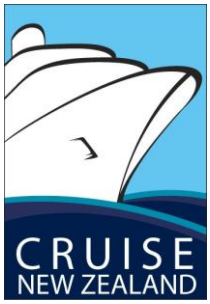

New Zealand Regional Cruise Industry Study

Prepared for

CRUISE NEW ZEALAND

by Market Economics Ltd, Auckland

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Disclaimer

Although every effort has been made to ensure accuracy and reliability of the information contained in this report neither Market Economics nor any of its employees shall be held liable for the information, opinions and forecasts expressed in this report.

Executive Summary

This assessment has drawn from the national study of the cruise industry (New Zealand Cruise Industry Study, 2010) to establish the regional distribution of the activity and the resulting economic impact for the 2009/10 season and forecasts for the coming two 2010/11 and 2011/12 seasons.

The national study (New Zealand Cruise Industry Study, 2010) found that the New Zealand cruise industry has grown strongly in recent years, from 27 cruises catering for 19,400 passengers in the 1996/97 season, to 81 cruises catering for 109,951 passengers in 2009/10 and potentially over 199,943 passengers in 2011/12. This activity by the cruise industry creates significant volumes of spend in the national economy. The national study estimates that the direct expenditure from the industry will grow from $176.7m in 2009/10 to $318.6m in 2011/12. The resulting value added (GDP) generated by the industry is expected to grow from $200.0m in 2009/10 to $362.7m in 2011/12. This level of activity is expected to generate employment for about 5,800 by 2011/12 which is 81% greater than 2009/10.

The regional results in this study show that the industry activity levels and the economic impacts are likely to grow for most regions and ports. In general, the growth over the coming two seasons is expected to be focused on the ports/regions that already see high levels of activity.

The forecast growth in ship port days and person port days is expected to be focused on the larger regions, Auckland, Bay of Plenty, Hawke's Bay, Wellington, Canterbury, Otago and Southland. These regions see a significant increase in ship days, with each region seeing an average of 40 additional ship port days by 2011/12 which creates an additional 100,000 port passenger days for these regions. Some of the smaller regions will see a small reduction in ship port or stop days. The Gisborne, Waikato, Nelson and Tasman Regions will loss around 2 to 4 ship visits between 2009/10 and 2011/12. This reduction in ship visits causes a drop in person port days for these regions of around 1,200 on average.

The value added (GDP) impact associated with the industry is focused on the four larger regions. These regions are expected to attract 64% of the growth in value added impact over the coming two seasons (Auckland 35%, Wellington 12%, Canterbury 9% and Otago 9%).

The cruise industry regional economic impacts for the larger ports are as follows,

- Auckland grows from $66.6m in 2009/10 to $113.3m in 2011/12, which creates an additional 680 jobs.
- Wellington grows from $14.8m in 2009/10 to $31.0m in 2011/12, which creates an additional 280 jobs.
- Canterbury grows from $19.7m in 2009/10 to $31.8m in 2011/12, which creates an additional 200 jobs.
- Otago grows from $16.5m in 2009/10 to $28.0m in 2011/12, which creates an additional 190 jobs.

It is also expected that the smaller ports and regions will capture a very small proportion of the growth in economic impact, with some regions recording a small decline (Tasman and Gisborne).

The study shows that Auckland region receives the largest proportion of the industry spend and economic impact in the 2009/10 season, which is consistent with previous studies of the industry. While Auckland is expected to remain the largest hub of activity and spend in the coming seasons, the other regions are expected to grow faster (all other regions grow by 37% p.a. while Auckland grows by

30% p.a.). This trend is caused by the expected increase in Australia swing voyages. These voyages tend to impact more evenly across the regions and have very little exchange activity.

The regional cruise industry employment impact shows that by 2011/12 seven of the regions are expected to have over 350 jobs supported by the industry (Auckland, Bay of Plenty, Hawke's Bay, Wellington, Canterbury, Otago and Southland). The results also show that the majority of the jobs created (around 70%) will be related to passenger demand (i.e. retail, exchange activity, excursions activities and transport).

Finally, in this study we have developed a new measure of activity for the industry. This measure estimates the number of people movements onto and off a cruise vessel in each port. The measure will be useful for local planners as it provides an indication of the potential traffic volumes created by the industry.

At the national level it is estimated that passengers and crew will move through a seaport or stop 1.3 to 2.6 million times in 2009/10 (or 1.6 to 3.1 movements per person per port day). The movements through ports will increase by around 40% p.a., with total movements expected to range between 2.6 to 5.2 million by 2011/12. The regional results show that there is likely to be significant growth in person movements in Northland, Auckland, Bay of Plenty, Hawke's Bay, Marlborough and Wellington (over 100% in the coming seasons).

Local planners and business operators need to plan for the future growth in movements to provide sufficient services, this would include additional coaches, guides, excursion capacity and port handling facilities. Each port needs to be careful to provide sufficient services as capacity issues may cause cruise ships to switch to other ports and stops.

Glossary

- *Direct Impacts*: also termed the first round effects. They cover the direct spending that occurs by all players in the industry (i.e. passenger spend, cruise vessel spend and crew spend). This direct spending sustains a certain amount of direct employment to meet these direct needs, and generates a certain amount of direct value added ($).

- *Exchange*: A passenger or crew member is defined as exchanging if they embark or disembark from a cruise ship within New Zealand waters. There are four possible outcomes for each passenger or crew member; (1) only embark, (2) only disembark, (3) embark and disembark or (4) transit. The first two outcomes result in one exchange being recorded for the passenger or crew member. The third outcome is recorded as two exchanges, one for the embarkation and one for the disembarking. The final outcome is recorded as no exchange, these cruise passengers transit through New Zealand often on round the world cruises, and therefore never exchange.

- *Employment Count (EC)*: Head count of salary and wage earners sourced from taxation data. Usually a higher count than FTEs – see below.

- *Gross Domestic Product (GDP)*: measures value-added of products produced within a country's borders. In this study the value of production is expressed in the prices of a base year so that comparison can be made with inflation removed (base year 2009).

- *Gross Registered Tonnage (GRT)*: represents the total internal volume of a vessel, where a registered ton is equal to a volume of water of 100 cubic feet.

- *Indirect Impacts*: are the effects that occur when suppliers to the directly impacted businesses have to increase their production to meet the increase in demand for goods and services. This requires the further purchase of other goods and services from their suppliers. Indirect effects are calculated in terms of indirect gross output ($),value added ($) and employment (ECs).

- *Induced Impact*: the effect of additional wages and salaries paid into the economy inducing additional expenditure. Businesses, either directly or indirectly impacted, are assumed to be operating at maximum capacity and therefore additional demand causes them to either hire additional workers or pay overtime. This means more money is available to households in the economy. The induced effect covers how this money then flows through the system as people spend more.

- *Input Output Model (IO)*: A model of the economy that measures the interdependence of industries and households (see Appendix A for detail).

- *Offshore Islands*: These are the set of sub-Antarctic Islands in the Southern Ocean south of New Zealand (Auckland Islands, Snares Island and Campbell Island).

- *Port Movement:* measures the passenger and crew movements onto and off each ship and port. This data provides an indication of the volume of traffic that can be expected at each port.

- *Port Day*: is a measure of when a ship, crew or passenger enters a port or a stop within New Zealand waters. In this study a ship that visits two ports in one day is counted as spending half a port day in each port.

- *Valued Added (VA)*: measures all payments to factors of production (land, labour and capital), and excludes all purchases of intermediate inputs. It broadly equates with gross domestic product (GDP) as a measure of economic activity at the national level, and gross regional product at the regional level. Components of value added include compensation of employees (salary and wages), operating surplus (company profits), consumption of fixed capital (depreciation), and taxes less subsidies.

1 Introduction

In recent times the worldwide cruise industry has grown to more than 17 million passengers (New Zealand Cruise Industry Study, 2010), up 70% on 2000 and up 54% on 2002[1]. This represents an impressive growth path compared to other tourism sectors, in total a 400% increase in passenger numbers over the past 20 years.

The cruise industry in New Zealand has shown strong growth in recent years, from 27 cruises catering for 19,400 passengers in the 1996/97 season, to 81 cruises catering for 109,951 passengers in 2009/10 and potentially over 199,943 passengers in 2011/12.

As the industry grows in New Zealand it constantly stimulates new activity and initiatives in each of the ports. The geographic distribution of cruise activity depends heavily on the cruise liners choice of ports each season. Although the industry is expected to grow rapidly at the national level the non-uniform nature of the industry means that some regions enjoy more growth than others.

It is important for the industry to understand which ports and regions are growing, to enable planning in order to avoid capacity issues.

1.1 Background and Scope

The economic impact of the New Zealand cruise ship season has been assessed every year or every second year since its inception in 1997. These past assessments have included sub-national analysis of each region to establish the geographic distribution of the industry.

The latest study (New Zealand Cruise Industry Study, 2010), updated the model's core data to 2009/10 season and provided national and Auckland Region results. The study involved in-depth investigation of the structure of the industry and the expenditure in the New Zealand economy resulting from the cruise ship activity. In that study we interviewed many of the key players in the industry, including providores, ground handlers, air services (airport and airlines), marine engineers and shipping agents. These companies provided both financial (actual) and anecdotal (based on experience) data for the 2009/10 cruise season. This data has been used in the economic modelling and to add real world context to the results of the modelling.

1.2 Objectives

This paper has two main objectives, the first is to establish the size and nature of the cruise industry in New Zealand for the past 2009/10 season and the coming two seasons, by port and region. The second objective is to estimate the economic impact that flows from the industry at a regional level for these three seasons. In this report we build on the national level study (New Zealand Cruise Industry Study, 2010) to provide detailed regional and port level data. The results are comparable to the previous studies where regional impacts were calculated. This study has involved the following:

- Quantifying the industry activity (passengers, crew and vessels) in each port and region.

[1] *'Global Changes in the Cruise Industry 2003-2010' July 2003, Tony Peisley*

- Estimating the total economic output or direct spend generated by ship visits, by port and region;
- Calculating the direct, indirect and induced contribution to gross output, value added and GDP;
- Estimating the effective employment generated, as employment counts (ECs).

A secondary objective of this work was to define and calculate a new activity measure for the industry. We propose that person port movements should be measured to provide an indication of traffic volume for the purposes of planning.

1.3 Report Structure

Section 2 of this report explains the methodology used, data collection, industry direct spend and the economic impact analysis. Section 3 reports on the activity levels by region and the direct spend results and economic impacts for the three seasons. The port level data is also presented in Appendix 1. Section 4 includes a brief summary of the findings from this study.

