LECG

Marine Industry Benefits Study

ECONOMIC IMPACT OF THE CANADIAN MARINE TRANSPORTATION INDUSTRY

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TORONTO OFFICE
55 University Avenue, Suite 1000,
Toronto, ON, M5J 2H7
Tel: 416.364.6400
Fax: 416.364.6900

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Anindya Sen
Assistant Professor
Department of Economics
University of Waterloo

and

Senior Economist

Executive Summary

The Marine Transport Industry has a tremendous impact on the Canadian economy

It is undeniable that the Marine Transport Industry has a tremendous impact on the Canadian economy. On an annual basis it facilitates the flow of goods and services worth hundreds of billions of dollars, through its ports. This report attempts to estimate the economic contribution of the Marine Transport Industry by focusing on direct, indirect, and induced effects through available data from Statistics Canada and with the help of a comprehensive macro-econometric model. In this respect, this research considerably advances the existing literature. The specific findings of this research are:

In 2000, the contribution of the Marine Transport Industry was:

$3 billion to GDP and 30,000 employees in terms of direct effects

- In terms of direct effects, the contribution of the Marine Transport Industry to national Gross Domestic Product (GDP) in 2003 was $3 billion while the total number of industry employees in the same year was roughly 36,000.

- The industry experienced healthy growth rates over the past decade. From 1990 and 2000 the contribution of the industry to GDP increased by 17% while the number of employees rose by 9%. In comparison national GDP and employment levels increased by 29% and 18%, respectively.

- The marine industry significantly outperformed other transport sectors with respect to net exports and operating revenues per employees. Specifically, net exports from the marine transport sector increased by 211% from 1990 and 2000, while operating revenues per employee grew by 46% over the same time period. In this respect, it can be construed to be an “engine of growth”.

From 1990 and 2000, net export increased by 211%, while operating revenues per employee grew by 46%. In this respect, it can be construed to be an “engine of growth”

Exclusively relying on direct effects significantly underestimates the economic impact of the Marine Transport Industry. It is also important to take into account industry specific indirect and induced effects, which can only be calculated using Input-Output Tables and a macro-econometric model.

Indirect effects are defined as the impacts one economic sector can have on others through its demands on those sectors’ goods and services as inputs for its own production processes. Our calculations suggest that the indirect effects of the industry are considerable.

The total direct and indirect impacts of the Marine Transport Industry were roughly $4 billion and 60,000 jobs, respectively in 2003

- Specifically, the total direct and indirect impacts of the Marine Transport Industry were roughly $4 billion and 60,000 jobs, respectively in 2003.

- However, the induced effects of the Marine Transport Industry are even larger in magnitude. Induced effects recognize that an existing industry contributes to the economy by providing employment and thus impacting consumption. Hence, the absence of an industry should lead to job loss and lower GDP. Our research suggests that the induced impacts of the Marine Transport Industry are sizeable as it contributes an additional $5 billion in GDP as well as approximately 33,000 jobs.

Combined direct, indirect, and induced impacts, marine transport accounted in 2003 for roughly $9.1 billion of GDP and over 93,000 jobs

In summary, combined direct, indirect, and induced impacts support the hypothesis that the economic impacts of the Marine Transport Industry are significant.

- Specifically, we estimate that marine transport accounted in 2003 for roughly $9.1 billion of GDP at market prices. The estimate for the total impact on employment is just over 93,000 jobs.

- Finally, our estimates reveal that the Marine Transport Industry generates between $1.7 to $2.4 billion of additional government revenue at the federal level, and between $1.7 to $2.5 billion at the provincial level. These impacts are summarized in table 1.

- Further, we find the Marine Transport Industry to be of above-average productivity. In simple terms, the sector causes more GDP to be generated per employee then is true for the economy on average. This is a consistent finding across direct, indirect as well as induced impacts.

Table 1 - Summary of Direct, Indirect, and Induced Effects in 2003

	Value Added to GDP at Market Prices (in millions of $)	Employment	Contribution to Federal Government Revenue (in millions of $)	Contribution to Provincial Government Revenue (in millions of $)
1. Direct Effects	$3,000	36 000		
2. Indirect Effects	$1,078	24 000		
3. Induced Effects	$5,056	33 000	$1,683 to $2,409	$1,695 to $2,550
Total	**$9,134**	**93 000**	**$1,683 to $2,409**	**$1,695 to $2,550**

Chapter 1: An Introduction to the Marine Transport Industry

1.1 Objective of the Study

Estimates of the national impacts of this key industry are practically non-existent. This study attempts to bridge this gap

The Marine Transport Industry obviously has a tremendous impact on the Canadian economy. As pointed out by previous research, the industry plays a pivotal role with respect to both domestic and international trade. For example, approximately 60% of Canada's international trade and a large percentage of its domestic trade are carried by ships[1]. Further, a significant portion of Canada's natural resources, semi-finished, and finished goods are transported through ships. However estimates of the national impacts of this key industry are practically non-existent.

This study attempts to fill this gap and is a result of a decision between various representatives of the Marine Transport Industry[2] and Transport Canada to undertake a comprehensive review of the economic impacts of the Marine Transport Industry in Canada. Some key objectives of the study are to:

- Present a quantitative assessment of the complete economic impact of the Canadian Marine Transport Industry
- Demonstrate the significance and value of marine transportation to the Canadian economy
- Provide a regional breakdown of economic impacts as well as sectoral impacts on a regional basis
- Accomplish all of the above using methods accepted and recommended by the scientific literature

[1] These figures are taken from, "Marine Transportation Industry: An Economic Impact Study" by HLB Decision Economics.

[2] Association of Canadian Port Authorities, Canadian Shipowners Association, Chamber of Maritime Commerce, Chamber of Shipping of British Columbia, St. Lawrence Economic Development Council, St. Lawrence Ship Operators Association, and the Shipping Federation of Canada.

There is no research that has evaluated the national impacts of the industry by employing the rigorous methodology, specifically by calculating direct, indirect, and induced effects

We attempt to quantify the economic impacts of the Marine Transport Sector on the Canadian economy by estimating the direct, indirect, and induced effects of the industry[3]. In this respect our research makes a unique contribution. To the best of our knowledge:

- There is no research that has successfully isolated the national impacts of the Marine Transport Industry; and
- More importantly, there is no research that has evaluated the national impacts of the industry by employing the rigorous methodology that is widely accepted in the economics literature; specifically, by calculating direct, indirect, and induced effects.

1.2 Caveats

This study differs from previous research on the economic impacts of the Canadian Marine Transport Industry

This study differs from previous research on the economic impacts of the Canadian Marine Transport Industry in some respects, which makes the direct comparison of results difficult. This section acknowledges and elaborates on these caveats.

1. **Measuring the Impacts of the Marine Transport Sector:** As detailed in the scoping study performed by HLB Consultants, many previous research papers have attempted to evaluate the impacts of marine transport by reporting figures on the value of cargo shipments through different ports. However, this is an incorrect methodology that has been quite emphatically rejected by economists. To use cargo shipment values as a proxy for economic impacts is to assume that the entire value of the good or commodity in question is due to the Marine Transport Sector. However, the service provided by the sector is just one input into the final value of the good.

   Hence, it is appropriate to calculate the value added to Gross Domestic Product (GDP) by the industry in order to assess its economic impacts. This is the methodology routinely employed by economists in estimating the impacts of any industry. So for example, the Marine Transport Industry adds value by enabling the import of a specific good from country "A", which can then

[3] The term "Marine Transport Sector" shall be used interchangeably with "Marine Transport Industry".

be purchased and enjoyed by Canadian consumers. The economic contribution of the industry then is in terms of the increase in the price of the good due to its transport services, or its value-added. This is one of the key reasons why estimates obtained in this study are not comparable to corresponding results from other earlier research, and in fact why figures from other research may be significantly over stated.

We will also employ statistics on the industry's contribution to employment levels in estimating its economic impacts.

This study evaluates the direct, indirect, and induced impacts of the industry

2. **Economic Impacts are Direct, Indirect, and Induced:** This study evaluates the direct, indirect, and induced impacts of the industry. Direct effects are measured in terms of the value-added of the industry to Gross Domestic Product (GDP) and national employment. For example, the Marine Transport Industry adds value to GDP by enabling the export of certain goods. The economic contribution of the industry is then in terms of the remuneration earned by its various components through the transport of these goods.

   In comparison, indirect impacts are defined as the impacts one economic sector can have on others through its demands on those sectors' goods and services as inputs for its own production processes. An example of such impacts, are repair services that Canadian operators may purchase from the ship manufacturing and repair industry.

   Finally, induced impacts are created in the economy when the workers in both the marine transport industry, and also in its supplier industries spend their wages and salaries on consumer goods. This obviously results in consumer spending and consequently, additional demand for various goods and services. To the extent that this spending creates new economic activity and new jobs, then there will be additional induced effects as the incomes earned in these activities are in turn re-spent.

This study relied exclusively on Statistics Canada data

3. **Defining the Marine Transport Industry through Statistics Canada Data:** For the purpose of our study, we relied exclusively on Statistics Canada data. The reason is that there is no other agency, which collects information on value added to GDP and employment annually on a provincial basis.

There are constituents of the industry that are excluded from this study. For this reason, our estimates of the impact of the industry may not be comparable to those obtained in other studies

Statistics Canada defines the Marine Transport Industry as consisting of passenger and freight transport, ferry transport, marine towing, ship chartering, marine cargo handling, harbour and port operations, marine salvage, piloting services, and marine shipping agencies. Hence, obvious omissions (among others) are cruise ships and storage and warehousing associated with the industry. We were forced to exclude these categories because Statistics Canada does not collect data with respect to cruise ships, and activities related to storage and warehousing are relegated to a separate industrial classification by Statistics Canada, making it impossible to disentangle the effects associated with the Marine Transport Sector from other modes of transport. There are other possible constituents of the industry that are also excluded from this study. A detailed list of these omissions is provided later in this chapter. For this reason, our estimates of the impact of the industry may not be comparable to those obtained in other studies.

