University of Strathclyde Business School

Shetland Economic Accounts 2017

Fraser of Allander Institute

Disclaimer

The analysis in this report has been conducted by the Fraser of Allander Institute (FAI) at the University of Strathclyde. The FAI is a leading academic research centre focused on the Scottish economy. The business survey was undertaken by AB Associates and SSQC.

The report was commissioned by Shetland Islands Council and completed in May 2021.

The analysis and writing-up of the results was undertaken independently by the FAI. The FAI is committed to providing the highest quality analytical advice and analysis. We are therefore happy to respond to requests for technical advice and analysis. Any technical errors or omissions are those of the FAI.

Executive summary

- Shetland GRDP in 2017 was £584.4 million, amounting to £25,443 per person which is 0.48% higher than the Scottish average
- Between 2011 and 2017 there was a £47.8 million increase in GRPD in real terms.
- The five sectors which account for most employment in Shetland (in descending order) are: Schools, Construction, Retail, Social Work and Public Administration.
- The five sectors which account for most value added (in descending order) are: Aquaculture, Retail, Public Administration, Construction and Schools.
- The five sectors which account for most output (in descending order) are: Aquaculture, Fish processing, Public Administration, Retail and Construction.
- There were various changes in the sectoral contributions to value added and output between 2011 and 2017. There was a significant increase in Aquaculture and reduction in the Oil sector (driven by reclassification of the oil terminal)
- Wages and salaries are the largest source of income of Shetland households, accounting for 70% of average income.
- On average household expenditure in Shetland in 2017 was £36,374 per annum with £22,030 of this spend within the Shetland region.
- The value of exports from Shetland in 2017 was £597.6 million and the value of imports £422.7 million, a trade surplus of £175 million.
- Over the 6 year period between 2011 and 2017 exports have grown, in real terms, at a rate of 1.75% while imports have grown 0.75%.
- The two largest export industries are aquaculture and fishing, which between them account for nearly 40% of total exports.
- The total value of tourism in 2017 was £23.2 million, up from £15.2 million in 2011 (in real terms).
- The IO table was used to calculate a range of multipliers, with the two largest for output being Fish processing and Agriculture, indicating their importance to the Shetland economy.
- The IO table was used to estimate the impacts of COVID on the Shetland economy using the Hypothetical extraction method.

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1. Introduction

The purpose of this report is to present the findings from the economic analysis of Shetland for 2017, commissioned by Shetland Islands Council. There are four main objectives of this project:

1. Construction of an Input-Output (IO) table for the Shetland economy, consistent with recognised IO accounts conventions and formats;
2. Compile a Shetland Occupational Employment by Industry matrix compatible with the core IO table;
3. Analyse the IO table and related data and provide comment on the current structure and recent performance of the Shetland economy;
4. Compare and analyse the results of the foregoing activities with equivalent data from the previous study in 2011, and provide comment on the changes of the Shetland economy in that time. It is important that longer term structural changes to the economy are identified rather than minor or one-off fluctuations.

Unlike the previous study which used a Social Account Matrix (SAM) framework, in this study the standard IO framework is applied. The IO framework was chosen as this is the standard framework comparable with Scottish data. Unlike previous studies this report uses a combination of bottom-up and top-down methods in developing the Shetland IO tables. The bottom up approach uses primary data collected from a series of interviews and surveys while the top-down approach uses published data from national sources (such as ONS and the Scottish Government).

This report is structured as follows: Chapter 2 details the methodology adopted in the development of the Shetland IO table with attention on the data sources and the new hybrid approach. Chapter 3 reports the information from the Shetland IO table, giving aggregate and sectoral estimates for output, value added and employment which are then compared to the previous study. Chapter 4 presents the other information available from the IO table and primary data, including household income and expenditure and Shetland trade balance.

In Chapter 5 description and results of the multiplier analysis are given with Chapter 6 containing the economic modelling results from a range of scenarios.

2. Methodology

2.1 Data

The method used in the construction of the Shetland 2017 IO table was similar to that found in previous Shetland studies, albeit with extensions accounting for recent developments in the regionalisation of Input-Output tables literature.

As with previous works the starting point of the Shetland IO was the collection of a large amount of primary data through the use of surveys. These surveys were designed to give as much information as possible on the structure of sales and purchases in Shetland in 2017. The surveys used in this report were:

- Shetland business survey
- Shetland household survey
- Shetland fishing fleet survey
- Shetland employment survey
- Shetland Islands Council survey

The business survey was a series of questionnaires completed by interview and handled by AB Associates and SSQC, with 75 interviews out of 150 requests. Through these questionnaires AB Associates and SSQC were able to gather a range of information regarding the businesses operations including: output; sales value and destination; inputs value and origin, and employment number, skill and cost. Table 2.1 contains the coverage of this survey in relation to overall employment.

Table 2.1: Number of businesses within the business survey[1]

	Number of businesses surveyed	Business survey full-time employment	Business survey part-time employment	Total Shetland FTEs
Agriculture	2	4	1	346
Fishing	4	22	5	367
Aquaculture	6	151	95	430
Oil	0	0	0	50
Mining	0	0	0	20
Fish processing	2	80	46	280
Other food and drink	1	11	7	75
Engineering	3	16	4	189
Textiles	2	2	0	67
Other manufacturing	0	0	0	467
Electricity, gas and water	2	2	6	61
Construction	3	146	42	745
Wholesale	4	98	266	531
Retail	6	0	0	724
Accommodation	1	3	5	466
Catering	0	0	0	213
Warehousing	1	48	12	452
Sea transport	0	0	0	54
Land transport	0	0	0	260
Air transport	0	0	0	171
Communications	3	14	55	209
Financial services	1	8	3	38
IT and retail estate services	1	7	3	35
Technical and professional services	5	8	15	252
Public administration	6	8	106	615
School	0	0	0	818
College	2	74	62	71
Health	1	454	486	573
Social work	5	5	64	638
Other services	15	147	445	517
Total	**75**	**1,308**	**1,728**	**9,734**

Demonstrated from Table 2.1, the business survey only covers a small number of Shetland businesses, and not all sectors are covered, meaning the business data survey was complemented with other data sources. One such data source was the Shetland Employment Survey 2017, which covers private sector employment in Shetland but does not contain any information on sales and purchases. In addition to the employment survey the Council survey was used which gives detail on each

[1] For all non-council sectors (Public admin, Schools and Colleges), FTE was calculated using the Shetland business survey with Full time employee representing 1 FTE and part-time employee 0.5 FTE. The Shetland Islands Council contains information on public admin, Schools and Colleges FTEs.

employee in Shetland Islands Council (SIC). These are then matched with the relevant economic sector. Revenue and expenditure data for Shetland Islands Council was also made available.

Also, due to the importance to the local economy, an individual survey was carried out for the fishing industry. This fishing survey contains information on inputs, output and employment which is used to supplement the business survey.

In previous studies the Shetland IO table has been based solely on the primary data available from the surveys. However, since the previous studies there have been developments in the literature with regards to the regionalisation of IO tables, particularly with a Scottish focus. In this literature are a range of methodologies are used to estimate these now – in this study we use the FLQ method (Hermannnson, 2017[2]).

2.2 Methodology

A key issue in the development of the Shetland IO was estimating total sectoral output for each of the economic sectors. For sectors which are included in both the business and employment surveys the output was estimated by scaling output within the business survey by the employment data. This was not possible for the sectors which are not included in the business survey, and as such another method was needed. The standard scaling method would be to estimate the output by scaling Scottish sectoral output based on the Shetland sectors proportion of Scottish employment. However, this does not take into account difference in regional GVA intensities, thus we use ONS published numbers on Shetland GVA to estimate GVA and output for sectors not covered in the business survey.

Sectoral inputs (the A matrix) are estimated using a combination of top-down and bottom-up methodologies. For sectors surveyed in the business survey, inputs structures can be approximated using the purchases of goods and services by relevant location. By nature the surveys will not be able to cover all sales and purchases within the region (and some purchases may be difficult to categorise), meaning zero values are contained within the A matrix. These zero values are estimated using the

[2] https://www.tandfonline.com/doi/full/10.1080/17421772.2016.1177194

regionalisation FLQ method which takes account of the relative size of industries within a region compared to the national average. For all sectors which are not included in the business survey the FLQ method is used to estimate all inputs.

Both the postal and face to face household surveys were used to estimate the household purchases column. The surveys contain information on a range of purchases (and related locations) which were matched to one of the 30 economic sectors or imports. As with the A matrix calculation the use of only the household survey data leaves zeros within the household purchases structures. These zero values are estimated by scaling the Scottish IO table purchases using sectoral location coefficients.

Government consumption was estimated using the Shetland Islands Council spend and revenue database made available for this project. This database contains detailed information on all government purchases and their location (i.e. in Shetland or outside). As information is available on all government purchases the column is generated using only the bottom-up approach.

For sectors which are included in the business survey, exports can be estimated using information on the value of sale and destination for export proportions by location. For zero values, in line with the regionalisation literature, it is assumed that Shetland sectoral exports to the rest of the UK and rest of the world are in the same proportion as Scotland as a whole. Rest of Scotland exports are used as the balancing item within the IO table (if these are not included in the business survey). Tourist's purchases are estimated using a combination of sales data from the business survey and sectoral location coefficients. Total tourist spend is estimated using the Shetland tourism survey.