2 Methodology

2.1 Introduction

This study builds on the national level work undertaken in 2010 for Ministry of Economic Development, Tourism New Zealand (TNZ) and Cruise New Zealand (CNZ). This regional study uses the previous national study along with regional Input Output models to measure the impact of the industry on the regional economies for the past season and the coming two seasons.

There are two main steps in assessing the economic impacts. First the direct expenditure is estimated by applying industry expenditure data from 2009/10 season (see subsection 2.3) to activity levels recorded in the past season and forecast activity levels (see subsection 2.2). The second step takes this direct expenditure and applies Regional Economic Input Output model (2007, inflation adjusted) that calculates the flow on effects of direct expenditure generated by the cruise lines, their passengers and crew whilst in New Zealand. The model is generated at the regional level and therefore generates multipliers for each region and New Zealand as a whole.

2.2 Cruise Data Collection

A schedule of all port arrivals by date and vessel was provided by CNZ through TNZ for the 2009/10 season. This dataset includes port visits, ship size, ship class, passenger numbers by country of origin, crew numbers and exchange numbers (embarking/disembarking and crew/passengers). CNZ was also able to provide detailed forward books for the next two seasons and a directory of the ships which includes vital characteristics (i.e. GRT, passenger capacity, crew capacity). The future seasons are forecast by combining the passenger and crew capacity per ship from the 2009/10 season with the forward bookings schedule and the directory of the future ships' characteristics. For more detail see the national study methodology section (New Zealand Cruise Industry Study, 2010).

2.3 Ship, Crew and Passenger Expenditure

Having established the scale of the industry by port and region in terms of numbers of vessels, cruises, passengers and crew, the next step is to quantify their impacts on each region's economy.

Direct expenditure from the cruise industry has been classified into its component parts:

- Cruise Vessel related

  This covers all expenditure related to the cruise and the operation of the cruise vessel. It includes ship specific expenses such as; port costs, marine expenses, bunkering and maintenance as well as; passenger flights to join the cruise, pre- and post-cruise packages booked with the cruise, re-provisioning costs, and various crew related expenses such as crew exchanges, crew accommodation and re-positioning flights.

- Cruise Passenger related

  This covers all incidental expenditure that occurs as a result of a cruise but is not necessarily part of the cruise itself. It includes items such as; all retail expenditure on shore, all café and

restaurant expenditure on shore, sightseeing day trips whilst in port (excursions) and other services such as visits to doctors.

- Cruise Crew related

  This includes all staff spending whilst in port – except that related to crew changes that are paid for by the cruise lines. It includes spend on: retail goods, personal services, casinos, recreational activities and transport.

Cruise vessels, their crews and passengers spend money on a wide range of goods and services in the economy. It is beyond the scope of this report to investigate the details of every transaction that occurred. By necessity averages have been applied, the spend data has been combined with the activity data to establish per unit average spend. These averages vary depending on the costs which are measured. The averages used in this study include per season, per cruise, per port, per GRT, per crew, per passenger, per exchange and combinations (i.e. average per port by GRT).

The modelling also excludes some ports and stops in the estimation of certain spend types because these activities cannot occur at the port or stop. As an example, each of the ports and stops are coded as either having retail opportunity (shopping available) or not, this avoids impossible outcomes such as passengers or crew spending in stops such as Kawau Island or Mercury Island where no retail exists. This method also applies to some cruise related spend which will only occur in certain ports.

All the averages are then combined with forward bookings for the next two seasons to forecast industry activity and output. The detail of the data collected is presented in the national level study (New Zealand Cruise Industry Study, 2010).

2.4 The Economic Model

Market Economics apply a set of Input Output models to the direct expenditure to assess the indirect and induced effects of spend to produce a total economic impact. Put simply "*an input-output model consists of a system of linear equations, each one of which describes the distribution of an industry's product throughout the economy*." (Miller 2009). This branch of modelling is concerned with flows of products between industrial sectors and consumers (which includes households, government, foreign trade and intermediate goods for production).

This technique is applied to expenditure estimates for the past season and the coming two seasons. The results are adjusted for inflation (real terms), with 2009 used as the base year or year of comparison (i.e. 2009 dollars).

It is important to note that in previous studies the assessment split total expenditure between cruise related (for which specific cruise industry multipliers have been calculated) and passenger and crew related (which are passed through standard economic multipliers). In this study the economic impact did not rely on separate multipliers for the industry spend. Details of the model used to calculate the flow on effects of the cruise industry are appended to the report.

The regional models assume that none of the spend by New Zealand residents is new or net additional to each region. This assumption will cause an undercount in the economic impact which will

be significant for some of the ports. For example the impact in Auckland from non-Auckland New Zealanders is not recorded in this study.

It is also important to note that the national impacts reported in the national study (New Zealand Cruise Industry Study, 2010) do not equate to the number measured in this study. The main reason for this difference is caused by the nature of the regional Input Output models. The regional IO models have a narrower focus than the national IO model, which means that the leakage (imports, savings, taxes) from the region by definition must be greater than the national level leakage. This means that the feedback from spend in each region is smaller than at the national level.

For example if a cruise passenger purchases a coffee in Auckland, the string of activity which must occur to supply that coffee results in some money flowing offshore to purchase coffee beans and some money flowing to farmers outside of Auckland to purchase milk. At the national level the only value that leaks from the economy is the money spent importing coffee beans. While at the Auckland regional level there is additional leakage from the region to purchase milk. This means that the flow on impacts measured at the regional level must be smaller than that recorded at the national level.

2.5 Changes compared to National Study

This regional assessment differs from the national level study. There were four issues which have arisen since the release of the national study. The first two issues relate to spend estimate ratios. The industry has provided more detailed information which we have applied in this study. These two changes cause a marginal increase in economic impact for all three seasons. There were also two reporting errors in the national study which are corrected in this report. Neither of the reporting errors impact on the modelling or the overall results.

Spend ratio data

Since the national level study the industry has provided additional data for the providoring and provided suggestions on the treatment of the shipping agent's data. These two changes have been incorporated into this study. The changes impact positively on the economic impact for the three seasons.

Reporting errors

There were two reporting issues in the national level study which are corrected in this study. First the split between passenger, crew and vessel spend for Auckland Region reported in Table 6.1 of the national study was incorrect. In this study we have presented the correct split (Table 3.5). The second reporting issue occurred in Table 4.2, the port passenger days for 2011/12 missed some of the Rugby World Cup port passenger days. This has been corrected in Table 3.1 of this report.

3 Regional Economic Impact and Activity Levels

3.1 Introduction

When a cruise vessel arrives in New Zealand it begins a long chain of economic transactions that add employment and value to the New Zealand economy. Expenditure occurs well before a vessel docks, and continues after it leaves. In the interim, direct expenditure occurs across many sectors and regions of New Zealand.

To add structure to this information, direct expenditure has been divided into three major categories:

- Passenger related expenditure;
- Crew related expenditure;
- Cruise related expenditure.

These relate to specific elements of the industry and help to refine the analysis. The information is reported across the category of spend and total spend is also disaggregated by region and port (see Appendix 1).

3.2 Cruise Activity Levels

In the following table we present the port and stop days spent in each region for the three seasons 2009/10, 2010/11 and 2011/12. In the last season cruise vessels spent 535 days in port or at a stop which enabled over 555,000 port days by international travellers and 253,000 by crew.

In the coming seasons the activity is expected to grow for most of the regions, with the seven larger regions attracting the majority of the growth[2]. The vessels that visit New Zealand in the 2010-11 season are expected to spend 595 days in port, which enables over 712,000 international passenger days and 315,000 crew days. The 2011-12 season grows faster with 794 ship days in port, 1,128,000 international passenger days and 484,000 crew port days.

Some of the smaller regions will see a small reduction in ship port or stop days. The Gisborne, Waikato, Nelson and Tasman Regions will loss around 2-4 ship visits between 2009/10 and 2011/12. This reduction in ship visits causes a drop in person port days for these regions of around 1,200 on average.

The seven larger regions see a significant increase in ship visits, with an each port see an average of 40 additional port days by 2011/12 and which results in an additional 100,000 port passenger days.

[2] Auckland, Canterbury, Wellington, Hawke's Bay, Otago, Southland and Bay of Plenty attract 91% of the growth in person port days between 2009/10 and 2011/12.

Table 3.1 Port and Stop Days by Region, 2009/10, 2010/11 and 2011/12 Seasons

	Ship			International Passenger			Domestic Passenger			Crew		
	2009-10	2010-11	2011-12	2009-10	2010-11	2011-12	2009-10	2010-11	2011-12	2009-10	2010-11	2011-12
Northland	40	41	59	35,002	45,020	81,040	576	525	1,431	15,834	20,050	34,947
Auckland	94	114	163	76,919	118,520	191,007	14,442	12,244	13,539	38,811	54,410	81,615
Bay of Plenty	50	59	98	68,533	85,172	143,369	1,534	1,965	3,289	29,921	36,657	61,792
Waikato	2	2	0	92	2,693	-	9	68	-	56	1,219	-
Gisborne	6	4	2	5,625	1,457	2,693	131	58	68	2,439	687	1,219
Hawke's Bay	41	50	77	47,911	69,493	114,759	716	1,189	2,210	21,193	30,109	50,099
Taranaki	0	0	1	-	-	1,363	-	-	11	-	-	610
Wellington	47	60	98	66,768	89,741	144,680	1,140	1,413	2,952	29,262	38,930	62,104
Nelson	3	0	0	206	-	-	1	-	-	216	-	-
Marlborough	22	20	24	8,159	9,080	20,165	114	276	394	4,529	4,462	8,925
Tasman	3	0	0	178	-	-	1	-	-	167	-	-
Canterbury	64	74	91	83,859	98,829	144,684	1,941	2,177	3,271	37,354	43,760	61,740
Otago	51	66	84	79,317	92,435	138,210	1,875	2,068	3,194	34,557	40,184	58,863
Southland	87	94	94	80,886	99,196	145,810	2,062	2,157	3,256	36,934	44,491	62,741
Offshore Isld	25	11	3	1,673	801	500	72	56	8	1,972	857	213
Total	**535**	**595**	**794**	**555,124**	**712,438**	**1,128,280**	**24,612**	**24,197**	**33,621**	**253,242**	**315,816**	**484,867**

Table 3.2 outlines the regional mix of the total person port days for the 2009/10, 2010/11 and 201112 season. The Auckland Region maintains its role as the main destination for ships and person port days. While the Wellington, Southland, Hawke's Bay, Otago, Canterbury and Bay of Plenty regions show strong growth with 80,000 to 150,000 additional passenger port days being spent in each region by 2011/12.

