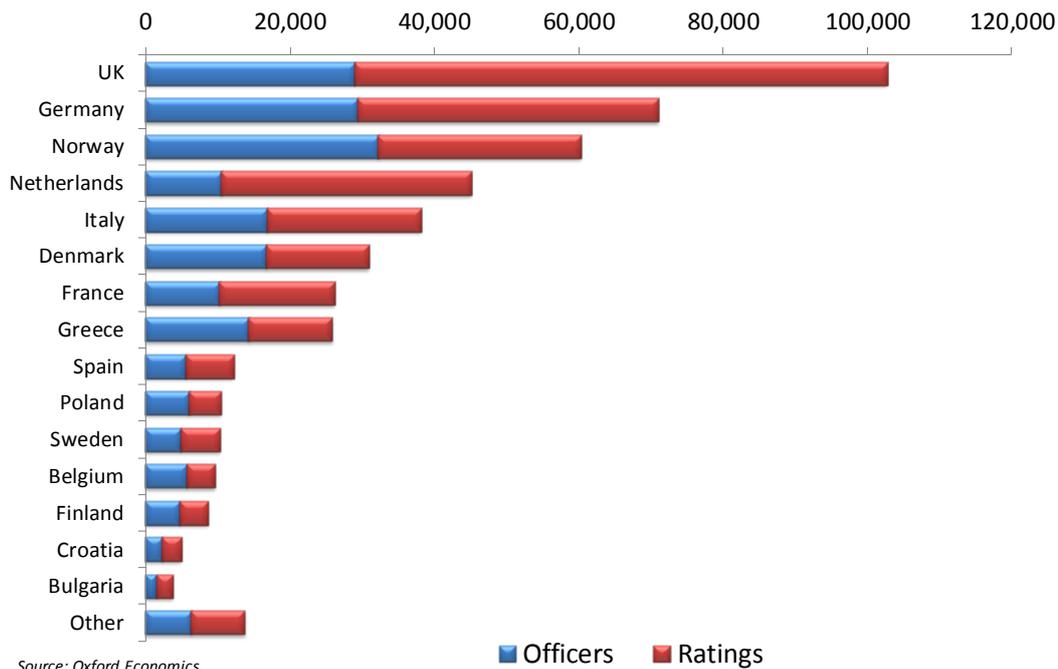
Officers account for an estimated 41 per cent of positions at sea, and ratings 59 per cent¹². The estimated split by country is shown in Figure 3.1.2c. Noticeable in the chart is the large number of UK ratings, which includes a significant number of hospitality employees in the country’s cruise fleet. The Netherlands also has a high proportion of ratings amongst its seafarers, once again reflecting large numbers of hospitality ratings on cruise ships.

¹⁰ This chart includes both EU and non-EU seafarers

¹¹ The sea-based employment figures for Greece only include those working on ships flying the Greek flag, and a small proportion of Greek controlled ships operating under foreign flags but affiliated with the Greek NAT Seamen’s Pension Fund. The use of these data is consistent with the previous national study by the Boston Consulting Group (see <http://www.bcg.gr/documents/file146826.pdf>). However, it is likely to result in an under-estimate of total employment in Greek shipping industry. This point is acknowledged in a 2013 report by the Foundation for Economic and Industrial Research titled ‘The contribution of ocean-going shipping to the Greek economy: performance and outlook’. That study suggested that “total employment in Greek-owned ships exceeds 60,000 jobs”.

¹² The split between officers and ratings was estimated using information from ECSA members or, where none was held, from ISF/BIMCO data presented in the European Commission Study on Seafarers Employment, available at: <http://ec.europa.eu/transport/modes/maritime/studies/doc/2011-05-20-seafarers-employment.pdf>

Figure 3.1.2c: Employment at sea split by officers and ratings, 2012¹³

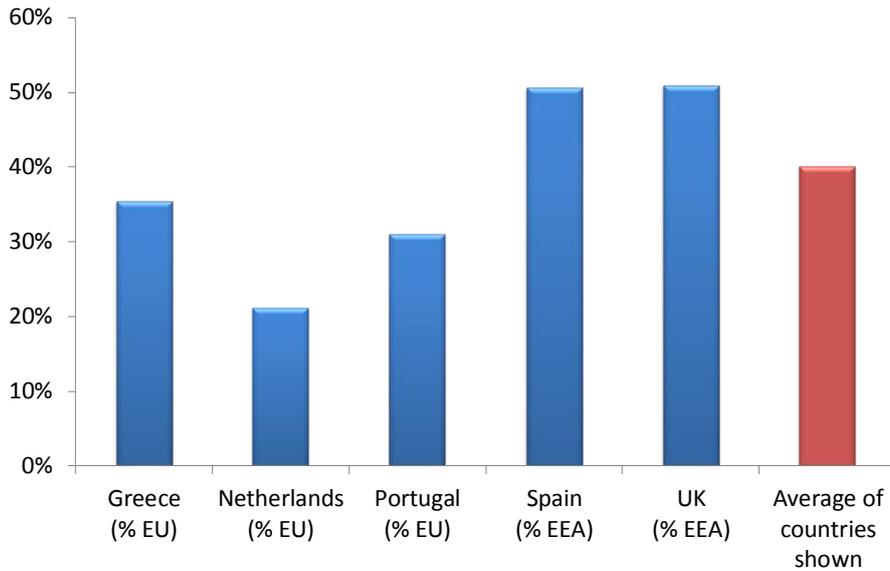


Source: Oxford Economics

The international nature of the shipping industry means that a wide range of nationalities are employed on board ships. For a small number of countries data are available on the share of seafarers that are from an EU or EEA country (Figure 3.1.2d). Taking a weighted average for these three countries suggests 40% of employees working at sea were EU or EEA nationals. It is not possible to robustly calculate the equivalent figure across the entire EU fleet, but if the same proportion applied across the countries for which data are not available, around 195,000 of the estimated 473,000 seafarers on EU ships would have been EU/EEA nationals in 2012.

¹³ This chart includes both EU and non-EU seafarers

Figure 3.1.2d: Proportion of seafarers that are EU or EEA nationals¹⁴



Source: Oxford Economics

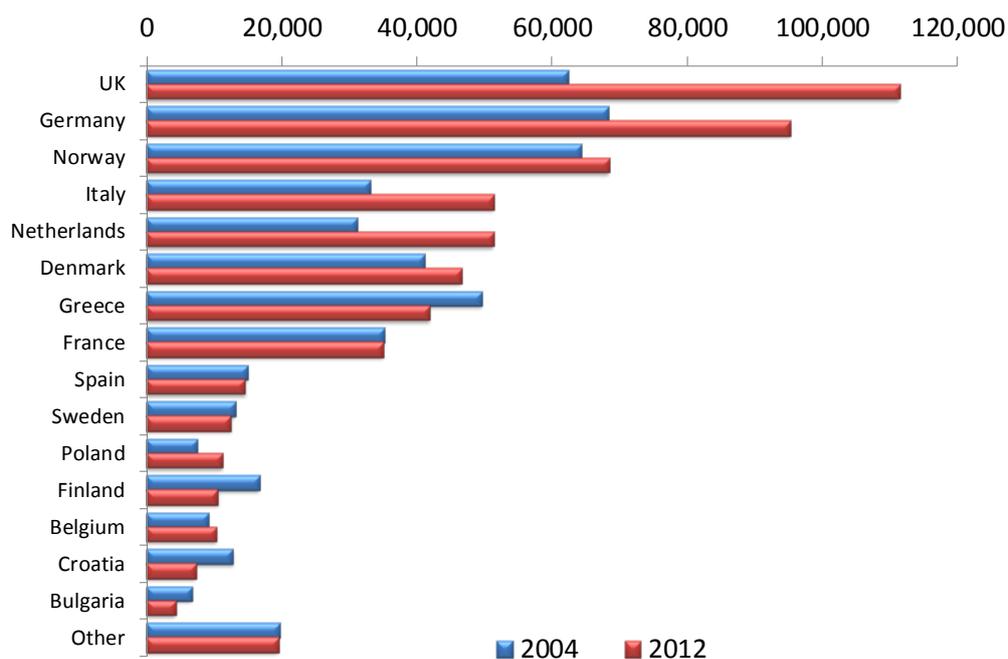
As discussed in Section 2, the EU fleet grew strongly between 2004 and 2012. This was accompanied by growth in employment, from 484,000 in 2004 to 590,000 in 2012. The increase in employment was proportionately less than the increase in both controlled and flagged tonnage, indicating that productivity also increased over the period so that fewer workers are now needed per tonne of the fleet. This is perhaps unsurprising, given that newer ships entering the fleet are likely to incorporate more modern technology and automated systems than the older vessels they replace.

There was a mixed picture in terms of employment growth amongst European countries (Figure 3.1.2e). The UK, the Netherlands, Italy and Germany, in particular, recorded strong employment growth rates between 2004 and 2012, reflecting large increases in the fleets controlled by these countries. In 2012, the UK accounted for 111,000¹⁵ workers, or 19 per cent of employment in the EU shipping industry. Germany accounted for 95,000 workers, or 16 per cent of EU shipping industry employment. Norway accounted for a further 12 per cent of employment.

¹⁴ The relatively low proportion of EU nationals for the Netherlands reflects that large numbers of non-EU ratings are employed on the cruise vessels of the Holland America Line

¹⁵ The UK employment estimates are based on results from the UK Chamber of Shipping (CoS) survey of members. Survey results are grossed up to reflect that CoS membership does not cover the entire UK shipping industry. In previous national studies a grossing factor of 1.7 was applied based on consultation with the UK Office for National Statistics (ONS). However, research in this area is ongoing and more recent evidence suggests this may result in an over-estimate. At the same time, applying no grossing factor would result in an under-estimate. Following consultation with the UK CoS it was decided that the most appropriate approach for this study was to apply a grossing factor of 1.35, at the mid-point of the plausible range. It is recommended that this issue should be revisited in any future national study.

Figure 3.1.2e: Direct employment in the EU shipping industry by country, 2004 and 2012^{16, 17}



Source: Oxford Economics

3.1.3 Direct contribution to GDP

The total direct gross value added contribution to GDP of the European shipping industry in 2012 was €56 billion. This means that the direct contribution of shipping to GDP is greater than that of postal and courier services, the manufacture of transport equipment (excluding motor vehicles), and the air transport industry.

Table 3.1.3: Direct GVA in the EU and Norway – shipping and comparator industries, 2012

Industry	GVA
Sports and recreation	€57.5 billion
Advertising and market research	€56.6 billion
Shipping	€55.8 billion
Postal and courier services	€53.5 billion
Manufacture of transport equipment (excluding motor vehicles)	€53.5 billion
Air transport	€30.1 billion

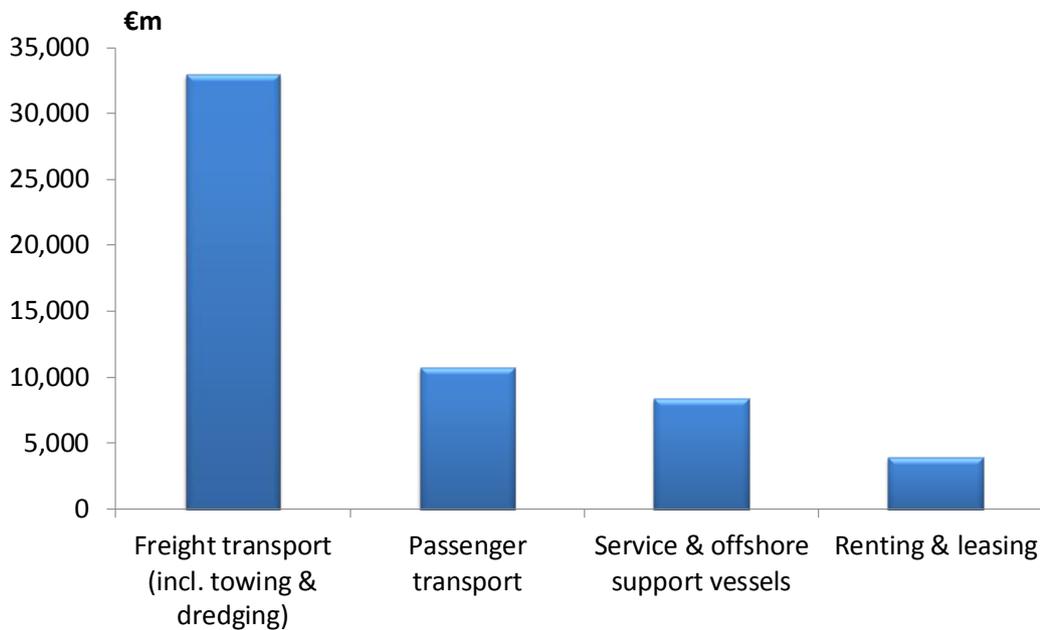
Source: Eurostat, Oxford Economics

¹⁶ Includes workers who are land-based and those at sea

¹⁷ The employment figures for Greece only include seafarers working on ships flying the Greek flag, and a small proportion of Greek controlled ships operating under foreign flags but affiliated with the Greek NAT Seamen's Pension Fund. The use of these data is consistent with previous national studies, such as that by the Boston Consulting Group (see <http://www.bcg.gr/documents/file146826.pdf>). However, it is likely to result in an under-estimate of total employment in Greek shipping industry. This point is acknowledged in a 2013 report by the Foundation for Economic & Industrial Research titled 'The contribution of ocean-going shipping to the Greek economy: performance and outlook'. That study suggested that "total employment in Greek-owned ships exceeds 60,000 jobs".

Within the total contribution to GDP, freight transport (including towing and dredging) accounted for €33 billion or 59 per cent (Figure 3.1.3a). Passenger transport contributed 19 per cent, and service and offshore support activities contributed 15 per cent. The remaining 7 per cent came from renting and leasing.

Figure 3.1.3a: Direct gross value added contribution to GDP of the EU shipping industry by sub-sector, 2012



Source: Oxford Economics

Germany accounted for €11 billion of the European shipping industry’s direct GVA contribution to GDP in 2012, equivalent to 20 per cent of the EU total (Figure 3.1.3b). Norway contributed a further 17 per cent, Greece 13 per cent, and the UK 11 per cent.

