

OXFORD ECONOMICS

The economic impact of the UK Maritime Services Sector in Scotland

A report for Maritime UK
January 2013



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1 Executive summary

The Scottish maritime services sector has a significant economic impact...

...it directly employed 41,600 workers in Scotland...

- In 2011, the maritime services sector employed an estimated 41,600 people in Scotland. Nearly two-thirds of these were in the ports industry, with the majority of the remainder employed by the shipping industry.
- Approximately one in every four people employed by the maritime services sector in the UK was based in Scotland in 2011. As such, there were nearly twice as many people employed in Scotland than in any of the UK's other countries or regions.

...contributed £2.2 billion to Scottish GDP...

- It is estimated that the maritime services sector contributed over £2.2 billion to the Scottish economy in 2011, accounting for an estimated 2.0% of the country's total economic output.
- The maritime services sector in Scotland is highly productive. The average level of productivity in the sector (in terms of GVA per person employed) was over £53,500 in 2011, around 10% higher than the UK economy-wide average and as much as 25% higher than the Scottish whole economy average.

...and generated £651 million in tax revenue for the Exchequer ...

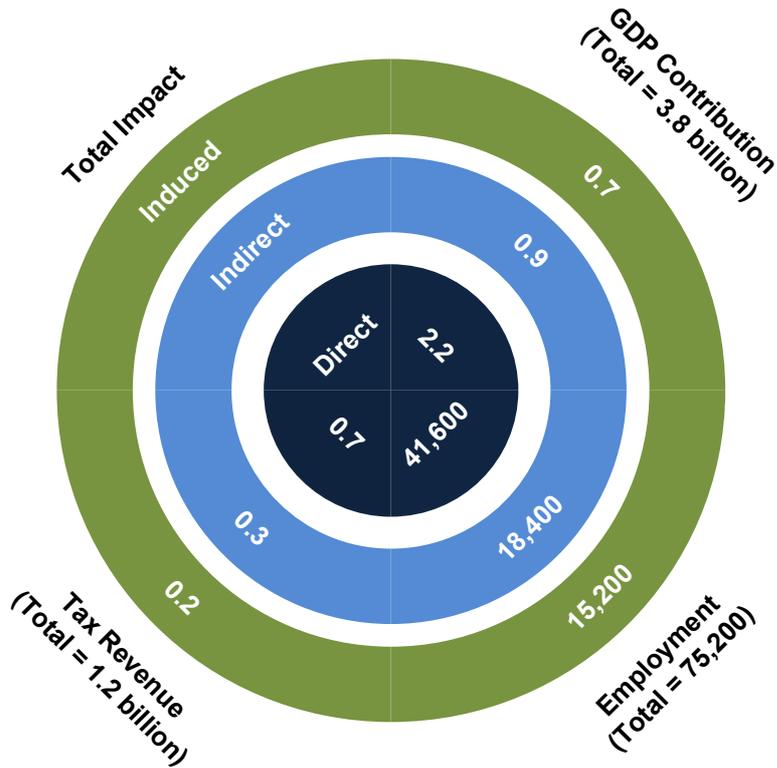
- These activities are estimated to have generated over £651 million in tax revenue for the government, through a combination of corporation tax on company profits, employee income and NICs, and other indirect taxes such as VAT and council tax.

...whilst generating considerable multiplier impacts

- Through the procurement of inputs of goods and services from Scottish-based suppliers, the maritime services sector supported a further £890 million in GVA and 18,400 people in employment.
- In addition, people employed by the maritime services sector and its suppliers will spend their wages on consumer goods and services produced by Scottish firms. This activity supported an additional £730 million of GVA and 15,200 jobs in the Scottish economy in 2011.
- Including the direct, indirect and induced impacts, the maritime services sector in Scotland is estimated to have supported over 75,200 jobs, contributed £3.8 billion to the country's economy and generated tax revenues of £1.2 billion in the process.

The full economic impact of the maritime services sector on Scotland, in terms of employment, GDP contribution and tax revenue generated, through each channel of impact, is summarised in Figure 1.1.

Figure 1.1: Summary of the economic contribution of the Scottish maritime services sector in 2011



2 Introduction

This report, prepared by Oxford Economics, evaluates the economic contribution of the UK maritime services sector in Scotland in 2011. Here the 'maritime services sector' refers to the combination of the ports, shipping and maritime business services industries. This study was done in conjunction with separate economic impact assessments of the ports, shipping and maritime business services sectors on both the UK as a whole and its countries and regions¹.

2.1 The channels of economic impact

A standard economic impact analysis investigates three channels of impact. These are:

- **Direct impact** – employment and economic activity in the UK maritime services sector itself, including the ports, shipping and maritime business services sectors.
- **Indirect impact** – employment, contribution to GDP and tax receipts supported down the supply chain as a result of UK maritime companies purchasing inputs of goods and services from Scottish suppliers. This includes, for example, jobs supported through the demand for iron and steel and other raw materials; communications; and a wide variety of activity in the business services sector (accountancy, IT etc).
- **Induced impact** – employment, contribution to GDP and tax receipts supported by those directly and indirectly employed in the UK maritime services sector, spending their wages on goods and services produced by Scottish firms. This helps to support jobs in the industries that supply these purchases, and includes jobs in retail outlets, companies producing consumer goods and in a range of service industries.