There are five regions where activity is predicted to decrease between 2009/10 and 2011/12[3]. However as these regions represent less than 2% of the person port days in any of the seasons the overall activity in the season is growing strongly.

Table 3.2 Total Person Port Days, 2009/10, 2010/11 and 2011/12 Seasons

	Total Person Port Days			Region Share		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Northland	51,412	65,595	117,418	6%	6%	7%
Auckland	130,172	185,174	286,161	16%	18%	17%
Bay of Plenty	99,987	123,795	208,450	12%	12%	13%
Waikato	156	3,979	-	0%	0%	0%
Gisborne	8,195	2,202	3,979	1%	0%	0%
Hawke's Bay	69,820	100,791	167,068	8%	10%	10%
Taranaki	-	-	1,984	0%	0%	0%
Wellington	97,169	130,085	209,735	12%	12%	13%
Nelson	422	-	-	0%	0%	0%
Marlborough	12,802	13,819	29,484	2%	1%	2%
Tasman	345	-	-	0%	0%	0%
Canterbury	123,154	144,766	209,695	15%	14%	13%
Otago	115,749	134,687	200,267	14%	13%	12%
Southland	119,881	145,844	211,807	14%	14%	13%
Offshore Isld	3,716	1,714	720	0%	0%	0%
Total	**832,978**	**1,052,450**	**1,646,768**	**100%**	**100%**	**100%**

[3] Waikato, Gisborne, Nelson, Tasman and the Offshore Islands.

The total person port days can then be split into different types of person by embarkation type. Table 3.3 shows the split of total person port days into either, embark, disembark or transit. We note that the numbers presented below are not a unique person count, as some ships visit a port multiple times or spend multiple days in port.

Table 3.3 Passenger and Crew Activity by Embarkation type 2009/10, 2010/11 and 2011/12 Seasons

	Embarking			Disembarking			Transit		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Northland	270	352	77	101	-	77	51,063	65,329	116,900
Auckland	31,390	26,693	36,670	32,704	28,197	39,584	133,104	191,547	290,717
Bay of Plenty	-	-	1,378	1	-	-	99,953	124,008	208,702
Waikato	-	-	-	-	-	-	208	3,979	-
Gisborne	-	-	-	-	-	-	8,195	2,202	3,979
Hawke's Bay	-	-	-	-	-	-	69,712	100,726	166,731
Taranaki	-	-	-	-	-	-	-	-	1,980
Wellington	164	3	-	264	14	1,382	96,912	130,935	211,573
Nelson	-	-	-	-	-	-	507	-	-
Marlborough	-	-	-	-	-	-	13,478	18,971	31,105
Tasman	-	-	-	-	-	-	507	-	-
Canterbury	-	-	-	326	-	-	122,639	145,650	211,915
Otago	263	303	-	-	154	-	115,355	134,482	200,166
Southland	529	67	105	422	137	249	120,503	145,789	211,582
Offshore Isld	-	-	-	-	-	-	4,346	1,714	848
Total	**32,616**	**27,417**	**38,230**	**33,818**	**28,502**	**41,292**	**836,482**	**1,065,332**	**1,656,198**

The data above is important as it can be used to measure the people movements to and from each port. We know that any person that is embarking must make one trip through the port to board the vessel. The disembarking passengers must make one trip through the port to exit the voyage. The transiting persons behaviour is less clear, there are four main possibilities;

- Zero movements: we believe that a small proportion of the transiting persons will not leave the vessel (sickness, lack of interest in excursions offered or staff on shift)
- Two movements: these persons are believed to be the most common; they leave and return to the vessel once to undertake a full day or a half day excursion.
- Four movements: these persons undertake two half day excursions, they return to the ship at lunch time.
- Six movements: these persons undertake two half day excursions and an evening outing, they return to the ship at lunch time and dinner.

For this study we have assumed that on average transiting passengers undertake two passenger movements. We also assume that 60% of crew do not leave the ship while in port (staff on shift etc).

TNZ believes that transiting passenger probably undertake more than two movements per day in each port or stop (i.e. a half day excursion in the morning and then FIT tour in the evening). We have provided estimate movements using an average of four movements to provide an indication of the potential movements (Appendix 1, Table A.4).

We also note that the average movements per passenger will vary by port and vessel as a result of differences in the excursions offered on each voyage and length of stay. It is believed that the metropolitan ports are likely to have a higher number of movements per passenger, as the excursion offered tend to be half a day long, which enables two trips in a day. While the smaller ports are believed to have a lower number of movements per passenger as these ports tend offer more full day excursions.

Generally ship port visits tend to occur during the daylight hours, however there are some ship visits that are only half a day long or longer day-evening visits[4]. When compared to the normal day visits these shorter and longer days will result in different numbers of movements. For example ships that visit Napier tend only remain in the port for half day, hence passengers are unlikely to undertake more than two movements. While some ships that visit Auckland arrive early in the morning and then leave late in the evening (day-evening), this allows up to eight movements.

There may also be a difference in passenger movements between vessels of different classes. In this study we have not attempted to control for these three patterns.

The Auckland region has the highest number of port person movements in all three seasons. The region is expected to see significant growth with port movements increasing from 253,000 in 2009/10 to 507,000 in 2011/12 (Table 3.4). The Wellington, Northland, Bay of Plenty, Hawke's Bay and Marlborough regions are expected to see significant growth in movement numbers (over 100%).

It is also worth noting that the movements will be focused on certain periods of the day, morning, lunch and midafternoon. We are informed that the organised excursion, tend to start and finish at the same time which creates large peaks in the volume of movements. This means that essential services need to be in place to handle large volumes of people during short periods.

Table 3.4 Person Port Movements 2009/10, 2010/11 and 2011/12 Season

	International			Domestic			Crew			Total		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Northland	69,590	89,718	160,064	1,151	1,044	2,919	6,342	8,049	14,194	77,083	98,811	177,177
Auckland	179,753	269,829	421,102	52,592	42,704	45,866	21,143	26,711	40,524	253,488	339,244	507,491
Bay of Plenty	136,913	170,487	286,496	3,076	3,931	6,666	11,984	14,719	25,124	151,973	189,138	318,286
Waikato	244	5,385	-	24	135	-	30	488	-	298	6,008	-
Gisborne	11,250	2,914	5,385	262	116	135	976	275	488	12,488	3,305	6,008
Hawke's Bay	95,606	138,857	228,843	1,432	2,378	4,421	8,477	12,043	20,040	105,515	153,279	253,304
Taranaki	-	-	2,718	-	-	22	-	-	244	-	-	2,984
Wellington	133,325	180,678	292,143	2,235	2,855	5,972	11,739	15,671	25,283	147,299	199,204	323,398
Nelson	496	-	-	2	-	-	103	-	-	601	-	-
Marlborough	16,928	25,182	42,218	248	747	861	1,956	2,403	3,826	19,132	28,332	46,905
Tasman	516	-	-	2	-	-	99	-	-	617	-	-
Canterbury	167,014	198,798	292,102	3,882	4,377	6,616	14,942	17,625	25,022	185,838	220,800	323,741
Otago	158,120	184,732	276,220	3,739	4,143	6,387	13,823	16,109	23,545	175,682	204,984	306,152
Southland	162,576	198,354	291,443	4,179	4,325	6,492	15,024	17,821	25,117	181,779	220,500	323,051
Total	**1,132,331**	**1,464,936**	**2,298,734**	**72,824**	**66,756**	**86,355**	**106,637**	**131,913**	**203,407**	**1,311,792**	**1,663,605**	**2,588,496**

3.3 Direct Expenditure Estimates

Direct expenditure estimates have been based on the 2009/10 spend ratios which are applied to cruise and passenger details of the latest season. Each cruise is assessed using these spend ratios,

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meaning expenditure can be disaggregated between ports and regions according to their cruising schedule for more detailed localised assessments.

In this section we present results for three categories; cruise industry spend, cruise passenger and cruise ship crew spend. There are over 75 sub-categories of spend that are calculated to estimate the total direct expenditure from the New Zealand cruise industry.

Cruise Vessel Expenditure

This expenditure category is that related to the vessels' presence in New Zealand waters. This includes not only the physical presence of the ship and the associated costs of running, berthing and maintaining the ships, but also cruise related passenger and crew activity – activities that are directly attributable to the cruises in New Zealand. This includes:

- spend by vessels on fuel, berthage, security, stevedoring, port fees etc;
- cruise passenger spend on flights, pre- or post- package accommodation;
- spend by the cruise lines on moving crew to and from New Zealand;
- spend on provedoring for all passengers and crew while onboard;
- spend on onboard entertainment.

Cruise Passenger Expenditure

Passenger related expenditure covers all expenditure that is not directly tied to the activities of the cruise itself. This is primarily retail spend while on excursions or during free time spent ashore (during port stops or before or after the cruise).

Cruise Crew Expenditure

The final category of spend covers crew related spend. As with passenger spend, crew related expenditure covers only that money spent independently in New Zealand while in port or before and after cruises - primarily retail spend.

Total Direct Expenditure

Summing the components of expenditure detailed above shows that total national cruise industry direct expenditure grows from $278.9m in 2009/10 season to $484.8m in 2011/12 season (Table 3.5). The regional data shows that the majority of the direct expenditure is focused on Auckland and six other regions (Bay of Plenty, Hawke's Bay, Wellington, Canterbury, Otago and Southland).

The passengers related spend is mostly focused on Auckland (40% of the total), with Canterbury, Otago and Wellington each capturing around 10% of the total spend by passengers.

The largest share of the cruise vessel spend is focused on Auckland (86%), with small amounts being spent in Wellington and Hawke's Bay and the regions in the southern regions of New Zealand capturing 2% of total vessel related spend.

While the crew spend is spread more evenly across the regions. Around a quarter of the crew spend is expected to occur in Auckland.

The Auckland Region attracts just over half of the national growth in direct spend, with spend increasing from $167.0m in 2009/10 to $275m in 2011/12 (28% p.a.). However there are many regions that are expected to see growth which exceed that shown in Auckland. Over the coming two seasons the direct spend from the industry is expected to grow by at least 40% p.a. in Marlborough, Wellington, Taranaki, Hawke's Bay, Bay of Plenty and Northland regions.