2.3 IO table structure

To be comparable, a similar sector classification structure to previous studies has been used. In total there are 30 industrial sectors in the IO table, these are listed in Appendix A.

IO tables have a standard outline with three distinct quadrants. The upper left hand quadrant of the IO records intermediate sales; i.e. all the inter-industry sales and

purchases within the economy. An n x n matrix with rows representing sales of goods and services to other sectors (or self-sales) and the columns being the input purchases by each industry. This allows for the sectoral linkages to be easily identified. Totalling the row for each industry within the quadrant gives the intermediate sales for each sector with the column sales being total intermediate purchases by each industry.

As well as the intermediate economy, industries will sell output to other consumers (such as households, exports etc.). This information is contained within the final demand quadrant.

The value added quadrant (bottom left of the IO table) shows the inputs purchased by an industry from out with the industries within the economy. As with final demand, the value added quadrant can (in separate rows) be separated into a series of activities. To generate an output (along with materials) sectors rely on labour, which incurs a cost. These costs are contained within the compensation of employees row found within the value added quadrant.

Also, it is unlikely that a region's economy will be able to supply every good needed for each industry and as such some industries may need to import goods or services from outwith the region, i.e. imports, which is another activity within the value added quadrant. Finally there will be taxes paid by each industry, which are represented within the value added as they are outwith intermediate purchases.

3. 2017 Shetland IO Table

The Shetland IO table can be found in Appendix B. From these tables rows are read as the sales by the sector while the columns are sectoral/final demand consumption.

3.1 Aggregates

Several indicators can be used to measure total economic activity within a region, with the most common being total output, employment and Gross Regional Domestic Product (GRDP).

- Total output is the value of sales across all economic sectors in basic (producers) prices in 2017.

- Employment is the number of FTEs used to generate the total output. GRDP is the total value added from the production of goods and services across all sectors within a region and is used as a measurement of living standards.
- GRDP is often expressed in a per capita basis, allowing for comparisons of regions to be made.

As IO tables are balanced (i.e. total sectoral inputs = total sectoral outputs) GRDP can be calculated by using the income method, which is the combination of income from employment, profits, other trade income (such as rent and interest) and taxes minus any subsidies. This is converted into a per capita basis by dividing by the population.

Shetland output in 2017 was estimated to be £1,265 million, representing a 4.76% increase since 2011 (average annual increase of 0.79%). £331 million of the output is in the form of employment income and £239.3 in gross profits. Over the 6 year period employment reduced by 762, which is an average annual reduction rate of 1.21%. The main driver for this (as demonstrated in the next section) is the difference in Public administration employment. Also, since the last report the Sullom Voe oil terminal transitioned from long term operator BP to Enquest, which also had an impact on employment in the region.

For 2017 the total GRDP, from the IO for Shetland was £584.4million, which on a per capita basis (23,080 residents) is £25,320. Overall this is a nominal increase of £99.5 million when compared with 2011 and a real increase £47.8million, corresponding to a real term increase of £2,072 in GRDP per person in Shetland over the period. Scottish GRDP for 2017 (from the 2017 Scottish IO table) was £25,443, £123 (0.48%) lower than that for Shetland.

3.2 Sectoral Analysis

As outlined in Section 1.2 the Shetland IO has 30 sectors with the contributions to output, value added and employment for each reported in Table 3.1.

Table 3.1: Output, value added and employment of economic sectors

	Output (£m)	%	GVA (£m)	%	Employment (FTE)	%
Agriculture	17.43	1.38	6.63	1.14	346	3.55
Fishing	70.9	5.6	22.89	3.92	367	3.77
Aquaculture	243.79	19.27	71.13	12.17	430	4.42
Oil	4.43	0.35	1.54	0.26	50	0.51
Mining	6.19	0.49	2.96	0.51	20	0.21
Fish processing	125.04	9.88	33.77	5.78	280	2.88
Other food and drink	7.25	0.57	2.2	0.38	75	0.77
Engineering	18.33	1.45	12.1	2.07	189	1.94
Textiles	2.7	0.21	0.96	0.16	67	0.69
Other manufacturing	44.15	3.49	17.28	2.96	467	4.8
Electricity, gas and water	26.29	2.08	9.41	1.61	61	0.63
Construction	76.15	6.02	38.44	6.58	745	7.65
Wholesale	31.48	2.49	14.79	2.53	531	5.46
Retail	79.59	6.29	54.63	9.35	724	7.44
Accommodation	23.72	1.88	16.6	2.84	466	4.79
Catering	6.71	0.53	3.78	0.65	213	2.19
Warehousing	93.37	7.38	42.76	7.31	452	4.65
Sea transport	12.76	1.01	6.12	1.05	54	0.55
Land transport	34.04	2.69	17.37	2.97	260	2.67
Air transport	29.45	2.33	8.6	1.47	171	1.76
Communications	4.42	0.35	3.37	0.58	209	2.15
Financial services	14.45	1.14	9.69	1.66	38	0.39
IT and retail estate services	17.55	1.39	13.83	2.37	35	0.36
Technical and professional services	19.53	1.54	14.48	2.48	252	2.59
Public administration	81.8	6.47	48.61	8.32	615	6.32
School	46.38	3.67	36.14	6.18	818	8.4
College	4.35	0.34	3.81	0.65	71	0.73
Health	64.49	5.1	29.94	5.12	573	5.89
Social work	28.18	2.23	21.13	3.62	638	6.55
Other services	30.12	2.38	19.44	3.33	517	5.31
Totals	**1265.06**		**584.39**		**9,734**	

From Table 3.1, determining the largest sectors to the Shetland economy depends on the criteria used.

In terms of output aquaculture is the largest sector in Shetland with an output of £243.8 which represents 19.27% of total regional output. The next four largest sectors in

terms of output (in descending order) are: Fish processing; Public administration, Retail and Construction.

Looking at value added aquaculture is again the largest contributor at 12.17%, which is lower than the sector's relative contribution to output. The next four highest value added contributing sectors (in descending order) are: retail, public administration, construction and schools.

Employment is dominated by the most labour intensive sectors with schools having the largest employment in Shetland, followed by (in descending order): Construction, Retail, Social work and Public administration.

Over time there will have been changes in the output, value added and employment growth rates by economic sector. Figure 3.1 reports on the sectoral output and value added growth (in real terms) between 2011 and 2017 and Figure 3.2 reports on the employment growth over the same period.