The following question then may arise: why is it not possible to pool data from other studies that will allow us to construct estimates of these missing items? The problem with this approach is that using data from a multiple of other sources might result in quite flawed estimates given the vast differences in data collection methodologies across various research papers. This could seriously compromise the scientific rigor of this research.

4. **The Impact of Foreign Owned Vessels**: Economic impacts are primarily assessed through the contribution of the industry to GDP. Gross Domestic Product (GDP) consists of the unduplicated value of production that originates within the boundaries of or are domiciled in a country regardless of the ownership of the factors of production. Therefore, foreign nationals working on a foreign owned vessel will not contribute to GDP. However, domestic nationals working for a foreign-based firm categorized under the Marine Transport Industry are earning income that is counted towards GDP. Further, foreign owned vessels do significantly contribute to economic impacts of the Marine Transport Sector in Canada through the use of piloting services, customs brokers, and so on and so forth.

5. **Disentangling Individual Impacts:** We are unable to distinguish between the individual economic impacts of the various constituents of the Marine Transport Industry. So for example, we cannot estimate the value added to GDP or employment by passenger and freight transport. The reason is that Statistics Canada does not disclose these data due to reasons of confidentiality and only reports statistics collectively for the "Water Transport Industry" (passenger and freight transport, ferry transport, marine towing, ship chartering) and the for "Services Incidental to Water Transport" (marine cargo handling, harbour and port operations, marine salvage, piloting services, and marine shipping agencies.).

Due to our reliance on Statistics Canada, we were forced to end most of our analyses at the year 2000. Hence, we devise a method that permits us to make crude estimates of the economic impacts of the Marine Transport Industry to 2003

6. **Use of data from the year 2000:** Due to our reliance on Statistics Canada, we were forced to end most of our analyses at the year 2000. This is because Statistics Canada switched from the Standard Industrial Classification (SIC) to the North American Industrial Classification (NAICS) for succeeding years. A result of this is that a considerable amount of activity associated with marine transport (e.g. marine cargo handling, harbour and port operations, marine salvage, piloting services, and marine shipping agencies) was included with other transport sectors such as trucking and railing, making it impossible to estimate their individual impacts. Hence, we devise a method that permits us to make crude estimates of the economic impacts of the Marine Transport Industry to 2003.

7. **No Forward Linkages:** It is important to acknowledge that direct, indirect, and induced effects do not constitute the sum of complete economic impacts. We are unable to assess the magnitude of forward linkages because of the general lack of consensus on how best to accomplish this. Forward linkages refer to those economic impacts that are generated as a result of other industries using the services offered by the Marine Transport Industry as an input to their own production process. So for example, this study does not take into account the economic effects, which are a consequence of the iron and steel or wheat industry using the services of the Marine Transport Industry to move their products domestically or internationally.

8. **Omission of Private Fleets:** Statistics Canada data would not capture the effects of private fleets owned by large companies and possibly used to transport both inputs and output. However, Canada's waterways, in terms of international trade are among

the most open and competitive in the world, thus guaranteeing reasonable prices. There is thus little incentive for firms to maintain their own fleets. What is perhaps more important is the fact that Statistics Canada data does not reflect private terminals and docks. These points are discussed in more detail in the next chapter.

9. **Omission of Government Fleets:** Statistics Canada for marine transport does not reflect federally owned ships such as fishery patrols and the Coast Guard, which are captured in public accounts. On the other hand, provincial and municipal ships are primarily passenger and vehicle ferries and are included in Statistics Canada's definition of marine transport.

Data limitations could result in an understatement of the true economic impacts of the Marine Transport Sector

In summary, the results of this research are not directly comparable to prior studies. More importantly, our inability to control for certain factors due to data limitations could result in an understatement of the true economic impacts of the Marine Transport Sector. However, it also important to emphasize that while there are significant benefits flowing from marine transport in the aggregate, that does not automatically imply that all marine projects are beneficial. Each project should be evaluated on its benefits relative to corresponding opportunity costs, and not assumed to generate above average productivity gains or benefits to the Canadian economy.

1.3 General Facts of the Industry

The total amount of cargo handled at Canada's ports in 2002 was 407.9 million tonnes, an increase of 3.4% over the previous year

The total amount of cargo handled at Canada's ports in 2002 was 407.9 million tonnes, an increase of 3.4% over the previous year.[4] This compares with an increase of 3.3% in GDP. International cargo declined 1.4%, from 286.9 million tonnes to 282.7 million while domestic cargo increased 16.1% from 107.8 million tonnes to 125.2 million, largely on the strength of the Newfoundland offshore oil and gas sector.

A total of 174.3 million tonnes of export cargo were loaded at Canada's ports in 2002, virtually unchanged from the year before. Slightly over 108 million tonnes of import cargo were handled in the same period, 3.3% less than in 2001.

[4] Much of the foregoing is based on Statistics Canada, "Shipping in Canada, 2002", Ottawa, February 2004.

Exports from Canada to the U.S. increased almost 6%, from 108 million tonnes to 114.3 million tonnes

Exports from Canada to the U.S. increased almost 6%, from 108 million tonnes to 114.3 million tonnes. Shipments of crude petroleum increased markedly, largely due to the Terra Nova oil field offshore Newfoundland coming on-stream. Other commodities showing increases included gasoline and aviation fuel, as well as iron ore and concentrates. Shipments of salt showed the only declines. U.S. waterborne imports declined 9.7% in 2002, led by coal, which was down 45% and fuel oil, which declined 16.3%. Shipments of iron ore rose 19.4%, limestone was up 11.7% and chemicals increased by 15.4%. Canadian-registered vessels carried 44.1% of its trade with the U.S., down from 50.3% the year previous.

Canada's overseas cargo declined 5.9% in 2002, to 168.4 million tonnes. Exports dropped 10% while imports only fell by 1.2%. Shipments of coal, most of which is loaded at Vancouver for Asian and European markets, led the decline, dropping 13.8%. Drought on the Prairies reduced wheat exports by 32.1%. Iron ore and concentrates, mostly shipped from Sept-Îles and Port Cartier, increased by 5.6% to 18.6 million tonnes. Imports increased 2.2%, led by shipments of iron and steel, from Europe and South America and fuel. Canada is served by a large number of foreign shipping services as well as Canadian companies operating foreign flag vessels

The shipment of domestic cargo increased by 16%, to 125 million tonnes

The shipment of domestic cargo increased by 16%, to 125 million tonnes. The Terra Nova oil field offshore Newfoundland had an impact on domestic cargo, too, as crude oil shipments increased from 11.1 million tonnes to over 30 million tonnes. In the pacific region, domestic cargo grew 3.6%, based on increased shipments of wood chips, logs and other wood. These commodities account for more than 70% of B.C.'s domestic shipping activity. Ports in the Great Lakes handled 28.9 million tonnes of domestic cargo in 2002, while ports in the St. Lawrence region handled close to 24 million tonnes. Both totals were down over the previous year. In the Atlantic region, domestic cargo increased by almost 82% on the strength of Newfoundland offshore oil shipments to Come-by-Chance and other east coast refineries.

On a regional basis, in 2002, the amount of international cargo handled was split as follows:

Table 1.1 – International Cargo handled in Canada by Region in 2002

Region	Tonnes, 000s	Percentage of total
Atlantic	80,865	28.60
St. Lawrence	72,327	25.58
Great Lakes	48,192	17.05
Pacific	81,349	28.77
Canada	282,734	100.00

Nineteen Canadian Port Authorities (CPAs) handled close to 60% of Canada's international and 40% of its domestic cargo in 2002

Nineteen Canadian Port Authorities (CPAs) handled close to 60% of Canada's international and 40% of its domestic cargo in 2002. Vancouver suffered a 12.3% decline in cargo, to 63.2 million tonnes, but is still by far Canada's largest port and one of the largest in North America. It is Canada's leading port for bulk and containerized cargoes, handling 47.8% of the containers handled at Canadian ports. Most of the decline in Vancouver's cargo was in coal (-14.2%), wheat (-54.9%). Potash and wood pulp increased, however, by 22.5% and 15% respectively.

Saint John, New Brunswick is Canada's second largest CPA port by tonnage handled, at 25.2 million tonnes in 2002. It handles a substantial amount of crude oil and refined petroleum produced at the massive Irving Oil refinery. Crude oil increased 10.2% while gasoline and aviation fuel was up 9.0%. These cargoes are carried in a mix of supertankers and coastal tankers. The port also experienced increased potash shipments.

One of the largest non-CPA ports is Port Hawkesbury, Nova Scotia, on the Strait of Canso. It is the location for a large petroleum trans-shipment facility, as well as bulk exports of gypsum and aggregate and imports of coal. In 2002, it handled 14.6 million tones of cargo.

Ports at Prince Edward Island handled substantially less export cargo in 2002, down from 36,000 tonnes in 2001, to 11,800 in 2002. Imports were up by 13.5%, from 56,500 tonnes to almost 65,000. Another 685,000 tonnes of domestic cargo was handled at these ports.

On the Prairies, the port of Churchill, Manitoba handled 14 international ships and 282,000 tonnes of export cargo, down from 478,000 tonnes the year previous. It also handled 21,700 tonnes of domestic cargo in 24 vessels.

Ports in the North West Territories saw a substantial reduction in export tonnage, from 245,000 tonnes to 196,400. Eleven (11) ships were handled. Another 31,500 tonnes of domestic cargo was handled in 22 vessels. In Nunavut, there was strong growth, from 113,000 to 154,800 tonnes, with 29 vessels handled at nine ports. On a domestic basis, a further 87,800 tonnes of cargo was handled in 163 ships at 27 ports.