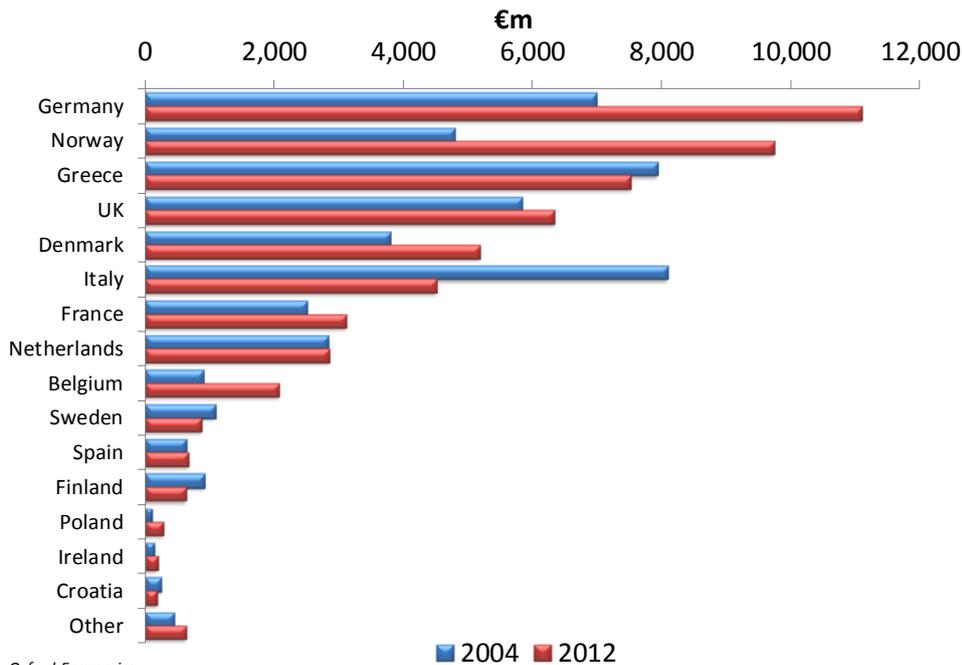
Germany’s share of EU shipping industry GVA is broadly in line with its share of the EU controlled fleet. Norway’s 17 per cent share of EU shipping industry GVA in 2012 compares to a 10 per cent share of gross tonnage in that year (or 9 per cent in deadweight tonnage terms). This reflects that the Norwegian shipping industry is orientated towards higher value added activities, particularly support of the offshore energy sector. The UK’s share of EU shipping industry GVA, at 11 per cent, is more than twice its share of tonnage, again reflecting an orientation towards higher-value sectors such as offshore support vessels and cruise shipping.

In 2004 the EU shipping industry made a direct gross value added contribution to GDP of €47 billion¹⁸. This means the industry’s direct contribution to GDP increased by around 18 per cent over this period. Whilst the EU fleet grew more strongly between 2004 and 2012, growth in the industry’s GDP contribution has been held back by the challenging trading conditions discussed in Section 2. In particular, global over-capacity and the associated drop in freight rates have hit profitability since the third quarter of 2008.

¹⁸ This value is expressed in current (non-inflation-adjusted) terms. As discussed in the Section 2, there have been large fluctuations in global shipping rates between 2004 and 2012. This has led to considerable year-to-year volatility in GDP deflators for the water transport sector which make it difficult to draw clear conclusions regarding the evolution of the shipping industry’s direct GDP contribution over the period when data are expressed in real (inflation-adjusted) terms.

Nonetheless, there is again a mixed picture amongst European countries (Figure 3.1.3b). The shipping industry’s direct gross value added contribution to GDP in Germany, Norway and Belgium increased strongly between 2004 and 2012. In contrast, the direct contribution to GDP declined by 5 per cent between 2004 and 2012 in Greece, where the industry has faced adverse conditions as a result of the severe economic crisis. Italy saw an even sharper fall in shipping industry GVA between 2004 and 2012, reflecting the orientation of its fleet towards large tankers and bulk carriers, which have been particularly hard hit by the challenging conditions in the industry since 2008¹⁹.

Fig 3.1.3b: Direct gross value added contribution to GDP of the EU shipping industry by country, 2004 and 2012



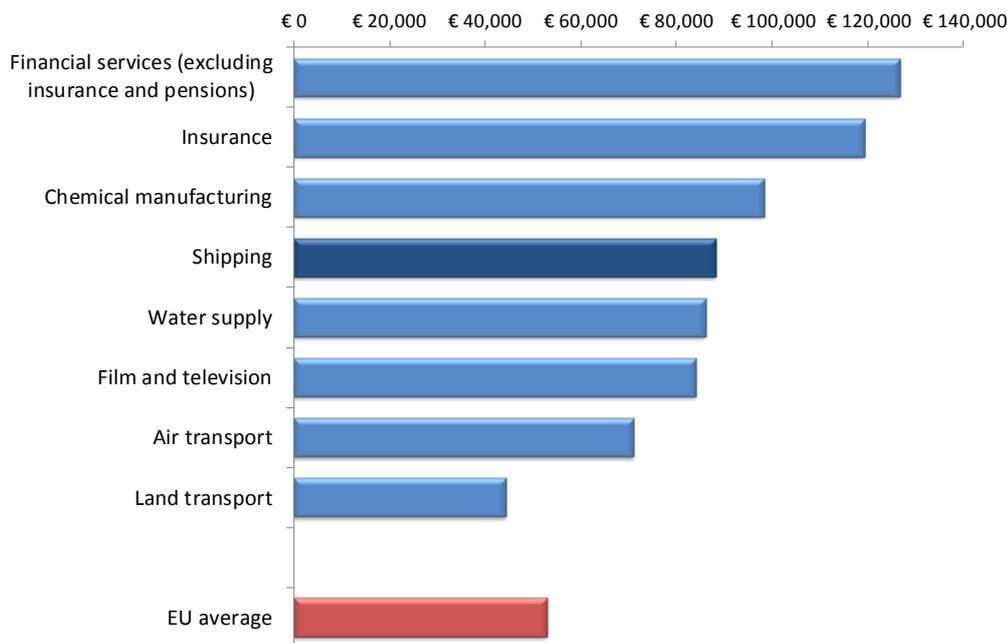
Source: Oxford Economics

Combining the results for the direct employment and gross value added contributions suggests productivity levels are relatively high within the European shipping industry: each worker generated an average of €88,000 of gross value added in 2012 (Figure 3.1.3c)²⁰. This compares to an average figure for the EU and Norway of €53,000 across all industries.

¹⁹ A methodological change in the Italian GVA statistics also contributed to the reduction in shipping industry GVA between 2004 and 2012. However, we understand from the Italian Shipowners’ Association that the bulk of the decline is attributable to the composition of the country’s fleet.

²⁰ Because of the likely under-estimation of employment in the Greek shipping industry, Greece has been excluded from the shipping industry productivity calculation.

Figure 3.1.3c: Productivity in EU shipping and comparator industries, euro per employee, 2012



Source: Oxford Economics

High productivity means the shipping industry contributes an above-average amount to Europe's GDP for each worker employed and therefore helps to raise living standards. Based on the estimate above, productivity in the shipping industry is higher than for the water supply industry (€86,000), the film and television industry (€84,000 per worker) and the air transport sector (€71,000 per worker). Productivity in the land transport sector is €44,000 per worker, less than half the figure for shipping.

3.1.4 Direct contribution to tax revenue

In addition to contributing to employment and GDP, the shipping industry generates tax revenues for member state governments. The analysis for this project has estimated the value of revenues generated in the form of employee and employer social security contributions, income tax levied on the earnings of the workforce, VAT on the spending of employees, and corporation and tonnage tax revenues from shipping firms²¹.

To estimate income tax and social security payments, OECD data on social security contributions and income tax rates have been applied to average industry wages in each country. It is assumed that all onshore workers are subject to tax and social security at the usual rates. In contrast, some proportion of workers at sea are likely to be exempt from income tax and social security payments because they are non-EU nationals, and/or because they spend a large proportion of their time at sea. In addition, some countries have schemes in place to reduce income tax and social security contributions for seafarers. National associations have provided information to indicate the proportion of seafarers who do not pay tax, or who are non-EU nationals and therefore unlikely to pay tax. For other countries, it is assumed that the proportion of non-taxpayers is in line with the average amongst those countries for which data are available.

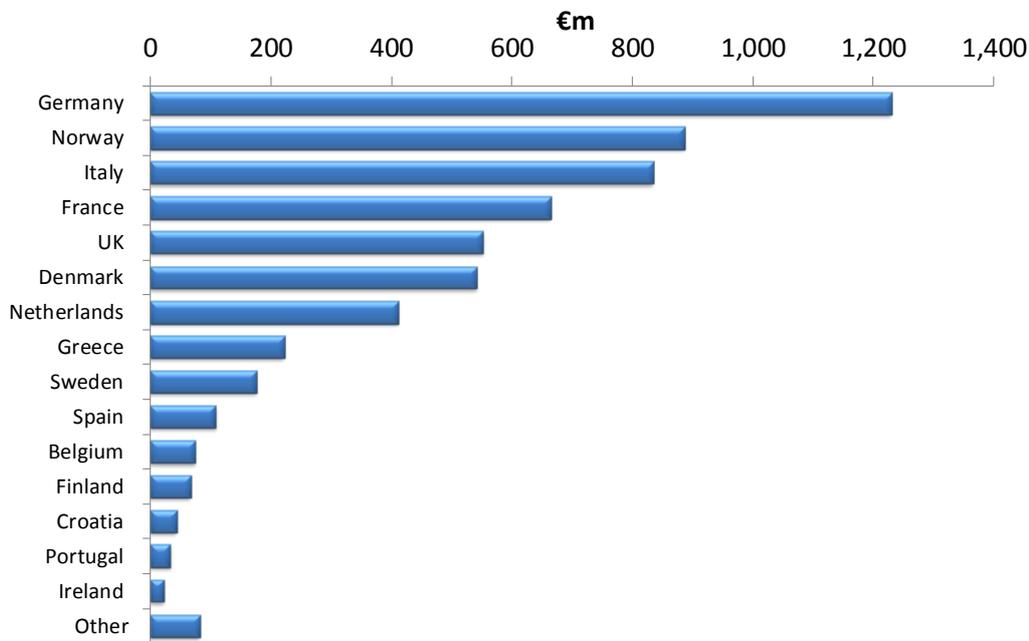
²¹ It should be noted that the shipping industry also benefits from government expenditure in European countries. The estimation of this expenditure is beyond the scope of this study.

To estimate VAT revenues, the consumption expenditure of shipping industry employees working on shore and EU nationals working at sea is estimated based on average wages, and Eurostat information on the savings rate in each country. Eurostat data on VAT receipts as a proportion of consumption expenditure in each country have then been used to estimate the VAT on the spending of shipping industry employees.

Tonnage tax revenues for countries with a tonnage tax regime have been estimated based on revenue information provided by a small sample of national associations. It is assumed that the renting and leasing sub-sector is subject to regular corporation tax, and the tax revenues from these activities have been estimated using information on average profitability and corporation tax rates in each country. For countries with no tonnage tax, it is assumed companies in the freight and passenger transport sub-sectors are also subject to corporation tax at the average rate for each country.

Using this approach, it is estimated that the EU shipping industry directly generated €6 billion in tax revenues in 2012. Almost four-fifths of this total was attributable to just six countries: Germany, Norway, Italy, France, the UK and Denmark.

Figure 3.1.4: The direct tax contribution of the EU shipping industry, 2012



Source: Oxford Economics

3.2 Indirect and induced impacts

3.2.1 Indirect and induced impact on GDP

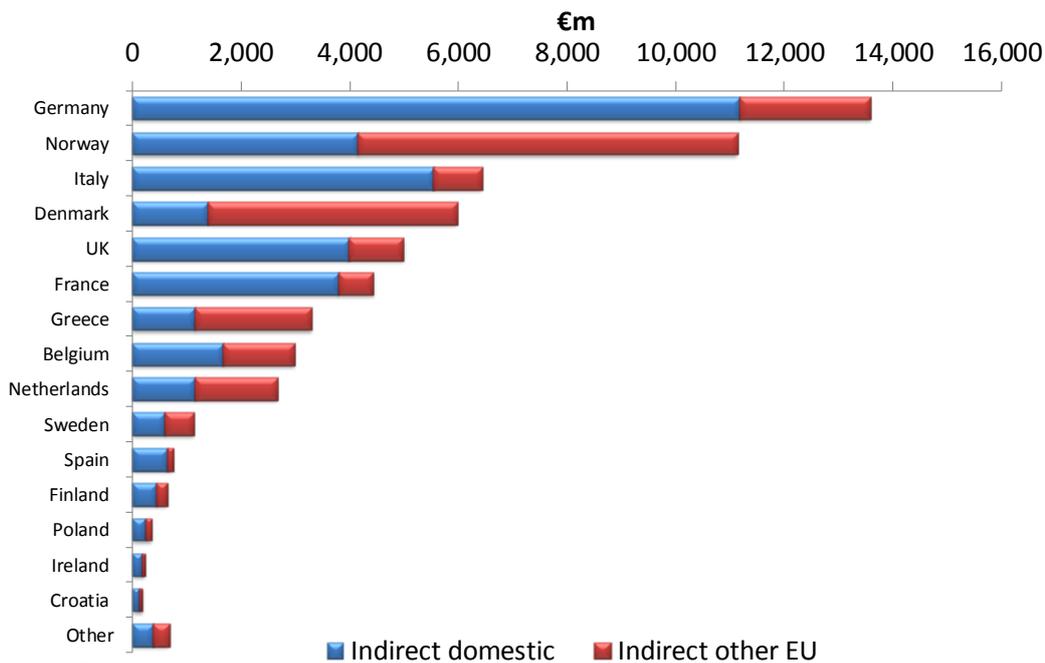
The indirect, or supply chain, impacts of the shipping industry are estimated using 'input-output' tables which map the inputs required by firms in a sector to produce a unit of output. To illustrate this concept consider the following simple example: to provide shipping services that sell for €5 million, a shipping firm may need to purchase fuel for €1 million, port services for €1 million and professional and technical services for €0.5 million. In this example the shipping firm has generated €2.5 million of gross value added (the value of its output less the value of inputs), and has generated €2.5 million in turnover for other firms in the supply chain.

The estimation of indirect GDP impacts for this project has been undertaken using Oxford Economics' Global Input-Output model. This not only allows the estimation of supply chain effects within countries, but also captures cross-country impacts amongst European countries. For example, this would detect the impact of, say, a Dutch shipping firm purchasing insurance from a firm in the City of London and computer software from a company in France²².

Overall, it is estimated that the indirect gross value added contribution to GDP of the European shipping industry in 2012 was €59 billion. As with the direct contribution to GDP, the largest figures were recorded for Germany and Norway. Figure 3.2.1a presents a breakdown of the indirect contribution to GDP according to whether it occurs domestically, or within another European country. For Germany, Italy, the UK, and France, at least four-fifths of the indirect impact is estimated to have occurred within the same country as the direct impact. However, a number of countries have very internationalised supply chains. For example, in Denmark around 77 per cent of the indirect impact occurred elsewhere in Europe, and for Norway the equivalent figure is 63 per cent.