Table 3.5 Regional Total Direct Expenditure 2009/10, 2010/11 and 2011/12 Seasons ($m)

	Passenger Related*			Crew Related			Cruise Vessel Related*			Total Expenditure		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Northland	6.1	7.4	12.7	1.3	1.7	3.0	0.8	0.9	1.6	8.2	10.1	17.4
Auckland	64.6	62.8	97.5	5.9	7.5	11.2	96.5	111.9	166.4	167.0	182.2	275.0
Bay of Plenty	9.8	11.6	20.6	2.4	3.0	5.2	2.0	2.4	4.7	14.2	17.0	30.4
Waikato	0.8	0.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.7	1.0
Gisborne	0.9	0.4	0.6	0.2	0.1	0.1	0.1	0.0	0.1	1.2	0.5	0.8
Hawke's Bay	7.5	10.4	17.6	1.8	2.6	4.3	2.1	2.9	5.0	11.4	15.9	26.9
Taranaki	0.3	0.2	0.6	0.0	0.0	0.1	0.0	0.0	0.1	0.3	0.2	0.7
Wellington	11.4	14.8	23.5	2.5	3.4	5.4	2.1	2.7	4.5	16.0	21.0	33.4
Nelson	0.6	0.5	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.5	0.8
Marlborough	1.9	1.8	3.8	0.4	0.4	0.8	0.4	0.6	0.9	2.7	2.8	5.6
Tasman	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canterbury	14.7	16.7	23.4	3.2	3.8	5.4	2.6	3.1	4.2	20.4	23.7	33.0
Otago	12.3	14.0	21.0	3.0	3.5	5.1	2.7	3.2	4.6	18.0	20.6	30.7
Southland	9.8	11.9	17.5	1.4	1.7	2.4	2.6	2.7	3.7	13.8	16.3	23.6
Other NZ	4.1	3.5	5.5	0.0	0.0	0.0	0.0	0.0	0.0	4.1	3.6	5.6
Total	**144.8**	**156.8**	**246.1**	**22.3**	**27.7**	**43.0**	**111.9**	**130.5**	**195.7**	**278.9**	**315.0**	**484.8**

**Incorporates total amount spent on ship fuel and International airfares*

Regional Direct Expenditure that 'Sticks'

Some of the direct spend associated with the industry has very little impact on the national or regional economics as it flows offshore to purchase goods (fuel) and services (flights). For this reason the model removes the spend from the industry that is related to imports.

The remaining spend is defined as 'sticking' to the regional and national economies (Table 3.6). This spend is important because it produces positive indirect and induce impacts on the regional and national economies. The majority of the direct spend that flows offshore occurs in the Auckland region (around 40% of direct spend in Auckland sticks to region). The other regions see over 96% of the direct spend stick to the area.

Of the direct spend that sticks, the passenger related spend is the largest expenditure category, with 67% of spend from industry activity. The cruise vessel related spend in the New Zealand economy is $36.2m in 2009/10 which is around 20% of the total industry expenditure that sticks to New Zealand. The cruise crew expenditure is the smallest expenditure category with around 13% of the industry expenditure in each season.

Table 3.6 Regional Direct Expenditure that 'Sticks' 2009/10, 2010/11 and 2011/12 Seasons ($m)

	Passenger Related*			Crew Related			Cruise Vessel Related*			Total Expenditure		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Northland	5.7	7.0	12.0	1.3	1.7	2.9	0.8	0.9	1.6	7.8	9.6	16.6
Auckland	42.3	43.3	67.1	5.8	7.3	10.9	21.3	27.6	39.2	69.3	78.2	117.2
Bay of Plenty	9.3	11.0	19.4	2.3	2.9	5.0	2.0	2.4	4.3	13.5	16.3	28.6
Waikato	0.7	0.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.6	1.0
Gisborne	0.9	0.4	0.6	0.2	0.1	0.1	0.1	0.0	0.1	1.2	0.5	0.8
Hawke's Bay	7.1	9.8	16.7	1.8	2.5	4.2	2.1	2.9	5.0	11.0	15.2	25.8
Taranaki	0.3	0.2	0.6	0.0	0.0	0.1	0.0	0.0	0.1	0.3	0.2	0.7
Wellington	10.8	14.1	22.3	2.4	3.3	5.2	2.1	2.7	4.5	15.3	20.1	32.0
Nelson	0.6	0.5	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.5	0.8
Marlborough	1.8	1.7	3.6	0.4	0.4	0.8	0.4	0.6	0.9	2.6	2.7	5.3
Tasman	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canterbury	13.9	15.8	22.2	3.1	3.7	5.2	2.6	3.1	4.2	19.6	22.6	31.6
Otago	11.7	13.2	19.9	2.9	3.3	4.9	2.7	3.2	4.6	17.3	19.8	29.4
Southland	9.8	11.8	17.4	1.4	1.7	2.4	2.2	2.7	3.7	13.4	16.3	23.4
Other NZ	4.1	3.5	5.4	0.0	0.0	0.0	0.0	0.0	0.0	4.1	3.5	5.5
Total	**118.9**	**133.0**	**209.0**	**21.6**	**26.8**	**41.6**	**36.2**	**46.2**	**68.0**	**176.7**	**206.0**	**318.6**

3.4 Economic Impacts

The direct expenditure by passengers, ship owners and crew generates second and subsequent rounds of spending as businesses, either supplying the sector directly (e.g. provedoring companies, bus tour operators, retail outlets etc) or indirectly (e.g. farmers, manufacturers etc) increase their demands for intermediate goods and services, labour and capital to meet the needs of cruise vessels and tourists. This in turn causes suppliers to produce more goods, pay more wages or employ more workers.

These transactions are called the **indirect effects**. Workers and owners are paid wages for the additional work they do, or take additional profits which are in turn saved or spent (generating additional activity). These are termed the **induced effects**.

Having established the scale of direct economic impacts, indirect, induced and employment impacts can be estimated by applying regional level economic multipliers (as described in the Methodology section, above). Multipliers are a simple way to measure the flow on effects throughout the economy arising from additional direct expenditure. They are expressed as a 'multiple' that is applied to the value of direct expenditure to generate total value added, total gross output or additional employment. In effect multipliers mimic the operation of the economy by summing sales of intermediate goods and services that make up final goods purchased by the cruise industry.

It is important to understand that multipliers assume the economy is operating at full capacity and that the additional spend generated by the cruise sector will create 'new' employment or new activity rather than utilise spare capacity. It is also important to focus on the beneficial effects of additional economic activity – that is those components that contribute to New Zealand's Gross Domestic Product (GDP). If all that was achieved by cruise ships visiting New Zealand was increased imports, then there are no benefits to the country. Contributions to GDP are measured by assessing the Value Added component of activity generated by the cruise industry. This is done by way of the Value Added ratio and multiplier.

It is also important to understand the difference between Total Gross Output and Total Value Added. Total gross output measures all transactions in the economy including; imports, raw materials, and the purchase of goods already manufactured, whereas total value added measures only **additional value generated** in the economy – essentially, it is the cruise industry's contribution to GDP.

Total Value Added is the most important measure of economic impact as this is the component that makes the nation as a whole better off.

As stated in section 2.4 the regional models treat imports from other regions as leakages from the economy. While at the national level these regional imports are not treated as leakage. This means that the multipliers calculated in the regional models are lower than those from the national model. For this reason the total sum of all regional impacts in the following tables do not sum to the national impacts presented in the national study (New Zealand Cruise Industry Study, 2010).

Regional Gross Output Impacts

Table 3.7 presents the total gross output which relates to the cruise industry throughout the regional economies for the 2009/10, 2010/11 and 2011/12 seasons. The gross output is the value of sales associated with the cruise industry's activity during the seasons. Roughly speaking, the gross output is the total value of sales by producing enterprises (their turnover) in an accounting period. The gross output measure includes value which does not impact on the economy, for example imports and factor payments to foreigners. While the gross output is useful for estimating firm turnover, it is important to note that the gross output is not synonymous to GDP.

In total, the $176.7m of direct expenditure that 'sticks' to the regional economies, generated almost $360.4m in total output during the 2009/10 season. In the coming seasons this is expected to grow to $649.3m. The gross output impact from the industry is greatest in Auckland. However the growth between the seasons is most significant in some of the other regions, such as Northland and Bay of Plenty (over 100% growth).

Table 3.7 Regional Gross Output Impacts 2009/10, 2010/11 and 2011/12 Seasons ($m)

	Passenger Related			Crew Related			Cruise Vessel Related			Total Expenditure		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Northland	10.9	13.4	22.9	2.4	3.1	5.5	1.2	1.5	2.7	14.6	18.1	31.2
Auckland	88.7	91.1	141.1	12.0	15.0	22.5	37.0	48.1	69.1	137.6	154.3	232.7
Bay of Plenty	18.4	21.8	38.5	4.5	5.6	9.7	2.7	3.4	5.9	25.6	30.7	54.1
Waikato	1.5	1.3	2.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.3	2.0
Gisborne	1.5	0.6	1.1	0.4	0.1	0.2	0.2	0.1	0.1	2.1	0.8	1.4
Hawke's Bay	13.6	18.9	31.9	3.3	4.7	7.9	3.5	4.8	8.2	20.5	28.4	48.0
Taranaki	0.5	0.4	1.1	0.0	0.0	0.1	0.0	0.0	0.1	0.5	0.5	1.3
Wellington	21.8	28.3	45.0	5.0	6.6	10.7	4.5	5.9	9.9	31.3	40.8	65.5
Nelson	1.2	1.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.0	1.5
Marlborough	3.2	3.0	6.5	0.6	0.7	1.4	0.6	1.0	1.3	4.4	4.7	9.2
Tasman	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canterbury	29.8	33.9	47.5	6.5	7.7	10.9	3.4	4.1	5.5	39.7	45.6	64.0
Otago	23.4	26.5	39.8	5.7	6.7	9.7	3.1	3.7	5.3	32.2	36.8	54.8
Southland	18.4	22.2	32.7	2.5	3.1	4.3	3.9	4.8	6.2	24.7	30.2	43.2
Other NZ	7.9	6.8	10.5	0.0	0.0	0.1	0.0	0.0	0.0	7.9	6.8	10.6
Total	**240.8**	**269.1**	**422.2**	**43.0**	**53.4**	**82.9**	**60.1**	**77.4**	**114.3**	**343.8**	**400.0**	**619.4**

Regional Value Added Impacts

The model estimates the resulting Value Added impact from the industry direct spend for each region. Value Added measure is comparable to GDP, this measure provides a reasonable estimate of the impact of the cruise industry on the value of productive activity in the regional economies. Comparing Table 3.8 to 3.7 we can see that the spend by all three groups creates a similar proportion of impact on GDP (value added).