All of Canada's ports handled 25.5 million tonnes of container cargo in 2002, or 3.055 million TEUs (twenty foot equivalent units)

All of Canada's ports handled 25.5 million tonnes of container cargo in 2002, or 3.055 million TEUs (twenty foot equivalent units). Canada's three major container ports, Vancouver, Montreal and Halifax handled more than 3.0 million TEUs (twenty foot equivalent units) in 2002, almost triple what they handled a decade earlier. Vancouver handled almost 50% of the total, at 1.459 million TEUs with Montreal at 980,000 and Halifax handling 456,000. In 1999, Canadian ports handled approximately 14.1% of containerized freight in North America. By comparison, Canada had only 9.9% of North America's population, 6.6% of retail sales and 7.6% of its manufacturing output.[5]

Marine Transport Industry has experienced healthy growth over the past few years. In this study we attempt to evaluate the impact of the industry by calculating its value-added

In summary, the above discussion suggests that the Marine Transport Industry has experienced healthy growth over the past few years. However, this conclusion is achieved by focusing on cargo flows through different ports across the country. In this study we attempt to evaluate the impact of the industry by calculating its value-added. The reasons for this are detailed below and in the next chapter.

[5] Doug O'Keefe, "The Future for Canada-US Container Port Rivalries", Statistics Canada, 2000.

1.4 Literature Review

In summary, our study attempts to bridge the gaps present in the literature by estimating the direct, indirect, and induced effects of the Marine Transport Industry at the national level by employing Statistics Canada. However, using Statistics Canada data does have it's limitations

Numerous studies have attempted to quantify the economic impacts of the Marine Transport Sector in Canada. The scoping study by HLB consultants describes these research papers in excellent detail.[6] For the present we confine our discussion to highlighting the differences between these papers and our study.

- First, very few of these papers have attempted to estimate aggregate economic impacts at the national level, and instead have focused on regional and port impacts. For example, InterVistas (2001) focuses on the economic impacts of the Port of Vancouver; the Economics and Statistics Branch of the Department of Finance, Government of Newfoundland and Labrador (2002) analyzes the impact of oceans, marine, and coastal activity; and the Quebec Ministry of Transport (1999) evaluates the effects of the marine sector on the Quebec economy.

- Acton White and Associates (2001) do attempt to evaluate the effects of the marine industry on the Canadian economy. However, their approach is rather simple as they rely on trends in GDP and employment. In other words, they do not attempt to calculate either indirect or induced effects.

- The one study that has attempted to quantify direct, indirect, as well as induced impacts is InterVistas (2001), which focuses on the Port of Vancouver. They find that the Port is responsible for significant economic impacts. Specifically, they attribute 19,720 jobs and $1.2 billion in GDP to the industry. These impacts are due to their ability to account for a number of activities that cannot be captured on a province-wide or nation-wide basis with consistent Statistics Canada data: Examples would include the economic impact of purchases ashore by cruise ship visitors, shipbuilding and repair activities, and the operations of warehouses and grain elevators – all of which are included in the Vancouver study, but must be excluded from our report.

In summary, our study attempts to bridge the gaps present in the literature by estimating the direct, indirect, and induced effects of the Marine Transport Industry at the national level by employing

[6] "Marine Transportation Industry: An Economic Impact Study" by HLB Decision Economics.

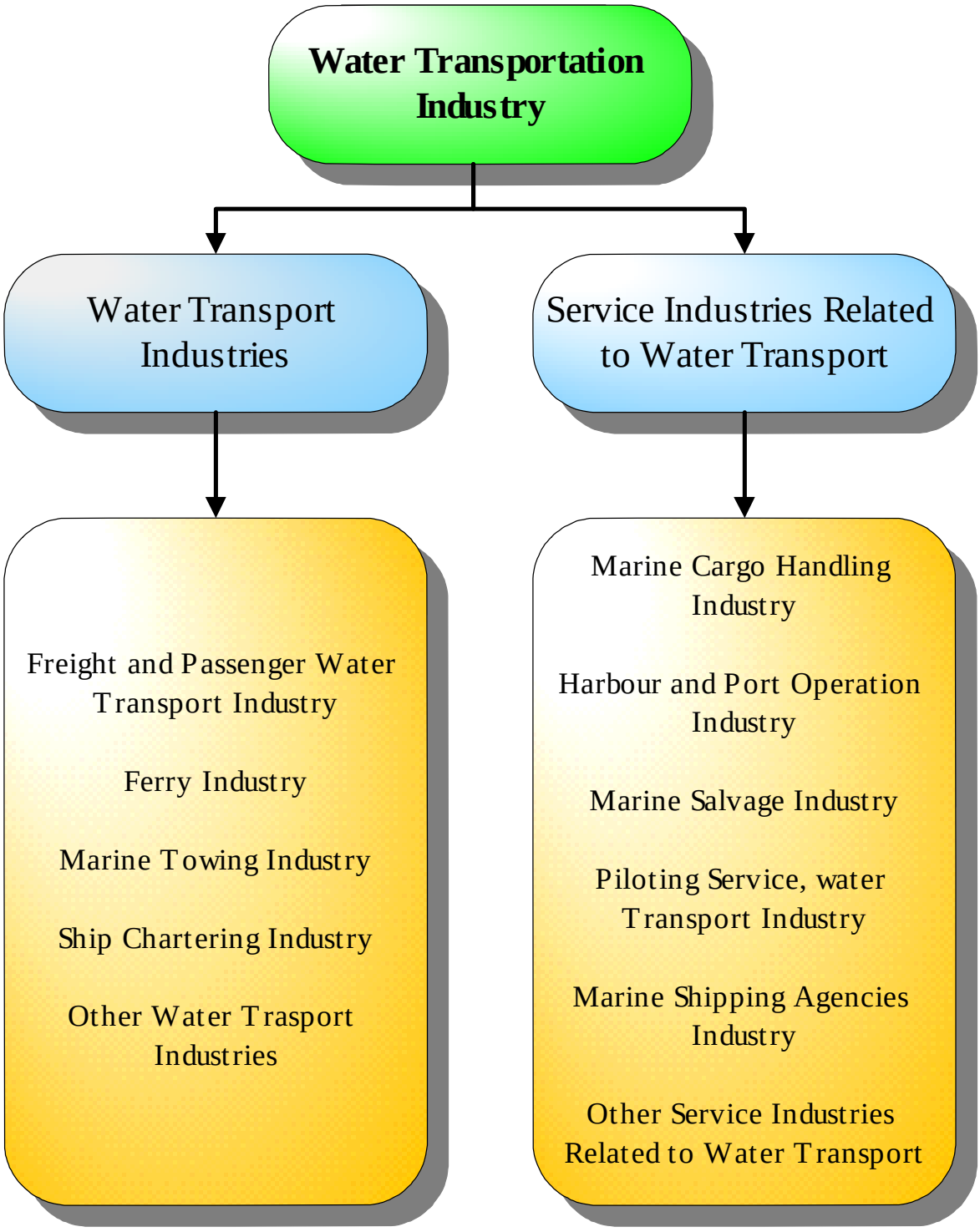
Statistics Canada. However, using Statistics Canada data does have it's limitations as it is not possible to factor in a number of activities that are associated with marine transport such as storage and warehousing, cruise ships, and shipbuilding and repair.

1.5 Defining the Marine Transport Industry

We define the Marine Transport Industry according to the Standard Industrial Classification (SIC) adapted by Statistics Canada

We define the Marine Transport Industry according to the Standard Industrial Classification (SIC) adapted by Statistics Canada given in the flow chart below.[7] Basically, all sectors are either classified as belonging to the "Water Transport Industry" or "Services Incidental to Water Transport". Table A.1 in the Data Appendix gives a more detailed description of each item in the chart. The purpose of this section is to describe the data employed in this study and thus gives readers a clear idea of the constituents of marine transport (as defined by Statistics Canada). It is again emphasized that we do not possess data on each individual constituent but instead aggregate data for either "Water Transport Industry" or "Services Incidental to Water Transport". Information is available for GDP, employment contributed by the Marine Transport Industry as well as industry revenue, profits, wages, and net exports.

[7] These descriptions are taken from Statistics Canada (http://www.statcan.ca/english/Subjects/Standard/sic/sice80-classg.htm).


Water Transportation Industry
Water Transport Industries
Service Industries Related to Water Transport
Freight and Passenger Water Transport Industry
Ferry Industry
Marine Towing Industry
Ship Chartering Industry
Other Water Trasport Industries
Marine Cargo Handling Industry
Harbour and Port Operation Industry
Marine Salvage Industry
Piloting Service, water Transport Industry
Marine Shipping Agencies Industry
Other Service Industries Related to Water Transport

1.6 An Overview by Classification

1.6.1 Water Transport Industries

1.6.1.1 Freight and Passenger Water Transport Industry

Much of Canada's domestic shipping sector is concentrated in the Great Lakes and St. Lawrence River

Much of Canada's domestic shipping sector is concentrated in the Great Lakes and St. Lawrence River. Marine operations are conducted by seven companies that are members of the Canadian Shipowners Association (www.shipowners.ca). In 2002 these firms operated 72 vessels – bulk carriers, self-unloaders, tankers and roll-on, roll off – that altogether carried 66.1 million tonnes of cargo, mostly consisting of cement, coal, coke, grain, gypsum, iron ore, limestone, potash, salt and petroleum products.[8] It also includes domestic shipping provided by Oceanex (www.oceanex.com) between the Canadian mainland and Newfoundland as well as between Newfoundland and Labrador.

1.6.1.2 Ferry Industry

A very important sector for the transportation of passengers and vehicles is the Canadian ferry industry, represented by the Canadian Ferry Operator's Association

The Ferry Industry is composed of both government and private operators. A very important sector for the transportation of passengers and vehicles is the Canadian ferry industry, represented by the Canadian Ferry Operator's Association (www.cfoa.ca), whose members operate a total of 129 vessels, carry 39 million passengers, 15 million vehicles and employ 7,500 people.