Figure 3.1: Real sectoral output and GVA growth between 2011 and 2017, £m

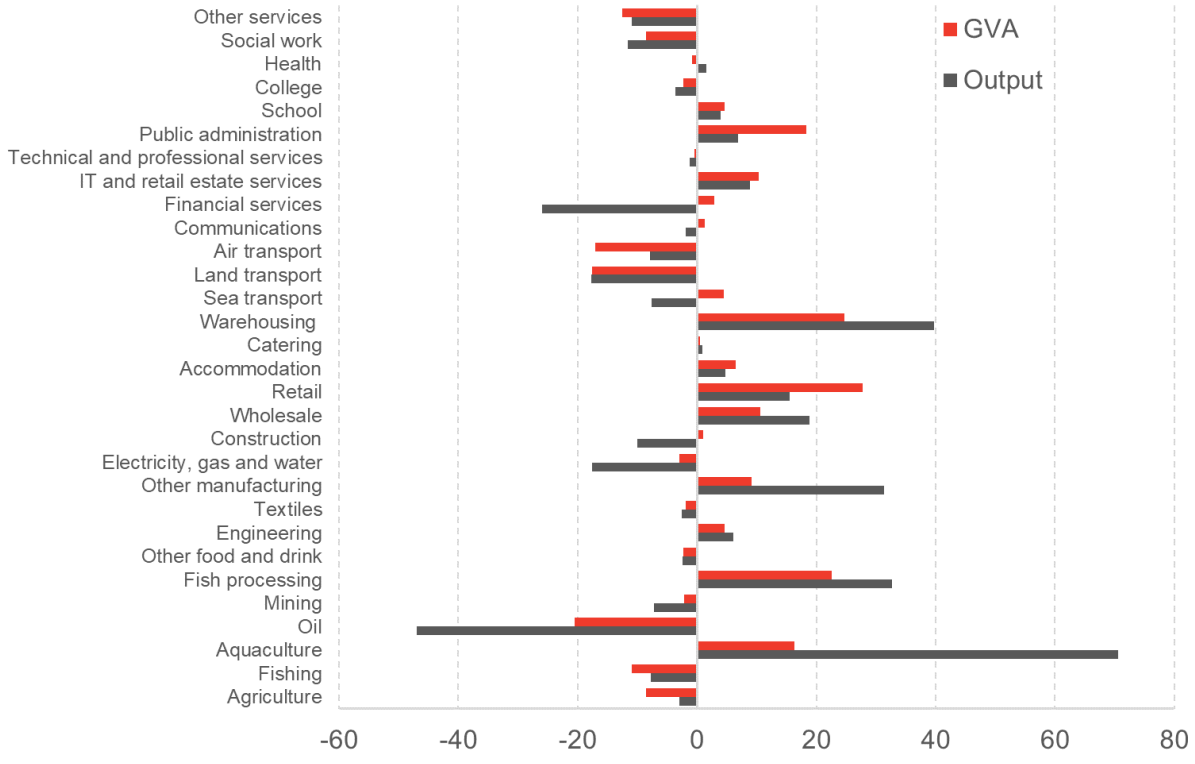
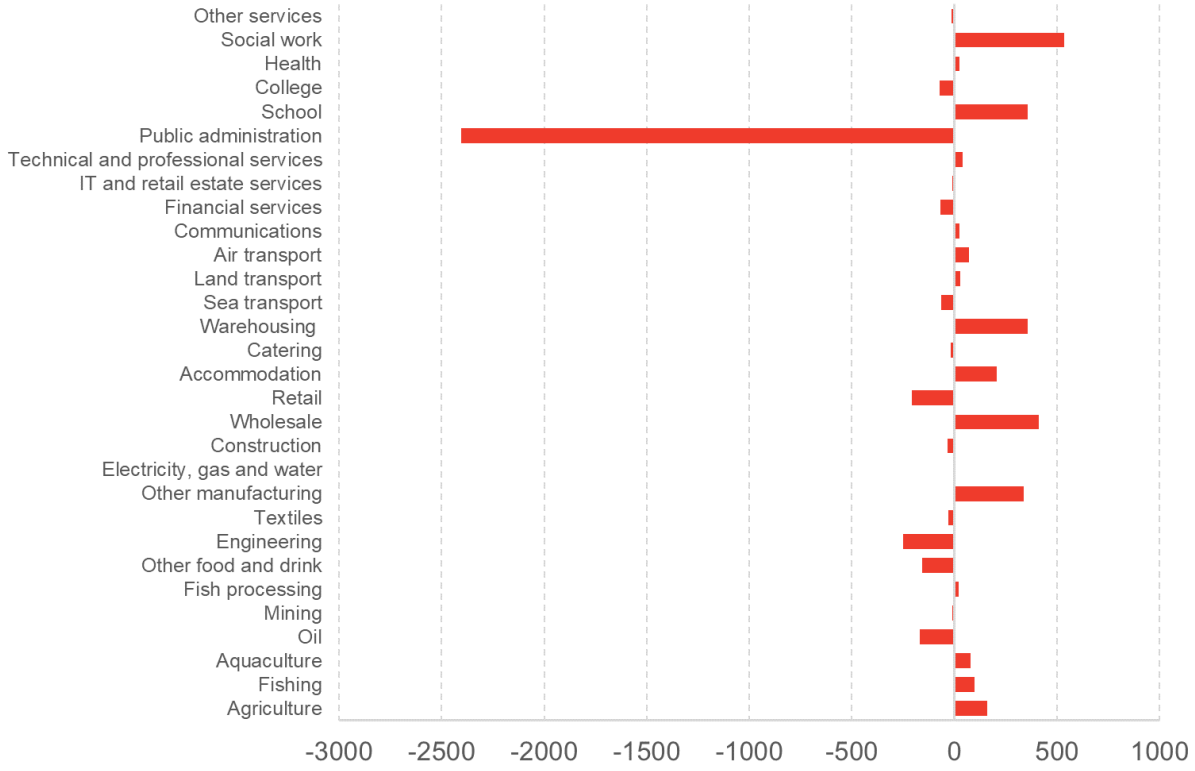


Figure 3.2: Sector employment growth between 2011 and 2017, FTE



In the six year period between 2011 and 2017 the real output of 13 sectors grew while the output of the other 17 economic sectors shrank. The largest increase in output was in the Aquaculture sector (£70.5 million) while the largest contraction was in the Oil sector**.** Much of the oil activity in Shetland has been re-classified as services activity rather than a primary energy activity, as there is no extraction or processing of oil on the Islands. Instead, the activity on Shetland is better represented as warehousing activities. Value added increased in 16 of the economic sectors over the six year period with the largest increase and decrease related to the Aquaculture and Oil sectors respectively. More than half (16) of the economic sectors had employment growth with Social work being the largest increase (537) and Public administration the largest decrease (2,406). The scale of these changes for Social work and Public administration do not seem feasible and the different may be down to a difference in attributing council employment to economic sector as was done for the 2011 study.

In the 2011 study employment from some sectors (such as Social work) was classified as Public administration whereas in this this employment is classified as part of the social work sector. The method used in this report is similar to that found in pre-2011

studies. Also we should note that due to the updating of the SIC system the economic sectors in this reports are slightly different to previous studies.

4. Households and Trade

4.1 Households

Through the combination of the household postal survey and face to face survey (175 responses in total) information was gathered on household income and expenditure, which is fed into the development of the Shetland IO.

4.1.1 Household income

Average household income in Shetland was estimated to be £41,322 which is a 7.56% increase in nominal terms since 2011 but a 2.96% decrease in real terms, indicating that household income growth has been slower than the national inflation rate. Household income varies by type with the largest income being households with children (£61,072) followed by households without children (£45,557) then retired households at £24,688. Households with children on average have more adults of working age, hence the difference in household income.

Across all households, wages and salaries accounted for 69.83% of income with pensions 21.02%. 5% of household income was from investments and savings, with benefits accounting for another 2.45% and the final 1.70% on income from unidentified other sources. Table 4.1 gives the breakdown of income by source and household type.

Table 4.1: Income by source and household type

	Wages	Investment & Saving	Pensions	Benefits	Other	Total Income
Working no children	38,397	1,739	4,179	1,211	31	45,557
	84.28%	3.82%	9.17%	2.66%	0.07%	
Working with children	56,158	2,114	830	1,697	272	61,072
	91.95%	3.46%	1.36%	2.78%	0.45%	
Retired	1,649	2,287	18,581	402	1,769	24,688
	6.68%	9.26%	75.26%	1.63%	7.16%	
Total	29,071	2,082	8,751	1,021	709	
	69.83%	5.00%	21.02%	2.45%	1.70%	

As is to be expected, the vast majority of income for working households is from wages while in retired households more than three quarters of the income is from pensions (both state and private). The pattern of income for working households is very similar to that from 2011. For retired households we find that there is some income from wages and salaries, which was not the case in the previous study. This occurs as some of the main house owners are retired but there are still some working age people (assumed to be children) living at the property.

4.1.2 Household Expenditure

On average, household expenditure in Shetland in 2017 was £36,374 per annum with £22,030 of this spend within the Shetland region. Table 4.2 details the spending breakdown by household type across 5 broad categories.

Table 4.2: Expenditure by household type and spending category

	All households	Employment without children	Employment with children	Retired
Food and drink	28.80%	35.88%	18.18%	39.27%
Housing	19.17%	7.51%	29.76%	27.51%
Private transport	9.03%	9.11%	8.35%	11.22%
Other transport	3.11%	3.86%	2.21%	3.40%
Other expenditure	31.41%	36.48%	31.59%	10.06%
Holiday & entertainment	4.91%	4.52%	5.71%	3.54%
Saving	3.57%	2.64%	4.20%	5.01%

From Table 4.2 the spending pattern of household groups vary. Overall a large proportion of the spending is concentrated in three areas: food and drink; housing and other expenditure (which includes clothing, electrical goods and regular payment). Since 2011 the proportion of spending on food and drink has increased to 28.80% from 20% while housing costs have stayed at around 20% of expenditure. Other expenditure[3] has also seen an increase over the 6 year period of 6.41% with other transport and holiday and entertainment seeing similar spend levels as 2011. The proportion of spending on private transport and savings decreased by 11.93% and 3.4% respectively since the last study.

Employed households with children spend the largest proportion of expenditure on housing and the second largest on other expenditure. The large housing cost is driven by mortgage and repair payments where households with children are paying on average more than 7 times that of employed households without children and 3 times more than retired houses – for retired households the average energy costs are much larger than the other household types. For other spending, households with children spend more than three times the amount on the unidentified regular expenditure category than households without children (twice the amount when compared with

[3] Other expenditure includes: clothing and footwear, electrical goods, furniture and durable good, tv and mobile, insurance, one of capital and banking.

retired households). With this being an unidentified regular payment, the assumption can be made these are costs associated with children such as child care/clubs.

Employed households with children spend the largest proportion on the other expenditure category and the second largest on food and drink. Within the food and drinks categories these households spend much more on off sales alcohol, tobacco and bars than the other household types. The large other expenditure is larger due to the much larger spend on communications and furniture. Finally retired households have the highest proportion of spending in the food and drink category, in which these households spend double the amount on eating out than employed households.