The value added (GDP) impact associated with the industry is focused on the four larger regions. These regions are expected to attract 64% of the growth in value added impact over the coming two seasons (Auckland 35%, Wellington 12%, Canterbury 9% and Otago 9%).

It is interesting to note that the Nelson and Waikato regions are expected see a growth in value added impact from the industry (9% p.a. and 16% p.a.). As was shown in section 3.2, these regions are expected to attract less cruise ship visits and person port days. This reduction in visits and days in port results in a decrease of on-voyage spend. However, these regions are expected to attract enough pre and post cruise spend to offset the loss in on-voyage spend.

Auckland is expected to see the largest amount of impact from the industry in all three seasons, growing from $66.6m to $113.3m. It is also interesting to note that the proportion of the industry's impact that occurs in Auckland declines from 40% to 37% over the next two seasons. This is created by the expected increase in ships undertaking Australian swing voyages. The Australian swing voyages tend to exchange passengers in Australia rather than Auckland and travel down the New Zealand coast visiting more ports than the average voyage and then sail back to Australia to exchange for another voyage. This type of voyage results in the impacts being spread more widely across the regions. We expect to see the non-exchange ports capture a larger proportion of the economic impacts as the number of Australian swing voyages increases.

Table 3.8 Regional Value Added Impacts 2009/10, 2010/11 and 2011/12 Seasons ($m)

	Passenger Related			Crew Related			Cruise Vessel Related			Total Expenditure		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Northland	5.0	6.2	10.6	1.2	1.5	2.7	0.8	1.0	1.7	7.0	8.7	15.0
Auckland	40.2	41.4	64.1	5.8	7.3	10.9	20.7	27.0	38.3	66.6	75.7	113.3
Bay of Plenty	8.4	10.0	17.7	2.1	2.7	4.6	2.2	2.6	4.6	12.7	15.3	26.9
Waikato	0.7	0.6	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.6	0.9
Gisborne	0.7	0.3	0.5	0.2	0.0	0.1	0.1	0.0	0.1	1.0	0.4	0.6
Hawke's Bay	6.2	8.6	14.6	1.6	2.2	3.7	2.2	3.0	5.2	10.0	13.9	23.5
Taranaki	0.2	0.2	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.6
Wellington	10.1	13.1	20.9	2.4	3.1	5.1	2.3	3.1	5.1	14.8	19.4	31.0
Nelson	0.5	0.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.4	0.7
Marlborough	1.5	1.4	3.0	0.3	0.4	0.7	0.4	0.6	0.9	2.2	2.3	4.6
Tasman	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canterbury	13.6	15.5	21.7	3.1	3.7	5.2	3.0	3.6	4.9	19.7	22.7	31.8
Otago	10.8	12.2	18.4	2.7	3.2	4.6	3.0	3.5	5.0	16.5	18.9	28.0
Southland	8.3	10.0	14.7	1.2	1.5	2.1	2.2	2.6	3.6	11.7	14.2	20.4
Other NZ	3.5	3.0	4.7	0.0	0.0	0.0	0.0	0.0	0.0	3.5	3.0	4.7
Total	**109.8**	**123.0**	**193.0**	**20.6**	**25.6**	**39.6**	**36.8**	**47.1**	**69.4**	**167.2**	**195.7**	**302.1**

Regional Employment Impacts

The models estimate the regional employment impact from the industry. The direct spend that sticks to each region generates additional indirect and induced activity which results in employment.

By 2011/12 season it is expected that the industry will support over 350 jobs in seven of the regions (Auckland, Bay of Plenty, Hawke's Bay, Wellington, Canterbury, Otago and Southland). The employment supported by the industry in Auckland is expected to grow by 680 (EC) to around 1,640 jobs by 2011/12. Wellington region is expected to gain an additional 280 jobs over the next two seasons. The Gisborne region is the only region that is expected to decline, with employment supported by the industry dropping from 18 in 2009/10 to 11 in 2011/12.

The majority of the jobs (around 70%) will be related to passenger demand (i.e. retail, exchange activity, excursions activities and transport). While 16% of the employment will be related to the ship services (such as bunkering, security, wharf services and providoring).

Table 3.9 Regional Employment Impacts 2009/10, 2010/11 and 2011/12 Seasons (EC)

	Passenger Related			Crew Related			Cruise Vessel Related			Total Expenditure		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Northland	94	116	199	23	30	53	8	10	17	125	156	269
Auckland	620	652	1009	97	122	183	211	270	383	928	1044	1575
Bay of Plenty	148	176	311	41	51	87	16	20	34	204	247	433
Waikato	12	10	16	0	0	0	0	0	0	12	10	16
Gisborne	13	5	9	3	1	2	1	1	1	18	7	11
Hawke's Bay	109	151	255	29	42	69	18	25	42	156	217	366
Taranaki	4	4	9	0	0	1	0	0	1	4	4	10
Wellington	183	238	379	46	61	99	24	32	53	253	331	532
Nelson	9	8	12	0	0	0	0	0	0	10	8	12
Marlborough	26	25	54	6	7	13	3	5	7	35	37	74
Tasman	0	0	0	0	0	0	0	0	0	0	0	0
Canterbury	228	260	366	56	66	94	21	25	34	305	351	494
Otago	190	216	324	51	59	86	19	22	32	260	297	442
Southland	168	203	298	25	31	44	18	22	29	211	257	371
Other NZ	63	54	84	0	0	1	0	0	0	63	54	85
Total	**1868**	**2117**	**3326**	**379**	**471**	**732**	**339**	**431**	**633**	**2586**	**3019**	**4691**

4 Conclusion

The results show that the industry's activity levels and the economic impacts are likely to grow for most regions and ports over the coming two seasons. In general, the growth is expected to be focused on the ports/regions that already attract most of the activity. It is also expected that the smaller ports and regions will capture very small proportion of the growth, with some regions recording a small decline in activity (Tasman and Gisborne).

As was found in the past studies of the industry, Auckland region receives the largest proportion of the industry activity and spend in the 2009/10 season. The impact on the region's economy is expected to increase from $66.6m in 2009/10 to $113.3m in 2011/12 (value added).

The study shows that on average the impact from the industry on the other regions is expected to grow faster than the impact on Auckland (all other regions value added grows by 37% p.a. while Auckland value added grows by 30% p.a.). This trend is caused by an increase in Australia swing voyages, these voyages tend to impact more evenly across the regions and have very little exchange activity. In particular the Northland, Bay of Plenty, Hawke's Bay and Wellington regions are expected to grow rapidly (over 100% in the coming two seasons)

In this study we have developed a new measure of the activity resulting from the industry. This measure estimates the number of people moving onto and off a cruise vessel in each port. In 2009/10 it is estimated that between 1.3 and 2.6 million crew and passengers will move through a seaport or stops in New Zealand. The number of movements is expected to increase by 40% p.a., in the range of 2.6 to 5.2 million by 2011/12.

The regional results show that there is likely to be significant growth in person movements in Northland, Auckland, Bay of Plenty, Hawke's Bay, Marlborough and Wellington (over 100% in the coming seasons). Local planners and business operators need to plan for the future growth in movements to provide sufficient services.

Appendix 1: Port and Stop Activity Data 2009-2012

These tables include both port visits and stops at non-ports. The non-port stops have been included for completeness. Most of the non-port stops are excluded from the economic impact analysis as there is no possibility for spend by passengers, crew or the vessel (for example Robertson Island is excluded from the economic analysis).

Table A.1 Port or Stop Days 2009/10, 2010/11 and 2011/12

	Vessel Port or Stop Days			Person Port or Stop Days											
				International Passenger			Domestic Passenger			Crew			Total		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Matauri Bay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Whangaroa	8	3	1	433	223	73	12	32	4	382	224	74	826	479	151
Robertson Is	-	1	-	-	37	-	-	2	-	-	37	-	-	76	-
Bay of Islands	32	37	58	34,569	44,761	80,967	564	491	1,427	15,453	19,789	34,874	50,586	65,040	117,267
Auckland	82	111	159	76,642	118,383	190,583	14,407	12,239	13,526	38,639	54,333	81,080	129,688	184,956	285,189
Waiheke Is	-	1	4	-	21	424	-	2	12	-	12	535	-	35	972
Kawau Is	6	1	-	127	95	-	21	-	-	75	53	-	222	148	-
Great Barrier Is	6	1	-	150	21	-	15	2	-	98	12	-	263	35	-
Tauranga	42	51	89	64,467	80,735	137,988	1,486	1,875	3,146	27,895	34,836	58,924	93,848	117,445	200,058
Mercury Is	2	2	-	92	2,693	-	9	68	-	56	1,219	-	156	3,979	-
White Is	8	8	9	4,066	4,438	5,381	48	91	143	2,026	1,821	2,868	6,139	6,350	8,392
Gisborne	6	4	2	5,625	1,457	2,693	131	58	68	2,439	687	1,219	8,195	2,202	3,979
Napier	41	50	77	47,911	69,493	114,759	716	1,189	2,210	21,193	30,109	50,099	69,820	100,791	167,068
New Plymouth	-	-	1	-	-	1,363	-	-	11	-	-	610	-	-	1,984
Wellington	47	60	98	66,768	89,741	144,680	1,140	1,413	2,952	29,262	38,930	62,104	97,169	130,085	209,735
Nelson	3	-	-	206	-	-	1	-	-	216	-	-	422	-	-
Ship Cove	5	5	4	233	1,531	219	5	54	13	249	795	221	487	2,380	453
Golden Bay	3	-	-	178	-	-	1	-	-	167	-	-	345	-	-
Marlbgh Sd	6	5	-	273	207	-	19	22	-	196	121	-	487	349	-
Picton	11	10	20	7,653	7,343	19,946	91	201	381	4,085	3,546	8,703	11,828	11,090	29,031
Kaikoura	6	5	-	414	261	-	17	17	-	394	150	-	825	428	-
Lyttelton	50	60	79	75,057	91,351	129,006	1,809	2,025	2,827	33,393	40,185	54,802	110,259	133,561	186,635
Akaroa	8	7	12	8,388	6,162	15,678	115	124	444	3,567	2,841	6,938	12,070	9,127	23,060
Timaru	-	2	-	-	1,055	-	-	11	-	-	585	-	-	1,651	-
Port Chalmers	51	66	84	79,317	92,435	138,210	1,875	2,068	3,194	34,557	40,184	58,863	115,749	134,687	200,267
Stewart Is	11	14	10	2,392	5,350	7,675	114	68	96	1,565	3,141	3,905	4,070	8,560	11,676
Fiordland	61	79	83	77,024	93,773	137,732	1,897	2,084	3,158	33,909	41,276	58,735	112,830	137,133	199,625
Dusky/Doubtful	8	-	1	1,069	-	402	28	-	2	1,059	-	101	2,156	-	506
Jackson Bay	2	1	-	181	73	-	1	4	-	170	74	-	352	151	-
Bluff	5	-	-	220	-	-	22	-	-	232	-	-	474	-	-
Offshore Is	25	11	3	1,673	801	500	72	56	8	1,972	857	213	3,716	1,714	720
Total	**535**	**595**	**794**	**555,124**	**712,438**	**1,128,280**	**24,612**	**24,197**	**33,621**	**253,242**	**315,816**	**484,867**	**832,978**	**1,052,450**	**1,646,768**