By far the largest operator in Canada, and one of the largest ferry operators in the world, is B.C. Ferries, which carries 21.4 million passengers and 7.9 million vehicles per annum and employs 4,692 people. The BC government also operates river and lake ferries in the Interior, which carry 3 million passengers, 1.6 million vehicles and employ about 200 people.

In Manitoba, the Department of Highways and Transportation ferry service employs 29 people while providing service to almost 290,000 passengers and 112,000 vehicles,

[8] www.shipowners.ca

In Ontario, service is provided to Manitoulin Island by the Owen Sound Transportation Company, a subsidiary of Ontario Northland Transportation Commission. This service carries approximately 300,000 passengers and 115,000 vehicles per annum between Tobermory and South Baymouth. That service employs 193 people. Other ferry services, including Pelee Island Transportation Service, carry 1.8 million passengers, 950,000 vehicles and employ 120 people.

In Quebec, the Société des Traversiers du Quebec carries 5.4 million passengers, 1.9 million vehicles and employs 355 people. Totals for the province are 5.7 million passengers, 2 million vehicles and 680 employees.

On the east coast, service to and from Newfoundland is a constitutional obligation under the Terms of Union, 1949 and is provided by Marine Atlantic, a federal crown corporation. It has seen a surge in traffic in recent years and now carries almost 500,000 passengers, 235,000 vehicles and employs 895 people. Elsewhere on the east coast, service between Nova Scotia and PEI is provided by Northumberland Ferries Ltd. Its subsidiary, Bay Ferries Ltd. operates two services across the Bay of Fundy. In total, both services carry 800,000 passengers, 265,000 vehicles and employ 310 people. The Government of Newfoundland and Labrador also operates coastal ferries, which carry 744,000 people, 350,000 vehicles and employ 200 people.

1.6.1.3 Marine Towing Industry

The marine towing industry takes three forms: typical harbour tug operations, tug and barge operations

The marine towing industry takes three forms: typical harbour tug operations, tug and barge operations that involve commodities such as wood pulp, forest products and coal, as well as offshore oil and gas supply boats, which are also capable of towing offshore drilling platforms to location and doing marine salvage work. The Eastern Canadian Tug Operator's Association represents 15 member companies operating on the east coast and the Great Lakes / St. Lawrence. On the west coast, the Vancouver-based Council of Marine Carriers has 37 member companies in its organization, encompassing 250 towing vessels, 750 cargo-carrying barges and 1,600 seagoing personnel. Major operators include Seaspan and Rivtow on the west cost, McAllister Towing in the St. Lawrence, Atlantic Towing and Eastern Canada Towing on the east coast.

1.6.1.4 Ship Chartering Industry

Canada does not have a highly developed ship brokerage industry. Fairplay International lists 42 shipbrokers across the country in St. John's, Halifax, Montreal, Toronto and Vancouver. It is mostly related to fixing bulk cargoes and offshore oil and gas support vessels, and projects related to offshore developments.

1.6.1.5. Other Water Transport Industries

This category refers to water taxi services, local tour boats for scenic and sightseeing transportation, dinner boats, offshore supply vessels, and so on and so forth.

1.6.2. Service Industries Incidental to Water Transport

When a vessel comes into port a variety of activities take place related to that simple event. The vessel would have reported to vessel traffic as it made its way along the coast or towards the harbour. A small pilot boat, (arranged beforehand by the vessel's agent) meets the vessel at the fairway buoy at the entrance to the harbour. (If the vessel has transited a long river passage, it would have taken on a pilot at the beginning of that section). The pilot guides the vessel into its berth. If it does not have stern or bowthrusters, or if the weather is inclement, the vessel may require tugs. Depending upon the size of vessel, this could be between one and four tugs, each of which will have its own crew and requirements (and economic impacts).

Depending upon the terms of the longshoring contract, the vessel is tied up by a group of up to eight stevedores. The vessel is boarded by the ship's boarding agent, accompanied by customs inspectors. The crew may go ashore and spend money on either personal or ship's provisions. Documentation is handled by the ship's agent, customs broker or freight forwarder. The vessel has to be cleared in and out by Canada Customs and Revenue Agency.

Many of these functions can apply to all types of vessels, including cruise ships, bulk ships (liquid or dry), car carriers, and forest product carriers, which have similar requirements. Shipping agents can specialize in containers, forest products, car carriers, offshore supply vessels or bulk shipping and project cargoes, or they can handle all types of vessels.

1.6.2.1 Marine Cargo Handling Industry

Marine cargo handling takes many forms, according to the type of cargo handled: containers, autos, forest products, liquid and dry bulk, palletized cargo. Most cargo handling in Canada is undertaken by stevedoring companies at terminals specially designed for each commodity. In the case of container terminals, they are highly capital-intensive and therefore only a very few ports are engaged in this activity: Vancouver, Montreal, Halifax, Saint John St. John's and Corner Brook. The first three account for about 95.7% of containers handled in Canada, with Vancouver alone accounting for about 47.8% in 2002. Bulk-cargo terminals, such as those for grain, coal, petroleum, iron ore, alumina etc., are also very specialized and capital-intensive.

Major stevedoring and marine cargo terminal operating firms include: TSI Terminal Systems Inc, Empire Stevedoring, Cast Terminals, Racine Terminal Company, Logistec Stevedoring Inc., Quebec Stevedoring Co. Ltd., Cerescorp Company, Halterm Ltd., A. Harvey & Co., and Oceanex.

1.6.2.2 Harbour and Port Operation Industry

The top 50 ports in Canada handled 384,773,000 tonnes of cargo, or 94.3% of the grand total of 407,948,000 in 2002

The 19 Canadian Port Authorities created by the Canada Marine Act of 1998 include Vancouver, Prince Rupert, Nanaimo, Fraser River Ports, North Fraser River, Port Alberni, Thunder Bay, Hamilton, Windsor, Toronto, Montréal, Trois Riviéres, Québec City, Saguenay (Chicoutimi), Sept Îles, Saint John, Belledune, Halifax, and St. John's. In 2002, these ports handled 58.9% of Canada's domestic and international trade. The top 50 ports in Canada handled 384,773,000 tonnes of cargo, or 94.3% of the grand total of 407,948,000 in 2002.

There are different kinds of port management structures. However, most of Canada's ports are landlord ports, where the port authority leases terminals or land to terminal operators and then collects rent. People working for port authorities are employed doing marketing, business development, operations, accounting, public relations and clerical functions. They do not generally get involved in actual cargo or vessel operations. Private stevedoring companies normally carry out these functions.

It is important to acknowledge that activity related to private ports and terminals will not be reflected in Statistics Canada data.

1.6.2.3 Marine Salvage Industry

The marine salvage industry is closely related to the marine towing industry as well as offshore oil and gas drilling activity, as many of the same firms provide vessels for salvage operations. The World Salvage Directory only lists two Canadian companies, McAllister Towing of Montreal, and Secunda Marine, of Dartmouth, NS.

There are marine casualties in Canadian waters virtually every year. Some will involve salvaging a vessel that has been abandoned or is in distress. A salvage tug or tugs will be dispatched to bring the vessel to nearest port. The operation would also usually involve extensive Search and Rescue efforts, usually coordinated by the Coast Guard. More elaborate salvage operations, such as raising the Irving Whale off the coast of PEI in 1996, involve extensive planning and co-ordination and cost many millions of dollars.

1.6.2.4 Piloting Services

Pilots are often required to guide large vessels (usually over 1,500 tonnes dwt[9]) into rivers and ports. There are compulsory and non-compulsory pilotage areas within Canada's coastal waters. Compulsory pilotage regions include the Atlantic, Laurentian (St. Lawrence), Great Lakes and Pacific regions. In the compulsory pilotage areas, a pilotage authority usually provides the service. This can consist of one or more "pilot boats" and several qualified marine pilots.

The Atlantic Pilotage Authority, for instance, provides compulsory pilotage services to Halifax, Pugwash, Strait of Canso, Sydney the Bras d'Or Lakes, Saint John, Miramichi, Restigouche, Bay of Exploits, Holyrood, Placentia Bay, Stephenville, Humber Arm, St. John's, Charlottetown and the Confederation Bridge. It has 84 employees, including 57 pilots, and an annual budget of $14m.

Both public as well as private piloting services are reflected in Statistics Canada data.

[9] dwt = deadweight tonnage.

1.6.2.5 Marine Shipping Agencies Industry

This industry consists of establishments primarily engaged in representing shipping lines, arranging for the taking on of cargo and transacting other business in port on behalf of ship owners and charterers. Shipping agents are located in port cities and towns as well as major consumer markets such as Montreal and Toronto. The Shipping Federation of Canada represents 85 (mostly eastern) Canadian companies that act as agents on behalf of 300 shipping lines throughout the world[10]. The B.C. Chamber of Shipping (www.chamber-of-shipping.com) fulfills much the same role in western Canada.

Boarding agents, and documentation clerks will usually be located in the port, and "back office" functions can take place in either the port office or at a customer service centre away from the port. Often, the marketing function will take place from the major centre. Montreal and Vancouver probably have the densest concentration of shipping agent activity in the country, and it is related both to the marketing and shipping operation function. In Toronto, many shipping agent or shipping lines have their head offices, but operations related to the ship itself are done at the port location from a satellite or branch office. Halifax has some regional marketing activity, boarding agent activity, back office /documentation and ship planning activity. In one instance, it has a North American service centre.

It is important to emphasize that Freight forwarders are classified in SIC Code 4592 - Freight Forwarding Industry, and are hence not counted as marine transport in Statistics Canada data.

1.6.2.6 Other Service Industries Incidental to Water Transport

This category includes lighthouse and canal operations and maintenance; boat cleaning, marine cargo checking and surveying.

[10] www.shipfed.ca

1.6.2.7 Omissions

It is important to acknowledge that the economic impacts calculated in this study will probably be an underestimate of the true effects of the Marine Transport Industry. But assessing the magnitude of this bias is beyond the scope of this research

Based on our examination of the above data and discussions with Statistics Canada, we conclude that the following categories are not covered in either "Water Transport Industry" or "Services Incidental to Water Transport", and consequently, are not included in our definition of the Marine Transport Industry.

