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The Republic of Croatia
Ministry of the Sea, Transport and Infrastructure

THE ECONOMIC IMPACT OF THE CROATIAN SHIPPING INDUSTRY

REPORT FOR THE REPUBLIC OF CROATIA'S
MINISTRY OF THE SEA, TRANSPORT AND
INFRASTRUCTURE

DECEMBER 2017

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EXECUTIVE SUMMARY

This report provides an assessment of the impact of the Croatian shipping industry on the economy of the Republic of Croatia. It has been prepared for the Republic of Croatia's Ministry of the Sea, Transport and Infrastructure.

This study sets out the economic benefits supported by the Croatian shipping industry, in terms of its GDP contribution and the jobs it sustains. We consider three channels of economic impact supported by the industry, following a standard means of analysis known as an economic impact assessment—direct, indirect (supply chain) and induced (worker spending) impacts.

The direct contribution to GDP of the Croatian shipping industry in 2016 was HRK 1.2 billion. This means that shipping directly contributed more to Croatia's GDP than the television and film industry and the travel agency and tour operation sector. General cargo and ferry transport each accounted for around 30 per cent of the Croatian shipping industry's direct contribution to GDP. Crude and product carriers together accounted for 24 percent, and catamaran transport accounted for a further eight percent.

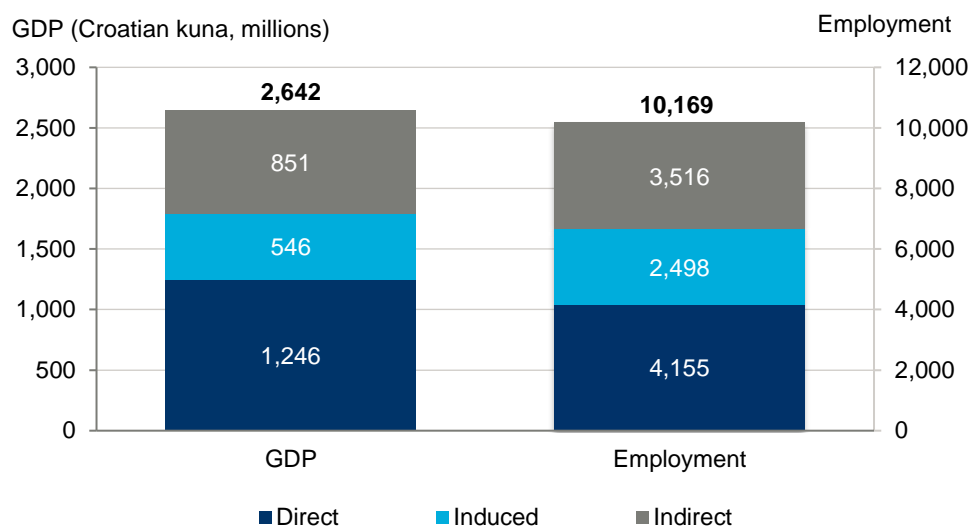
Overall, it is estimated that the Croatian shipping industry directly employed 4,200 people in 2016. Similar to shipping's contribution to GDP, ferry and general cargo vessels comprise 62 percent of employment within the shipping sector. We estimate that 3,300 of the jobs are on board ships and remainder are in roles based on shore.

The total contribution to GDP from the Croatian shipping industry, including supply chain and worker spending multiplier effects, is estimated to have been HRK 2.6 billion in 2016. This is equivalent to one per cent of Croatian GDP. For every HRK 1 million the Croatian shipping industry contributes to GDP itself, it creates another HRK 1.1 million elsewhere in the Croatian economy. This means the industry's GDP multiplier is 2.1.¹

The Croatian shipping industry is estimated to have supported a total of 10,200 jobs in 2016, either directly, through its supply chain, or the spending of workers. For every direct job the industry supports, another 1.4 are supported elsewhere in the Croatian economy. This means the shipping industry's employment multiplier is 2.4.

¹ The multiplier is calculated as: (Direct GDP + Indirect GDP + Induced GDP) / Direct GDP

Fig. 1. **Economic impact of the Croatian shipping industry, 2016**



Source: Oxford Economics

1. INTRODUCTION

1.1 PURPOSE OF THE STUDY

This report has been prepared for the Republic of Croatia's Ministry of the Sea, Transport and Infrastructure (the Ministry) and it provides an assessment of the impact of the Croatian shipping industry on the economy of the Republic of Croatia.

1.2 DEFINING THE SHIPPING INDUSTRY

To assess the economic impact of the Croatian shipping industry we need to define the activity that is to be considered part of the industry. For this study we are seeking to identify the economic activity associated with the operation and management of ships which are considered part of Croatia's fleet. There are three main ways of defining the Croatian fleet:

- The **'operated'** fleet includes ships operated by companies (or legal entities) based in the Croatia, which have substantive shore establishments within the country, and which are subject to Croatian laws and taxation. The operated fleet includes ships operated under the Croatian flag, plus non-Croatian flagged ships operated by Croatian shipping companies. The shore establishments may be a company's headquarters, but they may also be the Croatian 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.
- The **'controlled'** or **'beneficially owned'** fleet includes ships whose ultimate ownership or control lies in Croatia, but which may be flagged in a different country. A limitation of this measure in the context of economic impact analysis is that the ultimate ownership or control of vessels may not align with where the economic activity to operate the vessels takes place.
- The **'flag'** fleet comprises ships operating under the Croatian flag. 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. 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.

In this study, we have chosen to examine the economic impact of the Croatian shipping industry, as defined by its operated merchant fleet. This choice reflects that the operated fleet definition aligns most closely with the shipping industry's actual economic contribution to Croatia's economy.

Following consultation with Mare Nostrum (the Croatian Shipowners' Association) and the Ministry, the Croatian operated fleet is defined to include vessels operated by the following companies:

- Atlantska Plovidba.
- Brodospas d.d.
- Dinamarin
- G&V Line d.o.o.
- G&V Line Iadera d.o.o.
- Jadranski Pomorski Servis d.d.
- Jadrolinija
- Jadroplov
- Kapetan Luka
- Linjska Nacionalna Plovidba d.d.
- Rapska Plovidba d.d.
- Tankerska Next Generation d.d.
- Tankerska Plovidba d.d.
- Uljanik Plovidba

Mare Nostrum and the Ministry have confirmed that this list is likely to represent a large majority of the companies associated with Croatia's operated fleet.²

² While there may be other small operators who are not listed here, it is beyond the scope of this study to collect information from such operators. Nonetheless, comparison of data provided by the listed companies and published statistics suggests that the inclusion of very small companies is unlikely to substantively affect the findings.

INTRODUCTION TO ECONOMIC IMPACT ANALYSIS

The economic benefits of the shipping industry are assessed using a standard means of analysis, called an economic impact assessment. This involves quantifying the sector's impact across three 'core' channels, consisting of:

- **Direct impact**, which relates to the shipping sector's own activities. It encompasses the economic activity and employment supported directly by firms in the shipping sector.
- **Indirect impact**, which encapsulates the economic activity and employment supported in the supply chain of the shipping industry, as a result of its procurement of goods and services from firms in other domestic sectors.
- **Induced impact**, which comprises the wider economic benefits that arise when employees within the shipping industry, and its supply chain, spend their earnings, for example in local retail and leisure establishments.

The sum of these channels make up the shipping industry's total economic impact. Two main metrics are used to present a picture of the industry's economic contribution:

- **GDP**, or more specifically, the *gross value added (GVA)* contribution to GDP.³
- **Employment**, measured on a headcount basis.