²² There is further discussion of the input-output methodology at Annex A.

Figure 3.2.1a: Indirect gross value added contribution to GDP of the EU shipping industry by country, 2012

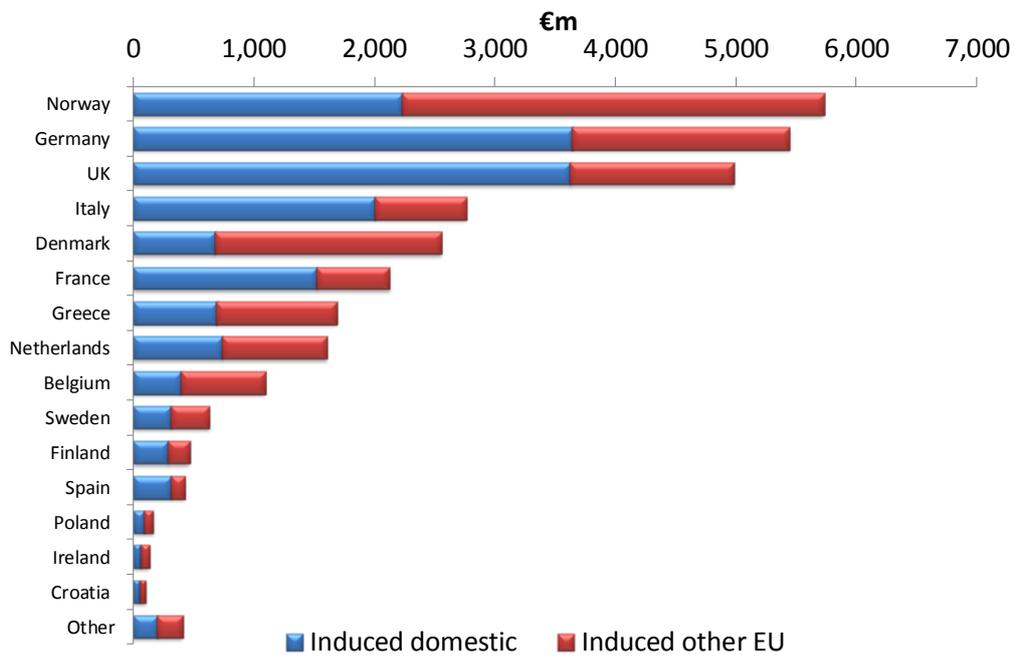


Source: Oxford Economics

Induced impacts result from the spending of workers employed in the shipping industry or its supply chain. The impacts are mainly felt in sectors serving households such as hotels, restaurants and shops. Within the Input-Output model, the induced GDP impact is estimated through ratios which estimate the value of wages generated by the activity associated with the direct and indirect contributions to GDP. From there it is possible to estimate consumer expenditure, and the induced contribution to GDP associated with this expenditure.

The total induced gross value added contribution to GDP of the European shipping industry is estimated to have been €30 billion in 2012. As with the indirect contribution to GDP, it is possible to split out whether induced expenditure impacts occur within the same country as the direct GDP impact, or elsewhere in Europe. This time, an estimated 74 per cent of the induced contribution to GDP from the Danish shipping industry is felt in other European countries. In Norway the equivalent figure is 61 per cent. These figures imply that a large amount of consumption expenditure in these two countries is on goods that are either imported from other European countries, or actually occurs in other EU countries, perhaps in the form of personal travel or cross-border shopping.

Figure 3.2.1b: Induced gross value added contribution to GDP of the European shipping industry by country, 2012

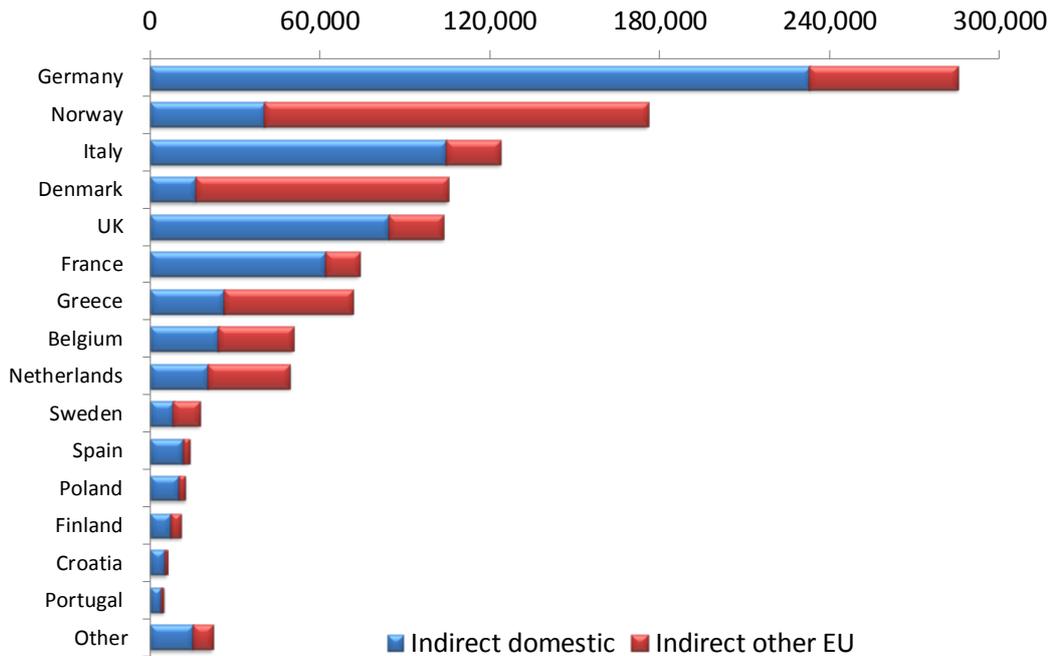


Source: Oxford Economics

3.2.2 Indirect and induced impact on employment

Once the indirect and induced impacts have been estimated in GVA terms, productivity data can be used to estimate the number of jobs created in the supply chain and in sectors where direct and indirect employees spend their wages. As with the GDP impacts, the employment impacts can be divided into those which occur within the same country as the direct impact, and those which occur elsewhere in Europe. In total, the indirect employment contribution of the European shipping industry is estimated to have been equivalent to around 1.1 million jobs across Europe in 2012.

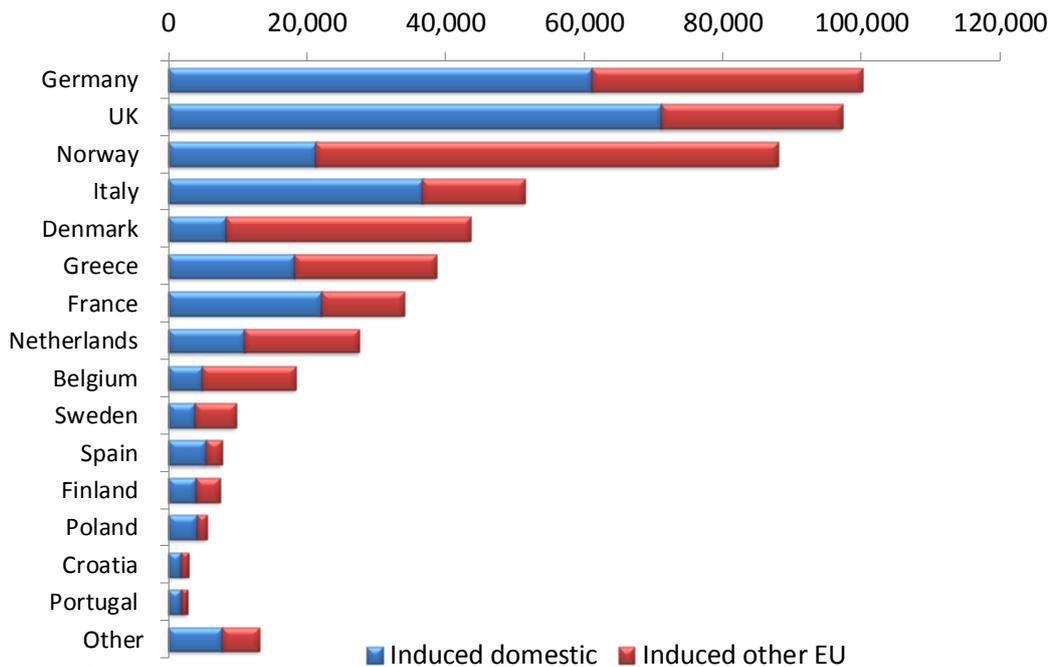
Figure 3.2.2a: Indirect employment impact of the EU shipping industry by country, 2012



Source: Oxford Economics

The induced impact of the European shipping industry in 2012 is estimated to have been 547,000 jobs. Just over half of these jobs were created in the same country that the direct impact occurs, and just under half were created in other European countries.

Figure 3.2.2b: Induced employment impact of the EU shipping industry by country, 2012²³



Source: Oxford Economics

3.2.3 Indirect and induced impact contribution to tax revenue

To estimate the value of employment taxes associated with the indirect and induced impacts of the EU shipping industry, average tax and social security rates have been applied to the estimated amount of indirect and induced employment in each country. This includes cross-border effects so that, for example, the calculations are based on the number of people employed in France not only as a result of the indirect and induced effects of the French shipping industry, but also those employed in France as a result of the indirect and induced effects of the industry in other EU countries.

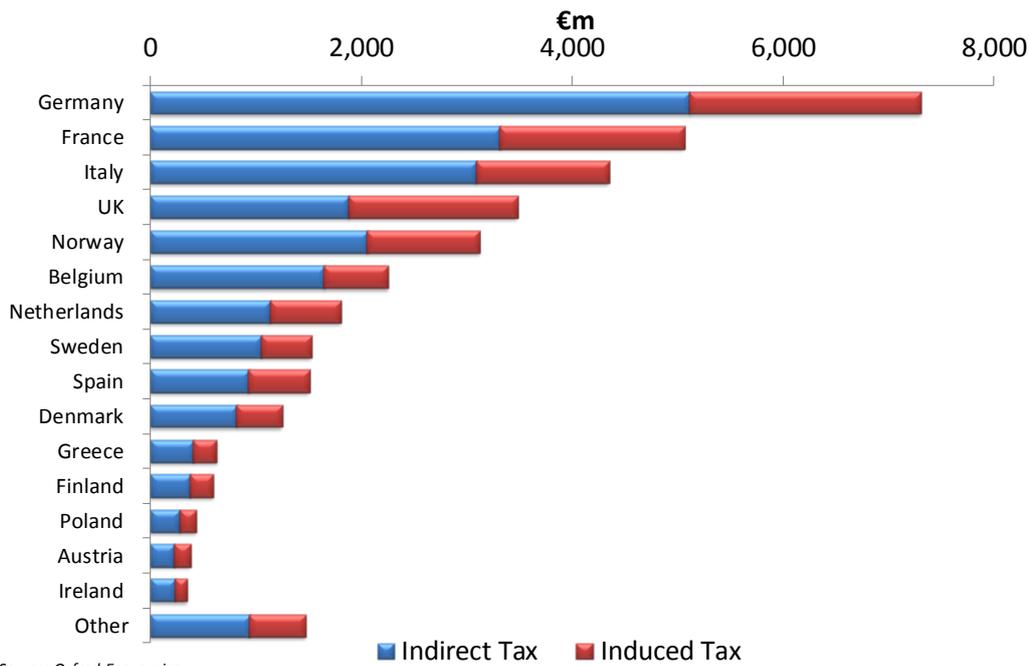
Consistent with the direct tax impact, VAT on the spending of workers has been estimated by applying average VAT rates from Eurostat to the estimated amount of spending, taking into account wages and savings rates.

Corporation tax revenues have been estimated by applying average profit margins and corporation tax rates to the indirect and induced GVA effects which occur within each country.

Using this methodology, it is estimated that the EU shipping industry supported €35 billion in tax revenues as a result of activity in its supply chain, and the induced spending of its employees and those in the supply chain (Figure 3.2.3).

²³ The Union of Greek Shipowners has noted that the Oxford Economics approach results in more conservative estimates of indirect and induced employment in Greece than the 2013 report by the Foundation for Economic and Industrial Research titled 'The contribution of ocean-going shipping to the Greek economy: performance and outlook'. The latter estimates that the indirect and induced employment impact of the Greek shipping industry was around 160,000 in 2009. That figure relates only to impacts occurring within Greece and does not incorporate any cross-border effects.

Figure 3.2.3: Indirect and induced tax contribution of the EU shipping industry, 2012²⁴



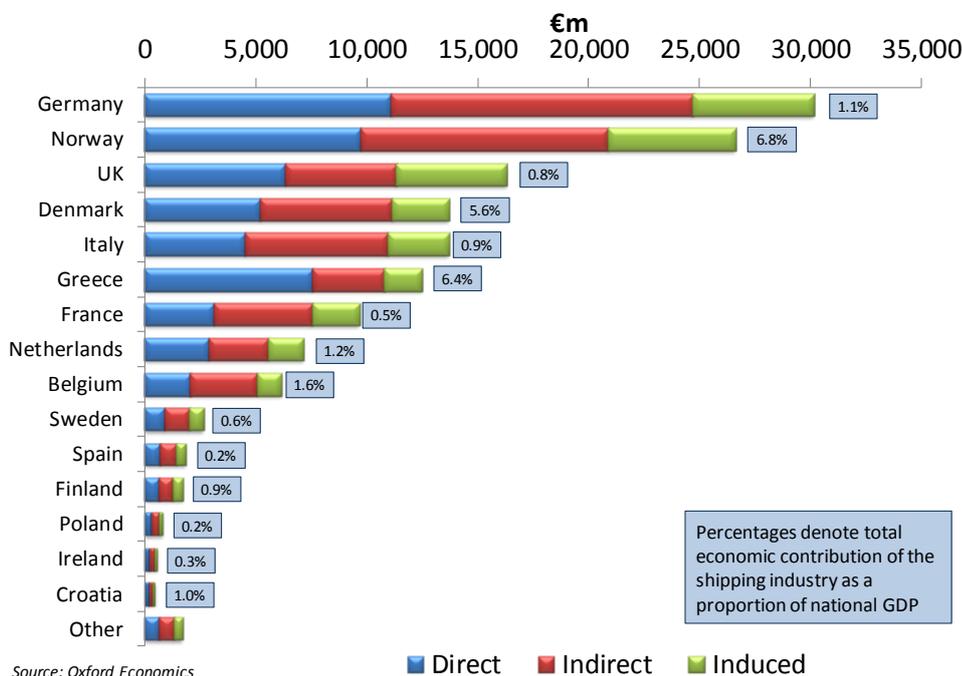
²⁴ For certain countries, notably Denmark, Greece and Norway, a large proportion of the indirect and induced GVA impact is estimated to occur in another EU country. This has contributed to the ranking of these countries being lower for the indirect and induced tax contribution, than for the direct tax contribution.