1. Ship Repair and Manufacturing
2. Ship Chandlers / Supplies
3. Cruise Ship Industry
4. Inland Transportation related to Port Activity i.e. Rail and Truck
5. Labour Administration / Union Administration
6. Marine Insurance / Cargo Insurance
7. Container Repair / Refrigeration Maintenance
8. Welding / Metal Fabrication
9. Bunkers / Fuel
10. Government Agencies related to Marine Transport (Coast Guard)
11. Security Services
12. Warehousing and Storage
13. Customs Agents
14. Freight Forwarders
15. Operators of private docks and terminals and private cargo handlers.
16. Dredging Operations.
17. Canadian Managers of Foreign Shipping

Hence it is important to acknowledge that the economic impacts calculated in this study will probably be an underestimate of the true effects of the Marine Transport Industry. But assessing the magnitude of this bias is beyond the scope of this research.

1.7 Overview of the Study

The next chapter discusses the methodologies employed in estimating the economic impacts of the Marine Transport Industry. Chapter 3 specifically discusses direct impacts, while Chapter 4 focuses on indirect effects. Chapter 5 provides an in-depth analysis of the induced effects of the industry as well as adding these impacts to direct and indirect effects obtained in previous chapters and discussing these consequent total effects.

Chapter 2. How to Measure the Impact of an Industry

The direct impacts of the marine transport industry will be evaluated by examining trends in metrics associated with this industry over time and comparing them to identical measures with respect to other industries

This study contributes to the literature by estimating the economic impacts of the Marine Transport Industry through the calculation of direct, indirect, and induced impacts. The **direct impacts** of the marine transport industry will be evaluated by examining trends in metrics associated with this industry over time and comparing them to identical measures with respect to other industries. Obvious indicators include: Value Added to GDP, Revenue, Profits, Employment, Exports, and Wages and Salaries. These analyses will be conducted chiefly through line graphs, and bar charts constructed from Statistics Canada data

The easiest way to conceptualize direct impacts is to ask the question: what economic effect does a cargo ship have once it docks in a Canadian harbor? A detailed illustration is presented in this chapter. For the present it is worth noting that such a ship, irrespective of whether it is domestically or foreign-owned, will require a multitude of services offered by Canadian firms such as being guided to the harbor by pilot ships, unloading and storage of cargo, and documentation. In this manner, the Marine Transport Industry contributes to GDP by generating income and also contributes to national employment. Of course these are not the only possible direct economic impacts the industry can have. As mentioned above, Statistics Canada defines the Marine Transport Industry as consisting of passenger and freight transport, ferry transport, marine towing, ship chartering, marine cargo handling, harbour and port operations, marine salvage, piloting services, and marine shipping agencies. The Marine Transport Sector directly impacts GDP and employment in Canada through these different channels.

Input/Output tables will be used to assess the indirect impacts of the marine transport industry

Input/Output tables will be used to assess the **indirect impacts** of the marine transport industry. Indirect impacts are defined as the impacts one economic sector can have on others through its demands on those sectors' goods and services as inputs for its own production processes. These figures will be in terms of GDP, and employment and will be broken up by industrial sector and province. For example, tables will be provided to show the indirect impact of the Ontario Marine Transport Industry on each Industrial Sector in Ontario with respect to GDP. Data restrictions prevent us from going to sectoral detail with respect to employment. Relevant data and calculations have been performed with the Statistics Canada 2000 Input/Output Modeling System.

Again, an example might be useful to demonstrate the intuition behind indirect impacts. In order to provide services, the marine transport sector purchases repair services from the ship manufacturing and repair sector, which has been classified separately from marine transport by Statistics Canada. The point is that this demand by marine transport has income as well as employment effects that benefit ship repair and maintenance. These are indirect effects.

The induced impacts of the industry are measured by posing the hypothetical question: What would happen if the marine transport industry were to be totally shut down?

Finally, there are many other **induced impacts** on the entire economy to consider as well. The induced impacts of the industry are measured by posing the hypothetical question: What would happen if the marine transport industry were to be totally shut down? But this question is no way considered to be a real possibility for the economy. Hypothesizing a shutdown is simply a method of obtaining the most comprehensive measure of the "impact" of the marine transport industry on the Canadian economy.

For example, suppose that a longshoreman or cargo handler no longer receives wages or a salary if the industry ceases to "exist". The longshoreman's overall expenditure on goods and services will decrease throughout the economy, resulting in lower profits for industries that experience the corresponding decline in demand. With lower profits being earned, real investment in plant and equipment is likely to decline. Finally, with decreased economic activity tax revenues will fall and expenditures might rise, all with a major impact on government tax revenue[11].

2.1 Direct Impacts

In the case of a Canadian owned vessel, the direct effects of the Marine Transport Industry are obvious. The concept of direct impacts can be best illustrated through the case of imported goods coming to Canada on a Canadian owned vessel. Usually, a vessel is guided into a port by a pilot boat, arranged by the ship's agent. In some instances (for example, inclement weather), the vessel may require tugs in addition to the pilot boat. The vessel is then tied up by stevedores.

[11] It is important to acknowledge that predictions of induced impacts have a greater variance relative to the other impacts. The induced impacts also ignore any strategic outcomes that may result after any industry change and thus are more uncertain for this reason.

Once secure, the vessel is boarded by the ship's boarding agent and customs inspectors. The crew may disembark and spend money on either personal or ship's provisions. Documentation is handled by the ship's agent, customs broker or freight forwarder. The vessel has to be cleared in and out by Canada Customs and Revenue Agency. Cargo can then be loaded in and/or out.

In the case of a Canadian owned vessel, the direct effects of the Marine Transport Industry are obvious. The vessel provides income and employment not only to its own crew, but to the crew of the pilot boat, stevedores, and the ship's agents. However, some other impacts are not captured by our data. For example, when the ship arrives - it could be inspected by Transport Canada Marine Safety and the cargo will be cleared by Customs Border Services Agency (CBSA). Their value added (protecting Canadians) appears in Input/Output accounts for "Public Institutions". If the box is picked up a truck driver - his/her income appears in the trucking industry's Input/Output accounts. Similarly, if the cargo is stored in a warehouse, the income of the warehouse owners is captured in the warehousing industry's Input/Output accounts.

A caveat, of course is that profit earned by the vessel is obviously not counted in case of a foreign ship. However, the foreign vessel's impact in terms of generating income for pilot boats, stevedores, and tugs is counted as a part of GDP. These income effects are embodied in value added to GDP. As in the case with domestic owned vessels, purchasing ship provisions is captured in our analysis under indirect effects. On the other hand, purchasing personal supplies constitute induced effects and will only be counted for crew actually domiciled in Canada.

Employment and GDP are the two primary metrics that used by economists in evaluating the economic impacts of an industry. The rest of this section elaborates on these and other indicators that can be used to obtain a complete profile of the industry.

Value Added to Gross Domestic Product (GDP)

Industry output is routinely measured in terms of its contribution or value added to Gross Domestic Product (GDP). The appropriate term for an individual industry or sector is "domestic product" and it is

[12] These measures also assume a competitive economy in that there are no rents. Hence prices approximate marginal costs.

important to note immediately that this concept is *not* "total sales" or a close equivalent. The total value of sales of an industry includes the value of all the inputs that have been purchased from other industries. The sum of final sales across all industries can therefore end up "counting" some output a multitude of times (for example, the crude oil that is refined into fuel, and the fuel that is purchased by a Great Lakes operator) and is not used as a measure of economic activity for a country as a whole. Instead, GDP is the sum of the "value" added to products by each industry – that is, the value of total sales less the cost of all purchased inputs. The distinction is important because many tertiary manufacturing sectors, for example, will have high 'sales" but much lower domestic "products" because so much of their sales value has actually been contributed by the inputs purchased from other sectors back along the production chain.[12]

Industry Revenue and Profits

Although valued added to GDP is obviously a better index of industry activity trends in industry revenue and profits may nonetheless yield some interesting insights of the potential impact of an industry on macro-economic aggregates such as employment. An industry with higher revenue and profits might imply more employment and less government expenditure on welfare and social assistance.

Number of Employees

An industry contributing significant numbers to employment figures has important ramifications for consumer spending and consequent economic activity. However, it is important to examine whether a majority of jobs are low paying, which might result in negligible economic impacts despite high employment figures.

Wages

As implied above, employment statistics should be studied in tandem with corresponding numbers on average wages and salaries. This is because an industry with high employment might still imply relatively small economic impacts relative to an industry with lower employment if average wages and salaries in the former are much lower than the latter.

Net Exports

Industries can vary in their impact on the economy through trade in goods and services with other countries. An industry that exports relatively high-priced goods or services abroad increases the potential for Canadians to increase their well being by purchasing in world markets. If a significantly export-oriented industry were to suddenly disappear from the Canadian economy, the impact would be a severe reduction in exports, resulting in a significant depreciation of the Canadian dollar and loss of real purchasing power for Canadian consumers.

2.2 Indirect Impacts

The extent of an industry's indirect impacts or backward linkages can be measured by using Input-Output (I/O) tables and data

The extent of an industry's indirect impacts or backward linkages can be measured by using Input-Output (I/O) tables and data. Effectively, I/O tables are snapshots of detailed economic activity at a specific point in time, recording how much industries bought and sold from each other, as well as industries' sales to various forms of final demand and "value added" (i.e. wages and salaries and gross profits). From the basic I/O data, Input-Output "coefficients" can be constructed and these, in turn, can be used to perform calculations to answer the kinds of questions posed above.

Statistics Canada provincial I/O Modeling System tables for 2000, the latest available data, permit us to examine the Canadian economy at detail in up to 300 economic sectors or industries

We used Statistics Canada provincial I/O Modeling System tables for 2000, the latest available data. The tables permit us to examine the Canadian economy at detail in up to 300 economic sectors or industries (the terms will be used interchangeably).