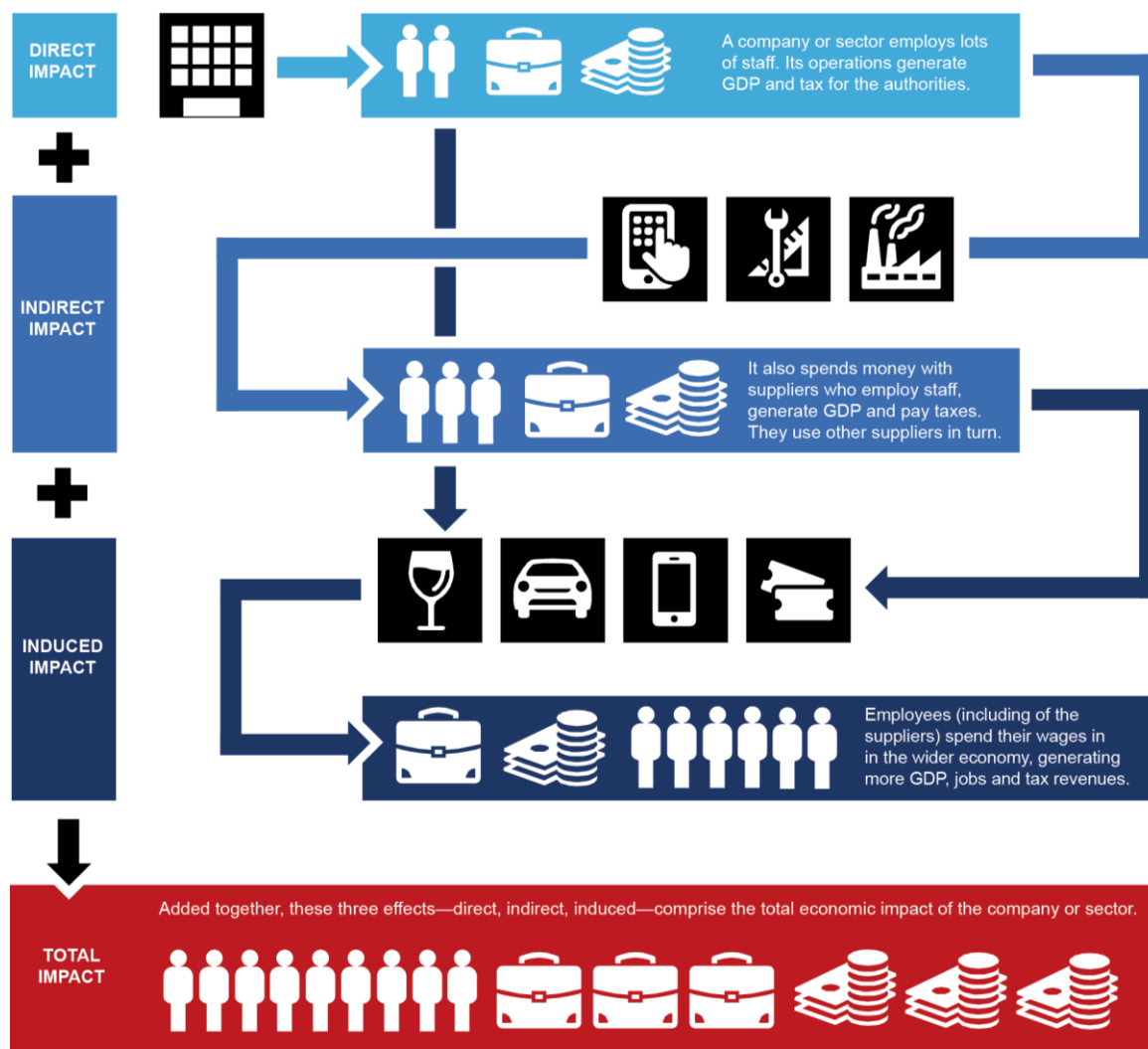
The modelling is conducted using an input-output model of the Croatian economy. This model was constructed by Oxford Economics, using macroeconomic and employment data published by the Croatian Bureau of Statistics.

Fig. 2 overleaf sets out how the various channels of a standard economic impact study relate to one another.

Further detail about the economic impact methodology is included in the Appendix.

³ GDP, or Gross Domestic Product, is the total value of final goods and services produced in an economy over a given period. The contribution of an individual producer, industry or sector to GDP can be understood as either: (i) the value of output (goods or services) less the value of intermediate inputs used in the production process; or (ii) the sum of compensation of employees (predominantly gross wages) and gross operating surplus.

Fig. 2. Channels of impact



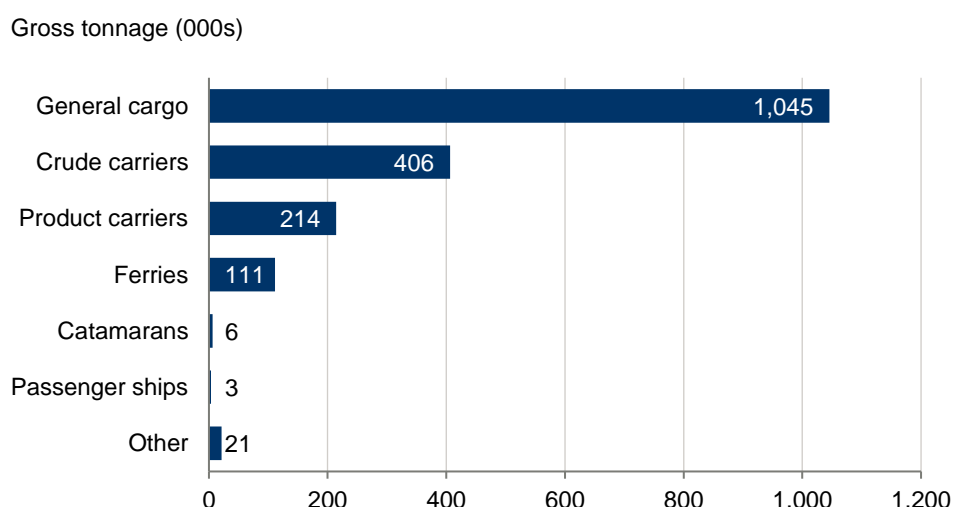
2. THE DIRECT IMPACT OF THE CROATIAN SHIPPING INDUSTRY

This chapter presents the findings of our analysis of the direct economic impact of the shipping industry in Croatia. The modelling underpinning this analysis was informed by data provided by Mare Nostrum, a bespoke survey of Mare Nostrum members and data held by the Coastal Maritime Traffic Agency.⁴ A detailed description of the data sources used can be found in the Appendix.

2.1 SIZE AND STRUCTURE OF THE CROATIAN OPERATED FLEET

Fig. 3, below, shows the size of the Croatian operated fleet by type of vessel in 2016, measured in terms of gross tonnage. Based on these data, we observe that freight shipping comprised the vast majority (92 percent) of the Croatian merchant fleet. The largest component of this was general cargo vessels, which alone accounted for more than one million gross tonnes of the Croatian fleet. Crude carriers accounted for a further 406,000 gross tonnes and product carriers accounted for 214,000 gross tonnes. The various types of passenger carriers (ferries, catamarans and passenger ships) collectively contributed 121,000 gross tonnes to the Croatian fleet.