3.3 Total economic impact of the EU shipping industry

Adding together the direct, indirect and induced impacts described above gives the total economic contribution of the European shipping industry. The total gross value added contribution to GDP from the EU shipping industry is estimated to have been €145 billion in 2012. €57 billion, or 39 per cent of this total came from just two countries: Germany and Norway (Figure 3.3a). Altogether, 99 per cent of the total impact was generated by the 15 largest countries.

The blue boxes in Figure 3.3a indicate the total contribution of the shipping industry relative to the total GDP of each country. Overall, the total economic contribution of shipping is equivalent to 1.1 per cent of EU GDP, but in some countries it can be considerably greater: between 5 and 7 per cent in Norway, Greece and Denmark.

Figure 3.3a: Total gross value added contribution to GDP of the EU shipping industry by country, 2012

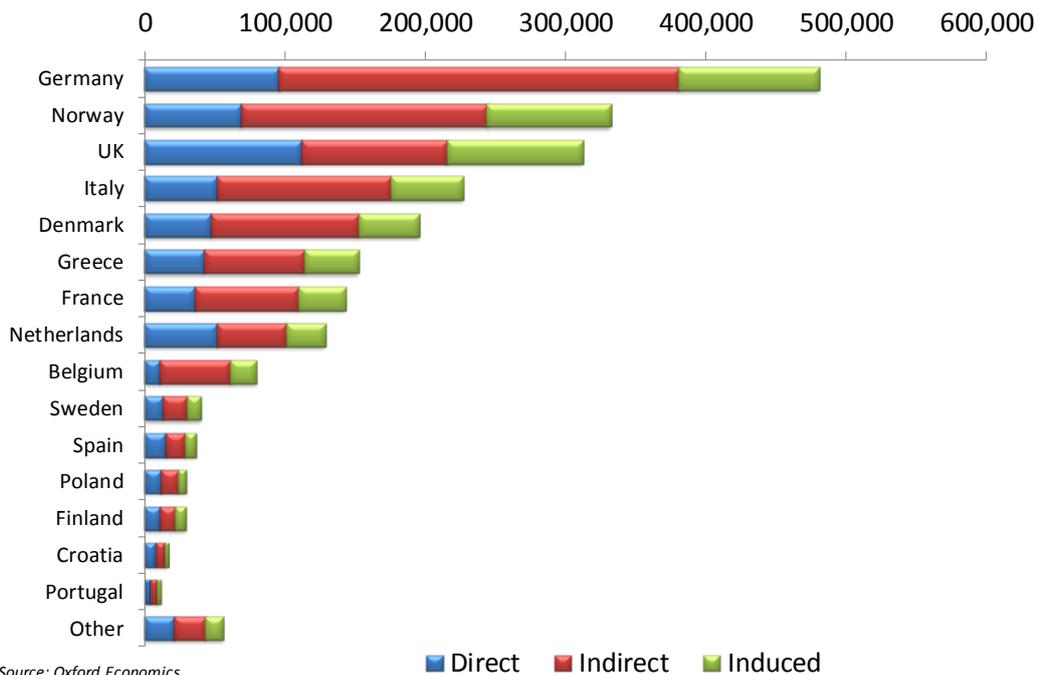


For every €1 million the European shipping industry contributes to GDP itself, it creates another €1.6 million elsewhere in the European economy. This means that that industry's GDP multiplier is 2.6²⁵.

Following a similar approach, the European shipping industry is estimated to have supported a total of 2.3 million jobs in 2012, either directly through its own activities, or through its supply-chain or the induced expenditure of its employees and those in its supply chain. For every direct job the industry creates, another 2.8 are created elsewhere in the European economy. This means the shipping industry's employment multiplier is 3.8. Half of the total employment contribution of the shipping industry occurs in Germany, Norway and the UK (Figure 3.3b).

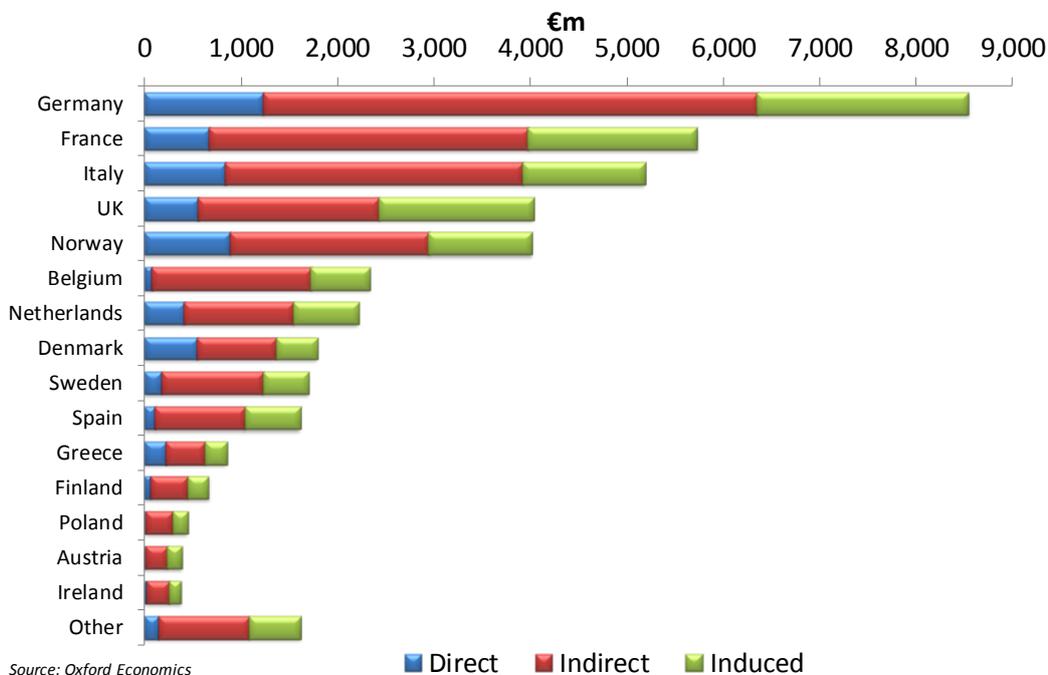
²⁵ The multiplier is calculated as: (Direct GDP + Indirect GDP + Induced GDP) / Direct GDP

Figure 3.3b: Total employment impact of the EU shipping industry, 2012



The EU shipping industry is estimated to support a total of €41 billion in tax revenues, either directly, through its supply chain, or through the induced spending of its employees and those in the supply chain (Figure 3.3c).

Figure 3.3c: Total tax contribution of the EU shipping industry in 2012



The total economic contribution of the European shipping industry is summarised in Figure 3.3d. Equivalent figures for 2004 are presented in Figure 3.3e.

Figure 3.3d: The total economic impact of the EU shipping industry, 2012

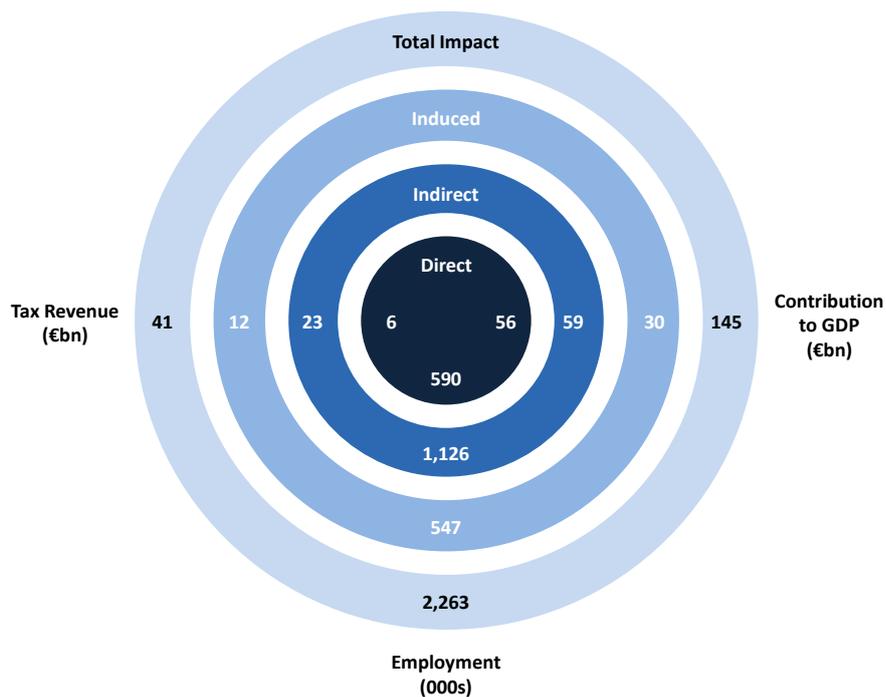
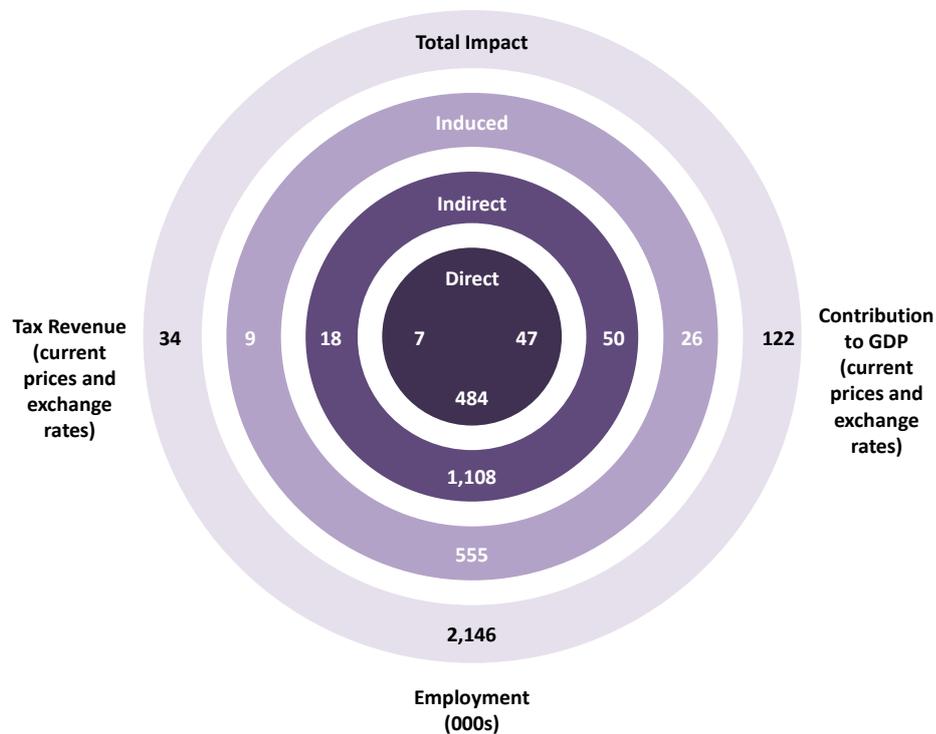


Figure 3.3e: The total economic impact of the EU Shipping industry, 2004



4 The economic impact of measures adopted under the Community guidelines on state aid to maritime transport

Key points

- The shipping industry has a number of unique features which provide a rationale for a more favourable taxation policy than is available to other industries. The industry is, by its very nature, highly mobile and activity can easily be moved to countries which adopt more favourable taxation and regulatory regimes. A healthy and competitive shipping industry forms the core of the wider European maritime cluster and supports development of the EU's international trading linkages. It is also strategically important, for example in ensuring a secure energy supply and in providing capacity to support military operations in times of crisis or in peacekeeping missions.
- Recognising such arguments, and in response to intense international competition from third country shipping registers and global shipping centres, EU governments have introduced a range of state aid measures to support shipping, most notably in the form of tonnage tax and reduced income tax and social security contributions for seafarers. This approach has been guided by policy at the European level, through the Commission's guidelines on state aid.
- Based on an illustrative counter-factual scenario using trends in fleet data for nine EU countries, it is tentatively estimated that the total economic contribution of the European shipping industry could have been around 50 per cent lower in 2012, in terms of GVA and employment, if the countries in the analysis had not introduced tonnage tax regimes and other state aid measures.

4.1 The state aid guidelines and the economic rationale for their implementation

The shipping industry has a number of unique and specific features which provide a rationale for a more favourable taxation policy than is available to other European industries.

Shipping is, by its very nature, a highly mobile activity and it is very easy for shipowners to register vessels under the flag of the country with the lowest corporate tax burden. This has resulted in intense international competition in taxation and regulatory regimes to attract shipping firms to 'open registries', which do not place nationality requirements on ship owners or shipping company employees.

For example, Singapore is actively attempting to become the world's maritime hub and has adopted a favourable taxation regime that provides tax exemptions on shipping income from the operation of Singapore-flagged ships, and on foreign flagged ships plying international waters where the control and management of the fleet is based in Singapore. Countries including China, Dubai and Hong Kong are also making significant efforts to become international centres of shipping.

A large amount of the activity undertaken by EU shipping firms involves cross-trades between two non-EU ports. It may make little difference to operations to move land-based activity to a country with a more favourable taxation and regulatory system. As well as leading to the loss of jobs within the EU shipping sector, this can have negative impacts on the wider maritime cluster, including high value onshore jobs in associated industries such as finance and insurance.

International competition to attract shipping firms could also have wider implications for international trade. A number of European countries have a long and successful history of maritime activity and possess a competitive advantage in some aspects of the sector. Such countries may be able to provide shipping services more efficiently or cheaply than other countries, encouraging international trade growth. However, this competitive advantage could become distorted by international tax competition, and the benefits to European trade may be lost.

At the same time, the shipping industry is strategically important for the EU. As well as enabling international trade, the shipping industry helps secure the EU energy supply through imports of oil and other fuels. The EU merchant fleet may also be called upon to support military operations in times of crisis, or in peacekeeping missions.

More broadly, the global shipping industry, and wider society, benefit, from an EU fleet that upholds the highest safety, security and social standards, as set out by international bodies such as the International Maritime Organisation and the International Labour Organisation.