The household data allows the spending by category to be split into local and non-local spending, with the aggregate household results in Table 4.3

Table 4.3: Aggregated proportion of local and non-local spending

	Local proportion of spending
Food and drink	79.70%
Housing	72.79%
Private transport	79.64%
Other transport	34.70%
Other expenditure	50.93%
Holiday & entertainment	43.85%
Saving	38.58%

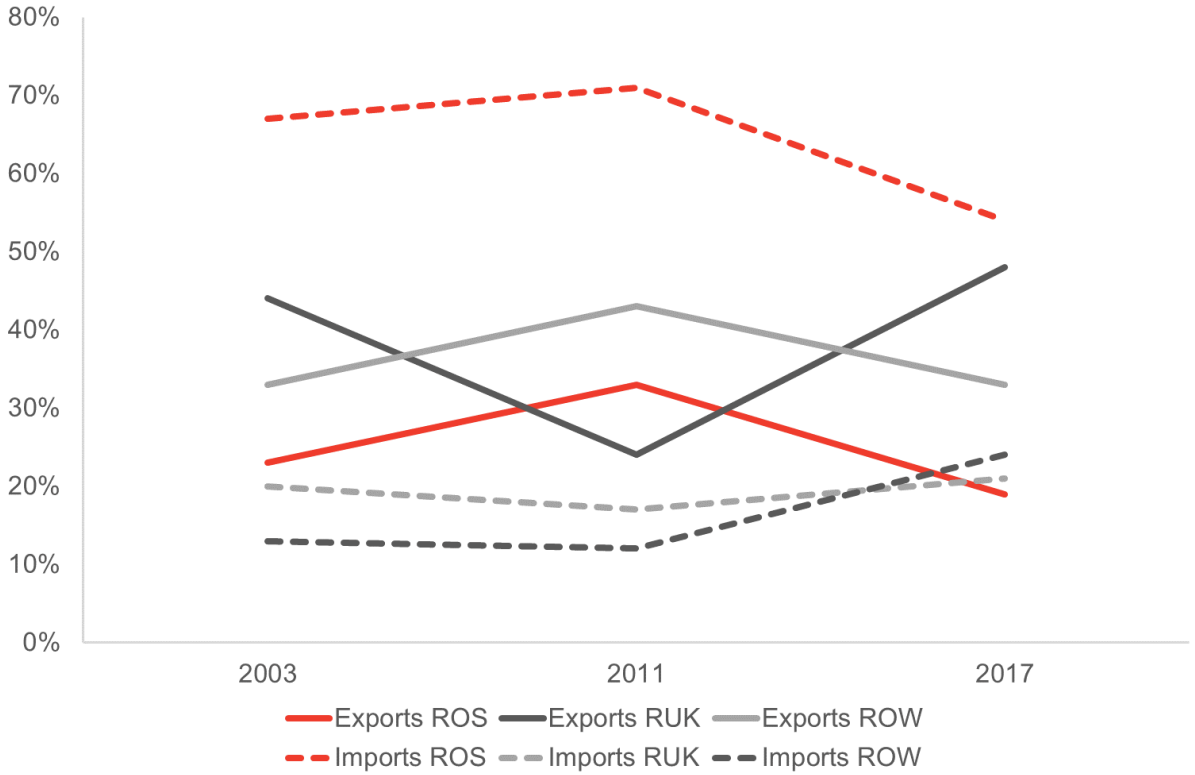
Food and drink and private transport have the highest proportion of local spend at nearly 80% of each; these are expected to be high due to the everyday nature of food items and fuel. Housing has a slightly lower local content spend of 72.29% with much of the non-local spend being on energy which will be from companies on the mainland. Just over half (50.93%) of the other expenditure is within Shetland and the local content drops below 50% for: holidays and entertainment (43.85%); savings (38.58%) and other transport (34.70%). A large proportion of holidays will be off the Shetland Islands hence the expenditure will be non-local. Other transport is a combination of local buses, sea transport and air travel with the latter two mostly for non-local travel. Finally a large proportion of savings not being local is a result of many major banks (saving accounts) not being headquartered in Shetland Islands.

4.2 Trade Balance

The development of the IO makes it possible to analyse the trade (exports and imports) occurring in Shetland. Overall Shetland exports were £597.6 million with £114.2 million to the rest of Scotland, £286.5 to the rest of the UK and £196.9 million to the rest of the world. Total imports were estimated to be £422.7 million with the majority of these from the rest of the Scotland (£230.1 million). The rest of the UK accounted for £90.8 million and the rest of the world £101.7 million. Overall this gives a trade surplus of £175 million.

In 2011 the trade surplus was estimated to be £131.1. In real terms, since the 2011 study, exports have grown at an annual rate of 1.75% with imports growing by 0.75% per annum on average. The growth rate of exports has slowed since 2011 when the annual rate of increase was 8.8% in real terms and at the same time the import rate was a 0.6% yearly decrease. Figure 4.1 displays the proportion of imports and exports by location between 2003 and 2017.

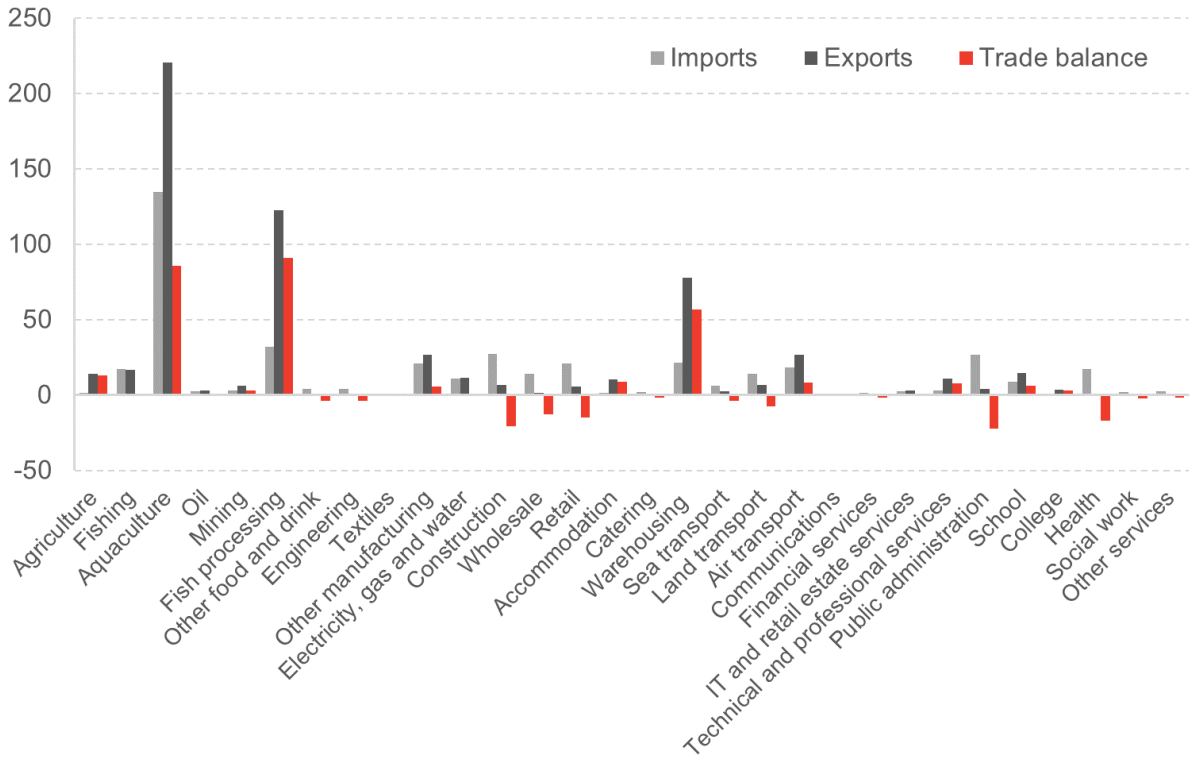
Figure 4.1: Exports, imports and trade balance by region



The distribution of exports for 2017 is more akin to the IO for 2003 than to 2011. In 2017 exports to the rest of Scotland was 19% of the total, which is a reduction from 33% in 2011 but similar to the proportion estimated for 2003 (23%). Exports to the rest of the UK are again of similar scale for 2017 (48%) and 2003 (44%), with both having a much larger proportion than 2011 when rest of the UK exports represented 24% of total exports. Finally, the rest of the world exports accounted for 33% of the total in 2017 compared with 42% in 2011.

Between 2003 and 2011 the share of imports from the Rest of Scotland was stable at around 71% but this decreased to 54% in 2017. The shift in imports is most noticeable for the rest of the world with there being a gradual increase from 2003, with these accounting for 24% of total imports in 2017. There was also a slight increase in imports from the rest of the rUK between 2011 and 2017, 21% from 17%, which is again similar to the 2003 share.

Figure 4.2: Exports, Imports and trade balance by industrial sector, £m



The above figure illustrates that Aquaculture and Fish processing dominate Shetland exports and imports. Aquaculture accounts for 31.9% (£134.8 million) of imports and

36.9% of exports (£220.5 million) of exports, while fish processing is responsible for 7.6% (£31.9 million) of imports and 20.1% (£122.7 million) of exports. Out of the 30 sectors, 14 have a trade surplus and 16 a trade deficit. The three sectors which have the largest trade deficit are Public administration (£22.4 million), Construction (£20.3 million) and Health (£16.8 million) which is in line with previous studies.

Tourism in the Shetland increased to £23.20 million (in real terms) between 2011 and 2017. Expenditure of tourists is dominated by 5 sectors which account for more than three quarters of total tourism expenditure: Accommodation; Retail; Catering; Wholesale, and Aquaculture.

4.3 Employment

The vast majority (68%) of employment is in the services sectors, with primary industries accounting for 13% of employment and manufacturing 19%. From 2011 the proportion of manufacturing employment has remained constant at 19% while there has been a slight increase in the primary industries proportion from 10% and reduction from 71% in the services industries. The Shetland employment matrix is found in Table 4.4.