Fig. 3. Croatian operated merchant fleet by gross tonnage, 2016⁵



Source: Mare Nostrum and Coastal Maritime Traffic Agency

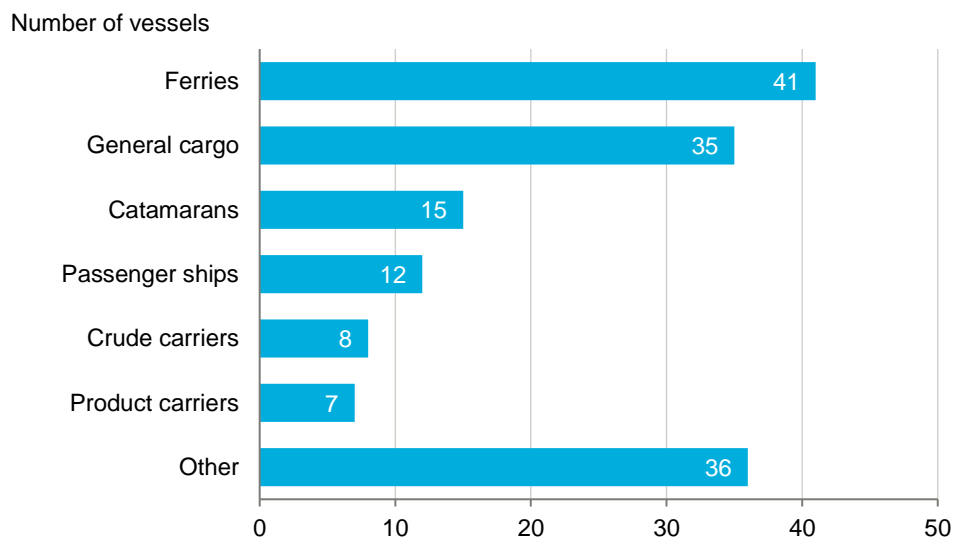
However, when the fleet is examined in terms of the number of vessels, a different picture emerges: under this metric, freight vessels accounted for only 32 percent of the fleet (Fig. 4). The largest number of vessels were found in the passenger carrier categories, which together accounted for 68 vessels, or 44 percent of the fleet. Amongst the different types of passenger carriers, ferries

⁴ Mare Nostrums members: Jadrolinija, Jadroplov, Uljanik Plovidba, Tankerska Plovidba d.d., Jadranski Pomorski Servis d.d., Brodospas d.d., Atlantska Plovidba., Tankerska Next Generation d.d. and Rapska Plovidba d.d.

⁵ Other category includes: platform carriers, tugs and commercial yachts.

were the largest component, accounting for 60 percent of all passenger carriers in the Croatian fleet.

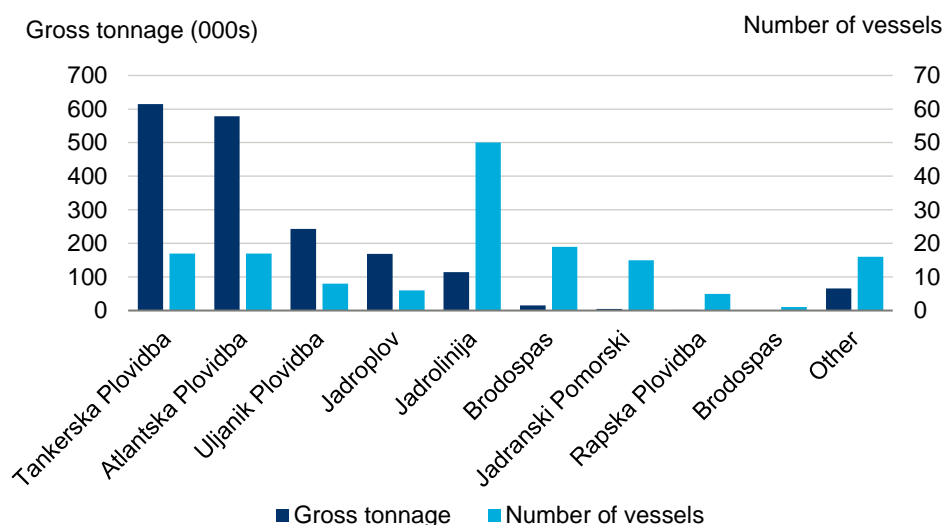
Fig. 4. **Croatian operated merchant fleet by number of vessels, 2016**



Source: Mare Nostrum and Coastal Maritime Traffic Agency

Fig. 5 shows the breakdown of the Croatian fleet by operator, in terms of both the number of vessels and gross tonnage. In tonnage terms, vessels operated by Tankerska Plovidba and Atlantska Plovidba made up two-thirds of the merchant fleet in 2016. In terms of number of vessels, Jadrolinija was by far the largest operator: its 50 vessels accounted for almost one-third of the total fleet in 2016. This meant that in 2016 Jadrolinija's fleet was about the same size as the next three largest operators combined.

Fig. 5. Croatian operated merchant fleet by company, 2016⁶



Source: Mare Nostrum and Coastal Maritime Traffic Agency

2.2 DIRECT CONTRIBUTION TO GDP

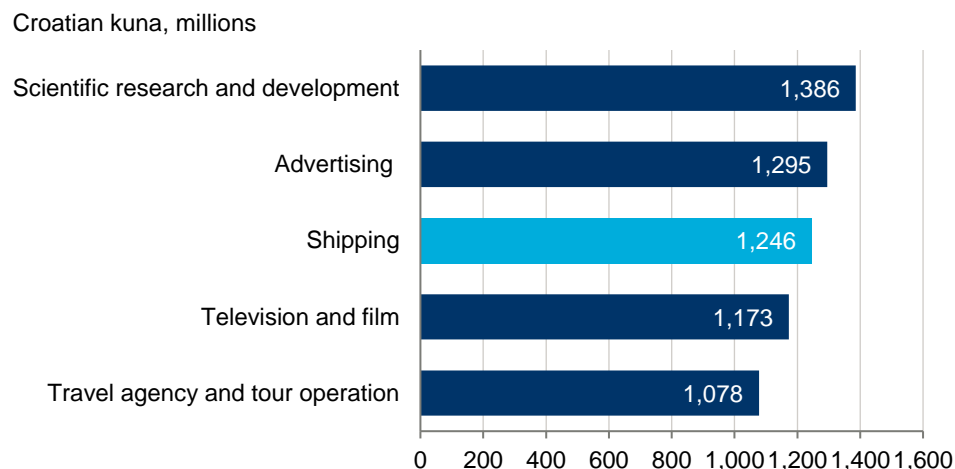
The shipping industry's direct contribution to GDP is the sum of all profits and wages supported by the companies within the industry. To estimate GDP for the Croatian shipping industry Oxford Economics produced a profit and wage estimate for all the companies identified in section 1.2 of this report. Information on wages and profits was collected through the survey of Mare Nostrum members. This information accounted for around 92 percent of the GDP value calculated. For non-Mare Nostrum member companies GDP was estimated using the average values of GDP per employee for Mare Nostrum members, and the estimated employment level for each non-member.⁷

On this basis, we estimate that the direct gross value added contribution to GDP of the Croatian shipping industry in 2016 was HRK 1.2 billion. Fig. 6 compares the shipping industry's GDP contribution to that of other similarly-sized sectors. It reveals that the direct contribution of shipping to Croatian GDP in 2016 was greater than that of the television and film industry and the travel agency and tour operation sector, but slightly smaller than that of the advertising sector.

⁶ Information on individual non-Mare Nostrum members is not publicly available, but we have created an estimated for this group using information provided by the Coastal Maritime Traffic Agency.

⁷ The average was weighted to reflect the vessel composition of non-Mare Nostrum member companies. The same approach was also applied to one Mare Nostrum member which was unable to respond to the survey.