When dealing with a single firm/sector the total economic impact of its activities would be defined simply as the sum of these three individual effects. However, due to the interconnections between the three industries under consideration it is important that adjustments are made to avoid the possibility of 'double counting'. This issue is explored in more depth in the Appendix².

2.2 Report structure

The rest of this report is structured as follows:

- **Chapter 3** focuses on the direct impact of the maritime services sector on the Scottish economy in terms of its contribution to GDP, employment and tax revenue generated for the government.

¹ Oxford Economics (2012), 'The economic impact of the maritime services sector: Shipping', 'The economic impact of the maritime services sector: Ports', and 'The economic impact of the maritime services sector: Business Services'. December.

² All figures presented in this study include adjustments made to account for double counting

- **Chapter 4** discusses the wider multiplier impacts of the maritime services sector, through the indirect and induced channels of impact.
- **Chapter 5** provides some concluding remarks.
- **The Appendix** provides a detail methodology behind the estimates of the impact of the maritime services sector.

3 Direct impact – employment and GDP contribution

This chapter details the employment, contribution to GDP and tax revenue created by the maritime services sector in the Scottish economy in 2011. The maritime services sector is defined as the combination of the ports, shipping and maritime business services industries.

KEY POINTS

- In 2011, the maritime services sector in Scotland directly employed **41,600 people**, primarily in the ports and shipping industries. This is equivalent to 1.6% of total employment in the country. There were **nearly twice as many people employed in the maritime services sector in Scotland** than any other country or region in the UK.
- The maritime services sector contributed **over £2.2 billion in GVA to the Scottish economy** in 2011. This was larger than the contribution to the Scottish economy of civil engineering and the land transport sector.
- This activity generated **over £651 million in tax revenue** for the Exchequer, through a combination of corporation taxes on company profits, employee income taxes, NICs and other indirect taxes.

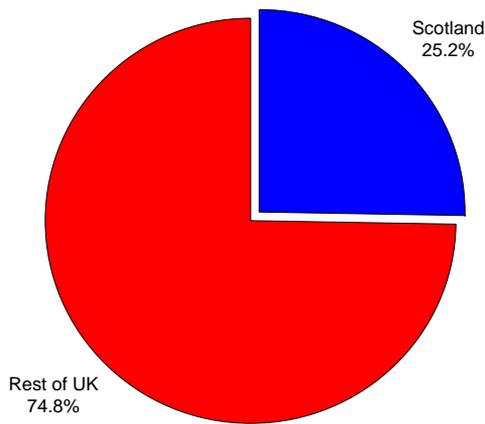
3.1 Direct impact on employment

In 2011, an estimated 41,600 people were employed in the maritime services sector in Scotland. Of these, nearly two-thirds were employed in the ports industry (27,300), with the majority of the remainder employed in shipping (14,300)³. Scotland was the largest of the UK's countries and regions in terms of employment, with approximately one in every four people directly employed by the maritime services sector in the UK in 2011 based in the country (Chart 3.1). Indeed, there were nearly twice as many jobs based in Scotland than any other country or region in the UK. In terms of the sectors relative contribution to the local economy, Scotland is again the highest ranked of the UK's countries and regions. In 2011, the maritime services sector accounted for 1.6% of total employment in the country. By comparison, the same figure was 1.4% in Northern Ireland and just 0.4% in both Wales and England. For the UK as a whole, the maritime services sector represented 0.5% of total employment⁴.

³ In absence of more reliable data, employment in industries such as the provision of Legal services has been attributed according to the location of the head office. Discussions with Maritime UK suggest that there is a large community of maritime lawyers operating in law firms with offices in Scotland. As such, it has not been possible to account for this level of geographical disaggregation.

⁴ UK-based employees only, excluding the impact of foreign seafarers.

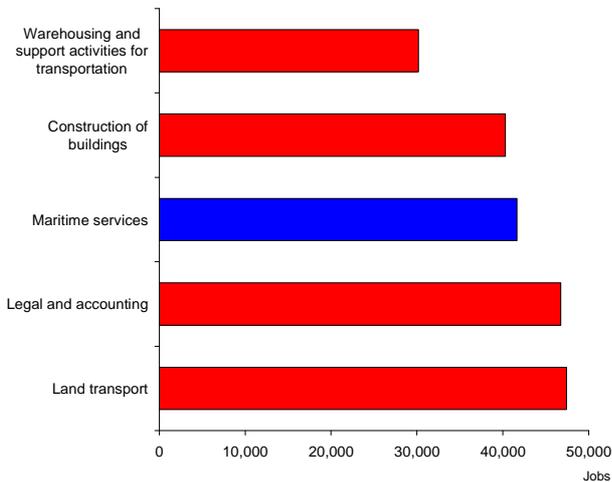
Chart 3.1: Share of UK employment in the maritime services sector in 2011



Source : Oxford Economics

To place these results in context it is useful to compare the figures to employment levels in other industries in Scotland⁵. This shows that the maritime services sector was a larger employer than in the construction of buildings and in warehousing and support activities for transportation (including the operation of storage facilities for water, air and land transport activities, the operation of passenger and freight terminals and facilities and cargo handling). The sector employs slightly fewer people than the legal and accounting profession and land transport activities (including transport via pipelines) (Chart 3.2).