Table A.2 Embarkation Type by *Port or Stop 2009/10, 2010/11 and 2011/12*

	Embarkation (Passengers and Crew)								
	Embarking			Disembarking			Transit		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Matauri Bay	-	-	-	-	-	-	-	-	-
Whangaroa	17	-	-	-	-	-	828	479	151
Robertson Is	-	-	-	-	-	-	-	151	-
Bay of Islands	309	352	77	101	-	77	50,185	64,699	116,749
Auckland	31,390	26,693	36,670	32,700	28,197	39,584	132,391	191,259	289,525
Waiheke Is	-	-	-	-	-	-	-	70	1,192
Kawau Is	-	-	-	-	-	-	367	148	-
Great Barrier Is	-	-	-	-	-	-	350	70	-
Tauranga	-	-	1,378	1	-	-	93,739	117,329	200,332
Mercury Is	-	-	-	-	-	-	208	3,979	-
White Is	-	-	-	-	-	-	6,214	6,679	8,370
Gisborne	-	-	-	-	-	-	8,195	2,202	3,979
Napier	-	-	-	-	-	-	69,712	100,726	166,731
New Plymouth	-	-	-	-	-	-	-	-	1,980
Wellington	166	3	-	264	14	1,382	96,912	130,935	211,573
Nelson	-	-	-	-	-	-	507	-	-
Ship Cove	-	-	-	-	-	-	819	4,445	604
Golden Bay	-	-	-	-	-	-	507	-	-
Marlbgh Sd	-	-	-	-	-	-	640	349	-
Picton	-	-	-	-	-	-	12,019	14,177	30,501
Kaikoura	-	-	-	-	-	-	825	428	-
Lyttelton	-	-	-	326	-	-	109,748	133,462	187,436
Akaroa	-	-	-	-	-	-	12,066	9,115	24,479
Timaru	-	-	-	-	-	-	-	2,645	-
Port Chalmers	263	303	-	-	154	-	115,355	134,482	200,166
Stewart Is	-	-	-	-	-	-	4,476	8,581	11,845
Fiordland	210	67	105	102	137	249	112,892	137,058	199,252
Dusky/Doubtful	-	-	-	-	-	-	2,307	-	486
Jackson Bay	-	-	-	-	-	-	352	151	-
Bluff	319	-	-	238	-	-	476	-	-
Offshore Is	-	-	-	-	-	-	4,346	1,714	848
Total	**32,674**	**27,417**	**38,230**	**33,732**	**28,502**	**41,292**	**836,436**	**1,065,332**	**1,656,198**

Table A.3 Person Movements by *Port or Stop (Minimum) 2009/10, 2010/11 and 2011/12*

	Person Movements											
	International Passenger			Domestic Passenger			Crew			Total		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Matauri Bay	-	-	-	-	-	-	-	-	-	-	-	-
Whangaroa	865	446	146	24	64	8	157	90	30	1,046	600	184
Robertson Is	-	146	-	-	8	-	-	30	-	-	184	-
Bay of Islands	68,725	89,126	159,918	1,127	971	2,910	6,186	7,930	14,165	76,038	98,028	176,993
Auckland	178,939	269,473	420,073	52,488	42,687	45,839	21,040	26,670	40,258	252,467	338,830	506,170
Waiheke Is	-	83	1,028	-	9	27	-	10	266	-	101	1,321
Kawau Is	414	191	-	64	-	-	51	21	-	529	212	-
Great Barrier Is	400	83	-	40	9	-	52	10	-	492	101	-
Tauranga	128,717	161,237	275,777	2,972	3,750	6,380	11,158	13,934	23,977	142,847	178,921	306,134
Mercury Is	244	5,385	-	24	135	-	30	488	-	298	6,008	-
White Is	8,196	9,250	10,719	104	181	285	826	785	1,147	9,126	10,217	12,152
Gisborne	11,250	2,914	5,385	262	116	135	976	275	488	12,488	3,305	6,008
Napier	95,606	138,857	228,843	1,432	2,378	4,421	8,477	12,043	20,040	105,515	153,279	253,304
New Plymouth	-	-	2,718	-	-	22	-	-	244	-	-	2,984
Wellington	133,325	180,678	292,143	2,235	2,855	5,972	11,739	15,671	25,283	147,299	199,204	323,398
Nelson	496	-	-	2	-	-	103	-	-	601	-	-
Ship Cove	798	5,827	584	20	180	34	164	577	118	982	6,583	736
Golden Bay	516	-	-	2	-	-	99	-	-	617	-	-
Marlbgh Sd	688	413	-	46	43	-	109	48	-	843	505	-
Picton	15,442	18,942	41,634	182	524	827	1,683	1,778	3,708	17,307	21,244	46,169
Kaikoura	828	521	-	34	35	-	158	60	-	1,020	616	-
Lyttelton	149,418	182,506	258,761	3,618	4,050	5,691	13,357	16,074	22,084	166,393	202,629	286,536
Akaroa	16,768	12,302	33,342	230	248	925	1,427	1,136	2,938	18,425	13,686	37,205
Timaru	-	3,469	-	-	45	-	-	355	-	-	3,869	-
Port Chalmers	158,120	184,732	276,220	3,739	4,143	6,387	13,823	16,109	23,545	175,682	204,984	306,152
Stewart Is	5,224	10,714	15,584	228	141	194	700	1,261	1,582	6,152	12,116	17,361
Fiordland	154,060	187,494	275,095	3,802	4,176	6,293	13,647	16,530	23,494	171,509	208,200	304,881
Dusky/Doubtful	2,274	-	764	70	-	5	454	-	41	2,798	-	809
Jackson Bay	362	146	-	2	8	-	68	30	-	432	184	-
Bluff	656	-	-	77	-	-	155	-	-	888	-	-
Total	**1,132,331**	**1,464,936**	**2,298,734**	**72,824**	**66,756**	**86,355**	**106,637**	**131,913**	**203,407**	**1,311,792**	**1,663,605**	**2,588,496**

Table A.4 Person Movements by Port or Stop (Maximum) 2009/10, 2010/11 and 2011/12

	Person Movements											
	International Passenger			Domestic Passenger			Crew			Total		
	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12	2009/10	2010/11	2011/12
Northland	138,772	179,099	319,982	2,283	2,074	5,829	15,856	20,123	35,486	156,911	201,296	361,297
Auckland	324,735	508,812	792,061	77,804	63,391	68,595	49,950	63,738	96,848	452,489	635,941	957,504
Bay of Plenty	273,825	340,975	571,659	6,152	7,862	13,286	29,959	36,799	62,810	309,936	385,635	647,755
Waikato	488	10,770	-	48	270	-	74	1,219	-	610	12,259	-
Gisborne	22,500	5,828	10,770	524	232	270	2,439	687	1,219	25,463	6,747	12,259
Hawke's Bay	191,212	277,715	457,687	2,864	4,757	8,842	21,193	30,109	50,099	215,269	312,580	516,627
Taranaki	-	-	5,436	-	-	44	-	-	610	-	-	6,090
Wellington	266,267	361,340	582,927	4,423	5,710	11,921	29,347	39,176	63,207	300,037	406,226	658,055
Nelson	992	-	-	4	-	-	258	-	-	1,254	-	-
Marlborough	33,856	50,365	84,435	496	1,494	1,721	4,890	6,007	9,566	39,242	57,865	95,722
Tasman	1,032	-	-	4	-	-	248	-	-	1,284	-	-
Canterbury	333,702	397,596	584,205	7,764	8,754	13,232	37,354	44,062	62,556	378,820	450,412	659,993
Otago	315,988	369,029	552,439	7,467	8,264	12,775	34,557	40,273	58,863	358,012	417,566	624,077
Southland	324,342	396,609	582,687	8,299	8,546	12,828	37,560	44,551	62,792	370,201	449,707	658,308
Total	**2,227,711**	**2,898,137**	**4,544,289**	**118,132**	**111,353**	**149,343**	**263,685**	**326,745**	**504,054**	**2,609,528**	**3,336,234**	**5,197,687**
Matauri Bay	-	-	-	-	-	-	-	-	-	-	-	-
Whangaroa	1,717	892	292	44	129	17	392	224	74	2,153	1,245	383
Robertson Is	-	292	-	-	17	-	-	74	-	-	383	-
Bay of Islands	137,055	177,915	319,690	2,239	1,928	5,812	15,464	19,826	35,412	154,758	199,669	360,914
Auckland	323,107	508,099	790,004	77,596	63,356	68,541	49,692	63,637	96,183	450,395	635,093	954,728
Waiheke Is	-	165	2,057	-	17	54	-	24	665	-	207	2,776
Kawau Is	828	382	-	128	-	-	128	53	-	1,084	435	-
Great Barrier Is	800	165	-	80	17	-	130	24	-	1,010	207	-
Tauranga	257,433	322,475	550,220	5,944	7,499	12,715	27,895	34,836	59,942	291,272	364,809	622,878
Mercury Is	488	10,770	-	48	270	-	74	1,219	-	610	12,259	-
White Is	16,392	18,500	21,439	208	363	571	2,064	1,963	2,868	18,664	20,826	24,877
Gisborne	22,500	5,828	10,770	524	232	270	2,439	687	1,219	25,463	6,747	12,259
Napier	191,212	277,715	457,687	2,864	4,757	8,842	21,193	30,109	50,099	215,269	312,580	516,627
New Plymouth	-	-	5,436	-	-	44	-	-	610	-	-	6,090
Wellington	266,267	361,340	582,927	4,423	5,710	11,921	29,347	39,176	63,207	300,037	406,226	658,055
Nelson	992	-	-	4	-	-	258	-	-	1,254	-	-
Ship Cove	1,596	11,654	1,168	40	360	67	410	1,442	295	2,046	13,455	1,530
Golden Bay	1,032	-	-	4	-	-	248	-	-	1,284	-	-
Marlbgh Sd	1,376	827	-	92	87	-	273	121	-	1,741	1,034	-
Picton	30,884	37,884	83,267	364	1,047	1,654	4,207	4,444	9,270	35,455	43,376	94,192
Kaikoura	1,656	1,043	-	68	69	-	394	150	-	2,118	1,262	-
Lyttelton	298,510	365,011	517,522	7,236	8,099	11,382	33,393	40,185	55,210	339,139	413,295	584,113
Akaroa	33,536	24,604	66,683	460	495	1,850	3,567	2,841	7,346	37,563	27,940	75,879
Timaru	-	6,938	-	-	90	-	-	888	-	-	7,916	-
Port Chalmers	315,988	369,029	552,439	7,467	8,264	12,775	34,557	40,273	58,863	358,012	417,566	624,077
Stewart Is	10,448	21,428	31,169	456	282	388	1,750	3,153	3,956	12,654	24,863	35,512
Fiordland	307,816	374,889	549,991	7,596	8,247	12,431	34,117	41,325	58,735	349,529	424,461	621,157
Dusky/Doubtful	4,548	-	1,528	140	-	10	1,135	-	101	5,823	-	1,639
Jackson Bay	724	292	-	4	17	-	170	74	-	898	383	-
Bluff	806	-	-	103	-	-	388	-	-	1,297	-	-
Total	**2,227,711**	**2,898,137**	**4,544,289**	**118,132**	**111,353**	**149,343**	**263,685**	**326,745**	**504,054**	**2,609,528**	**3,336,234**	**5,197,687**