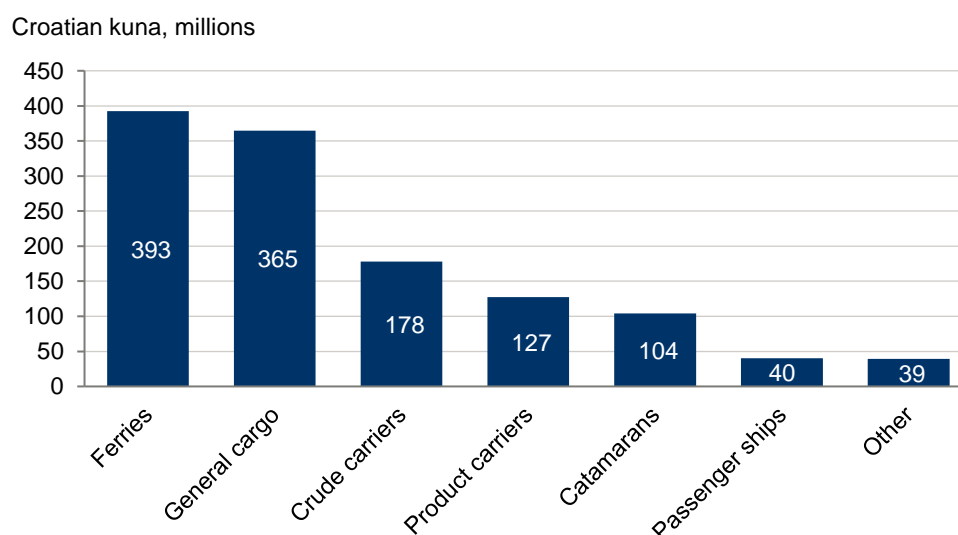
Fig. 6. Direct contribution to GDP in Croatia in 2016: shipping and comparator industries



Source: Oxford Economics

Fig. 7, below, shows the direct GDP contribution of the Croatian shipping industry split by the type of vessel operated. General cargo and ferry transport each contributed more than HRK 350 million, or around 30 per cent of the Croatian shipping industry's direct contribution to GDP. Crude and product carriers together accounted for 24 per cent, catamaran transport accounted for a further eight percent and passenger ships accounted for three percent (Fig. 7).

Fig. 7. Direct contribution to GDP of the Croatian shipping industry by sub-sector, 2016



Source: Oxford Economics

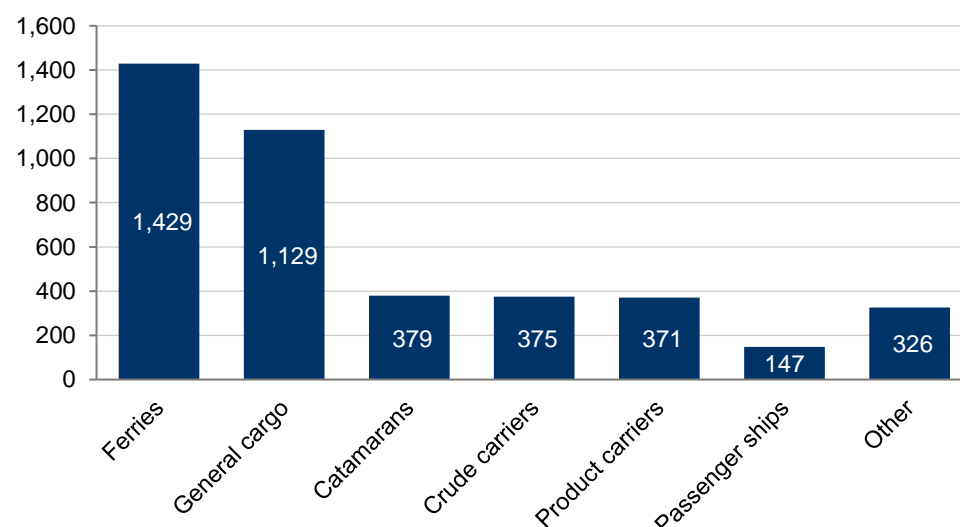
2.3 DIRECT CONTRIBUTION TO EMPLOYMENT

Similar to GDP, to estimate total employment for the shipping industry we produced an employment estimate for all the companies listed in section 1.2 of this report. For Mare Nostrum members, we obtained detailed onshore and crew employment information from the survey of member companies.⁸ For non-Mare Nostrum members, the Coastal Maritime Traffic Agency provided crew estimates for the vessels operated by non-member companies.⁹ We then uplifted these estimates to account for onshore employment.¹⁰

Overall, it is estimated that the Croatian shipping industry directly employed 4,200 people in 2016. As with shipping's contribution to GDP, crew on ferry and general cargo vessels comprised the majority (62 percent) of the employment within the shipping sector, as shown in Fig. 8.

Catamarans, crude carriers and product carriers each accounted for around 370 jobs in 2016. Although product carriers and catamarans contributed less to GDP than crude carriers in 2016, the three categories are of a similar size when measured in terms of employment, reflecting productivity differences across the different types of vessel.

Fig. 8. Direct employment of the Croatian shipping industry by sub-sector, 2016



Source: Oxford Economics

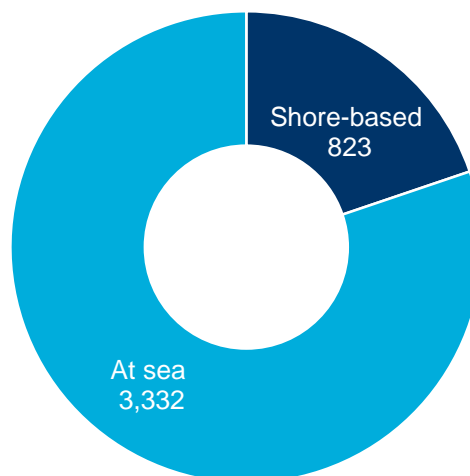
⁸ One Mare Nostrum member was unable to provide survey information. To estimate total employment for this company, we calculated an average total employment per ship ratio from the information provided by other members and applied it to the number of vessels the company operated in 2016.

⁹ The Coastal Maritime Traffic Agency was unable to provide employment data on one non-member company. To estimate total employment for this company, we calculated an average total employment per ship ratio from the information provided by Mare Nostrum members and applied it to the number of vessels that the company operated in 2016.

¹⁰ The uplift factor was based on the ratio between onshore and sea-based employment observed in the Mare Nostrum members' data.

We estimate that four-fifths of employment in Croatian shipping consists of positions at sea, and one-fifth of employment is on shore within Croatia, for example in roles associated with the management of the fleet (Fig. 9).

Fig. 9. Employment in the Croatian shipping industry by place of work, 2016

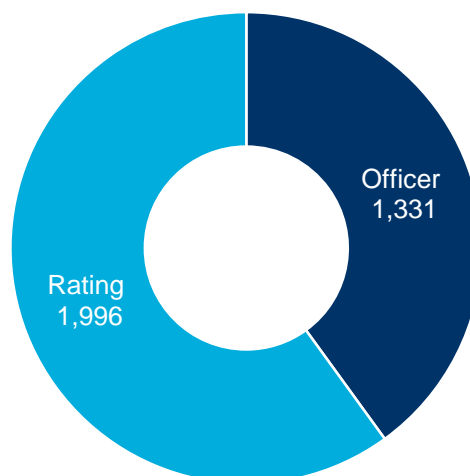


Source: Oxford Economics analysis of information provided by Mare Nostrum members

Fig. 10, below, shows the split of roles at sea between officers and ratings. Officers accounted for an estimated 40 percent of roles at sea, and ratings 60 percent. This suggests that the Croatian fleet has a slightly larger share of ratings than the global average: the most recent Baltic and International Maritime Council (BIMCO) manpower report estimated that officers accounted for 51 percent of global seafarer demand in 2015, and ratings accounted for 49 percent.¹¹

¹¹ BIMCO and International Chamber of Shipping, "Manpower report: the global supply and demand for seafarers in 2015" (Executive summary, 2016), 6.