Chart 3.2: Comparison of employment with other industries in Scotland in 2011



Source : ONS, Oxford Economics

⁵ Data on the size of employment in other industries is sourced from the ONS' Business Register and Employment Survey, 2011.

3.2 Contribution to GDP

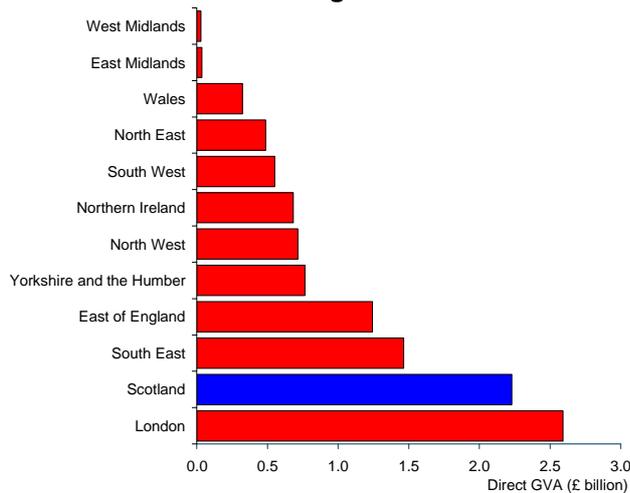
Gross Domestic Product (GDP) is the main measure of the level of economic activity in a region or country in a given time period. It is the indicator used by economists to determine the rate of growth of the economy and when it enters recession. It is estimated using the 'output approach' which measures the sum of the Gross Value Added (GVA) created through the production of goods and services within the economy⁶. GVA is most simply thought of as the difference between an industry's total pre-tax revenues and total brought-in costs (i.e. costs excluding wages and salaries) adjusted for any changes in stocks. An alternative method of calculating GVA is the sum of profits and wages (before tax) generated from a sector's economic activity, known as the 'income approach'. The output and income approaches should produce the same results.

Oxford Economics estimate that in 2011 the maritime services sector generated an estimated £2.2 billion in GVA for the Scottish economy. As expected, this impact was primarily composed of the impacts of the ports industry (£1.7 billion) and the shipping industry (£500 million). Maritime business services were estimated to contribute less than £5 million to GDP. In terms of the contribution of the maritime services sector in the UK's countries and regions, only London had a larger GDP contribution in absolute terms in 2011, with Scotland accounting for approximately 20% of the total UK-wide contribution to GDP (Chart 3.3). The strength of the Scottish maritime sector is particularly apparent in the Shipbuilding industry, where Scotland accounts for around 40% of total UK output and over one-third of the sector's contribution to GDP⁷. By way of comparison, Scotland accounted for approximately 9.1% of manufacturing output and 8.2% of total UK output in 2011 (in terms of GVA).

⁶ It is only true to an approximation that the sum of GVA equals GDP. The difference in each case, however, is small enough to proceed as if the equalities do in fact hold. GVA differs from Gross Domestic Product (GDP) in the price used to value goods and services. GVA is measured at producer prices that reflect the price at the 'factory gate' together with cost of distribution. GDP is measured at market prices that reflect the price paid by the consumer. The two prices differ by the taxes less subsidies levied on the goods or services.

⁷ Based on 'Scottish Annual Business Statistics, 2010', a national statistics publication for Scotland (available at <http://www.scotland.gov.uk/Resource/0040/00402047.pdf>). Elements of the shipbuilding sector will be included within the total estimate for the ports industry in so far as the activities are located on-site at Scottish ports.