Table 4.4: 2017 Shetland employment matrix[4]

Employment Matrix	Mangers; Director and Managing	Professionals	Associate professionals and technicians	Administrative	Skilled trade	Caring and other series	Sales and customer services	Process; plant and machine operation	Elementary occupation
Agriculture	135	*	*	10	105	5	*	10	65
Fishing	225	*	*	*	30	*	*	45	65
Aquaculture	45	*	*	5	230	*	*	105	30
Oil	*	15	*	*	5	*	*	25	*
Mining	*	5	*	*	*	*	*	*	*
Fish processing	35	*	*	5	60	*	15	25	125
Other food and drink	15	*	*	*	5	*	10	20	10
Marine Engineering	20	10	25	10	60	*	30	20	5
Textiles	35	*	*	*	5	*	*	10	0
Other manufacturing	60	65	60	35	105	*	10	80	30
Electricity Gas and Water	10	5	5	10	5	*	5	*	*
Construction	75	10	10	25	385	*	25	105	90
Wholesale	55	15	25	10	50	*	255	95	5
Retail	40	15	35	35	20	50	350	90	70
Accommodation	115	*	15	35	30	40	10	*	200
Catering	25	*	*	5	40	*	10	5	110
Warehousing	45	15	85	15	35	5	85	75	55
Sea transport	5	0	20	5	0	*	*	10	*
Land Transport	15	5	5	15	5	5	5	175	10
Air transport	10	*	50	5	*	70	5	10	*
Communications	15	25	120	10	15	*	10	*	5
Financial services	10	*	15	*	*	*	*	*	*
IT and retail estate services	*	10	10	*	*	*	5	*	*
Technical and Professional services	105	15	15	65	10	5	15	*	15
Public administration	15	100	50	5	5	15	15	*	390
School	20	410	80	60	10	165	*	5	50
College	0	25	10	5	*	10	*	*	0
Health	5	20	15	45	210	235	5	*	15
Social work	30	55	45	30	5	370	60	*	15
Other services	35	*	*	*	20	425	10	*	5
Totals	1,260	870	770	495	1,515	1,430	980	960	1430

Overall the largest occupation group in Shetland is Skilled trade with 1,515 FTE, which was the case for the last study in 2011 although the number of FTEs in the occupation group decreased by 318. Other large occupational groups (with more than 1000 FTEs) are Caring and other services (1,435), Elementary occupations (1,435) and Managers and directors (1,265). From Table 4.3 it is found that there is significant representation

[4] Totals may not sum due to rounding.

across all occupation groups in Shetland – there are 13 sectors which employ people across all occupational groups (an increase from 9 in 2011).

Some changes have occurred in the occupational distribution when compared with 2011. Fishing is now the largest employer of managers and directors, overtaking the Agriculture sector. Both have large number of managers and directors due to the method used to categorise farmers and fishermen. Schools now have the largest number of Professionals, overtaking Public administration, which is driven by the difference in methods used in calculating Public administration jobs between the two studies.

The largest number of Associate professionals is now in Communication sectors instead of Public administration, the fundamental reason for this is a difference in methodology. Schools has the largest number of Administrative employees with the changes again driven by the difference in the public administration counting method. This difference in Public administration counting also explains why Social care now has the largest number of Caring and other services employees.

Similar to the previous study the Construction sector has the highest level of Skilled trades and retail has the largest number of Sales customer employees. Finally the largest number of Elementary occupations employees is in the Public administration sector, which was also the case for the 2011 study.

Using employment data and output, the employment coefficients for each sector can be calculated. Employment coefficients give the amount of labour supported by one million pounds of output, Table 4.5 displays the employment coefficients for each of the 30 Shetland economic sectors.

Table 4.5: Shetland employment coefficients

	Employment coefficient (FTE/£million)
Agriculture	19.85
Fishing	5.18
Aquaculture	1.76
Oil	11.28
Mining	3.23
Fish processing	2.24
Other food and drink	10.35
Engineering	10.31
Textiles	24.78
Other manufacturing	10.58
Electricity, gas and water	2.32
Construction	9.78
Wholesale	16.87
Retail	9.10
Accommodation	19.64
Catering	31.75
Warehousing	4.84
Sea transport	4.23
Land transport	7.64
Air transport	5.81
Communications	47.28
Financial services	2.63
IT and retail estate services	1.99
Technical and professional services	12.90
Public administration	7.52
School	17.64
College	16.31
Health	8.88
Social work	22.64
Other services	17.16

The largest employment coefficient is for the Communication sector at 47.3 FTEs per million of output. In 2011, again due to the method used, public administration had a much higher coefficient of (44.7 FTEs/£million). In general services sectors have a larger employment coefficient reflecting the high labour intensities of these sectors and primary and manufacturing sectors (which are more capital intensive) have a lower employment coefficient.

4.4 Exchequer Balance

Even with an IO methodology being applied, comment can be made on the exchequer balance (i.e. the difference between government revenue and expenditure in Shetland). The exchequer balance is the difference between government revenue raised from households and businesses in Shetland and the government expenditure on businesses and households in Shetland. As with previous studies "Government" is the combination of local and central government, illustrated by the single row within the IO table.

There are two main sources of Government revenue, Shetland Islands Council (SIC) income and business and household taxes. All SIC revenue data was made available for this report with overall revenue amounting to £103.8 million. The largest sources of SIC income were; business rates (£24.8 million), council tax (£9.7 million), towage dues (£8.2 million) and harbour dues (£6.9 million).

Business and household taxes were estimated using GERS[5] figures with the assumption that these taxes are based on Shetland's proportion of Scottish population. Overall tax revenue[6] amounted to £217.4 million with the more 26% of this from income tax (£53.1 million). National Insurance contributes amounted to £44.5 million and VAT from Shetland amounted to £42.9 million. Other source tax income include fuel duties, capital gains tax and alcohol and tobacco duties among others.

There are three sources of government spending. The first is local authority (SIC) spend which amounts to £181.5 million, calculated using the SIC revenue and expenditure database. This expenditure is for the running of the local area and includes costs associated with education and housing. Over half of this spend (£97.8 million) is related to salary costs while another £57.8 is identified as general revenue spend and £27.8 million on capital/infrastructure spend. From the SIC data base, 56% of revenue spend and 36% of capital spend is within Shetland.

Shetland's proportion of total Scottish Government expenditure is included in the exchequer balance, with these including costs on transport, health and policing. Using

[5] Government Expenditure and Revenue Scotland (GERS) is a statistics publication, which estimates the revenues raised in Scotland and the goods and services provided for the benefit of Scotland.
[6] GERS has information on council tax and business rate revenue but these are excluded in this estimate as they are part of the SIC revenue database

the GERS database, the estimated value of this expenditure was £140.4 million with £53.8 million of this related to health and £11 million on policing.

The third and final source of government expenditure is for Shetland's proportion of UK national spend such as defence and social protection. Again this information is estimated using the GERS figures and amounts to £128.8 million. The majority of this national spend (59.7%) is related to social protection with a further 10.4% related to defence spending and the remaining 29.9% on activities such as public debt financing, transport and international services.

Overall Shetland has an exchequer deficit of £129.5 million, amounting to £5,610 per person within the region, which is more than double Scottish average deficit of £2,525 per person. In 2011 the exchequer balance was estimated to be a net contribution of £84.3 million (in 2017 prices) representing a reduction of £213.8 million over a 6 year period. This does not seem feasible and it is the update of the methodology which is the main source in the differences. The previous study included national taxes raised in Shetland but did not account for Shetland proportion of national expenditure, skewing the results towards an exchequer surplus. For a clearer picture both national taxes and Shetland's proportion of national spend must be accounted for which is applied in this report.

5. Multiplier Analysis

5.1 IO multipliers

To this point the focus of this report has been on the regional output, value added, employment and growth. However, the development of the Shetland IO allows for economic multipliers to be estimated, which can then be used in economic modelling (Chapter 6).

Economic multipliers give the quantity of a given item (e.g. output/employment) supported – directly or indirectly throughout the economy – by £1m of final demand for a sector in the economy. To take an illustrative example: an output multiplier of 1.5 means that for every £1 of final demand for the output of that sector, £1.50 of output is supported in the economy.

There are two fundamental variations of multipliers found from IO tables (Type 1 and Type 2), which differ in their treatment of households. For Type 1 the household sector is treated as exogenous and not included in the **A** matrix. The **A** matrix is the matrix of technical coefficients – the proportion of sector i inputs which contribute to the output of sector j – calculated from the columns of the IO table.

Type 1 multipliers capture the direct and indirect change resulting from a unit change in final demand for the output of a sector. Direct effects are the simplest – if there is an increase in demand for a sector then the output of that sector will increase by at least that amount.

However, each sector in the economy is linked to the others, thus an increase in output in one sector (which is reliant on inputs from others sectors) will also require an increase in the output of the linked input sectors, known as the indirect effects.

Type 2 multipliers will also measure the direct and indirect effects along with a third effect, the 'induced effect'. An increase in the final demand will require some degree of increased labour input, reflected in the increased payment to compensation of employees. This in turn will generate additional increases – due the work force having an increased level of disposable income to spend – in final demand and thus output. This is known as the induced effect and is calculated by 'closing' the IO modelling to endogenise household consumption, by expanding the **A** matrix to add a row and column representing labour input and household consumption (Miller and Blair, 2009).

These Type 2 multipliers can be calculated through a variety of methods, with pros and cons of each (Emonts-Holley et al, 2015). The difference in methods arises from the way in which household consumption is handled. Emonts-Holley et al, 2015 indicate that while M&B can overestimate the impacts, Batey underestimate impacts. For the IO modelling used in this thesis the M+B methods is used for the calculation of Type 2 multipliers.