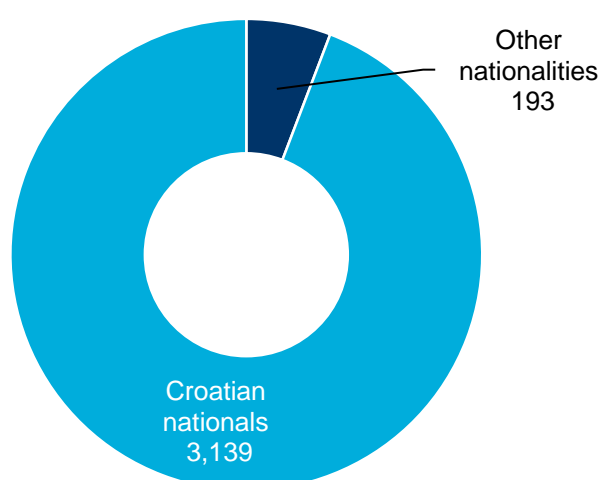
Fig. 10. **Employment at sea split by officers and ratings, 2016**



Source: Oxford Economics analysis of information provided by Mare Nostrum members

Due to the international nature of the shipping industry ships often employ crew members from a wide range of nationalities. However, data provided by Mare Nostrum members and presented in Fig. 11 suggest this is not the case within the Croatian operated fleet. More than 3,100 roles were filled by Croatian nationals in 2016, equivalent to 94 percent of employment at sea in 2016. A key driver behind this high ratio was the large proportion of employment sustained on ferry and catamaran vessels in 2016. Employees on these vessels were all Croatian nationals, reflecting that crew members on this type of ship are likely to return home on shore at the end of shift, rather than spend extended periods at sea.

Fig. 11. **Employment at sea by nationality, 2016**



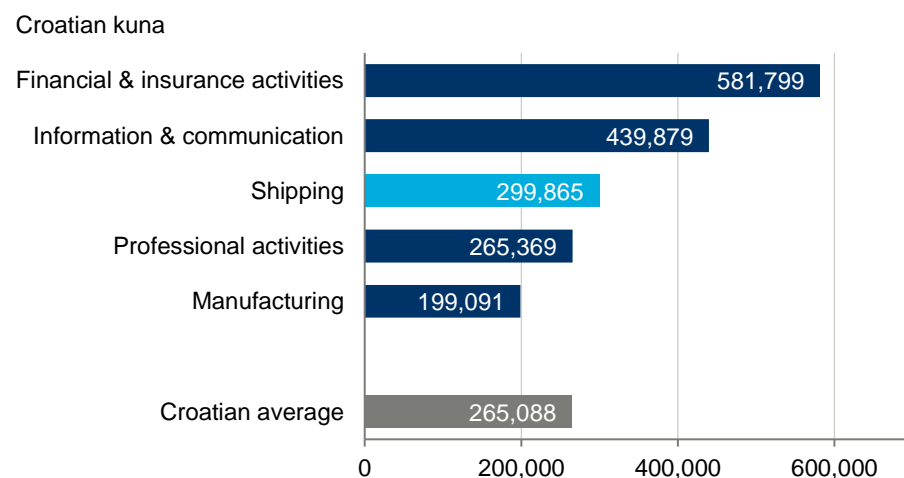
Source: Oxford Economics analysis of information provided by Mare Nostrum members

The employment estimates above include employees working onshore in Croatia, and seafarers onboard vessels which are part of the Croatian operated fleet. However, a large number of Croatian seafarers are employed onboard vessels which are part of other nations' operated fleets. The Ministry has indicated that in 2016 there were a total of 15,663 active Croatian seafarers in international navigation. The majority of these seafarers worked onboard vessels which were not part of the Croatian operated fleet. It is beyond the scope of this study to assess the economic contribution of these seafarers.

2.4 PRODUCTIVITY OF THE CROATIAN SHIPPING INDUSTRY

Combining the results for the shipping industry's direct contribution to employment and GDP suggests productivity levels are relatively high within the Croatian shipping industry: each worker generated an average of almost HRK 300,000 of gross value added in 2016 (Fig. 12). This compares to an average figure for Croatia of HRK 265,000 across all industries. This means that workers in the shipping industry are, on average, 13 percent more productive than the Croatian average. They are also 13 percent more productive than those in professional activities, such as legal, advertising and architectural activities, and 50 percent more productive than those in manufacturing.

Fig. 12. Labour productivity in Croatian shipping and comparator industries, HRK per employee, 2016



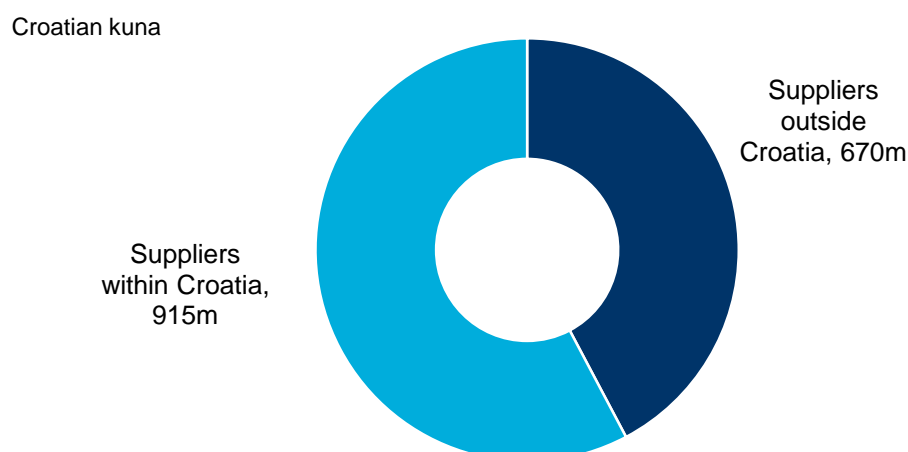
Source: Oxford Economics

3. THE INDIRECT IMPACT OF THE CROATIAN SHIPPING INDUSTRY

3.1 INDIRECT CONTRIBUTION TO GDP

As well as the employment and GDP it supports itself, the shipping industry supports further activity through its purchases from Croatian suppliers. Based on information from the survey of Mare Nostrum members, we estimate that Croatian shipping companies purchased HRK 1,585 million of goods and services in 2016. Just over HRK 900 million of this was spent with Croatian suppliers, as shown in Fig. 13.¹²

Fig. 13. **Estimated supply chain expenditure by Croatian shipping companies, 2016**



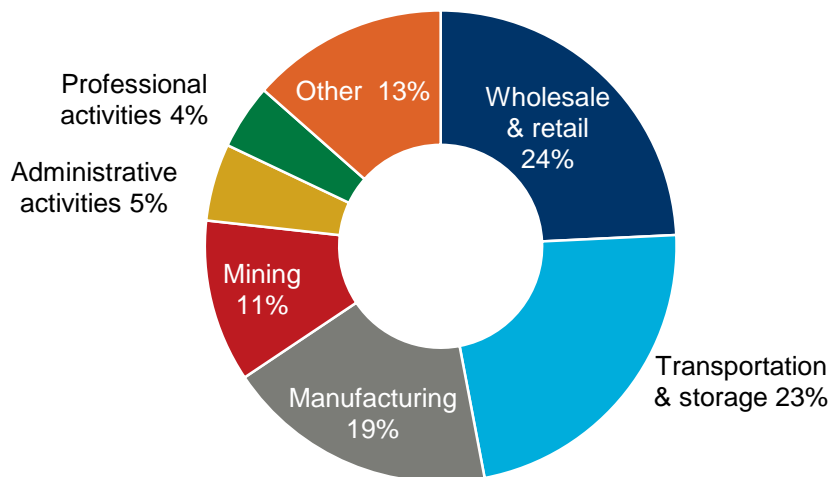
Source: Oxford Economics

We have estimated the impact of supply chain spending with Croatian suppliers using 'input-output' tables, which map the purchases of each sector from other sectors of the economy, and enable us to estimate the associated contribution to GDP of these purchases.