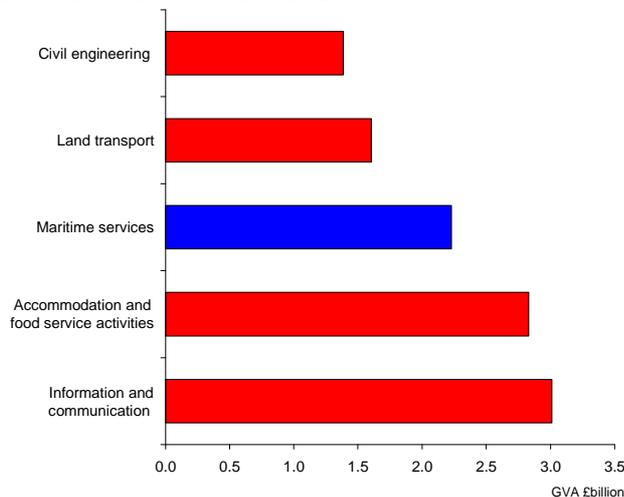
Chart 3.3: GDP contribution of maritime services in the UK's countries and regions in 2011



Source : Oxford Economics

Again, in order to provide context, it is useful to compare these results with the value-added contribution of other industries in Scotland⁸. This indicates that the maritime services sector's contribution to Scottish GDP was larger than both the activities of civil engineering and the land transport sector. Meanwhile, the sector GVA was approximately 25% less than in accommodation and food service activities and two-thirds that of the information and communications industry (Chart 3.4).

Chart 3.4: Comparison of GVA with other industries in Scotland in 2011



Source : ONS, Oxford Economics

Combining the estimates for the contribution to GDP and employment suggests that the maritime services sector in Scotland is highly productive, with each employee generating on average of approximately £53,500 in GVA in 2011. This is over 10% higher than the UK economy-wide average of £48,400 and over 25% higher than the Scottish average (£42,300).

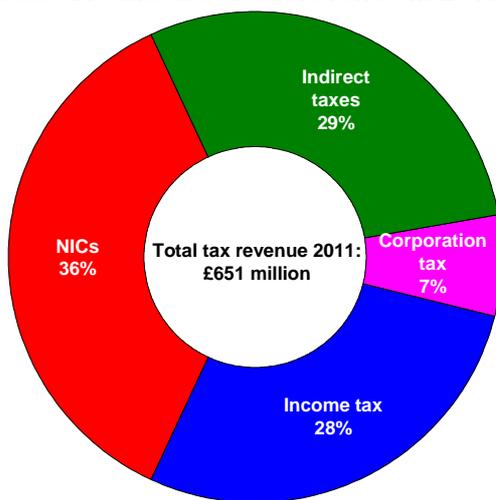
⁸ Data on the size of other industries contribution to Scottish GDP is sourced from the ONS' (2010), 'Annual Business Survey', July 2012, representing the latest available data at a regional level.

3.3 Revenue generated for the Exchequer

A further benefit from the maritime services sector in Scotland is that it contributes towards the tax revenue collected by the UK Exchequer. Oxford Economics have calculated the sectors tax contribution in terms of corporation tax paid by companies, National Insurance Contributions (NICs) of both employers and employees, income tax levied on employee earnings and other indirect tax contributions generated through the spending of those directly employed by the sector (including VAT and council tax on any domestic property they may own or rent).

The results indicate that the maritime services sector in Scotland generated approximately £651 million for the government in 2011. The highest component was that of NICs, which at nearly £235 million; accounted for over one-third of the total tax contribution in 2011 (Chart 3.5). Contributions through indirect taxes and employee income tax followed, amounting to an estimated £191 million and £182 million respectively. Meanwhile, corporation taxes on industry profits were an estimated £43 million. In total, nearly one in every four pounds in tax revenue generated by the maritime services sector in the UK originated from individuals and companies in Scotland.

Chart 3.5: Breakdown of tax revenue in 2011



Source : ONS, HMRC, Oxford Economics

4 Multiplier effects – indirect and induced effects

As well as the direct contribution of the maritime services sector to the Scottish economy, there are indirect impacts on employment and output via the supply chain, and induced impacts from those directly and indirectly employed by the industry using their wages to buy consumer goods and services. This not only includes the impact of the activity of Scottish firms and individuals within the maritime services sector, but also of those firms and individuals located outside the country. For example, a shipping firm based in Yorkshire and the Humber may source inputs from a Scottish supplier as part of their production process. As such, the impact of this demand on GDP and employment in Scotland will be included within the figures presented. The remainder of this chapter will summarise the key findings focusing on the same three metrics: employment, contribution to GDP and tax receipts.

KEY POINTS

- It is estimated that **18,400 jobs** are supported in Scotland indirectly via the supply chain activity based in the country, with a further **15,200 jobs** supported through the induced spending of both direct and indirect employees. Therefore, it is estimated that the maritime services sector supported a **total of 75,200 Scottish jobs in 2011**, equivalent to 1 in every 35 people employed in the country.
- In terms of the multiplier effects on GDP, estimates suggest that the UK maritime services sector supported **£890 million** through its Scottish based supply chain, while an additional **£728 million** was generated through the expenditure of direct and indirect employees on consumer goods and services produced in Scotland. This implies that the total **economic impact on GDP in Scotland was an estimated £3.8 billion in 2011**.
- Additional tax revenue amounting to nearly £521 million was generated through these multiplier impacts (through the indirect and induced channels of impact), resulting in a **total tax contribution of an estimated £1.2 billion in 2011**.