One of the key impacts one economic sector can have on others is through demands for those sectors' goods and services as inputs to its own production. These **indirect impacts** or backward linkages are related to an industry in different degrees. For example, the Marine Transport Industry provides demand for gasoline and diesel, which in turn obliges refiners to purchase petroleum. I/O methods permit us to trace back all these indirect requirements. At the same time, the extent to which inputs come from imports is also accounted for. It is assumed that imported inputs do not generate any further domestic demand – generally a reasonable assumption for a small economy like Canada's.

In order to isolate backward linkages from marine transportation using Input-Output methods, we will raise expenditures on the marine

transportation industry by an arbitrary $10 million and then examine the impacts, both direct and less indirect, on all other sectors' output and employment.

2.3 Induced Effects

Induced activity occurs as the result of spending on goods and services by the employees of firms within the marine transport industry and its upstream or indirect suppliers

Employing Input-Output tables enables us to examine the important indirect impacts of the Marine Transportation Industry. A caveat in the use of Input-Output techniques is that while they are excellent for doing detailed industrial impacts, they cannot capture the impacts of the resulting flows of income through the economy. These flows, and their impacts, are what we call 'induced effects'. Induced activity occurs as the result of spending on goods and services by the employees of firms within the marine transport industry and its upstream or indirect suppliers. For example, a decline in wages in the industry, or in one of its suppliers, will result in less spending by employees and therefore a drop in demand for consumer goods from other industries

To capture these induced effects we use a different tool: a macro-econometric model

To capture these induced effects we use a different tool – a macroeconometric model, which is a computer simulation model of the entire economy in aggregate accounting for all the important macroeconomic interrelationships. The macroeconometric model, together with the I/O system, is used to perform the hypothetical experiment of "removing" the marine transport industry from the Canadian economy and examine the results for the key economic indicators like GDP, employment, and government revenues and balances. While the experiment is indeed hypothetical, the results constitute the most comprehensive measure of the total "impact" of the marine transport industry in the Canadian economy

But it is important to emphasize that the "shutdown" of the industry in question is in no way considered to be a real possibility for the economy. Hypothesizing a shutdown is simply our method of obtaining the most comprehensive measure we can of the "impact" of the marine transport industry on the Canadian economy.

To describe the procedure in somewhat greater detail: With the aid of its highly-disaggregated industrial information, we can use the I/O model to determine the direct impacts of a marine transport shutdown on imports, employment, wages and salaries, sales taxes, subsidies and other variables. These calculations will include all direct and

indirect, or upstream, effects working through industrial sectors. For example, a shutdown in the marine transport industry would reduce demands from supplier sectors (backward linkages) and so reduce output, employment, and wages paid in these sectors as well. Also, a shutdown in marine transport will reduce demand for imports as inputs to its suppliers sectors. This step thus estimates the sum of direct and indirect impacts. Greater detail on the procedure, and the results obtained, will be found in chapter 4.

There are the induced impacts on the entire economy to consider as well

But there are the induced impacts on the entire economy to consider as well. For example, when wages and salaries are no longer being paid by marine transport or by one of its supplier sectors, consumption will likely decrease throughout the economy. With lower profits being earned, real investment in plant and equipment is likely to decline. Finally, with decreased economic activity tax revenues will fall and expenditures might rise, all with a major impact on government balances.

FOCUS macro-econometric model of the Canadian economy, built and maintained at the Institute for Policy Analysis at the University of Toronto, has been used over the years for a wide variety of forecasting and impact studies

To examine these more diffuse (but still important) economy-wide impacts we will use the FOCUS macro-econometric model of the Canadian economy. This model, built and maintained at the Institute for Policy Analysis at the University of Toronto, has been used over the years for a wide variety of forecasting and impact studies. The model has been used in the past to analyze the impacts on the economy of the GST and HST, of various payroll taxes, and of annual federal budgets. Using techniques similar to those of the present study, the model has been used, together with I/O calculations, to examine the impacts of the electricity and banking sectors in the Ontario economy and of the mining and primary metals sector and various types of housing activity in the Canadian economy. As a forecasting tool, FOCUS is one of the four models consulted by the Department of Finance since the late-1990s for its annual estimates of projected budget balances.

The complex economic relationships embodied in the FOCUS model permit us to evaluate the magnitude of economy-wide induced effects. In size, FOCUS is a medium-scale model consisting of 300+ behavioural[13] equations and identities and somewhat over 700 variables in total. The model is based on a synthesis of Keynesian and neo-classical macro theory, and depicts both short-term demand-

[13] 'Behavioural' equations attempt to embody key elements of aggregate economic behaviour, like the propensity to consume additional goods or services from changes in after-tax income. They are estimated using multiple regression techniques as applied to economic variables ('econometrics').

oriented detail where under-employment can persist for significant periods, and full-employment long-run equilibria based on the supply side of the economy. Considerable care has been taken in developing the model's structural equations to ensure that they embody desirable long-run properties as well as short-run dynamics, but for present purposes it is the ability to trace the impacts through the economy from a specific change to output, employment and incomes in the shorter term that is of most interest to us. In sum then, we can thus use the FOCUS model, together with the I/O system, to examine the full impacts (direct + indirect + induced) of the marine transport sector on the Canadian economy [14].

The provincial breakdown of direct and indirect impacts has been obtained directly from unpublished Statistics Canada data and from special calculations with the Statistics Canada Interprovincial Input-Output model. For induced impacts by province, the national induced effects from FOCUS are distributed among the provinces based on their direct and indirect activity and on provincial consumption impacts developed from a smaller version of the interprovincial I/O system.

2.4 Differences from the Original Approach Suggested by HLB Decision Economics

In its study on the economic impact of the Marine Transport Industry, HLB Decision Economics implies that either Input-Output analysis or a macro-econometric framework can be employed to evaluate industry specific economic effects. These different methodologies entail varying benefits. Specifically, while Input-Output Analysis lends itself well to sectoral detail, it cannot be used to estimate the impact of an industry on macro-economic aggregates, which can be accomplished through an econometric model. Our understanding is their study implies that one methodology can be used in isolation from the other.

It is well established in the academic literature that the total economic impact of an industry consists of direct, indirect, and induced effects

However, it is well established in the academic literature that the total economic impact of an industry consists of direct, indirect, and induced effects. In order to estimate all these effects it is necessary to employ Input-Output Analysis as well as an econometric model. This

[14] For a complete description of the model see *FOCUS: Quarterly Forecasting and User Simulation Model of the Canadian Economy*. Version 02B, by Peter Dungan, Gregory Jump and Steve Murphy, Institute for Policy Analysis, University of Toronto, 2003.

is the approach that we employ for this study.

It is also important to note that the econometric model recommended by HLB Decision Economics is mispecified. Their proposed methodology consists of regressing various macro-economic variables on a series of variables, with the covariate of interest being some indication of "marine activity". However, this is somewhat vague and it is questionable whether a proxy for marine activity such as the volume of shipping will accurately reflect the magnitude of direct effects of the marine industry on the economy, as it is not an all-encompassing measure of the impact of the marine transport industry. Of further concern is the fact that obtaining data on proxies such as volume of shipping might be difficult, as we could not easily retrieve such a series from Statistics Canada. In our experience, obtaining data from sources other than Statistics Canada usually results in discontinuous and disjointed time-series information, which adversely affects the reliability of any econometric results.

On the other hand, use of the I/O modeling system and the FOCUS model can overcome these deficiencies. Specifically, the model can be employed to evaluate the direct, indirect and induced effects of the marine transport industry with data that are directly available from Statistics Canada such as economy and industry specific GDP, employment, and balance of trade figures.

In summary, HLB was correct in noting that attempting to capture direct, indirect, and induced impacts of a particular industry within a macro-econometric framework is very difficult and requires a large number of equations and complex modeling to account for the inherent simultaneity in these relationships. However, the advantage our firm possesses is that we will use the I/O Modeling System in conjunction with the FOCUS model to capture all these different effects, which has already been used in a variety of other similar projects.

However, HLB Decision Economics has correctly pointed out that an improperly specified macro-econometric model might lead to confounded estimates if simultaneity is not properly controlled. Simultaneity in this case refers to the problem of reverse causality. For example, take a simple model that attempts to measure the direct impact of the marine transport industry on total Canadian GDP, employment and domestic exports:

Total GDP in Canada = GDP from Marine Transport Industry + Total Labor Force in Canada + Other Variables (1)

Total Employment in Canada = Employment in Marine Transport Industry + Total GDP in Canada + Other Variables (2)

Total Domestic (Net) Exports in Canada = (Net) Exports from Marine Transport Industry + Total GDP in Canada + Other Variables (3)

The above equations were run employing national level data on an annual basis from Statistics Canada, employing ordinary least squares (OLS). The results from equations (1), (2), and (3) are contained in columns (1), (2), and (3) respectively. Columns contain coefficient estimates with corresponding p-values in the parentheses.

Quarterly and year fixed effects are used to control for the effects of unobserved events that are time-specific. The results from column (1) show that an increase in GDP from the Marine Transport Industry is counter-intuitively associated with a decline in total Canadian GDP. However, an increase in the number of employees in the marine transport industry is significantly correlated with an increase in total Canadian employment (column (2)). But the implied multiplier effect at roughly 50, seems rather large. Finally, an increase in exports from the marine transport industry results in a significant increase in domestic exports (column (3))- but the coefficient at 144, also seems rather large.

Hence, using simple OLS techniques we obtain results that appear to be implausible and are probably due to measurement error. The need for a well-specified model like the I/O Modeling System and FOCUS that are able to deal with these issues, is thus obvious.