Appendix 2: Economic Models & Multiplier Analysis

National Economic Model

The basis of this study is a multiplier analysis of the flow on effects arising from direct expenditure generated by cruise ships, passengers and crew. A national level 88 sector Input Output model of the New Zealand economy has been applied. The model is based on Statistics New Zealands Inter-Industry Study carried out in 1995/96. The inter industry study collected transaction information between different sectors of the economy so that it is possible to tell how much one sector purchases from another in order to produce final outputs. This study collected information across 88 sectors of the economy allowing multipliers to be calculated at the 88 sector level across regions.

Multipliers

Multipliers measure the flow on effects of direct expenditure in the economy. They measure two things specifically;

- The **Indirect effect** of direct spending. The indirect effect occurs when suppliers to the cruise industry increase their demands for goods and services from their suppliers in order to meet the increased demand from the cruise industry. For example, a providoring company receives an order for $20,000 worth of fresh fruit and vegetables from a cruise line. They immediately place orders with a range of suppliers for the goods. These suppliers in turn, purchase more seed, fertiliser and machinery in response to the increased sales they are making. The indirect or Type I multiplier attempts to capture all these transactions in a single "multiple". In effect it measures how many time a single dollar of increased demand is multiplied through the economy.

- The ***Induced effect*** of direct and indirect spending. The induced effect captures increased spending due to increases in wages and salaries paid to workers and owners indirectly, and indirectly affected sectors. As people earn more money for the additional work they do, they spend more. The induced multiplier attempts to capture this round of increased economic activity. The induced multiplier is usually added to the indirect multiplier to produce a Type II multiplier that measures the total economic effect of additional spend.

Economic impacts can be measured a number of ways, therefore multipliers have been calculated for three different aspects of economic activity;

- Gross Output. Gross output measures the total activity within the economy. It is the broadest measure of economic activity and does not necessarily provide an accurate measure of economic benefits. For example, if an economy has a very high import component then a gross output measure might be high, however as most of the goods are not produced locally the economy is creating very little internal wealth.
- Value Added. Value added is the most appropriate measure of economic impact. It measures the level of value that is generated within an economy. It is closely related to GDP, the standard measure of economic performance of an economy.
- Employment. This is measured in employment count (EC).

The balance of this appendix describes the derivation of regional input-output models, and multipliers developed for impact analysis. It outlines the fundamentals of input-output modelling, including definitions and structures and the methodology that generates sub-national economic accounts through a series of mechanical steps. Finally, the key aspects of multiplier analysis are described.

Input-Output Modelling

The origins of input-output modelling may be traced back to the Physiocrats of the 18th Century. Francois Quesnay's Tableau Economique of 1758 traced successive rounds of wealth generated by agricultural expenditure. While the Tableau Economique investigated the concepts of circular flow and general equilibrium, it was not until another Frenchman, Leon Walrus in his Elements d'Economie Politique Pure of 1874, that a detailed theoretical framework for analysing economic interdependence was created. Contemporary input-output economics is attributed to Wassily Leontief, a Noble prize winning American economist, who in 1936 published an input-output table for the American economy. Leontief simplified the Walrus model to develop a theory of production based on the general equilibrium concept of economic inter-dependence.

The Input-Output Table

An input-output table describes inter-industry linkages in an economy for a given period. Information on such linkages is normally obtained from national economic accounts, which are, in turn, derived from a national census of production. Information on final demand consumption and expenditure on primary inputs is also included. Input-output tables share an intimate relationship with the national accounts and as such allow the derivation of standard economic indicators such as Balance of Trade, Gross Domestic Product (GDP), contribution to GNP by sector, and gross output by sector.

Conventionally, an input-output table is presented in a matrix format, with each industry assigned a row and column. The element xij in row i column j indicates the volume of goods flowing from industry i to be used as inputs in industry j. In other words, each row indicates the flow from each industry to all other industries and to final demand, while each column indicates the purchasing pattern of each industry.

An input-output table may be divided vertically into two parts: the part on the left represents the inputs into the production process of the productive industries, while the part on the right represents the sales to the final disposal sectors. Each part may further be subdivided horizontally into two sections so as to distinguish between intermediate inputs and primary inputs. The resulting input-output table consists of four quadrants (labelled I to IV) (Table A.1).

Table A.1 **An Input-Output Table**

	Industry 1	Industry ... *j* ...	Industry *n*	Sub Total	House -holds	Govt. Expen- diture	Other Final Demands	Exports	Sub Total	Total Gross Output
Industry 1 Industry ... *i* ... Industry *n*	Quadrant I x_{ij}				Quadrant III					X_i
Sub Total										
Labour Value Added Other Primary Inputs Imports	Quadrant II				Quadrant IV					
Sub Total										
Total Gross Input	X_j									

Quadrant I, known as the processing or intermediate demand quadrant, represents the flows of transactions between industries used in the intermediate stages of production. A key characteristic of the intermediate demand quadrant is that there must be the same number of rows as columns. Furthermore, the total value of output of each intermediate industry must always be equal to its total expenditure on inputs.

Quadrant III displays the sales by each sector to final demand, ie. the part of an industry's output not used by another industry as an input. This quadrant describes the consumer behaviour of a number of important markets including household consumption, government consumption, increases in stock, capital formation, and exports.

Quadrant II describes the primary inputs used in each industry. These inputs are described as 'primary' because they do not form part of the output of intermediate production as defined by the rows forming quadrants I and III. The following primary input categories are typically included: subsidies[5], indirect taxes, depreciation, wages and salaries, gross operating surplus and imports. The total of the primary inputs for each industry less imports represents the value added to commodities consumed in the production process ie. the contribution made by that sector to GDP.

Quadrant IV displays the primary inputs that are directly used by final demand sectors. This includes non-market transfers such as benefits and pensions as well as imports of commodities for consumption by households and investors.

Input-output tables are often converted into technical coefficient format that more clearly represents the purchasing patterns of industries. This is undertaken by dividing column elements by their respective column totals. Such coefficients represent the first round inputs from each row industry i following a unit increase in output of any row industry i per unit of output produced by column industry j.

[5] *Subsidies are entered with a negative sign as they represent receipts, not expenses.*

Assumptions of Input-Output Modelling

Four major assumptions make the derivation of input-output tables feasible:

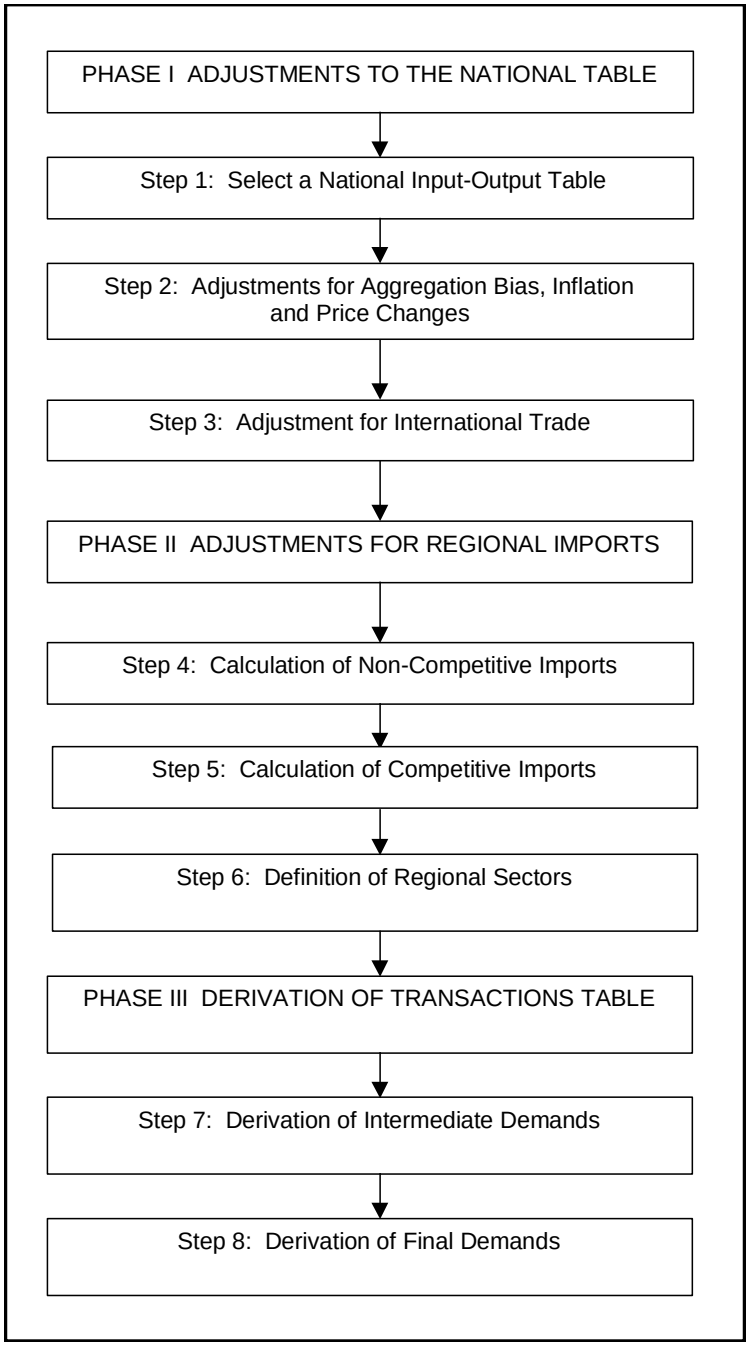
- Homogeneity. This states that each industry in an input-output table produces only one output. Implicit in this assumption is the notion that all businesses that constitute an industry use the same product mix in production of this one output.
- Additivity. This states that the total effect of carrying out several types of production is the sum of the separate effects. This implies the absence of any synergistic effects and external economies (or diseconomies) of scale.
- Linearity. This presumes that the ratio of inputs to outputs decreases and increases in a linear nature. This also infers that there are no external economies (or diseconomies) of scale.
- Fixed coefficients of production. This states that inputs are required in fixed proportions to outputs in each industry. Inherently this assumes that there are constant returns to scale in production and that the elasticity of substitution between inputs is zero.