Overall, we estimate that the indirect, or supply chain, gross value added contribution to GDP of the Croatian shipping industry in 2016 was HRK 546 million. Fig. 14 shows the sectors within which this activity occurred. More than three-quarters was within four broad sector groups: wholesale and retail, transport and storage, manufacturing and mining.

¹² Mare Nostrum members provided data on the value of their supply chain spending with suppliers inside and outside of Croatia in 2016. To estimate the supply chain spending of non-Mare Nostrum members we assumed that the average procurement spending to GDP ratio for each type of vessel was in line with the average reported by Mare Nostrum members for the same type of vessel.

Fig. 14. **Sectoral share of the indirect GDP contribution of the Croatian shipping industry, 2016**

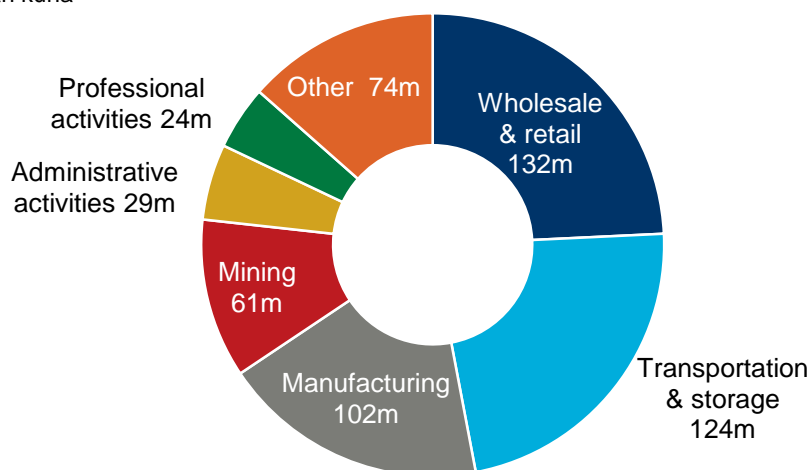


Source: Oxford Economics

Fig. 15 presents the same information in terms of the value of activity supported. It shows that the Croatian shipping industry indirectly supported over HRK 100 million of value added in each of the wholesale and retail, transport and storage and manufacturing sectors.

Fig. 15. **The indirect GDP contribution of the Croatian shipping industry by sector, 2016**

Croatian kuna

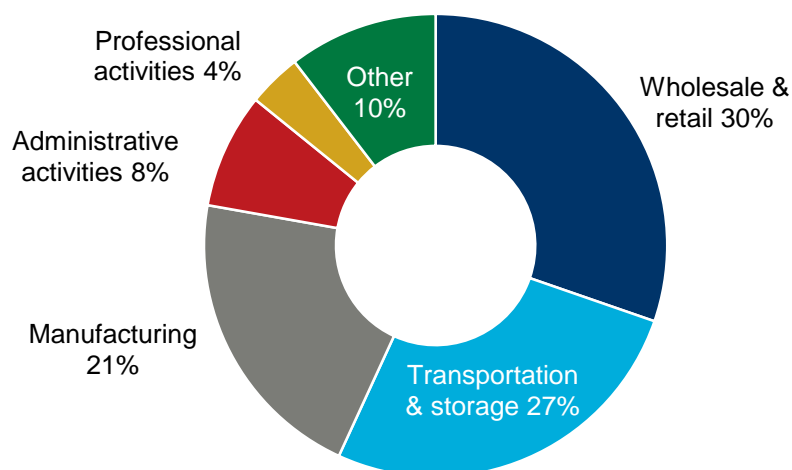


Source: Oxford Economics

3.2 INDIRECT CONTRIBUTION TO EMPLOYMENT

Once the indirect impacts have been estimated in GDP terms, data on productivity in each sector can be used to estimate the number of jobs supported in the supply chain. We estimate that the indirect employment contribution of the Croatian shipping industry was equivalent to around 2,500 jobs across Croatia in 2016. Fig. 16 shows that more than three-quarters of this employment fell within three sectors: wholesale and retail, transport and storage, and manufacturing. Although mining was a key contributor to the shipping industry's indirect GDP contribution, it does not play a large role in employment terms, reflecting that mining is a highly productive sector and requires relatively few employees to produce a given value of output.

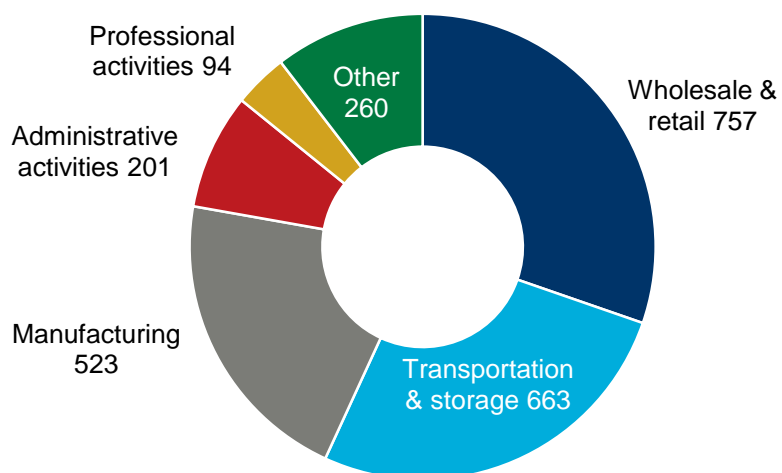
Fig. 16. **Sectoral share of the indirect employment contribution of the Croatian shipping industry, 2016**



Source: Oxford Economics

Fig. 17 shows that, in absolute terms, the Croatian shipping industry indirectly supported 760 employees in the wholesale and retail sector, 660 in the transport and storage sector and over 520 in manufacturing.

Fig. 17. The indirect employment contribution of the Croatian shipping industry by sector, 2016



Source: Oxford Economics

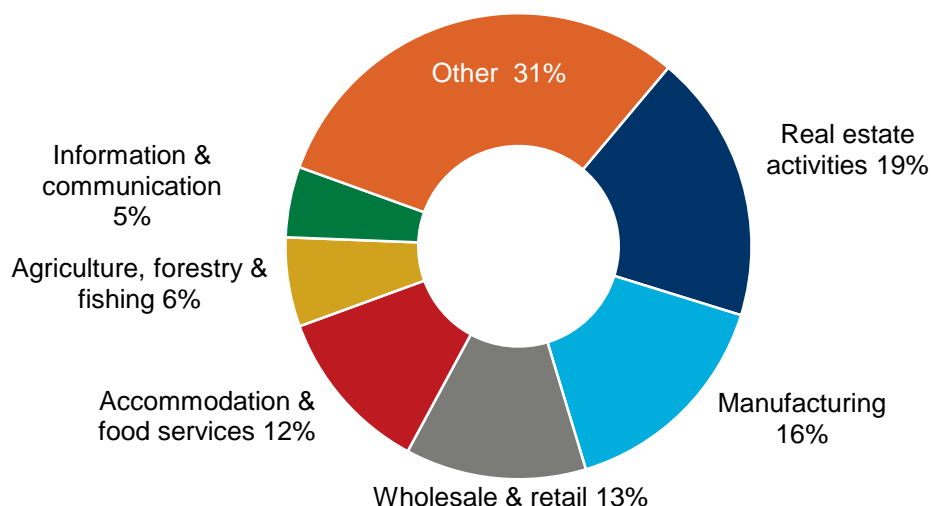
4. THE INDUCED IMPACT OF THE CROATIAN SHIPPING INDUSTRY

4.1 INDUCED CONTRIBUTION TO GDP

Induced impacts accrue as workers employed in the shipping industry, or its supply chain, spend their wages within the Croatian economy. The impacts are mainly felt in sectors serving households such as hotels, restaurants and shops. Again using the input-output model, we can estimate the value of wages associated with the direct and indirect contribution to GDP. We can then estimate the value of consumer spending supported by those wages, and the induced contribution to GDP associated with this expenditure.¹³

The induced gross value added contribution to GDP of the Croatian shipping industry is estimated to have been HRK 851 million in 2016. Fig. 18 shows the distribution of this impact across sectors of the Croatian economy. Perhaps unsurprisingly, the sectors where the induced impact was felt most heavily are those where households spend the majority of their income, and include: real estate activities, manufactured goods, wholesale and retail and accommodation and food services.