There are also wider benefits to society from having a highly trained workforce of seafarers who may go on to work in other parts of the maritime cluster or the wider economy after they finish working on board ships²⁶ (this is discussed in more detail in Section 5).

Recognising the need to support the international competitiveness of the EU shipping industry in the face of intense international competition, national governments have introduced a range of measures to support the shipping industry, particularly in the form of tonnage tax and reductions in income tax and social security contributions for seafarers. The first European country to introduce a tonnage tax was Greece, during the 1950s. The current Greek regime was introduced in 1975, and it has remained largely unchanged since then. A number of European countries have followed this example over the last two decades (Table 4.1).

The steps national governments have taken have been guided by policy at the European level: the European Commission introduced its first set of state aid guidelines for the shipping sector in 1989 in an attempt to encourage consistency in the policy stances of member states. However, this proved relatively ineffective and the flagged fleets of many EU countries continued to decline. New guidelines were introduced in 1997, revised in 2004 and confirmed in 2013 (following a public consultation in 2012), again with the aim of encouraging a more harmonised approach to supporting the EU shipping industry amongst member states. More specifically, the 2004 guidelines aim to increase transparency and support the European Union's maritime interests by clarifying the kinds of state aid schemes that European governments may introduce. In general any such benefits may only be granted to ships flying the flag of a member state, although aid may also be granted to non-EU flagged ships that comply with international standards and EU law, which are operated from within the EU, and which are owned by a company established within the EU.

²⁶ Economists refer to this as a "positive externality" – the benefit to ship-owners of training seafarers is lower than the total benefit to society. Left to their own devices, shipowners would tend to train fewer seafarers than may be optimal from society's perspective

Table 4.1: Year of introduction of national tonnage tax regimes

1957	Greece (adapted in 1975)
...	
1963	Cyprus
...	
1973	Malta
...	
1996	Netherlands, Norway
...	
1999	Germany
2000	UK
...	
2002	Belgium (adapted in 2004); Denmark (slightly amended in 2004, 2005 and 2007); Latvia; Spain
2003	France (adapted in 2004); Ireland
...	
2005	Bulgaria; Italy
2006	Poland
2007	Lithuania
2008	Slovenia
...	
2012	Finland

The main types of aid that can be granted under the guidelines are:

- tonnage tax, whereby a shipowner pays tax linked to the amount of tonnage they operate, regardless of the profit or loss generated. Tax relief is applicable to shipowners, but can also be applied to ship managers under certain circumstances;
- reduced income tax and social security contribution rates for seafarers employed on board ships;
- aid with the training of seafarers or cadets on board ships; and
- support with the set-up costs for short-sea shipping between EU member state ports.

The following sections consider how the EU shipping industry and its economic contribution might have evolved in the absence of such state aid measures.

4.2 Developing an alternative scenario: how might the EU shipping industry have evolved in the absence of national state aid regimes?

This section of the report compares the estimates of the economic impact of the EU shipping industry presented in Section 3 with an illustrative counterfactual scenario in which shipping firms are assumed to have been subjected to more traditional tax regimes.

Counter-factual scenarios have been constructed across a number of countries by assuming the trend in a country's fleet observed before the introduction of state aid measures would have continued had the measures not been introduced. The analysis uses information on either the flagged or controlled fleet for each of the countries, depending on data availability and the definition of the fleet that is most closely related to GVA trends.

The output from this analysis is an estimate of the percentage by which the national fleet could have been smaller in the absence of state aid measures. It is assumed that the economic contribution of the shipping industry in that country would have been reduced in proportion to this.

This section of the analysis should be regarded as purely illustrative. It is extremely difficult to know what would have actually happened in the absence of state aid measures, not least because the evolution of national shipping fleets is influenced by a wide range of other factors within countries, in the wider shipping industry, and in the global economy. This task is further complicated by the global recession and its impact on the shipping industry, which have introduced a strong cyclical component into recent data trends.

To summarise, the aim of this part of the analysis is to show what *could* have happened under the assumption that the pre-state aid trend in a country's fleet continued to 2012, and assuming a proportionate effect on the economic impact of the shipping industry in that country. It should not be regarded as a formal assessment of what *would* have happened.

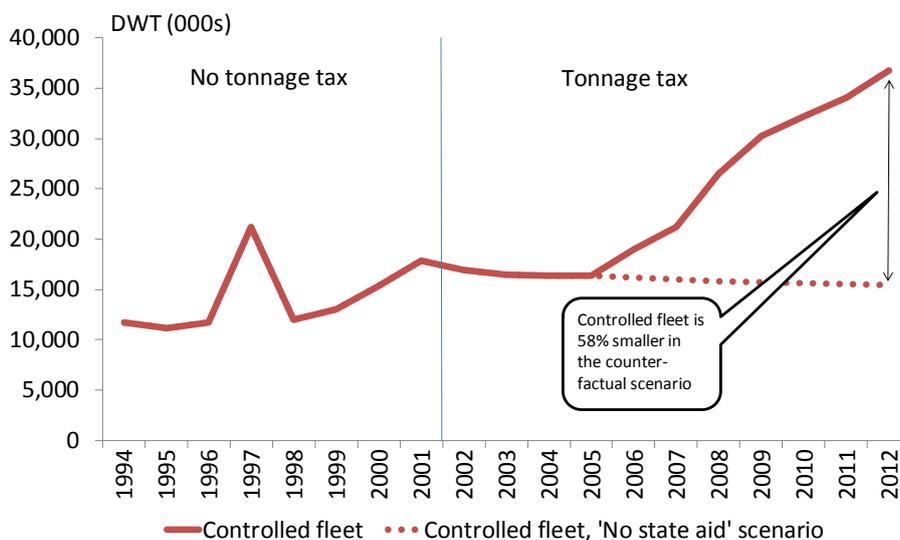
4.3 Assessing the economic impact of state aid regimes in individual countries

This section of the report presents case studies for four countries to examine the impact of the introduction of state aid measures on national fleets. A fifth case study is then presented for Sweden, a country with employment tax incentives, but no tonnage tax regime.

4.3.1 Denmark

Denmark introduced a tonnage tax regime in 2002, and this was slightly amended in 2004, 2005 and 2007. The Danish controlled fleet initially continued to decline in 2002. There was an increase in 2005, mainly as a result of A.P. Møller-Maersk buying P.O. Nedlloyd, but the Danish controlled fleet has continued to record strong growth since 2006. In addition to the tonnage tax, the development of Denmark's fleet has been supported by the government's 2006 strategy to develop the country as a leading shipping nation. This has resulted in a large number of measures to support the industry, including research, the removal of special technical rules, other tax adjustments, and education initiatives.

Figure 4.3.1: Denmark controlled fleet, 1994 to 2012



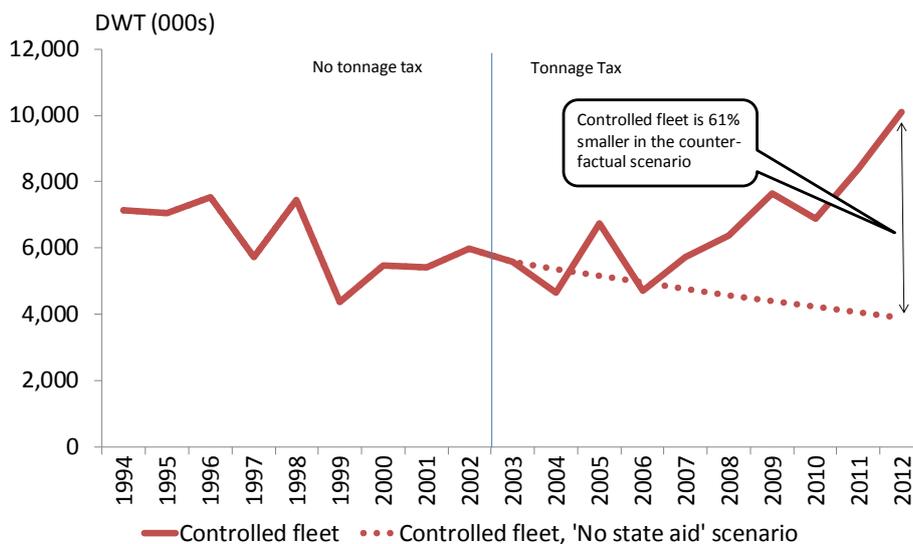
Source: ISL Bremen; counter-factual scenario estimated by Oxford Economics

For the counter-factual scenario, it is assumed that if the tonnage tax regime (including the subsequent amendments) and the government’s other support measures had not been implemented, the trend in the Danish controlled fleet observed between 2001 and 2005 would have continued. Had this been the case, in 2012 the fleet would have been 58 per cent smaller in the counter-factual scenario than in reality. If the economic impact was proportionate to the impact on the Danish controlled fleet, the industry’s direct contribution to Danish GVA would have been around €3 billion lower in 2012.

4.3.2 France

France introduced tonnage tax in 2003, and adapted the scheme in 2004. Between 2001 and 2005 France also applied a separate system to reimburse social security contributions and charges to shipowners, subject to certain conditions relating to training, employment and fleet evolution. From 2006, all ships that face international competition have been exempted from social security contributions. While there appears to have been no immediate response in the size of the controlled fleet to the introduction of tonnage tax in 2003, or the 2004 changes, there is a clear upward trend in the controlled fleet from 2006 onwards, suggesting the simplified social security exemption may have played an important role in encouraging renewed growth in the French controlled fleet.

Figure 4.3.2: France controlled fleet, 1994 to 2012



Source: ISL Bremen; counter-factual scenario estimated by Oxford Economics

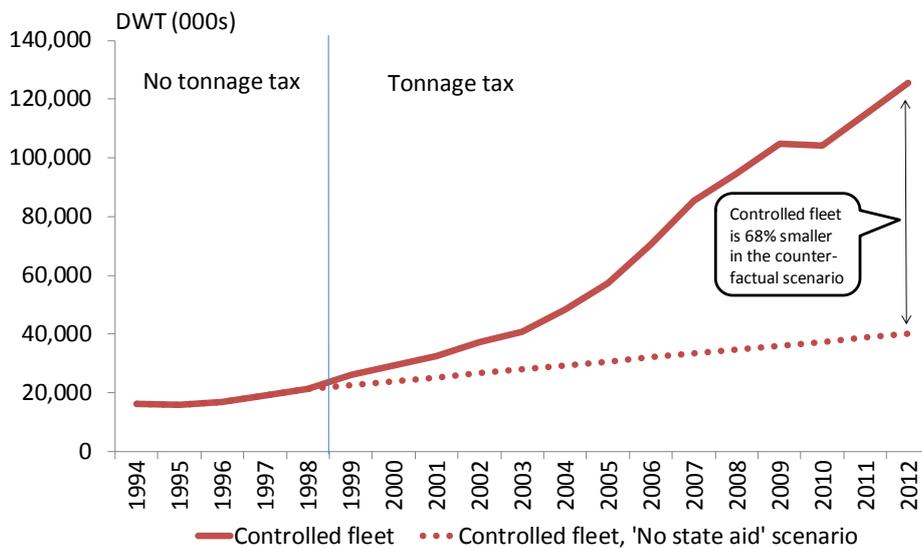
For the counter-factual scenario, it is assumed that the French controlled fleet would have continued to decline at the rate observed between 1994 and 2002 if state aid measures had not been introduced (Figure 4.3.2). Had the pre-2003 trend continued, it is estimated that the French controlled fleet would have been 61 per cent smaller by 2012. If the economic contribution of the French shipping industry was also 61 per cent smaller in 2012, there would have been 21,000 fewer jobs in French shipping, and the industry’s direct contribution to French GDP would have been £1.9 billion lower than in reality.

4.3.3 Germany

Germany introduced a tonnage tax regime in 1999. In the same year, it also introduced a separate wage tax retention scheme, which allows the employer of crew members serving on board German flagged merchant ships to retain 40 per cent of the wage taxes they would otherwise have paid to the tax authorities. The introduction of these measures appears to have supported a noticeably

stronger growth rate amongst the German controlled fleet, particularly since 2003. By 2012, the German controlled fleet was almost four times as large as in 1999.

Figure 4.3.3: Germany controlled fleet, 1994 to 2012



Source: ISL Bremen; counter-factual scenario estimated by Oxford Economics

To estimate a counter-factual scenario, it is assumed that if the state aid measures had not been implemented, the German controlled fleet would have continued to grow at the rate observed between 1994 and 1998. As a result, by 2012 the fleet would have been 68 per cent smaller than the size actually observed in 2012.

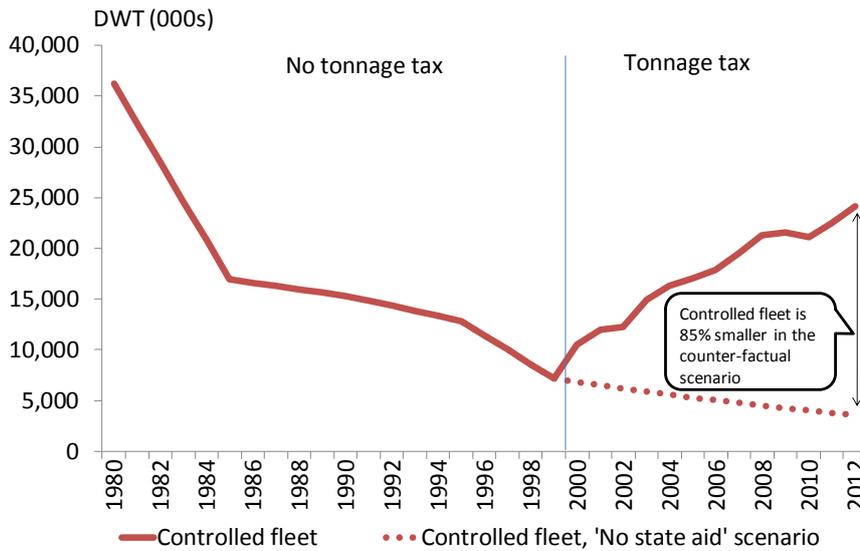
The direct GDP contribution of the German shipping industry in 2012 was €11 billion. In the counter-factual scenario, which assumes a much more modest progression of the German controlled fleet and a proportionate reduction in economic impact, the direct contribution of the German shipping industry to German GDP in 2012 would have been just €4 billion. There would also have been around 65,000 fewer jobs in the German shipping industry 2012.

4.3.4 The UK

Tonnage tax was introduced in the UK in July 2000, with the objective of creating a positive fiscal environment for international shipping based in the UK, in line with other major maritime countries. To join the system, a company must have “*strategic and commercial management*” of its fleet in the UK, and the ship must be over 100 tonnes and be seagoing. The UK regime brings a requirement that a shipping company must recruit and train one new cadet each year for every 15 officer posts in the tonnage tax fleet, and the cadet must be ordinarily resident in the UK (there is further discussion of training in Section 5 of this report).