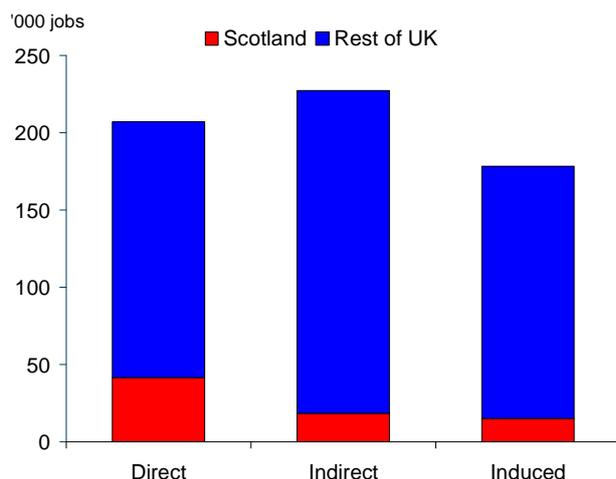
4.1 Indirect and induced impact on Scottish employment

In 2011 an estimated 18,400 jobs in Scotland were supported by the UK maritime services sector through the purchases of goods and services from local suppliers. In addition, a further 15,200 jobs were supported in Scotland through the induced spending of both the direct employees and those employed in the sectors supply chain. Therefore in total, the maritime services sector in Scotland supported over 75,200 jobs in 2011 or 2.9% of the country's employment (equivalent to 1 in every 35 jobs in Scotland). This relative contribution to employment was larger than any other country or region in the UK, highlighting the significant contribution of maritime services to the Scottish economy. To put this number into some context, it is approximately equal to the population for the Inverclyde Council Area in 2011⁹.

⁹ National Records of Scotland 2011

In total, Scotland accounted for 14% of total employment supported by the maritime services sector in 2011, despite accounting for a quarter of all direct jobs. This relationship is illustrated in Chart 4.1, indicating how Scotland accounts for a greater share of employment through the direct channel of impact than through the indirect and induced channels. As such, there are a large number of jobs supported through supply chain activity in regions such as London and the South East of England. Despite this, only in London did the maritime services sector support more jobs than Scotland did in 2011.

Chart 4.1: Total employment breakdown of the maritime services sector in 2011

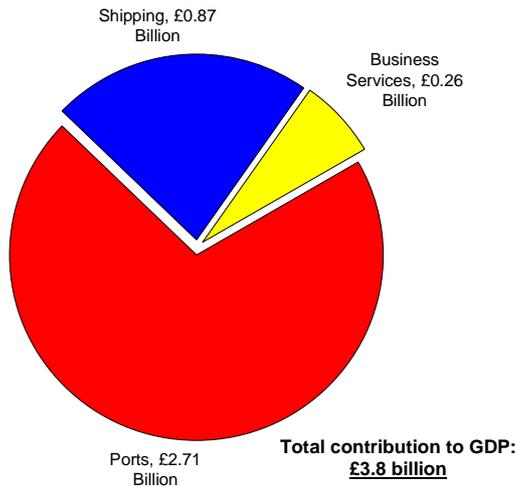


Source : Oxford Economics

4.2 Indirect and induced impact on GDP in Scotland

In terms of the multiplier effects on GVA, estimates indicate that the activity of the UK maritime services sector generated an additional £890 million of GVA indirectly in Scotland via the supply chain, with a further £728 million generated in the country by the spending of those employed directly and indirectly as a result of the sector's activity. This implies that in total, the maritime services sector supported an estimated £3.8 billion of GVA in Scotland, equivalent to 3.5% of the country's total economic output in 2011. In terms of the breakdown of this total impact, the ports industry accounted for approximately 70% of the impact, supporting over £2.7 billion in 2011. This was followed by the shipping industry, supporting a total impact of £0.9 billion in 2011, with business services accounting for the remaining £260 million (Chart 4.2).

Chart 4.2: Total contribution to Scottish GDP of the maritime services sector in 2011

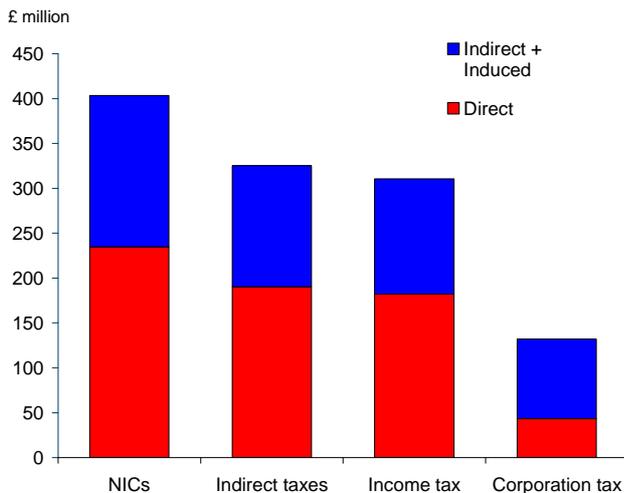


Source : Oxford Economics

4.3 Indirect and induced impact tax revenues

A further benefit of these indirect and induced impacts is that they generate additional tax revenue for the UK Exchequer. The results indicate that in 2011, the maritime services sector supported a further £521 million in tax receipts through the indirect and induced channels of impact. Including the direct impact, it is therefore estimated that the sector contributed nearly £1.2 billion in tax revenue to the government, equivalent to 14% of the total tax revenue generated by the UK maritime services sector. Chart 4.3 illustrates the breakdown of tax receipts by the type of tax and channel of impact.