Fig. 18. **Sectoral share of the induced GDP contribution of the Croatian shipping industry, 2016**

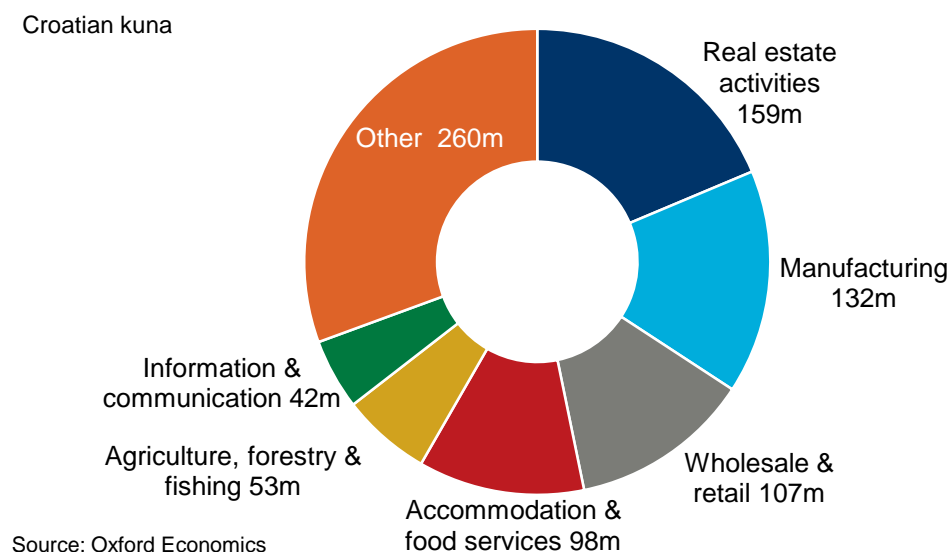


Source: Oxford Economics

Fig. 19 presents the same information in terms of the value of GDP contribution supported in each sector. It shows that the shipping sector's induced gross value added contribution to GDP was greater than HRK 100 million in each of the real estate, manufacturing and wholesale and retail sectors.

¹³ We have assumed that only the Croatian nationals employed in the shipping industry will spend their wages within the Croatian economy. Non-Croatian nationals are assumed to spend their wages in their country of origin.

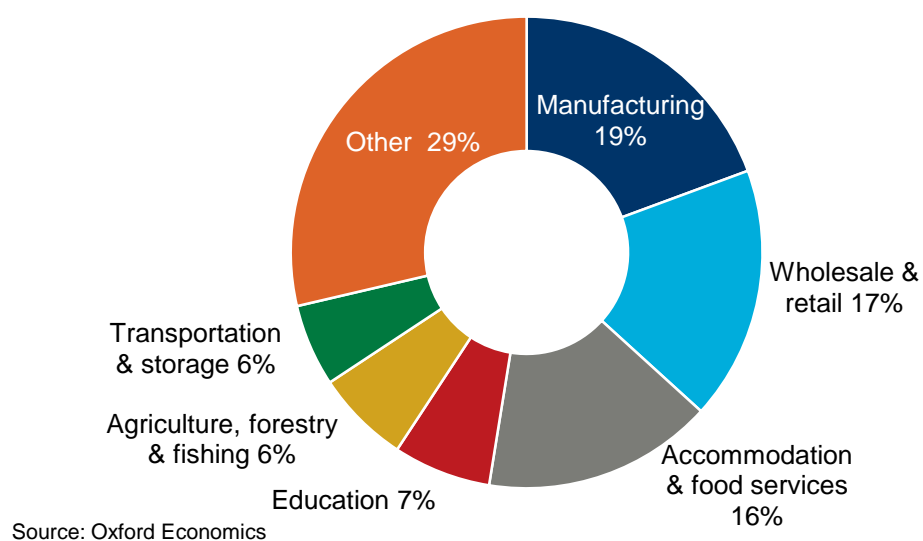
Fig. 19. The induced GDP contribution of the Croatian shipping industry by sector, 2016



4.2 INDUCED CONTRIBUTION TO EMPLOYMENT

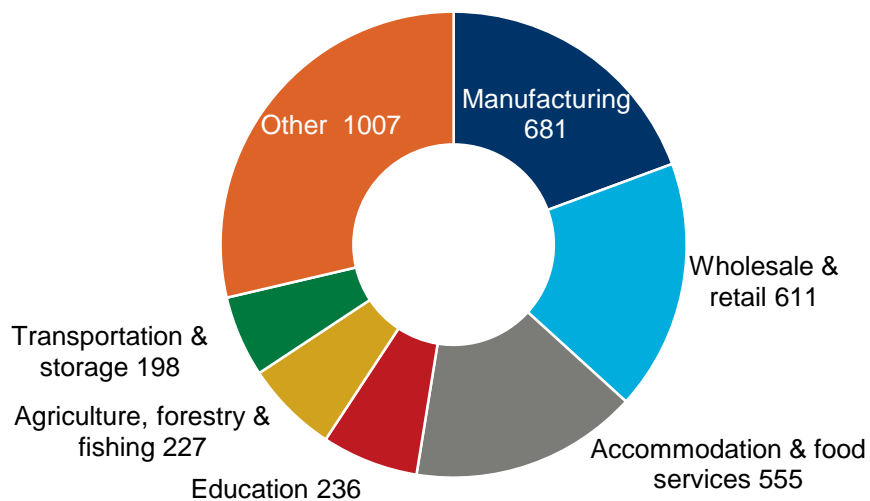
As with the indirect impacts, once the induced impacts have been estimated in GDP terms, productivity data can be used to estimate the number of jobs supported in each sector. On this basis we estimate that 3,500 jobs were supported across Croatia in 2016 as a result of the induced impact of the shipping industry. The proportion of these induced jobs falling within each sector is shown in Fig. 20.

Fig. 20. Sectoral share of the induced employment contribution of the Croatian shipping industry, 2016



The shipping sector's induced impact supported 680 jobs in the manufacturing sector, 610 jobs in the wholesale and retail sector and 550 jobs in the accommodation and food sector (Fig. 21).

Fig. 21. The induced employment contribution of the Croatian shipping industry by sector, 2016



Source: Oxford Economics

As noted in section 2.3, our analysis excludes the impact of Croatian seafarers working onboard vessels which do not fall within the Croatian operated fleet. Nonetheless, the Ministry has noted that these seafarers are resident in Croatia and are therefore likely to spend a large proportion of their wages within the Croatian economy. This will in turn support GDP and employment which is not reflected in the estimates above.