The UK controlled fleet declined steeply during the 1980s and 1990s, and by 1999 it was just one fifth of its size in 1980 (Figure 4.3.4). However, there was a clear reversal of this trend following the introduction of tonnage tax: the fleet increased strongly and steadily after 1999, and by 2012 it had more than tripled in size. This meant the UK controlled fleet was at its largest since the early 1980s.

Figure 4.3.4: UK controlled fleet, 1994 to 2012



Source: UK Chamber of Shipping, Oxford Economics

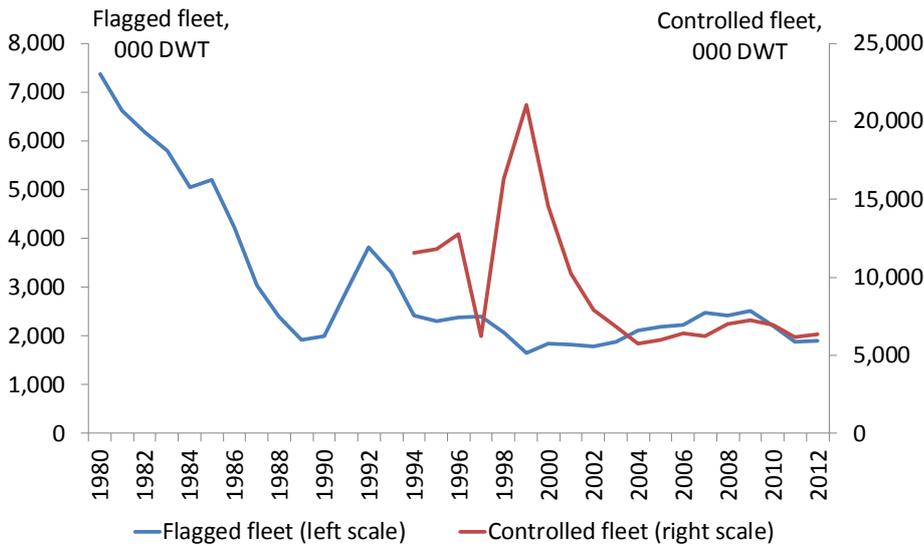
For the counter-factual scenario it is assumed that the pre-1999 trend in the controlled fleet would have continued in the absence of tonnage tax. As a result, in 2012 the fleet is 85 per cent smaller than was observed in reality. Assuming a proportionate impact on the industry's economic contribution, this implies that the direct contribution to UK GDP from the shipping industry would have been around €5 billion lower in 2012 in the counter-factual scenario. Employment in the UK shipping industry in 2012 would have been 95,000 below the level actually observed.

4.3.5 Sweden

The final case study example looks at the experience in Sweden, which in 2001 introduced a system of social security and income tax incentives for Swedish flagged ships. However, in contrast to the countries discussed above, Sweden has not introduced a tonnage tax regime.

The Swedish flagged fleet declined sharply during the 1980s (Figure 4.3.5). After a temporary recovery in the early 1990s, the Swedish flagged fleet has been relatively flat at around two million deadweight tonnes since 1998. Figures for the Swedish controlled fleet exhibit considerable volatility in the late 1990s, but between 2004 and 2012 the controlled fleet was relatively flat at between six and seven million deadweight tonnes.

Figure 4.3.5: Sweden controlled fleet, 1994 to 2012



Source: UNCTAD, ISL Bremen

The most striking difference between the experience in Sweden and that in the countries discussed above, is that those countries which have introduced a tonnage tax have experienced strong fleet growth over the last decade, whereas the Swedish fleet has remained relatively flat. Given that the world fleet has also grown strongly over the last ten years, this means that the Swedish flagged share of the world fleet has fallen from 1.1 per cent in 1980, to just 0.1 per cent in 2012. The Swedish Shipowners' association reports that at least three shipowners have moved their head offices to other EU countries between January 2010 and January 2014.

4.4 Illustrative assessment of the economic impact of state aid regimes across the EU

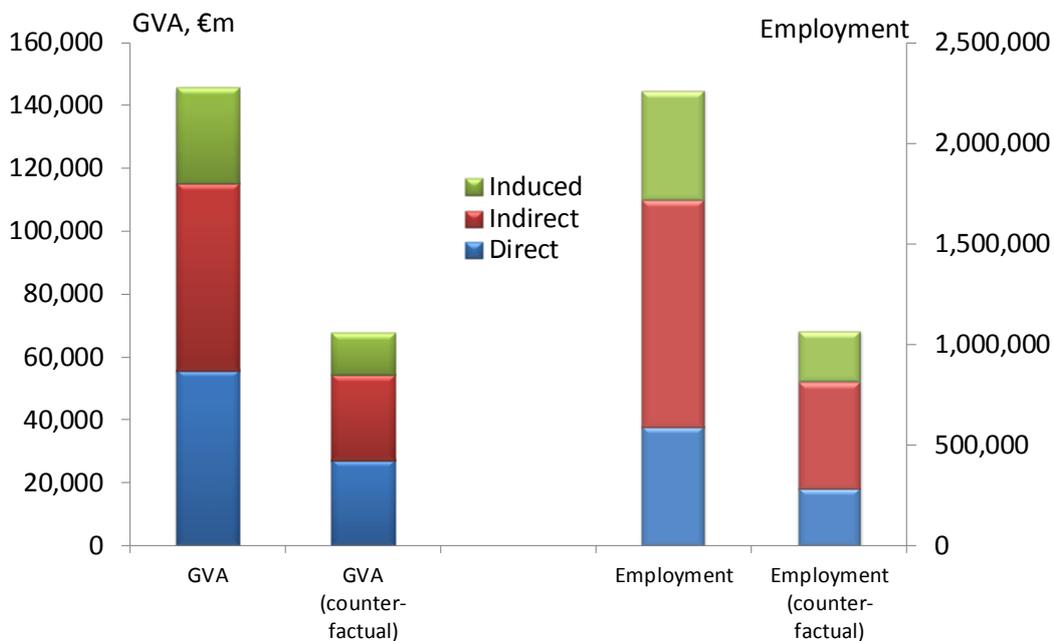
Following the same methodology used in Sections 4.3.1 to 4.3.4, it has been possible to estimate the impact of state aid regimes in a number of other countries: Belgium, Ireland, the Netherlands, Norway and Poland. It was not possible to estimate counter-factual scenarios for all countries that have introduced tonnage tax regimes and other state aid measures, either because data series are not available for a sufficiently long time period, or because there is too much ‘noise’ in the data to be able to identify clear changes in long-term trends.

To estimate an EU figure for the economic impact of state aid regimes, the direct economic contribution of each of the countries has been reduced in proportion to the reduction in fleet size under each country’s counter-factual scenario. By applying the multiplier estimates from the Oxford Economics Input-Output model it is also possible to estimate the indirect and induced impacts in the counter-factual scenario. The results are presented in Figure 4.4, below.

In this illustrative counter-factual scenario, the direct GVA contribution of the EU shipping in 2012 is €27 billion, or 52 per cent, lower than in our main estimate. Once indirect and induced effects are included, the total GVA contribution of the EU shipping falls from €145 billion to €68 billion, a reduction of 54 per cent.

The direct employment contribution of the shipping industry is 287,000 in the counter-factual scenario, 51 per cent lower than in reality. Including indirect and induced effects, it is estimated that the total employment contribution of the EU shipping industry in 2012 would have been around 1.1 million, compared to 2.3 million in reality.

Figure 4.4: The total economic impact of the EU shipping industry, 2012



Source: Oxford Economics

5 The contribution of maritime academies

Key points

- The skills and experience of seafarers are vital to the smooth functioning of the shipping industry, and are also highly valued by firms in the wider maritime cluster and beyond.
- Indicative estimates suggest there were almost 38,000 students/cadets in maritime academy-type training across the EU and Norway in 2012, an 11 per cent increase from 2004.

5.1 The economic importance of trained seafarers

It is essential that seafarers are properly trained and have a thorough understanding of the intricacies and complexities of working in a maritime setting. This is important in terms of safety, efficiency and ensuring the maritime environment is protected. Ultimately, it is the professionalism of seafarers that ensures the smooth running of the shipping industry and, in turn, global maritime trade.

The training of seafarers also brings benefits away from ships and ports. Their skills are highly valued by firms in the wider cluster of maritime-related industries across Europe, as outlined in a 2009 study by the Copenhagen Center of Shipping Economics and Innovation²⁷. An earlier survey by Gardner *et al.*²⁸ in the UK showed that for around 16,000 jobs it was preferred to hire a former seafarer and considered essential for half of these positions.

More broadly, seafarers enjoy a genuinely international career and in an increasingly globalised world such experience is highly valued beyond maritime-related companies.

5.2 The number of students/cadets in training in the EU

Given the benefits trained seafarers bring to the shipping industry and wider economy, national governments have made provisions to encourage greater investment in maritime education. Aid with the training of seafarers is also covered by the 2004 Community guidelines on state aid to maritime transport.

This section analyses the contribution of maritime academies over the last decade. This task is complicated by the lack of a single consistent dataset for the number of seafarers trained in each European country. Nonetheless, it has been possible to develop an estimate of the total number of students/cadets in maritime academy-type training across the EU and Norway.

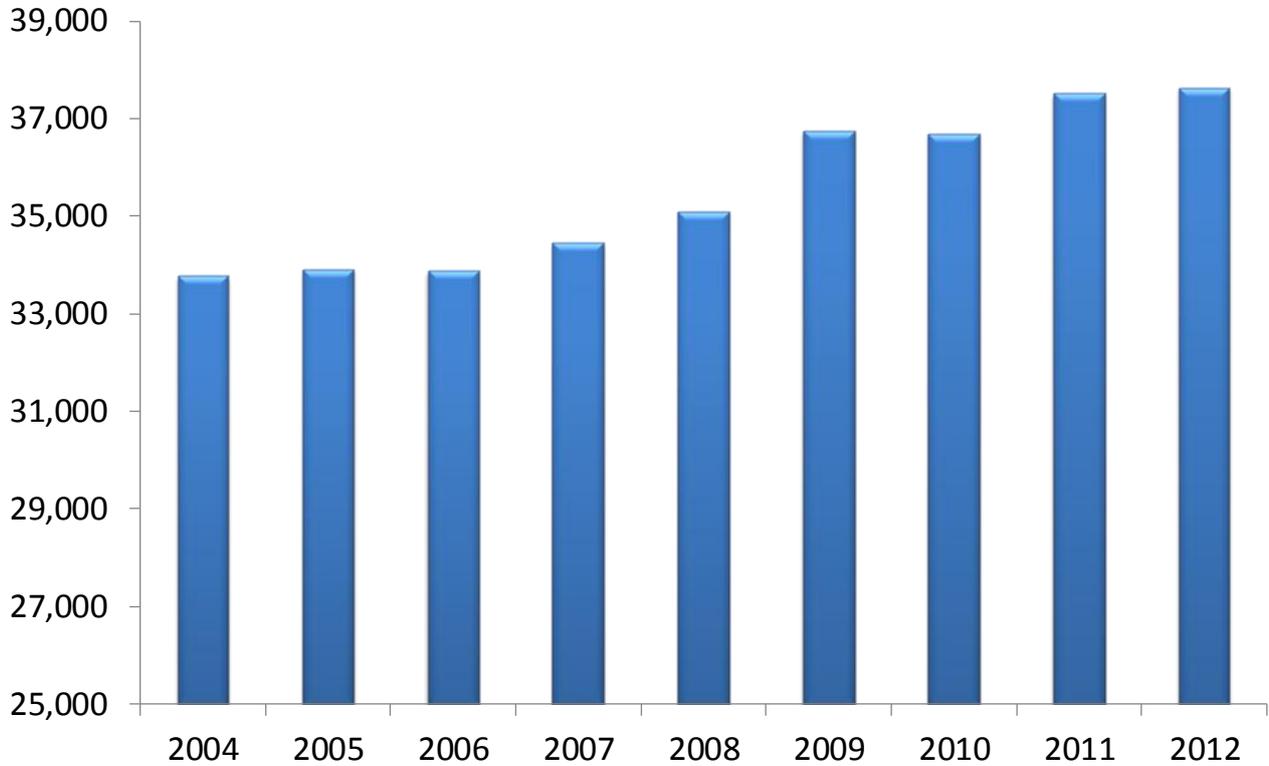
Information for some countries has been provided by ECSA members, and this has been complemented with data from previous research in this area. This information has been used to generate an indicative estimate of the number of students/cadets in other countries, using information on the average ratio of students/cadets to people employed in freight and passenger

27 Sorn-Friese, H and Iversen, M (2009) Evermore, the Times They Are A-Changin': Expounding the Challenge of Offshoring in the International Shipping Industry, Mercator Media Forum, December 2009, pp. 143-147

28 Gardner, BM, Marlow, PB, Naim, MM, Nair, RV and Pettit, SJ (2003), The UK economy's requirements for people with experience of working at sea 2003, Department for Transport

water transport²⁹. The analysis suggests there were approximately 38,000 students/cadets in 2012, a 11 per cent increase in over the estimate for 2004 (Figure 5.2).

Figure 5.2: Indicative estimates of the total number of students/cadets in maritime academy –type training across the EU, 2004 to 2012



Source: Oxford Economics

²⁹ Based on Eurostat official statistics

5.3 Analysis of maritime students and cadets by country

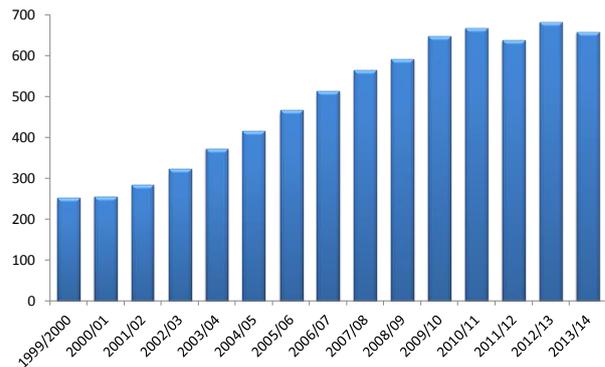
This section sets out summary data for individual countries. As discussed above, there is little consistency of data definitions between countries, hindering comparison between countries on a like-for-like basis. Nonetheless, this analysis is informative in highlighting recent trends within specific countries.