Chart 4.3: Summary of tax revenue generated by the maritime services sector in 2011



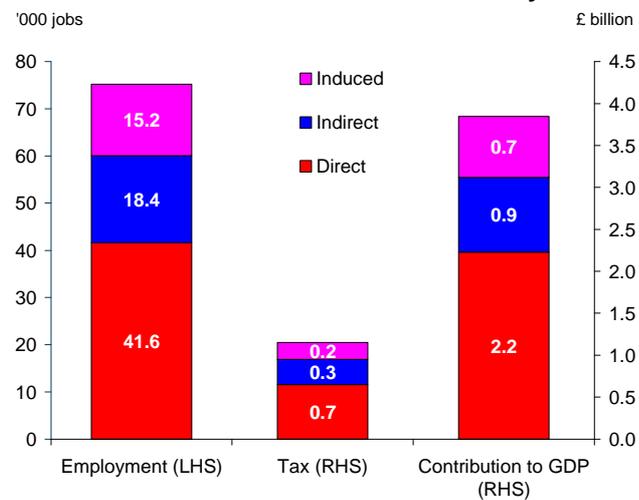
Source : Oxford Economics

5 Conclusion

This report has evaluated the economic impact of the maritime services sector, including the contribution of the ports, shipping and maritime business services industries, on the economy of Scotland. Results are presented in terms of three standard metrics (employment, contribution to GDP and tax revenue generated for the Exchequer). In 2011, the maritime services sector:

- contributed £3.8 billion to Scottish GDP;
- supported over 75,200 jobs in the country; and
- generated nearly £1.2 billion in tax revenue for the Exchequer.

Chart 5.1: Summary of the total economic impact of the Scottish maritime services industry in 2011



Source : Baltic Exchange, Nautilus International, UK Chamber of Shipping, ONS, HMRC, Oxford Economics

6 Appendix – Methodology

This chapter details the methodology behind the results presented in the preceding chapters.

6.1 The Ports Industry

The ports industry is defined to include a range of activities such as warehousing and storage, transport services and shipbuilding and repair, undertaken in the vicinity of the location of ports. Using the ONS Business Register and Employment Survey (BRES), Oxford Economics have selected SIC codes that reflect the type of activities that occur in ports¹⁰. This was mapped to wards containing ports as shown by maps on the websites of major port groups and in hard copy. From this, an estimate was derived for the employment at four major Scottish ports: Forth, Clyde, Sullom Voe and Orkney, together accounting for nearly 70% of port freight traffic (by tonnage) handled by Scottish ports in 2011. In order to account for the remainder of Scottish ports this total was then grossed up using this share.

For some of the public sector occupations in ports it is possible to obtain more accurate information from other government sources. The National Audit Office (2008) reports that in 2007, HM Revenue and Customs (HMRC) had 4,500 staff working for the UK Border Agency on detection¹¹. Assigning a share of this total to UK ports using the share of imports (in volume terms) to the UK that arrive via ports suggests that there were approximately 3,375 people working as custom officers at UK ports in 2007. In order to extrapolate to 2011, this figure has been adjusted to account for the growth of freight volumes handled at UK ports, which has fallen by over 10% since 2007. This suggests there are currently 3,015 HMRC staff working on detection at UK ports. As such, the share of HMRC staff working at Scottish ports was estimated using the share of total UK freight handled at Scottish ports. Moreover, the Home Affairs Committee (2012) reports a total of 7,790 staff were employed by the Border Force in March 2011¹². ONS (2012) tourism data shows just under 15% of foreign visitors to the UK arrived by sea¹³. Using this proportion, it is estimated that just over 1,100 of the Border Force's staff are employed in UK ports. Again, the share of total UK international passengers handled at Scottish ports was used to estimate the proportion of Border Force staff working in Scotland.

To calculate the contribution to GDP of the Scottish ports sector, we have multiplied the number of employees in each industry operating within the ports sector by the average productivity of employees working in that industry. The calculation is undertaken at the 4 digit SIC level¹⁴. The

¹⁰ The BRES covers all UK businesses registered for Value Added Tax (VAT) and/or Pay as you Earn (PAYE). Focusing on employment and financial information, its data is disaggregated by industry and geography. The Standard Industrial Classification of Economic Activities (SIC) is used by the Office for National Statistics to classify businesses by the type of economic activity in which they are engaged. It provides a framework for the collection, tabulation, presentation and analysis of data.