5.2 Sector Analysis

Table 5.1 reports the Type 1 and Type 2 multipliers for each of the 30 Shetland economic sectors along with their rank.

Table 5.1: Type 1 and Type 2 multipliers & employment effects and multipliers

	Type 1	Type 1 Rank	Type 2	Type 2 Rank	Employment Effect	Employment Effect rank	Employment Effect	Employment multiplier Rank
Agriculture	1.632	2	1.923	1	29.48	5	1.48	15
Fishing	1.420	3	1.722	5	11.96	22	2.31	5
Aquaculture	1.117	15	1.195	29	3.17	30	1.80	9
Oil	1.026	26	1.179	30	13.25	18	1.17	28
Mining	1.000	30	1.315	23	6.75	27	2.09	7
Fish processing	1.644	1	1.922	2	9.09	24	4.06	1
Other food and drink	1.121	14	1.293	24	13.76	17	1.33	24
Engineering	1.116	16	1.410	19	14.63	15	1.42	19
Textiles	1.277	6	1.500	13	30.96	4	1.25	25
Other manufacturing	1.123	13	1.388	20	15.09	14	1.43	18
Electricity, gas and water	1.205	9	1.361	22	5.63	28	2.43	4
Construction	1.145	12	1.516	11	15.34	12	1.57	14
Wholesale	1.090	19	1.289	25	19.93	10	1.18	27
Retail	1.055	22	1.475	14	14.41	16	1.58	13
Accommodation	1.227	8	1.625	7	26.47	6	1.35	23
Catering	1.094	18	1.468	15	37.24	2	1.17	29
Warehousing	1.378	4	1.749	4	12.03	21	2.48	3
Sea transport	1.013	28	1.362	21	8.20	26	1.94	8
Land transport	1.041	24	1.419	18	12.24	20	1.60	12
Air transport	1.008	29	1.228	26	8.32	25	1.43	17
Communications	1.057	21	1.431	17	52.03	1	1.10	30
Financial services	1.191	10	1.599	9	9.60	23	3.65	2
IT and retail estate services	1.087	20	1.203	27	4.19	29	2.10	6
Technical and professional services	1.102	17	1.202	28	15.34	13	1.19	26
Public administration	1.047	23	1.460	16	12.70	19	1.69	11
School	1.017	27	1.563	10	23.99	8	1.36	22
College	1.034	25	1.652	6	23.64	9	1.45	16
Health	1.250	7	1.504	12	15.57	11	1.75	10
Social work	1.159	11	1.784	3	31.42	3	1.39	21
Other services	1.282	5	1.622	8	24.04	7	1.40	20

The largest Type 1 multiplier, indicating the highest proportion of local interconnectivity, is for the fish processing sector at 1.644. Meaning that for an increase of £1,000 in fish processing demand will result in an overall increase in Shetland economic output of £1,644. Agriculture processing has the second largest type 1 multiplier at 1.632, indicating significant interlinkages with the local economy.

The top 5 largest type 1 multipliers are rounded out with fishing (1.418), warehousing (1.378) and other services (1.282).

In Table 5.2 we compare the Type 1 multipliers with last two Shetland economic studies – 2011 and 2003.

Table 5.2: Largest Type 1 multipliers 2003-2017

2017	2011	2003
1. Fish processing	1. Communications	1. Agriculture
2. Agriculture	2. Wholesale	2. Fish processing
3. Fishing	3. Electricity, gas and water	3. Other food and drink processing
4. Warehousing	4. Oil terminal	4. Communications
5. Other services	5. Sea transport	5. College education

From Table 5.3 we find significant differences between 2017 and 2011, with the 2017 more in line with 2003 as agriculture and fish processing have the two largest multipliers.

Column three of Table 5.1 gives the Type 2 multipliers for each of the 30 Shetland economic sectors. Across all sectors multipliers are larger, driven by the increase in overall employment income (not wage rates), which increases sectoral demand further depending on the household consumption pattern. Again Agriculture and Fish processing have the two largest multipliers at 1.923 and 1.922 respectively. The next three largest Type 2 multipliers are Social work (1.784), Warehousing (1.749) and Fishing (1.720)

Both Social work and College see very large differences between Type 1 and Type 2 multipliers which is attributed to their large employment to output coefficient. This is also the cause of other employment intensive sectors (such as retail, schools and public administration) which see large difference between multipliers.

Unlike with the Type 1 multipliers, the Type 2 cannot be directly compared with previous studies which use the SAM methodology. However, they do find similar patterns in that the change in multipliers is largest within the labour intensive sectors.

The table can also be used to measure employment effects and multipliers. Employment effects measure the total employment for the whole economy generated from a unit increase (£1m) in demand for sectors. These are generated by multiplying the Leontief inverse matrix by the diagnosed employment-coefficient matrix. Similar to the employment coefficient, Communication has the largest employment effect at 52.0 FTE/£ million, meaning that for every £1million of output in the Communication sector 52.0 FTEs are created. Across all sectors the employment effect is larger than the coefficient as inter-industrial linkages are now accounted for.

Employment multipliers are calculated by dividing the total employment effects for each sector by the sector's employment coefficients (again found in Table 5.1). These multipliers give the whole economy increase resulting from a unit increase in employment of a particular sector. The largest employment coefficients for Shetland 2017 were found in the Fish processing, Financial and Warehousing sectors. Fish processing has an employment multiplier of 4.06 indicating that for every 1 FTE created in this sector 3.06 FTEs are created elsewhere in the economy. Sectors with lower employment coefficients (i.e. capital intensive) in general have lower employment multipliers.

The employment effects can be separated further using the information from the employment occupation matrix with the results in Table 5.3. For the table below the sum of the 9 occupational effects matches that for the total employment effects in Table 5.1.

Table 5.3: Occupational employment effects

	Mangers; Director and Managing	Professionals	Associate professionals and technicians	Administrative	Skilled Trade	Caring and other series	Sales and customer services	Process; plant and machine operation	Elementary occupation	Total
Agriculture	9.44	0.59	0.75	1.26	7.39	1.25	2.32	1.76	4.71	29.48
Fishing	3.42	0.44	1.06	0.44	2.03	0.67	1.22	1.40	1.28	11.96
Aquaculture	0.35	0.11	0.18	0.12	1.19	0.17	0.26	0.56	0.23	3.17
Oil	0.65	3.92	0.16	0.09	1.59	0.43	0.32	5.89	0.21	13.25
Mining	1.35	2.08	0.84	0.28	0.98	0.14	0.08	0.85	0.14	6.75
Fish processing	1.93	0.32	0.65	0.33	1.58	0.67	0.94	1.03	1.63	9.09
Other food and drink	3.00	0.48	0.77	0.41	1.37	0.50	1.99	3.31	1.91	13.76
Engineering	1.60	0.92	2.14	0.80	4.52	0.20	2.35	1.54	0.56	14.63
Textiles	14.47	0.33	1.49	1.28	3.90	1.16	1.60	4.62	2.12	30.96
Other manufacturing	1.82	1.39	1.57	0.87	2.40	1.53	1.94	2.26	1.31	15.09
Electricity, gas and water	0.84	0.48	0.56	0.65	1.13	0.43	0.60	0.50	0.42	5.63
Construction	1.56	0.46	0.61	0.67	5.68	1.07	1.45	2.01	1.83	15.34
Wholesale	2.13	0.77	1.20	0.53	2.03	0.58	8.70	3.38	0.62	19.93
Retail	1.05	0.48	0.96	0.69	0.95	1.79	5.21	1.76	1.53	14.41
Accommodation	5.67	0.49	1.29	1.79	2.32	2.90	1.82	1.02	9.17	26.47
Catering	4.59	0.33	1.08	1.30	6.74	1.35	3.07	1.38	17.40	37.24
Ports and Harbour	1.38	0.59	2.20	0.68	1.37	1.24	1.16	1.67	1.74	12.03
Sea transport	0.82	0.22	2.05	0.57	0.66	1.10	0.76	1.37	0.66	8.20
Land transport	0.90	0.47	0.62	0.72	0.74	1.27	1.00	5.66	0.86	12.24
Air transport	0.64	0.23	2.02	0.29	0.41	3.05	0.61	0.78	0.30	8.32
Communications	3.83	6.08	28.49	2.38	4.24	1.06	3.66	0.63	1.65	52.03
Financial services	1.62	0.60	2.26	0.49	0.78	1.23	1.12	0.76	0.74	9.60
IT and retail estate services	0.43	0.70	0.78	0.29	0.40	0.30	0.69	0.23	0.36	4.19
Technical and professional services	5.66	0.99	1.12	3.61	0.79	0.65	1.08	0.40	1.06	15.34
Public administration	0.73	1.51	1.12	0.34	0.69	1.39	1.02	0.63	5.27	12.70
School	1.04	9.14	2.31	1.60	0.95	5.03	1.12	0.93	1.88	23.99
College	1.62	6.17	3.50	2.16	0.98	4.32	2.14	1.01	1.72	23.64
Health	0.83	0.67	0.78	0.93	3.96	4.43	2.22	1.00	0.74	15.57
Social work	2.03	2.49	2.37	1.67	1.28	15.09	3.80	1.03	1.65	31.42
Other services	2.05	0.38	0.56	0.47	1.62	15.22	1.91	0.93	0.90	24.04

6. The impact of COVID on Shetland Islands

Many of the direct impacts of the pandemic on national economies have been clear. Many businesses have been forced to close and the behavioural patterns of consumers have changed dramatically.