Table 2.1 Regression Results

Variable(MT = Marine Transport) (ALL = All Industries)	(1) GDP (All Industries)	(2) Total Number of Employees (All Industries)	(3) Domestic Exports (All Industries)
Constant	-14,256.0 (0.274)	0.87xE-7 (0.000)***	-55094.8 (0.001)***
Exports from Marine Transport Industry (MT)			143.842 (0.000)***
Employees from Marine Transport Industry (MT)		49.508 (0.000)***	
Employees from all Industries (ALL)	0.0067 (0.000)***		
GDP from Marine Transport Industry (MT)	-7.684 (0.470)		
GDP from all Industries (ALL)		26.350 (0.000)***	0.1605 (0.001)***
Quarterly Fixed Effects	YES	YES	NO
Year Fixed Effects	YES	YES	NO
R-Square	0.9240	0.9802	0.9717

***Significant at 1%, **Significant at 5%, *Significant at 10%

P-values are noted in brackets

Chapter 3. The Data

The study is concerned with evaluating the: (i) direct; (ii) indirect; and induced effects of the marine transport industry. Below is a discussion on the data employed in assessing each of these effects.

3.1 Direct Effects

Our research will evaluate the direct impacts of the marine transport industry on an annual basis from 1980 onwards

Our research will evaluate the direct impacts of the marine transport industry primarily through line graphs and bar charts on an annual basis from 1980 onwards. Basically there will be a line graph for each indicator for the marine transport industry showing its movements over time. This graph will be compared against corresponding movements in the same metric over time from other sectors. In addition bar charts will be employed to focus on the relative impacts of different sectors (the air, and truck and rail industries) at particular points in time. For example, employment figures from the air and rail transport industries in 2000.[15]

With the exception of the Marine Transport Industry, which has also been discussed, tables A.2 to A.10 in the Data Appendix specify the components of the air and rail industries according to Standard Industrial Classification (SIC).[16] All these data were obtained from Statistics Canada.

As has been pointed out, Statistics Canada defines the Marine Transport Industry as consisting of passenger and freight transport, ferry transport, marine towing, ship chartering, marine cargo handling, harbour and port operations, marine salvage, piloting services, and marine shipping agencies. As mentioned earlier, obvious omissions are: Ship Repair and Manufacturing; Ship Chandlers / Supplies; Cruise Ship Industry; Inland Transportation related to Port Activity i.e. Rail and Truck; Labour Administration / Union Administration; Marine Insurance / Cargo Insurance; Container Repair / Refrigeration Maintenance; Welding / Metal Fabrication; Bunkers / Fuel; Government Agencies related to Marine

[15] We did not employ data from the trucking industry as figures are not comparable to data for marine transport. Specifically, Statistics Canada GDP data includes warehousing for the trucking industry but not for marine transport.

[16] These descriptions are taken from Statistics Canada (http://www.statcan.ca/english/Subjects/Standard/sic/sice80-classg.htm).

Transport (Coast Guard); Security Services; Warehousing and Storage; Customs Agents; Freight Forwarders; Operators of private docks and terminals and private cargo handlers; Dredging Operations; and finally, Canadian Managers of Foreign Shipping.

It is not advisable to form "guess-estimates" of these categories from data collected by other studies (…) combining them with Statistics Canada data would compromise the scientific integrity of this report

It is not advisable to form "guess-estimates" of these categories from data collected by other studies. These studies have collected data with vastly different statistical methodologies and combining them with Statistics Canada data would compromise the scientific integrity of this report.

Further, we are unable to distinguish between the individual economic impacts of the various constituents of the Marine Transport Industry. So, for example, we cannot estimate the value added to GDP or employment by passenger and freight transport separately from the impacts generated by the ferry industry. The reason is that Statistics Canada does not disclose these data due to reasons of confidentiality and only reports statistics collectively for the "Water Transport Industry" (passenger and freight transport, ferry transport, marine towing, ship chartering) and the for "Services Incidental to Water Transport" (marine cargo handling, harbour and port operations, marine salvage, piloting services, and marine shipping agencies).

Another key feature of the analysis is that we were forced to end most of our analyses at the year 2000. This is because Statistics Canada switched from the Standard Industrial Classification (SIC) to the North American Industrial Classification (NAICS) for succeeding years. A result of this is that a considerable amount of activity associated with marine transport (e.g. marine cargo handling, harbour and port operations, marine salvage, piloting services, and marine shipping agencies) are only available together with other transport sectors such as trucking and rail, making it impossible to estimate their individual impacts. Hence, we devise a method that permits us to make crude estimates of the economic impacts of the Marine Transport Industry to 2003.

At this point it is worth explaining why we did not count the value of good and services flowing through ports and harbors as economic impacts of the industry. This is an incorrect methodology that has been quite emphatically rejected by economists. To use cargo shipment values as a proxy for economic impacts is to assume that

[17] For further details please refer to www.tc.gc.ca/vigilance/sep/marine_security/compliance.htm.

the entire value of the good or commodity in question is due to the Marine Transport Sector. However, the service provided by the sector is just one input into the final value of the good.

It is appropriate to calculate the value added to Gross Domestic Product (GDP) by the industry in order to assess its economic impacts

Hence, it is appropriate to calculate the value added to Gross Domestic Product (GDP) by the industry in order to assess its economic impacts. This is the methodology routinely employed by economists in estimating the impacts of any industry. So for example, the Marine Transport Industry adds value by enabling the import of copper from Brazil, which can then be purchased and enjoyed by Canadian manufacturers. The economic contribution of the industry then is in terms of the increase in the price of the good due to its transport services, or it's value-added. This is one of the key reasons why estimates obtained in this study are not comparable to corresponding results from other earlier research, and in fact why figures from other research may be significantly over-stated.

A final concern may be the fact that Statistics Canada does not allow us to estimate the impact of privately owned fleets operated by vertically-integrated companies. However, the Canadian marine industry has become less vertically and horizontally integrated in recent years, especially for international trade. Canadian shippers have the benefit of operating in one of the freest and most competitive transportation environments in the world. There are virtually no restrictions on what vessels or companies can do business in Canada, except that they must meet Canadian safety and environmental regulations.

Container trades are increasingly dominated by Far East carriers, although the largest container line in the world is based in Denmark. The second largest carrier is based in Taiwan and the third largest is based in Geneva, Switzerland. CP Ships, which was spun out of Canadian Pacific, is based in London and is the eighth largest container company, with several subsidiaries including Canada Maritime, ANZDL, Cast, Contship Containerlines, Italia Line, Lykes Lines and TMM Lines, operating on a worldwide basis.

The forest product industry is served by carriers largely based in Scandinavia, and Norway in particular. The largest car carrier company is a Norwegian-Swedish joint venture, but other large carriers are operated by some of the largest auto exporters, including Volkswagen (VAG Transport), Nissan, and Honda. Large oil companies still tend to operate their own fleets but increasingly rely on chartered tonnage with their logos on them.

Perhaps the most vertically and horizontally integrated group of companies in Canada is the Irving group in Saint John, New Brunswick. Its three main business lines are oil refining, forest products and consumer goods. Until recently, it also operated a major shipbuilding enterprise in Saint John. In this sector, it is now primarily engaged in ship repair.

Even though they had their own shipyard, the Irvings still built several Ultra-Large Crude Carriers (ULCCs) in South Korea, to supply their refinery in Saint John with crude oil. In the nineteen-eighties the company built a series of ice-breaking coastal tankers, with which it distributes refined product throughout Atlantic Canada. This arrangement is now quite unusual for Canadian oil companies. Imperial Oil recently sold its tanker division to Upper Lakes Shipping and Ultramar utilizes the services of a third party shipping company, Rigel Shipping of Shediac, New Brunswick to do its costal deliveries. Similarly, Groupe Desgagnes in Quebec City performs a similar role in the lower St. Lawrence.

The Irvings also have a shipping division, called Kent Lines, which caters to its forest products and consumer products exports to the Caribbean and Europe. Even though it had recently built two container ships in its own shipyard, it sold its container division to Tropical Shipping of West Palm Beach, Florida (in 1999), because it was not competitive and was also no longer seen as a core business. In the break bulk trades, which concentrate on forest products shipped to northern and southern Europe, it has also recently entered into a co-operation or vessel pooling arrangement with a Swedish company, B&N Gorthon, to spread risks and costs.

It is, therefore, increasingly rare to see shipping operations integrated with manufacturing or other forms of enterprise. In the case of Canadian Pacific, five divisions were spun out of the original entity, to “unlock” shareholder value and to allow them to flourish (or sink) on their own. There is still a symbiotic relationship between CP Rail and CP Ships but they are run as separate enterprises.

In this respect it is interesting to note that both Kent Lines and CP Ships will not figure in GDP statistics, as they are foreign held entities. Kent Lines is registered in the Bahamas and CP Ships in the United Kingdom. Any profits would appear in the accounts of the parent company, which in the case of Irving is manufacturing and for CP is rail transport.

Shipping has become very competitive on a worldwide basis and there are many credible operators

Shipping has become very competitive on a worldwide basis and there are many credible operators. As a result, market forces tend to prevail and large corporations have tended to outsource their marine transport requirements as opposed to assembling private fleets. This situation also largely prevails in the domestic sector, with specialized operators tending to offer shipping services to third parties.

Finally it is important to acknowledge that vertical integration also occurs with respect to privately owned terminals and will not be counted in Statistics Canada figures for GDP attributable to marine transport. Companies that have private terminals will engage in their own stevedoring, vessel chartering, and so on and so forth. Examples of firms, which have their own private terminals, include Irving (for petroleum products), Ontario Power (for coal), Lafarge (for cement), Redpath (for sugar), and ALCOA (for bauxite and aluminum). There are a significant number of private docks and terminals in Canada[17]. However, it is difficult to assess the magnitude of statistical bias accruing from these omissions we could not find evidence on the magnitude of activity in these terminals relative to terminals that are included in services incidental to water transport.