¹¹ National Audit Office, (2008), 'HM Revenue & Customs: The control and facilitation of imports', 7 November.

¹² House of Commons Home Affairs Committee, (2012), 'The work of the Border Force', Sixth Report of Session 2012-13, 16 July.

¹³ ONS, (2012), 'Travel trends 2011', 26 July.

¹⁴ Where the ONS does not publish the information required to calculate productivity at the 4 digit SIC code level in the ABS, we use the appropriate 3 digit code.

labour productivity estimates are sourced from the ONS Annual Business Survey (ABS) results for Great Britain, by dividing GVA by employment for each industry.

6.2 The Shipping Industry

Data on employment in the UK shipping industry are available in the UK Chamber of Shipping's manpower survey for 2011. This survey covers all employees in UK shipping companies that are members of the UK Chamber of Shipping. In order to estimate employment in UK-based shipping companies that are not members, Oxford Economics have applied a grossing factor based on that used by the Office for National Statistics (ONS) when grossing up turnover data from UK Chamber of Shipping members. The UK Chamber of Shipping's manpower survey also estimates the number of UK shore-based employees suggesting that, after up-scaling the figure by the ONS grossing factor, there are currently over 7,700 shore-based employees in the UK¹⁵. These figures were combined with statistics on the geographical breakdown of employment sourced from Nautilus International¹⁶, to estimate the numbers employed in Scotland and the UK's other countries and regions.

In order to estimate the shipping industry's direct contribution to the UK economy, Oxford Economics have made use of ONS data on turnover provided by the UK Chamber of Shipping Annual Sea Inquiry¹⁷ and then applied estimates for total bought-in costs and changes in stocks from ONS National Accounts data. Subsequently, Oxford Economics adopted a hybrid approach to estimating the geographical distribution of the contribution to GDP to the UK's countries and regions. Typically geographical impacts can be modelled by using either a 'workplace-based' method, or a 'residence-based' method, allowing for the impact of commuting. The two methods often produce similar results, however as there often exists a disconnection between the location of seafarers and the shipping companies that employ them, it is unlikely that this will be the case for the shipping industry. As such, and partly to reflect the nature of the available data, Oxford Economics have chosen an approach that combines elements of both methods to produce a better representation of the distribution of GVA by country and region.

Recalling that GVA can be estimated using the 'income approach' (Section 3.2), the first step in estimating the regional impact of the shipping industry was to decompose the direct impact into the components that constitute this approach (i.e. profits and wages). This exercise was done by applying the ratio of employee compensation to GVA for the water transport sector from ONS data¹⁸. The resulting estimate for gross compensation of employees was split between the UK's

¹⁵ Here onshore employees refer to those individuals involved in the administration and management of UK-based shipping companies, such as Fleet Directors, Technical Supervisors and other Secretarial and Accounts employees, and not those ex-seafarers now employed in other industries based onshore (e.g. insurance, finance etc).

¹⁶ Trade union for maritime professionals at sea and ashore. Data on the regional breakdown of employment was also received from the Maritime and Coastguard Agency (MCA), however Oxford Economics based the final results on data provided by Nautilus International which included information on both officers and ratings in the UK.

¹⁷ The UK Chamber of Shipping surveys all its members annually and the data is uplifted by the ONS to account for UK sea transport companies who are not members using estimates for the gross tonnage of the UK fleet for different types of ship.

¹⁸ ONS (2012), 'Input-Output Supply and Use Tables, 2012 Edition', 31 July.

countries and regions according to the breakdown of employment of Nautilus International members, using the 'residence-based' accounting method¹⁹.

The remaining element of GVA, gross profits, was allocated geographically using the 'workplace-based' approach. This was based on returns to the UK Chamber of Shipping's balance of payments inquiry 2011, an annual survey of members which forms part of the ONS' balance of payments accounts, by allocating shipping revenues to countries and regions based on the location of the head offices of respondents. The breakdown of shipping revenues was subsequently applied to the estimate of gross profits to apportion this component of GVA to the UK's countries and regions.

6.3 The Business Services Sector

As official statistics on the number of jobs in the maritime business services sector do not exist²⁰, Oxford Economics have relied heavily on the findings of a Baltic Exchange report authored by Sun Wei²¹. His study employed a variety of methodological techniques to estimate the contribution of the maritime business services sector to the UK's countries and regions, in terms of employment and turnover, including an annual survey of Baltic Exchange members, interviews with major trade organisations or companies, discussion with industry experts, and reference to public information such as conference material, annual reports and industry yearbooks.

To estimate GVA, Oxford Economics sourced data on the average earnings of staff in each industry that composes the maritime business services sector from the ONS' Annual Survey of Hours and Earnings (ASHE)²² in 2011. The average wage for each sector was subsequently applied to Wei's (2012) employment data to generate an estimate of employee compensation. This was combined with estimates of the profitability of each industry, estimated by applying the relationship between revenue and profits, sourced from the ONS analytical input-output tables, to Wei's (2012) estimates of revenue for each industry²³. Finally, by summing the estimates of employee compensation and industry profits, an estimate for GVA of the sector is generated using the income approach. The geographical breakdown of GVA was estimated by applying the same distribution as with employment.