Belgium

Since the introduction of a tonnage tax regime in 2002 (adapted in 2004), Belgium has seen a significant increase in the size of its flagged and controlled fleets. This growth has been reflected in a substantial increase in the number of students registered at the Antwerp Maritime Academy.

Looking at the entire period for which figures are available, the number of students registered at the Antwerp Maritime Academy expanded from 251 in 1999/00 to 657 in 2013/14, an increase of 162 per cent.

Number of students registered at Antwerp Maritime Academy



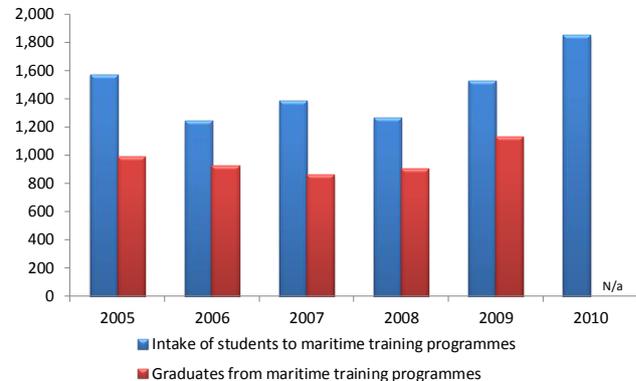
Source: Antwerp Maritime Academy

Denmark

In 2005, just under 1,000 people graduated from maritime training programmes in Denmark. This figure declined slightly in subsequent years, before increasing to 1,100 in 2009. The number of students entering programmes also increased noticeably in 2009 and 2010.

The increased intake in the latter years' data may reflect the impact of the "World Careers" publicity campaign launched by the Danish Shipowners' Association in 2008.

Number of graduates and entrants in Danish maritime training programmes



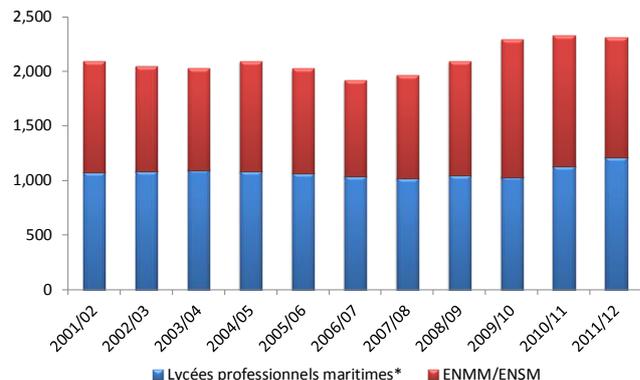
Source: Danish Maritime Authority

France

Education and training courses for seafarers are provided by the *lycées professionnels maritimes* (ratings) and the *Ecole Nationale Supérieure Maritime* (officers; previously called Ecoles Nationales de la Marine Marchande).

The total number of trainees remained relatively stable between 2001/02 and 2008/09, but has picked up since then. In 2011/12 there were 1,200 students at lycées professionnels maritimes and 1,100 at the Ecole Nationale Supérieure Maritime.

Trainees in French national schools of the merchant navy



Source: Amateurs de France

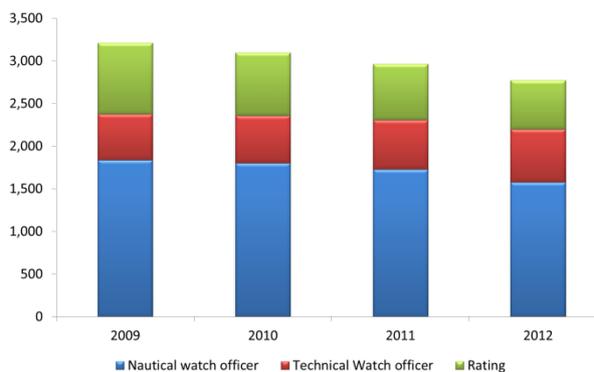
*Only includes trainees on courses directly related to merchant marine activities

Germany³⁰

The number of students/cadets in maritime academies has gradually decreased from 3,200 in 2009, to 2,800 in 2012.

Across this period, just under 60 per cent of students/cadets were undertaking nautical watch officer training. The proportion undertaking rating level training fell from 26 per cent in 2009 to 21 per cent in 2012. In contrast, the proportion undertaking technical watch officer training increased from 17 per cent in 2009 to 23 per cent in 2012, reflecting efforts by the German Shipowners' Association to promote this type of training to young people.

Total number of students/cadets in German maritime academies

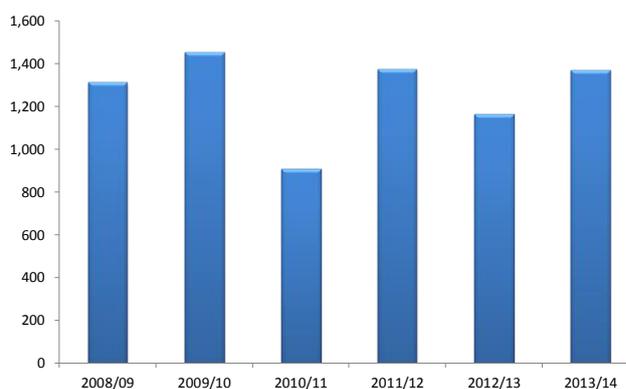


Source: Standing working group of the coastal states for maritime training and education

Greece

The number of trainees in Greek national merchant marine academies fluctuates year to year, but between 2008-09 and 2013-14 there have been an average of around 1,260 trainees per year. This average is dragged down by an unusually low number of trainees in 2010-11. In the current, 2013/14, academic year there are almost 1,400 trainees at merchant marine academies in Greece.

Trainees in Greek national merchant marine academies



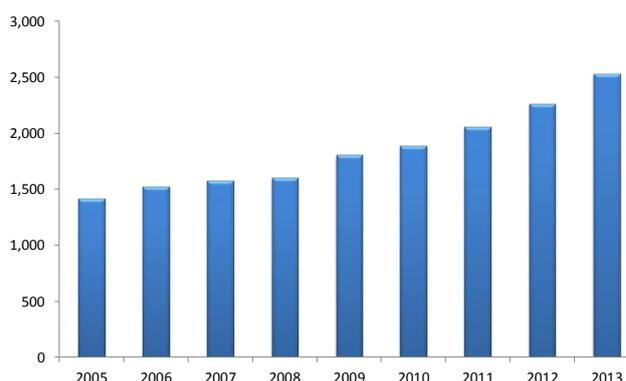
Source: Union of Greek Shipowners

Italy

In 2005, the introduction of tonnage tax imposed a requirement to train at least one cadet on board each ship on the International Italian Register that adopts the tax regime. This condition helped to increase the number of cadets by 79 per cent between 2005 and 2013.

To date there is no sign that the trend is levelling off: in 2013 there were just over 2,500 cadets in training, the highest number on record.

Number of cadets training in Italy



Source: Accademia Italiana della Marina Mercantile of Genoa, ITS Giovanni Caboto of Gaeta and Nautical Technical Institutes

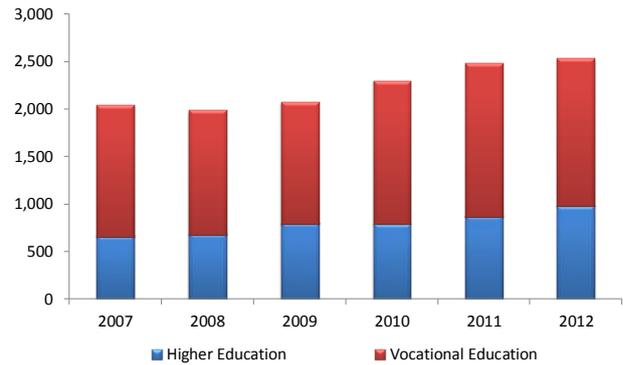
³⁰ Oxford Economics has been advised by the German Shipowners' Association that maritime training within Germany is difficult to accurately estimate, due to its flexible and complicated nature. As such, the above figures should be treated as indicative estimates.

Netherlands

In 2007 there were just over 2,000 students at Dutch maritime academies. This had increased to over 2,500 by 2012. This increase was primarily driven by a 48 per cent increase in higher education students; vocational students increased by just 12 per cent.

In 2012, around 490 trainees were serving on board ships through on board traineeships taking place in the 3rd and 4th year of study. The number of trainees on board ships in 2012 was down slightly from 530 in 2007.

Students at Dutch maritime academies



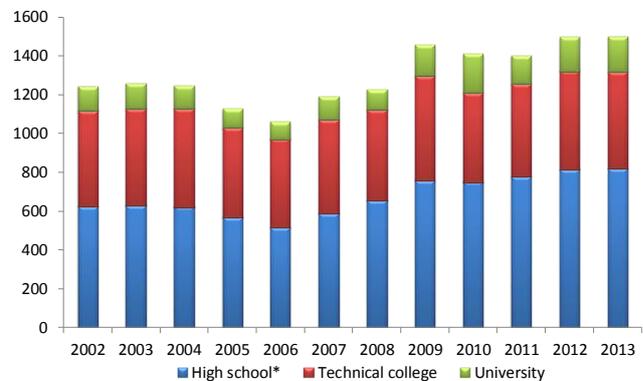
Source: Royal Association of Netherlands Shipowners

Norway

The number of students in maritime education in Norway declined from 1,240 in 2003 to 1,060 in 2006. However, in 2007 the Norwegian Maritime Forum launched a recruitment campaign to highlight maritime sector opportunities to young people. Since then, the total number of students has increased by 42 per cent to reach 1,500 in 2013.

In the most recent year, 55 per cent of all maritime students were at high school, 33 per cent studied at technical college, and 12 per cent were at university.

Students in maritime education in Norway



Source: Maritime Opplæringskontor

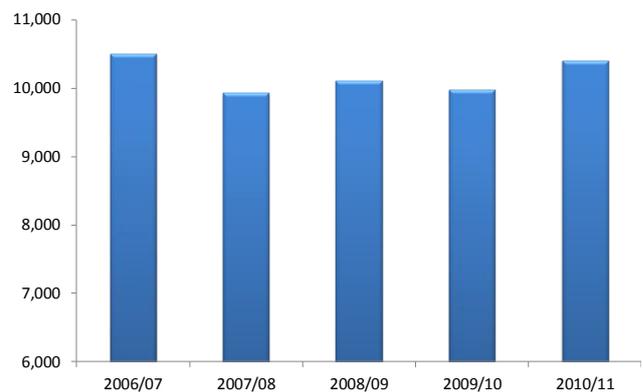
*High school figures are for the academic year starting in the calendar year indicated

Poland

Poland produces the largest number of maritime academy graduates amongst EU countries. The annual number of graduates is too great to be absorbed by the Polish fleet, and many go on to work on ships owned by or flagged in other EU countries.

Although there was some year-to-year fluctuation, the total number of maritime students in Poland remained reasonably stable between 2006/07 and 2010/11 at around 10,000.

Students at maritime academies in Poland



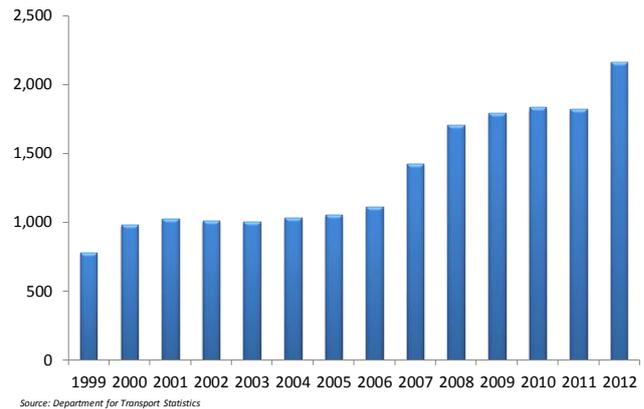
Source: Polish Statistical Yearbook of Maritime Economy

UK

In the UK there is a direct link between membership of the tonnage tax regime and training. This imposes a minimum requirement that a shipping company must recruit and train one new cadet each year for every 15 officer posts in the tonnage tax fleet, and the cadet must ordinarily reside in the UK.

The number of officer cadets in training has risen strongly from 780 in 1999 to almost 2,200 in 2012.

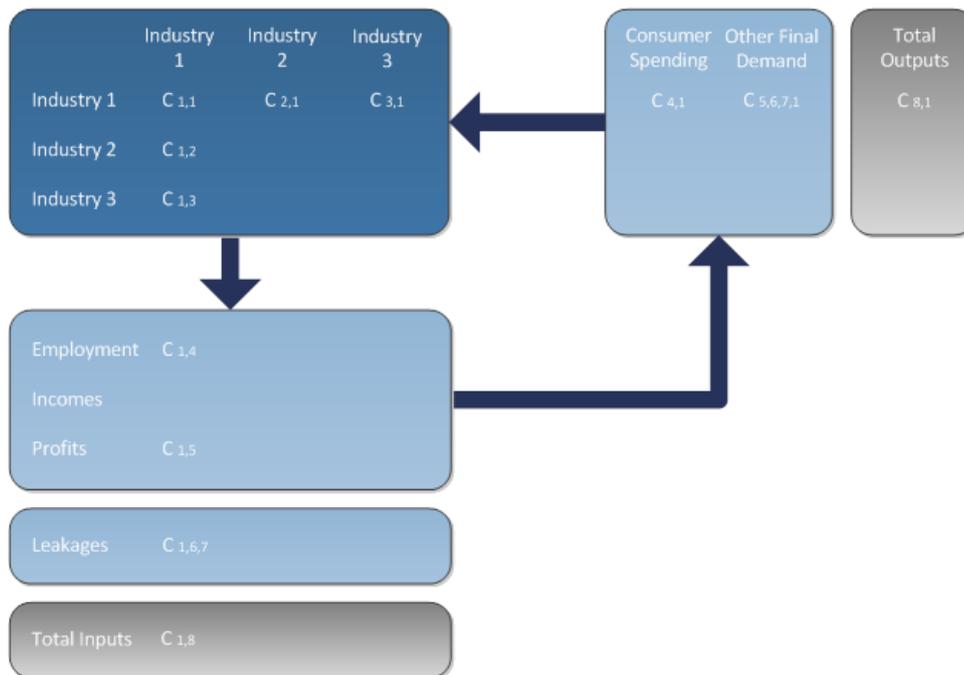
Officer cadets in training in the UK



Annex A: An overview of input-output tables

An input-output model gives a snapshot of an economy at any point in time. The model shows the major spending flows from “final demand” (i.e. consumer spending, government spending investment and exports to the rest of the world); intermediate spending patterns (i.e. what each sector buys from every other sector – the supply chain in other words); how much of that spending stays within the economy; and the distribution of income between employment incomes and other income (mainly profits). In essence an input-output model is a table which shows who buys what from whom in the economy.