5. CONCLUSION: THE TOTAL ECONOMIC IMPACT OF THE CROATIAN SHIPPING INDUSTRY

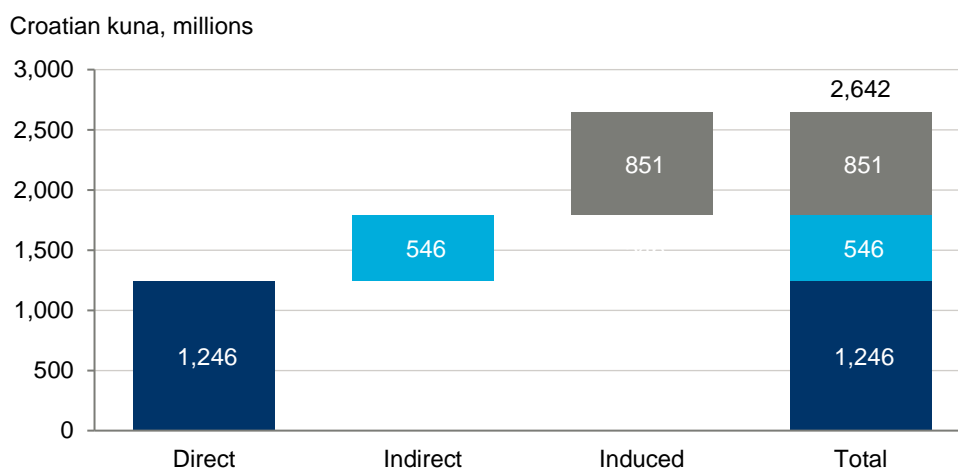
5.1 TOTAL CONTRIBUTION TO GDP

Adding together the direct, indirect and induced impacts described above gives the total economic contribution of the Croatian shipping industry.

The total gross value added contribution to GDP of the Croatian shipping industry is estimated to have been HRK 2.6 billion in 2016. This is equivalent to one per cent of Croatian GDP.

For every HRK 1 million the Croatian shipping industry contributes to GDP itself, it creates another HRK 1.1 million elsewhere in the Croatian economy. This means that industry's GDP multiplier is 2.1.¹⁴

Fig. 22. The total GDP contribution of the Croatian shipping industry, 2016



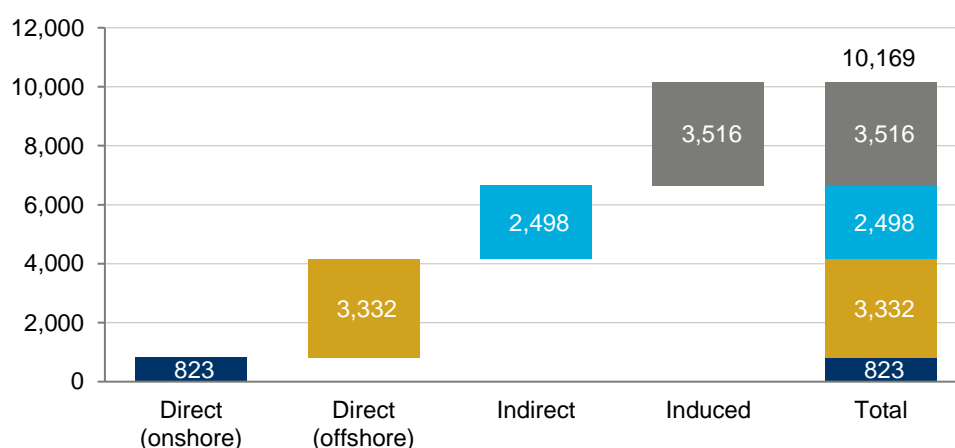
Source: Oxford Economics

¹⁴ The multiplier is calculated as: $(\text{Direct GDP} + \text{Indirect GDP} + \text{Induced GDP}) / \text{Direct GDP}$

5.2 TOTAL CONTRIBUTION TO EMPLOYMENT

Following a similar approach, the Croatian shipping industry is estimated to have supported a total of 10,200 jobs in 2016, either directly through its own activities, or through its supply chain or the induced expenditure of workers. For every direct job within the industry, another 1.4 are supported elsewhere in the Croatian economy. This means the shipping industry's employment multiplier is 2.4.

Fig. 23. The total employment contribution of the Croatian shipping industry, 2016



Source: Oxford Economics

6. APPENDIX: METHODOLOGY

SURVEY OF MARE NOSTRUM MEMBERS

Oxford Economics designed a short survey questionnaire to gather financial information from Croatian shipping companies. Mare Nostrum distributed the questionnaire to its members during Autumn 2017. A total of nine companies were invited to participate and eight responses were received.

DIRECT IMPACT

Data sources for key metrics in analysis of direct impacts

Company name	Metrics		
	Croatian operated merchant fleet	Direct contribution to GDP	Direct employment
Atlantska Plovidba.	Data provided by Mare Nostrum	Based on profit and wage information provided by company in response to survey of Mare Nostrum members	Employment data provided by company in response to survey of Mare Nostrum members
Brodospas d.d.			
Jadranski Pomorski Servis d.d.			
Jadrolinija			
Jadroplov			
Tankerska Next Generation d.d.			
Tankerska Plovidba d.d.			
Uljanik Plovidba			
G&V Line d.o.o.	Data provided by Coastal Maritime Traffic Agency	GDP per worker assumed to be in line with the average reported by Mare Nostrum members	Employment at sea provided by Coastal Maritime Traffic Agency. Onshore employment estimated by uplifting the values of employment at sea, using the average for Mare Nostrum members
G&V Line Iadera d.o.o.			
Kapetan Luka			
Linijska Nacionalna Plovidba d.d.			
Dinamarin	Data sourced from website: http://www.dinamarin.hr/index.html		Employment was estimated by calculating an average total employment per ship ratio from the information provided by Mare Nostrum members and applying it to the number of vessels operated by the company
Rapska Plovidba d.d.	Data provided by Mare Nostrum		

INDIRECT IMPACT

We define the indirect impact to include the economic activity supported within Croatia as a result of the Croatian shipping industry's purchases of goods and services from Croatian suppliers.

The size (in total cost terms) of the sector's supply chain was estimated using procurement data gathered from the survey of Mare Nostrum members. The sectors where the shipping

companies made their purchases and the value these purchases created in the economy was estimated using our bespoke input-output model.¹⁵

The modelling for this study was based on Croatian input-output tables published by the Croatian Bureau of Statistics.¹⁶ They set out the goods and services that Croatian industries purchase from one another in order to produce their output (as well as their purchases from abroad). These tables also provide detail on the spending patterns of Croatian households, and indicate whether this demand is met by Croatian production, or imported products. In essence, the tables show who buys what from whom. Using details of these linkages from the input-output tables, Oxford Economics constructed a bespoke Croatian impact model, which traces the supply chain impacts attributable to the shipping industry.

Oxford Economics' impact model quantifies all rounds of subsequent purchases along the supply chain. These transactions are translated into GDP contributions, using Croatia-specific ratios of value-added to gross output, sourced from the Croatian input-output table.

INDUCED IMPACT

The induced impact is modelled using a similar method to the indirect impact. Using employment and wage data calculated as part of the direct impact, Oxford Economics used household spending data to model the typical consumption patterns of Croatian households, making an allowance for 'leakages' in the form of imports and savings.

For workers within the shipping industry's supply chain, we used industry-specific ratios of employee compensation per unit of output to estimate the value of household wages supported among the suppliers' workers.

Both of these spending streams were then fed into our input-output model, to calculate the total impact of this spending on GDP.

¹⁵ Our modelling assumes that the companies that comprise Croatia's operated fleet are not part of each other's supply chains. This is a necessary simplifying assumption given the information available to the study team, but could be further explored in future through a more detailed survey of procurement patterns.

¹⁶ Croatian Bureau of Statistics, "Input-output table for 2010 and supply and use tables for 2010 ", in https://www.dzs.hr/default_e.htm <https://www.dzs.hr/Hrv_Eng/publication/2015/12-01-04_01_2015.htm > [accessed November 2017]



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