6.4 Issues with 'double counting'

In order to combine the economic impacts of the three sectors together there were two key issues that needed to be addressed:

¹⁹ It is not possible to apportion the element of employee compensation that would accrue to foreign seafarers. As such, this element of the Shipping industry's contribution to UK GDP has not been allocated regionally.

²⁰ Employment data is available for more aggregated sectors only such as financial services or insurance.

²¹ Wei, S, (2012) 'Updates on UK maritime professional services revenue and employment', the Baltic Exchange.

²² Where ASHE does not publish the information at the appropriate level of disaggregation, broader industry definitions are used to estimate average wages.

²³ Using the ratio of Gross Operating Surplus to Gross Output for each industry. ONS (2012), 'Input-Output Supply and Use Tables, 2012 Edition', 31 July.

- firstly, the definitions of each sector were not mutually exclusive, implying that by simply summing the three direct impacts would lead to an over-estimation, i.e. including the impact of certain sub-sectors more than once, or 'double counting'. Indeed, the ports industry included local employment in both the 'sea and coastal transport sector' (part of the shipping industry) and the 'non-life insurance' sector (part of the maritime business services sector). To account for this, the employment and GVA attributed to those sectors were subtracted from the direct estimate of the ports industry; and
- secondly, it is evident that, particularly in the case of shipping, the supply-chain effects (identified as part of the indirect impact) would have already been counted as part of the direct estimates of either the ports industry or the maritime business services industry. For example, some workers in UK ports and in the ship broking industry would already be captured as part of the shipping industry's supply chain. As such, Oxford Economics estimated the proportion of the shipping industry's supply chain that would have been accounted for by the ports and maritime services sector. Subsequently, the indirect and induced impacts of the shipping industry were adjusted accordingly.

6.5 Indirect and induced impacts on GDP and employment

To calculate the size of the indirect effects Oxford Economics multiply the direct GVA of each sub-component of the industries that make up the maritime services sector (ports, shipping and business services) by a supply chain (or Type I) multiplier derived from the ONS analytical input-output tables²⁴. Where there is not a direct match between a multiplier and an industrial sector, the most applicable broad industry multiplier has been used. The results for the individual industries are then aggregated to estimate the value added contribution to GDP that the maritime services sector's purchases of inputs generates in its UK-based supply chain. Meanwhile, the induced impact was calculated using Type II multipliers derived from the ONS analytical input-output tables, in a similar procedure to that used to calculate the indirect impact²⁵.

In order to calculate the geographical breakdown of the indirect impact (and hence, the impact in Scotland), data was sourced from the ONS' Annual Business Survey (ABS), which provides a regional breakdown of UK GVA by broad industrial sector²⁶. This was combined with the

²⁴ ONS (2011), 'Input-Output Analytical Tables, 2005 Edition', 2 August. A Type I multiplier shows the activity generated by the sectors spending on inputs of goods and services. It measures the size of the direct and indirect effects divided by direct effects. Input-output tables are designed to give a snapshot of an economy at a particular time, showing the major spending flows from 'final demand' (i.e. consumer spending, government spending and exports to the rest of the world); intermediate spending patterns (i.e. what each sector buys from every other sector – the supply chain); how much of that spending stays within the economy; and the distribution of income between employment income and other income (mainly profits). In essence an input-output model is a table which shows who buys what from whom in the economy. The latest available domestic use input-output table for the UK, published by the ONS, was for calendar year 2005.

²⁵ A Type II multiplier shows the activity generated by spending on inputs of goods and services and by the spending of households. It measures the size of the direct, indirect and induced effects divided by direct effects.

²⁶ The regional split of GVA for 2010 data was used, divided into industrial sections according to the 2007 Standard Industrial Classification of Economic Activities (SIC), representing the latest available statistics at that level of disaggregation.

indirect contribution to GDP for the UK, which was split into 85 different industries according to the breakdown of intermediate consumption of the relevant industries that together comprise the maritime services sector, according to ONS analytical input-output tables²⁷. The resulting model apportions the indirect impact of the maritime services sector to the different countries and regions for each of the 85 industries based on the distribution of total UK output for that industry. A similar method was used to estimate the regional induced impacts, but rather the induced contribution to GDP of the UK maritime services sector was split into the 85 different industries according to the distribution of household consumer expenditure, again sourced from ONS analytical input-output tables.

To calculate the number of people employed in the maritime services sector supply chain based in Scotland, Oxford Economics divide the estimate of indirect and induced GVA by a figure for average whole economy productivity (£48,400 per person in 2011), again sourced from ONS data.

²⁷ ONS (2012), 'Input-Output Supply and Use Tables, 2012 Edition', 31 July.

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