Figure A1: A simple input-output model



Traditionally input-output tables are produced on a national basis, with the linkages recorded for a single economy only. However, the World Input-Output Database, funded by the European Commission, has developed a series of global input-output tables that reflect the linkages between economies, as well as within them. Consequently, such tables enable supply chains to be tracked across multiple countries. For example, a Dutch shipping company may purchase a vessel from Germany, which in turn uses steel from Spain, the supplier of which uses an IT provider based in France. Under a traditional input-output table the purchase of a vessel from Germany would be a ‘leakage’ and be removed from the model. As a consequence, the economic activity created in Germany, Spain and France would not be captured. The World Input-Output Database’s global input-output table captures all of these transactions, and consequently provides a greater degree of coverage and accuracy in an impact assessment.

This study has used the Oxford Economics’ Global Input-Output model, which is based on the World Input-Output Database global input-output table. Norway and Croatia are not covered by the World Input-Output Database as standard, but Oxford Economics has undertaken bespoke modelling to incorporate them into its model, based on national input-output tables and trade data.

Input-output tables can be used to generate industry multipliers by using the Leontief system.³¹ Under the Leontief system, industry multipliers are achieved through a series of manipulations of the input-output matrix. The first of these manipulations is the creation of a new base coefficients matrix (A matrix) for global economy. The second manipulation is the creation of an identity matrix (I matrix), within which all values are zero except for when the consuming industry (columns) and the producing industry (rows) are the same; these cells are given a value of 1. The third stage of the manipulation is the subtraction of the A matrix from the I matrix. The final stage is the inversion of the matrix produced in the third stage. The result of these manipulations is a matrix in which the values represent the individual cross-multipliers for each industry, showing the impact on each producing industry (row) of an increase in 1 unit of output in a consuming industry (column). The total multiplier for each consuming industry is the sum of the multipliers in the relevant column.

³¹ Leontief, W. (1986). *Input-output economics* (2nd ed.). New York: Oxford University Press

Annex B: Data sources

Freight Transport - GVA													
Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Source of country specific study
Belgium			Green						Green	Yellow	Yellow		Policy Research Corporation
Bulgaria			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Czech Republic			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Denmark		Green	Yellow								Green		Danish Maritime Authority
Germany			Red								Green		PWC
Estonia			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Ireland			Yellow	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Yellow		
Greece			Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Green	The Boston Consulting Group
Spain			Yellow	Yellow	Yellow	Green					Red		DBK & Instituto Nacional de Estadística
France			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Yellow		
Italy			Green								Green		Federazione del Mare
Cyprus			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Latvia			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Yellow	Yellow		
Lithuania			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Luxembourg			Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Yellow	Yellow	Yellow		
Hungary			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Malta			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Netherlands	Green	Light Blue	Light Blue	Green							Green		'De Nederlandse Maritieme Cluster' Monitor
Austria			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Poland			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Yellow	
Portugal			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Yellow	
Romania			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Slovenia			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Slovakia			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Finland			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Sweden			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Yellow	
United Kingdom			Green	Green	Green	Green	Green	Green	Green	Green	Green	Yellow	UK Chamber of Shipping
Norway			Green	Green	Green	Green	Green	Green	Green	Green	Green	Green	Menon Business Economics
Croatia			Yellow	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue	Yellow	

Green	Country specific study
Blue	Oxford Economics estimate based on Eurostat data
Dark Blue	World Input - Output Database
Purple	Eurostat growth rate applied
Yellow	Oxford Economics European Model growth rate applied
Light Yellow	Shipping export growth rate applied
Red	Oxford Economics estimate based on a combination of Eurostat, national sources and Oxford Economics proprietary data
Light Blue	Interpolated

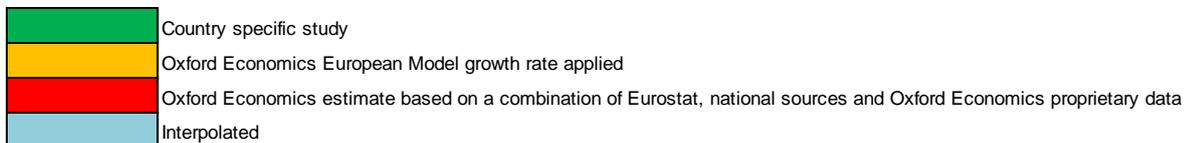
Passenger Transport - GVA													
Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Source of country specific study
Belgium													
Bulgaria													
Czech Republic													
Denmark													Danish Maritime Authority
Germany													PWC
Estonia													
Ireland													
Greece													The Boston Consulting Group
Spain													DBK & Instituto Nacional de Estadistica
France													
Italy													Federazione del Mare
Cyprus													
Latvia													
Lithuania													
Luxembourg													
Hungary													
Malta													
Netherlands													'De Nederlandse Maritieme Cluster' Monitor
Austria													
Poland													
Portugal													
Romania													
Slovenia													
Slovakia													
Finland													
Sweden													
United Kingdom													UK Chamber of Shipping
Norway													Menon Business Economics
Croatia													

	Country specific study
	Oxford Economics estimate based on Eurostat data
	World Input - Output Database
	Eurostat growth rate applied
	Oxford Economics European Model growth rate applied
	Shipping export growth rate applied
	Oxford Economics estimate based on a combination of Eurostat, national sources and Oxford Economics proprietary data
	Interpolated

Towage and Dredging - GVA													
Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Source of country specific study
Belgium			Green						Green	Yellow	Yellow		Policy Research Corporation
Bulgaria													
Czech Republic													
Denmark			Green								Green		Danish Maritime Authority
Germany													
Estonia													
Ireland													
Greece													
Spain			Red								Red		Spanish Shipowners' Association
France			Red								Red		Armateurs de France
Italy			Red								Red		Federazione del Mare
Cyprus													
Latvia													
Lithuania													
Luxembourg													
Hungary													
Malta													
Netherlands	Green	Light Blue	Light Blue	Green							Green		'De Nederlandse Maritieme Cluster' Monitor
Austria													
Poland													
Portugal			Red								Red		Associação de Armadores da Marinha de Comércio
Romania													
Slovenia													
Slovakia													
Finland													
Sweden													
United Kingdom			Green	Green	Green	Green	Green	Green	Green	Green	Yellow		UK Chamber of Shipping
Norway			Green	Green	Green	Green	Green	Green	Green	Green	Green		Menon Business Economics
Croatia													



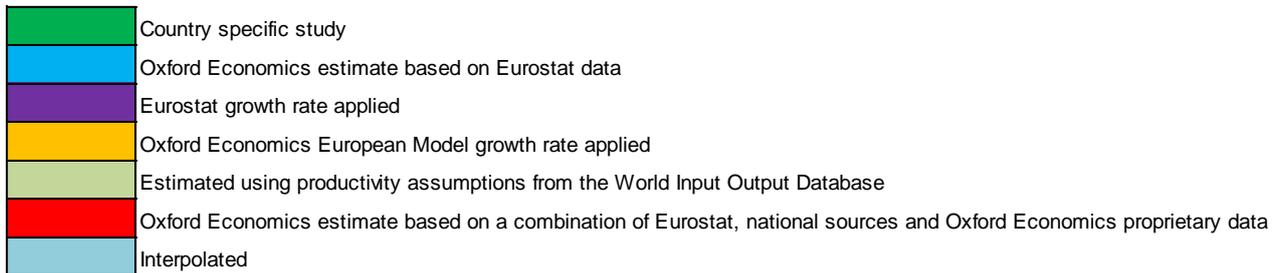
Offshore Support Vessels - GVA													
Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Source of country specific study
Belgium													
Bulgaria													
Czech Republic													
Denmark													Danish Maritime Authority
Germany													
Estonia													
Ireland													
Greece													
Spain													
France													Armateurs de France
Italy													Federazione del Mare
Cyprus													
Latvia													
Lithuania													
Luxembourg													
Hungary													
Malta													
Netherlands													'De Nederlandse Maritieme Cluster' Monitor
Austria													
Poland													
Portugal													Associação de Armadores da Marinha de Comércio
Romania													
Slovenia													
Slovakia													
Finland													
Sweden													
United Kingdom													UK Chamber of Shipping
Norway													Menon Business Economics
Croatia													



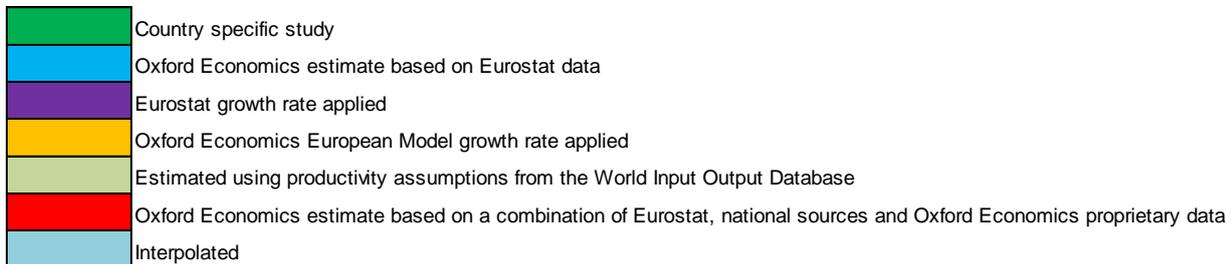
Renting and Leasing of Water Transport Equipment - GVA													
Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Source of country specific study
Belgium													
Bulgaria													
Czech Republic													
Denmark													
Germany													
Estonia													
Ireland													
Greece													
Spain													
France													
Italy													
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Latvia													
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Luxembourg													
Hungary													
Malta													
Netherlands													
Austria													
Poland													
Portugal													
Romania													
Slovenia													
Slovakia													
Finland													
Sweden													
United Kingdom													
Norway													
Croatia													

 Oxford Economics estimate based on Eurostat data
 Oxford Economics European Model growth rate applied

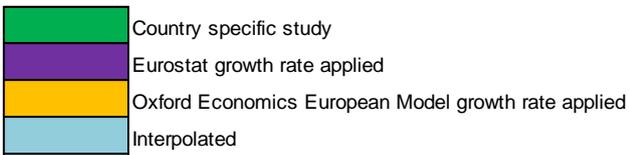
Freight Transport - Employment													
Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Source of country specific study
Belgium			Green						Green	Yellow	Yellow		Policy Research Corporation
Bulgaria			Light Green										
Czech Republic													
Denmark			Red								Red		Danish Maritime Authority
Germany			Green	Green	Green	Green	Green	Green	Green	Green	Green		PWC & German Shipowners' Association
Estonia			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Ireland			Light Green										
Greece			Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Green	The Boston Consulting Group
Spain			Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green		Spanish Shipowners' Association
France			Light Green										
Italy			Green								Green		Federazione del Mare
Cyprus			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Latvia			Light Green										
Lithuania			Light Green										
Luxembourg			Light Green										
Hungary			Light Green										
Malta			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue		
Netherlands			Red	Green							Green		'De Nederlandse Maritieme Cluster' Monitor
Austria			Light Green										
Poland			Light Green										
Portugal			Light Green										
Romania			Light Green										
Slovenia			Light Green										
Slovakia			Light Green										
Finland			Light Green										
Sweden			Yellow	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Yellow		
United Kingdom			Green	Green	Green	Green	Green	Green	Green	Green	Green		UK Chamber of Shipping
Norway			Green	Green	Green	Green	Green	Green	Green	Green	Green		Norwegian Ship owners' Association
Croatia			Light Green										



Passenger Transport - Employment													
Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Source of country specific study
Belgium													
Bulgaria													
Czech Republic													
Denmark													Danish Maritime Authority
Germany													PWC & German Shipowners' Association
Estonia													
Ireland													
Greece													The Boston Consulting Group
Spain													Spanish Shipowners' Association
France													
Italy													Federazione del Mare
Cyprus													
Latvia													
Lithuania													
Luxembourg													
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Netherlands													'De Nederlandse Maritieme Cluster' Monitor
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Portugal													
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Slovenia													
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Finland													
Sweden													
United Kingdom													UK Chamber of Shipping
Norway													Norwegian Ship owners' Association
Croatia													



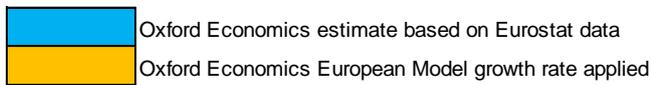
Towage and Dredging - Employment													
Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Source of country specific study
Belgium			Country specific study						Country specific study	Oxford Economics European Model growth rate applied	Oxford Economics European Model growth rate applied		Policy Research Corporation
Bulgaria													
Czech Republic													
Denmark			Country specific study								Country specific study		Danish Maritime Authority
Germany													
Estonia													
Ireland													
Greece													
Spain			Oxford Economics European Model growth rate applied	Country specific study	Oxford Economics European Model growth rate applied	Oxford Economics European Model growth rate applied	Oxford Economics European Model growth rate applied		Spanish Shipowners' Association				
France			Eurostat growth rate applied	Eurostat growth rate applied	Eurostat growth rate applied	Eurostat growth rate applied	Eurostat growth rate applied	Country specific study	Armateurs de France				
Italy			Country specific study								Country specific study		Federazione del Mare
Cyprus													
Latvia													
Lithuania													
Luxembourg													
Hungary													
Malta													
Netherlands	Country specific study	Interpolated	Interpolated	Country specific study							Country specific study		'De Nederlandse Maritieme Cluster' Monitor
Austria													
Poland													
Portugal			Country specific study								Country specific study		Associação de Armadores da Marinha de Comércio
Romania													
Slovenia													
Slovakia													
Finland													
Sweden													
United Kingdom			Country specific study	Country specific study	Country specific study	Country specific study	Country specific study	Oxford Economics European Model growth rate applied	UK Chamber of Shipping				
Norway			Country specific study	Country specific study	Country specific study	Country specific study	Country specific study	Country specific study	Norwegian Ship owners' Association				



Offshore Support Vessels - Employment													
Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Source of country specific study
Belgium													
Bulgaria													
Czech Republic													
Denmark													Danish Maritime Authority
Germany													
Estonia													
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Greece													
Spain													
France													Armateurs de France
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Finland													
Sweden													
United Kingdom													UK Chamber of Shipping
Norway													Menon Business Economics
Croatia													



Renting and Leasing of Water Transport Equipment - Employment													
Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Source of country specific study
Belgium													
Bulgaria													
Czech Republic													
Denmark													
Germany													
Estonia													
Ireland													
Greece													
Spain													
France													
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Norway													
Croatia													



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