But businesses do not operate in isolation. Supply chains make up a complex web of activity running through local economies, such as the Shetland Islands, and connecting to firms in Scotland, the rest of the UK and further afield.

To understand how demand shocks can affect economies – whether that is new investment and projects, or the shutting down of sectors – it is therefore crucial to understand how supply chains work.

Input output tables enable such an understanding as they describe the relationships between sectors, labour and sources of demand.

In this section, we illustrate the power of economic modelling using IO tables by analysing the potential impact of COVID on Shetland Islands.

6.1 Size of the shock

It is difficult to estimate the impact of the pandemic for a number of reasons. But first, we must define the scope of this impact. We define this as the impact of business closures due to government restrictions and do not attempt to explicitly consider medium-term behavioural changes due to the lack of information.

The first issue is that input-output tables look at an economy for a whole year and therefore requires the shock is specified in whole year terms.

It's very difficult to say what the annual level of restrictions has been in the Shetland Islands. For example, Shetland has moved between different tiers and restrictions have changed greatly over 2020 and 2021.

And specifying the direct shock is also an issue. Looking at how GDP has changed over several quarters would include not just the direct impact, but also some of the spill-over impacts. Using these as the direct shock would therefore lead to double counting of the indirect impact.

Because of this, we have not attempted to model the whole economic impact of the pandemic. A follow up post-restriction analysis will be required to examine this. We have instead modelled a specific period of restrictions.

There are also some clues in a survey run by Shetland Islands Council conducted in October 2020. It should be noted that it was difficult to draw conclusions from smaller or less surveyed sectors due to small sample sizes.

The survey showed large amounts of furloughing over the summer in construction, food & drink, retail & wholesale and tourism, leisure & hospitality.

By October, the vast majority of furloughed construction workers were working again. Comparatively, over a third of food & drink and tourism, leisure & hospitality workers were still furloughed. Around one in four retail & wholesale employees also remained furloughed.

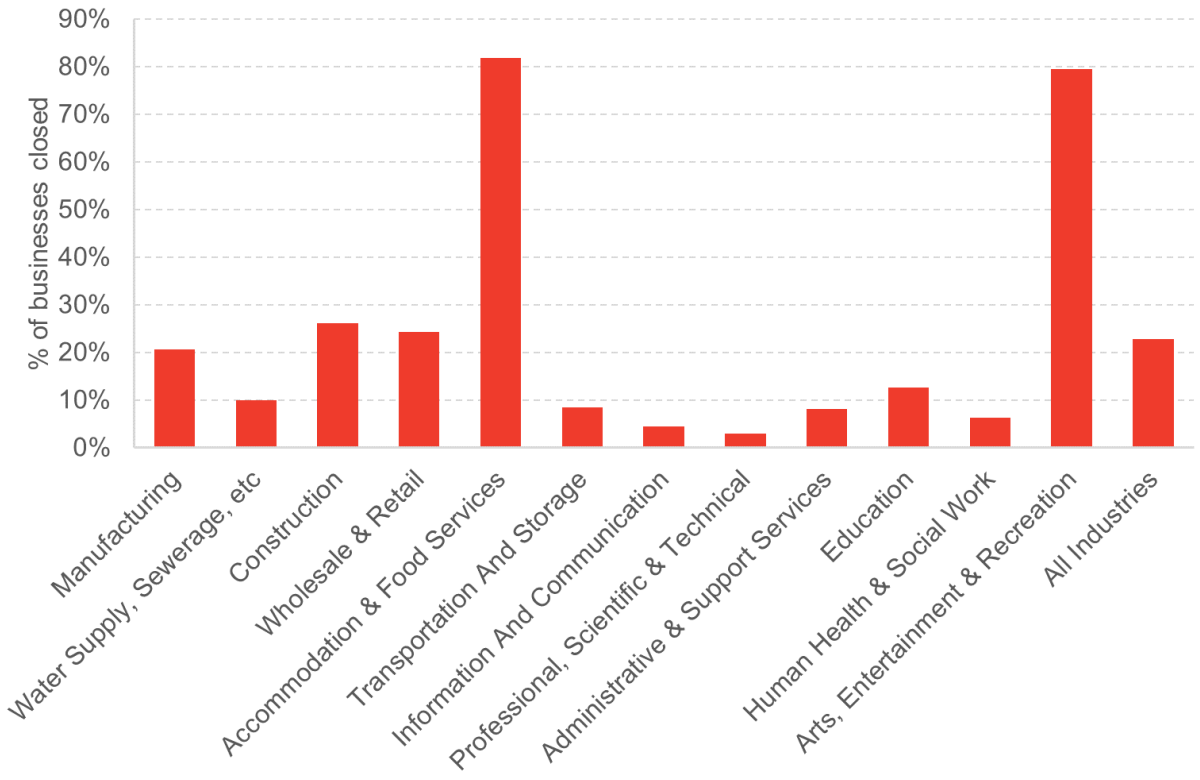
A large proportion of responding firms in these two sectors, along with Personal Services (e.g. hair and beauty) were also very concerned with going out of business in the 3-6 months following October. Retail & Wholesale followed closely behind these sectors in their concerns.

While the sample sizes on the individual sectors are not enough to make a quantitative estimate of the level of shutdown over the year, it does indicate that the food & drink, tourism-facing, leisure & hospitality and personal services sectors likely saw the largest and longest shutdowns.

Comparatively, sectors such as construction likely experienced a large temporary drop in activity followed by a relatively swift recovery. This chimes with the experience of many construction firms around Scotland.

In our modelling, we look at the temporary and permanent closure of UK businesses by sector using the ONS Business Impact of COVID-19 Survey (BICS), undertaken between the 6th and 19th of April 2020. This gives us an understanding of how different sectors reacted to restrictions in the UK. It only includes closure of businesses rather than reduced operation, however.

Figure 6.1: Percentage of UK businesses that had permanently or temporarily ceased trading between 6 April and 19 April



Source: ONS BICS

In summary, we use the proportion of business closures by sector in the UK as a proxy for the direct shock at the start of the lockdown. We then specify the length of the first lockdown as twelve weeks.

6.2 Estimates of economic impacts

Using our model of Shetland Islands, we can understand the impact of these closures on the Shetland Islands economy.

Before looking at the results, it is important to understand the three impacts that they are composed of. It is easiest to illustrate this with an example – here, on the accommodation sector.

- The **direct impact** is the fall in output in the accommodation sector from the enforced closure.

- Hotels and other forms of accommodation purchase goods and services from other firms in the Shetland Islands economy. The **indirect impacts** includes these supply chain impacts.
- The closure of hotels and other forms of accommodation leads to a fall in employment in accommodation and its supply chain. These people no longer spend their wages across the Shetland Islands economy and so this generates a knock on impact – this is the **induced impact**.

In the table below, we look first at the modelled impact of this twelve week lockdown on gross value added (GVA) and full-time equivalent (FTE) employment had there been no policy response. We follow this of a discussion on how this has been tempered by furloughing and the job security of public sector employment.

Table 6.1: Modelled first lockdown impact without policy response*

	GVA (£m)	FTE Employment
Direct	26.3	-575
Indirect	4.1	-75
Induced	6.5	-125
Total	**36.9**	**-775**

* Employment rounded to the nearest 25. Columns may not sum as a result.

Public sector employment has been protected over the past year and so any modelling should reflect this. We have removed the impact on public sector employment in the table below.

Table 6.2: Modelled first lockdown impact with public sector employment protected*

	FTE Employment
Direct	-425
Indirect	-75
Induced	-75
Total	**-575**

* Employment rounded to the nearest 25. Columns may not sum as a result.

The impact on employment will also have been significantly tempered by the furloughing scheme. In the first lockdown, this was backdated to the 1st of March and

provided grants of 80% of employment costs up to a total of £2,500 per person per month.