Regionalisation Methodology

The various approaches available for generating regional input-output tables are usually categorised as ‘survey’ or ‘non-survey’. In survey methods, the elements which make up the transactions table are generated from primary data gathered through the use of various survey techniques and are often considered the most attractive in theoretical terms. In non-survey methods, transactions table elements are derived from other tables by various adjustment techniques. These methods are employed when data is unavailable and/or time and cost constraints exist.

The economic accounts used for this study have been derived using a non-survey approach. This approach employs a series of mechanical steps to reduce national coefficients to regional equivalents, but also provides opportunities for insertion of superior data. The economic account construction methodology is shown in Figure A.2.

Figure A.2 **The Economic Account Methodology**



Phase I: Adjustments to the National Table

In this phase an appropriate national input-output table is chosen and adjustments for aggregation bias, inflation, price changes and international trade are made.

Step 1: Select a National Input-Output Table

The economic accounts were generated from the 1995/96 Inter-Industry Study of the New Zealand Economy published by Statistics New Zealand (SNZ). This study has been updated by Market Economics using employment and output information collected by SNZ to 2003/04. This study covered 126 sectors, with 9 primary input and 7 final demand categories. All sector definitions are compatible with the New Zealand Standard Industrial Classification (NZSIC) system.

Step 2: Adjustment for Aggregation Bias, Inflation and Price Changes

Reduction of national coefficients to form regional equivalents almost always results in aggregation bias. This occurs because the constituent businesses that form a sector do not have homogenous output, even though they are classified in the same sector. Thus the more aggregated an industry, the greater the over-estimation of self-sufficiency. While aggregation bias cannot be eliminated, it may be partially overcome by sector disaggregation.

This adjustment was undertaken using SNZ's 1995/96 Inter-Industry Study of the New Zealand Economy, which allowed for a 126 sector breakdown. Specifically:

- The 126 sectors for 1995/96 were aggregated to form 123 sectors that, in turn, could be uniquely aggregated to form the 88 sectors for 2001/02.

To obtain a national input-output table by 123 industries for 2001/02 the following simple extrapolation method was used:

- Productivity estimates (output per employment count (EC)) were calculated for the years 1995/96, 1997/98, 2000/01 and 2001/02.
- For each of these years the Producers' Price Index (PPI) was used to convert sector output, at the 123 sector level, into constant dollars. This allowed for changes in inflation and prices.

These output estimates were then aggregated and compared with Statistics New Zealand's SNA figures, and adjustments were made where deemed appropriate.

Final demand and primary input totals for 2001/02 were obtained from Statistics New Zealand. Components of final demand for aggregated sectors were applied to the 123 sectors, assuming equal splits across like sectors, to determine estimates of primary inputs for each sector.

Step 3: Adjustment for International Trade

Adjustments are made for international trade using Statistics New Zealand's Harmonised System, which disaggregates physical imports and exports into 10,000 commodities. As exports are coded by sector it is possible to obtain an exact match with the 123 sectors used at the national level. Matrix manipulations allow categorisation of the imports as sector inputs.

Phase II: Adjustment for Regional Imports

In this phase approximations of regional coefficients were produced through the calculation of non-competitive and competitive imports.

Step 4: Calculation of Non-Competitive Imports

Where production in sector i does not occur within a region then any inputs from sector i into sector j are treated as regional imports. Therefore the regional technical coefficient is set to zero, and its value in the national table is added to imports.

Step 5: Calculation of Competitive Imports

Following the calculation of non-competitive imports, it is necessary to adjust the national coefficients for sectors known to exist in each region. This is accomplished by determining the component of the national coefficients allocated to competitive imports. The Simple Location Quotient (SLQ) may be used to achieve this.

The SLQ is a measure which compares the relative importance of output or employment of a sector in a region to its relative importance in the nation. Mathematically, this may be modelled as,

$$SLQj = (X^r j/X^r)/(X^n j/X^n)$$

Where X represents employment and the superscripts r and n respectively the region and nation, and j row sector. Operationally, the regional coefficients for row sector j are estimated by multiplying the national coefficient by SLQj, and apportioning the difference to imports, that is,

$$r_{ij} = a_{ij}SLQ_j \text{ where } SLQ_j <= 1$$

This means that the region produces less than its share of national output in industry j and imports are therefore required. If the SLQ for an industry exceeds 1 then the size of the regional industry is greater in relative terms than its national equivalent, and is assumed to be capable of satisfying local demand. The SLQ technique assumes that national and regional technologies are identical, and that there are no product or sector mix problems. The SLQ technique allow national coefficients only to be revised downwards but not upwards.

The SLQs for Auckland were calculated using 2001 ECs from Statistics New Zealand Business Directory.

Step 6: Definitions of Regional Sectors

A total of 88 sectors were used to represent economic transactions in the model. Inputs into production not covered by the 88 sectors were described by the following primary input categories: compensation of employees, operating surplus, indirect taxes, subsidies, consumption of fixed capital, imports and import duties and other primary inputs. Similarly, consumption of commodities not covered by the 88 sectors was described by the following final demand categories: household consumption, local and central government consumption, and other final demands (exports, net increases in stocks and capital formation).

Phase III: Derivation of Transactions Tables

In this phase transactions tables were derived for the region. Two functions were required: (1) the derivation of the intermediate demand transactions, and (2) the completion of the final demand quadrants.

Step 7 Derivation of Intermediate Demands

This involved the conversion of regional coefficients to transactions by multiplying the elements of each column sector by estimates of that sectors' share of total gross output. Shares were derived by calculating the regional (or TLA) share of national employment. This resulted in the intermediate demand and primary input quadrants of the regional transactions table.

Step 8 Derivation of Final Demands

This involved the generation of estimates for the final demand quadrants of the transactions table. Household consumption is particularly important as it is necessary for the calculation of multipliers. Local and central government consumption were also calculated. Other final demands were calculated as the residual achieving the necessary row and column consistencies.

Household consumption along with local and central government consumption were estimated by applying a population index (for example):

Population of region	404,200
Population of New Zealand	3,454,900

Population index : 404,200/3,454,900 = 0.1170 (4 d.p.)

In turn, estimates of household consumption for each regional sector were obtained by multiplying the population index by the national output for each sector. For example, if the national household consumption for the other farming sector was $241 million, then for the region this was estimated as:

Other farming: 241 * 0.1170 = $28.20 million

Multiplier Analysis

Introduction

A major extension of the input-output model is the derivation of multipliers. Multipliers are a summary measure of the economic interdependence produced as a result of secondary benefits. Specifically, an increase in final demand for any sector has repercussions throughout the whole economy, causing increases in output beyond the initial change in demand. This is known as the multiplier effect.

Multiplier Definitions

In general, multipliers are capable of measuring output, income, value added and employment generated from economy activity within a region. Three types of multiplier are conventionally used:

- Output Multipliers. These show the relationship between an additional unit of spending and changes in the level of output.

- Employment Multipliers. These show the relationship between an additional unit of spending and changes in the level of employment.
- Value Added Multipliers. These show the relationship between an additional unit of spending and changes in the level of value added.

There are two different types of output, employment and value added multipliers commonly used:

- Type I Multiplier. This multiplier attempts to explain indirect effects initiated from second and subsequent round effects as successive waves of necessary output increases occur in the economy. It is expressed as the ratio of the direct and indirect change to direct change.
- Type II Multiplier. This multiplier explains induced effects initiated through consumer expenditure ie. this includes the effect of household expenditure generated by wages and salaries resulting from variations in demand in a given sector. It is expressed as the ratio of direct, indirect and induced change to direct change.

Multiplier Derivation

The transactions table may be converted into a table of technical coefficients. These are calculated by dividing the elements of the columns of the transactions table by the respective column total. These coefficients are often termed 'direct', 'input-output', or 'technical' coefficients, they are usually noted as Aij. They represent the first round inputs from each sector i (row) following a unit increase in output of any sector j (column) i.e. aij = Xij/Xj. However, this only shows the direct purchases from a sector i per unit of output produced by sector j.

To account for indirect effects, and to calculate Type I multipliers, it is necessary to subtract the quadrant I matrix from an identity matrix ((I - A), or Leontief matrix) and to invert the result, resulting in the Leontief inverse matrix, or (I - A)-1. Mathematically, this may be expressed in matrix terms as:

$$X = AX + Y$$

By transposition,

$$X (I - A) = Y$$

By solving the above system we derive the general solution:

$$X = (I - A)^{-1}Y$$

(I - A) is termed the Leontief matrix

$(I - A)^{-1}$ is termed the Leontief inverse matrix

where:- A = (n x n) matrix of quadrant I technical coefficients

X = (n x 1) matrix of gross inputs

Y = (n x 1) matrix of final demand

I = (n x n) identity matrix

To account for direct, indirect and induced effects, and to calculate Type II multipliers, it is necessary to expand the quadrant I matrix to include the households coefficients (A*) then to subtract this matrix from the identity matrix ((I - A*), Leontief* matrix) and to invert the result, resulting in the Leontief* inverse matrix, or (I – A*)-1. This treats household inputs and household consumption as sectors, producing income and requiring inputs from other sectors.

The indirect effect for any sector can be calculated simply as technical coefficient element minus corresponding Leontief inverse matrix element. The induced effect for any sector can be calculated simply as Leontief inverse matrix element minus the corresponding Leontief* inverse element.

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