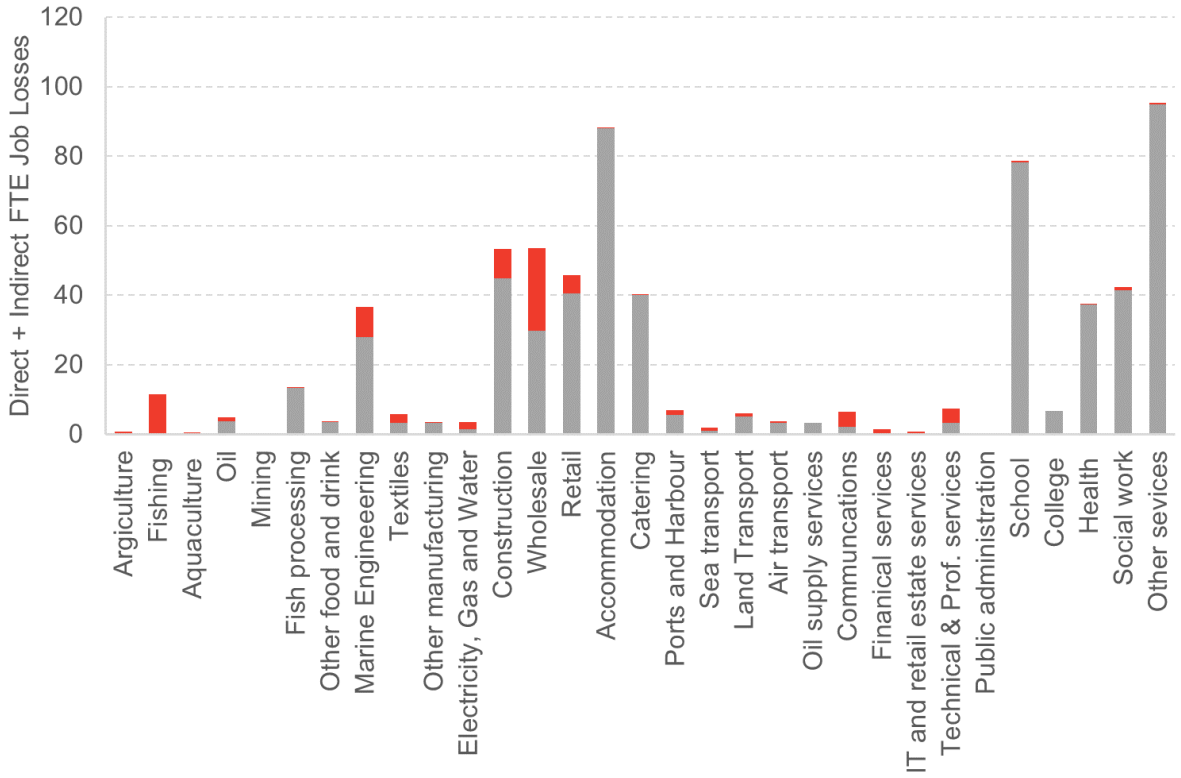
This protected jobs that would have otherwise been lost. That is, it tempers the direct and indirect job losses. The induced impact is the result of direct and indirect job losses leading to a fall in wages (and other employee costs) which are then no longer able to be spent around the economy. The protection of a large amount of wages will therefore significantly temper the induced effect.

In addition, grants and loans provided by local and central government as well as private loans will have further protected job losses in the Shetland Islands.

We can therefore estimate that in the first lockdown, without the policy response of local and central government, an estimated 575 full-time equivalent jobs (5.9%) are expected to have been lost in Shetland Islands.

The chart below shows these estimated job losses (induced excluded) by sector. Jobs were most at risk in other services (creative, arts, entertainment, sports services etc) and accommodation. Indirect job losses played a proportionately large role in the wholesale and fishing sectors.

Figure 6.2: Direct + indirect impact of temporary and permanent business closures on FTE employment in Shetland Islands



6.3 Illustrating the size of shocks to sectors

Due to the limited data on exact levels of closure by sector over the lockdown period, we have modelled the economic impact of 'shutting down' nine different sectors individually. Each sector is shut down by 20% to allow for comparisons between the results.

The nine sectors included represent some of the most likely sectors to experience large direct closures due to a lockdown.

Table 6.3: Fall in output from an annualised 20% fall in activity in a specific sector, £ thousand*

	Direct	Indirect	Induced	Total
Accommodation	4,745	1,075	2,050	7,875
Construction	15,230	2,100	6,075	23,416
Wholesale	6,300	545	1,350	8,175
Retail	15,925	850	6,825	23,600
Catering	1,340	125	545	2,000
Sea Transport	2,550	30	975	3,550
Land Transport	6,810	270	2,735	9,810
Air Transport	5,890	40	1,515	7,450
Other Services	6,025	1,680	2,160	9,865

* Column totals may not match sums due to rounding. Rounded to the nearest 5

Table 6.4: Fall in employment from a 20% fall in activity in a specific sector, FTE Employment*

	Direct	Indirect	Induced	Total
Accommodation	95	10	25	130
Construction	150	20	75	245
Wholesale	105	5	15	130
Retail	145	10	75	230
Catering	45	0	5	50
Sea Transport	10	0	10	20
Land Transport	50	0	30	85
Air Transport	35	0	15	50
Other Services	105	20	25	1,450

* Column totals may not match sums due to rounding. Rounded to the nearest 5

Table 6.5: Fall in GVA from an annualised 20% fall in activity in a specific sector, £ thousand*

	Direct	Indirect	Induced	Total
Accommodation	3,320	535	1,200	5,060
Construction	7,690	1,335	3,565	12,590
Wholesale	2,960	305	790	4,055
Retail	10,925	455	3,960	15,340
Catering	760	60	320	1,140
Sea Transport	1,125	15	565	1,805
Land Transport	3,475	130	1,605	5,210
Air Transport	1,720	15	830	2,565
Other Services	3,890	785	1,260	5,935

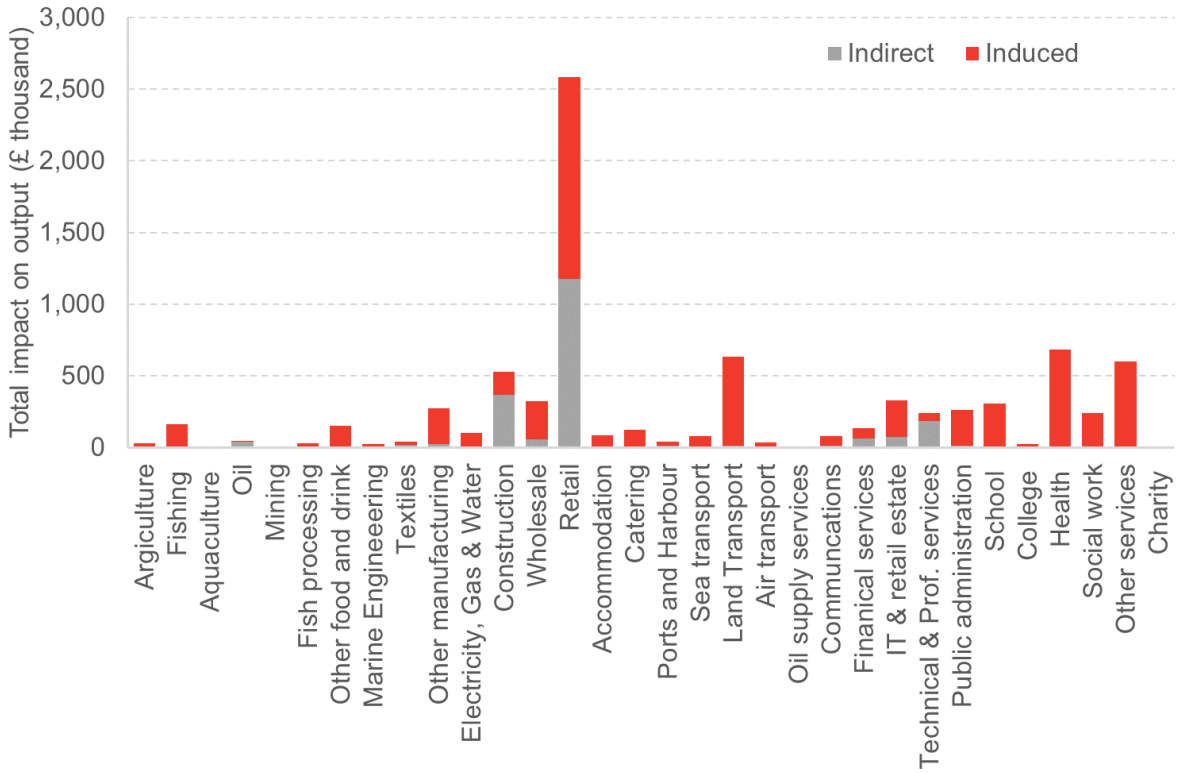
* Column totals may not match sums due to rounding. Rounded to the nearest 5.

Bearing the caveats of furloughing in mind, a 20% fall in activity in the construction sector leads to an estimated fall of £23.4 million in output, £12.6 million in GVA and 245 FTE employment in Shetland Islands.

Approximately 36% of this impact on output comes from the spill-over effects, i.e. indirect and induced impacts.

The chart below shows the spill over impacts of a 20% shutdown in construction on output. In particular, you can see that the retail sector is particularly affected, followed by sectors such as land transport, health and other services.

Figure 6.3: Spill over impact of a 20% shutdown in construction on output in Shetland Islands



References

Hermannsson K (2016) Beyond Intermediates : The Role of Consumption and Commuting in the Construction of Local Input – Output Tables Beyond Intermediates: The Role of Consumption and. 1772. Taylor & Francis. DOI: 10.1080/17421772.2016.1177194.

Appendix A: Shetland 2017 IO sector classification

Sector	SIC 2007 Code
Agriculture	01-02.4
Fishing	03.1
Aquaculture	03.2
Oil	06-08
Mining	05, 09
Fish processing	10.2
Other food and drink	10.1, 10.4-12
Marine Engineering	30,32
Textiles	13-18
Other manufacturing	19-33
Electricity Gas and Water	35-39
Construction	41-43
Wholesale	45,46
Retail	47
Accommodation	55
Catering	56
Warehousing	52
Sea transport	40
Land Transport	49
Air transport	51
Communications	58-61 63
Financial services	64-66
IT and retail estate services	62, 68
Technical and professional services	69-82
Public administration	84
School	85
College	85
Health	86
Social work	87,88
Other services	90-97

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