3.2 Magnitude of Direct Impacts

In this section we provide a set of macro level statistics. These are designed to do three things. First, it provides a sense of what this sector of the Canadian economy looks like, how big it is, its composition and how it has been changing. Second, the statistics paint a picture of the relationship between the level of economic activity in Canada and the amount of activity in the marine sector. For example, there appears to be about a one to one correspondence between GDP growth and marine activity growth. Thirdly, the statistics illustrate the significant changes that take place within the marine sector and that a number of local, national and international factors are the underlying reasons. Thus, for example, changes in trading rules under the WTO have an impact on the demand for marine services. Finally, and most important, these statistics give the magnitude of direct impacts of the Marine Transport Industry.

3.2.1 Gross Domestic Product

Figure 3.1 shows valued added to Gross Domestic Product (GDP) as a proportion of total GDP in the year 2000. The first observation is that all transport industries contribute a small portion to GDP. Rail Transport industries have the highest share at roughly 0.6%, while Water Transport and Related Service industries are not far behind at approximately 0.3%.

The time-series trends contained in Figure 3.2 shed some more light on the evolution of these industries. The share of Air Transport and Related Services has increased slightly, while the corresponding figure for Railway Transport and Related Services has dropped marginally. In comparison, the share of Water Transport and Related Service industries has dropped from above 0.4% to slightly below.

However, it is important to acknowledge that while Transport and Related Service Industries form a small proportion of total GDP, the absolute numbers are nontrivial, and in fact the value added to GDP by each of these industries has increased over time. As detailed in Figure 3.3, the contribution of the Water Transport and Related Services Industry was roughly $3 billion. Further, the industry experienced healthy growth rates over the past decade. From 1990 and 2000 the contribution of the Water Transport and Related Services Industry to GDP increased by 17%

Figure 3.1: Share of Gross Domestic Product* (2000)

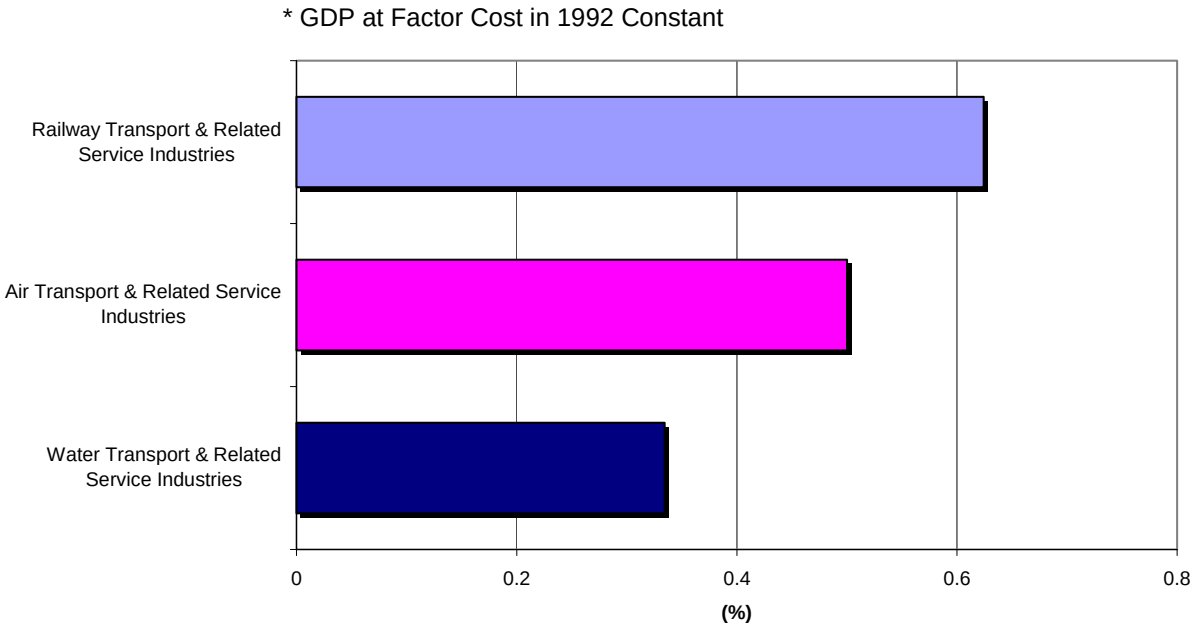


Figure 3.2: Share of Gross Domestic Product* (1961-2000)

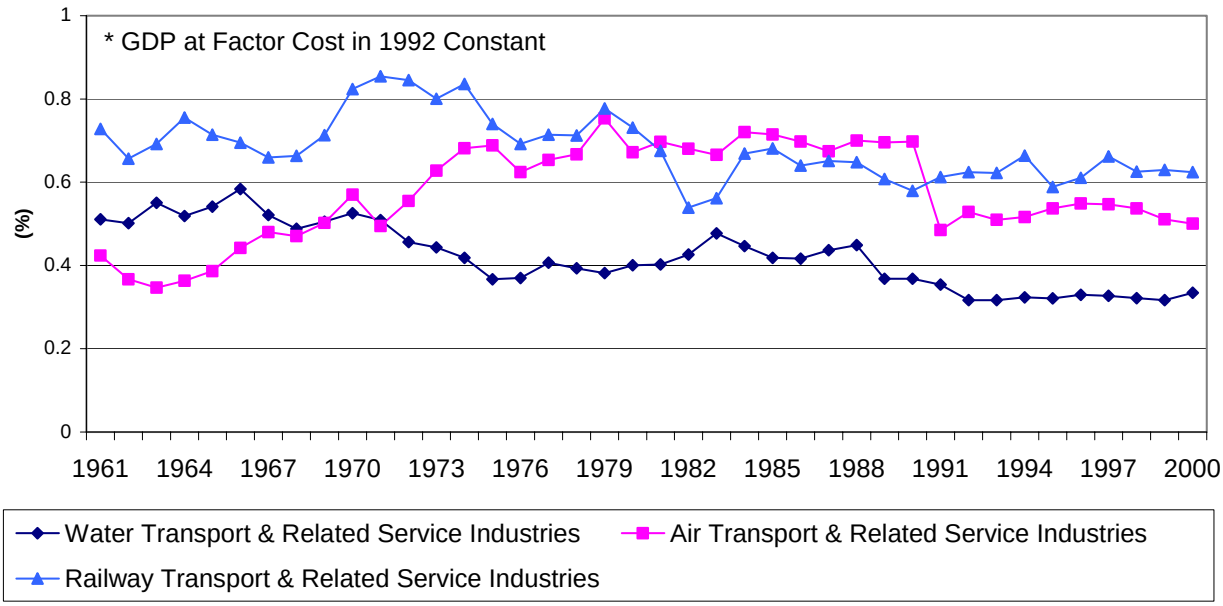
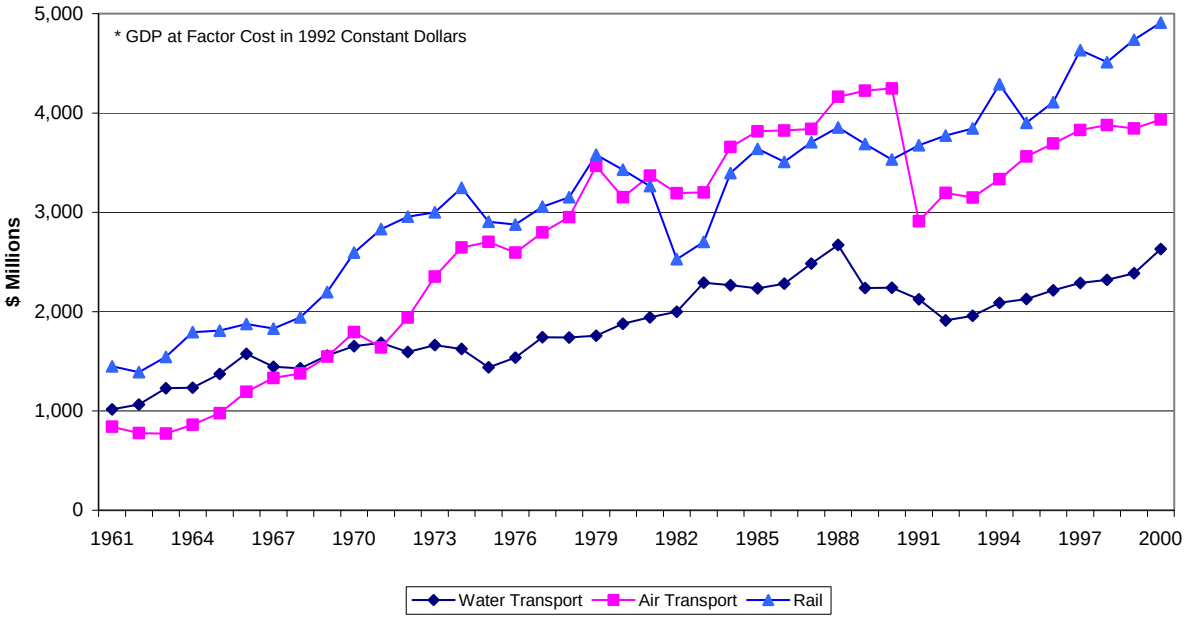


Figure 3.3: National Gross Domestic Product* (1961-2000)



3.2.2 Number of Employees

In 2000 the number of employees in Water Transport and Related Services Industries was approximately 30,000

The share of transport-related industries with respect to employment is broadly consistent with corresponding GDP movements. Figure 3.4 implies that Air Transport and Services Incidental to Air Transport had the greatest share of national employment in 2000 at approximately 0.78%, followed by Railway Transport and Related Service Industries (0.43%), and Water Transport and Related Service Industries (0.26%). Figure 3.5 expresses these statistics in absolute numbers. Of specific interest is the fact that in 2000 the number of employees in Water Transport and Related Services Industries was approximately 30,000.

Number of employees in Water Transport and Related Services Industries rose by 9% from 1990 and 2000

Figure 3.6 shows that employment shares for the Water Transport and Related Services Industries have remained relatively stable over time. In contrast, the share of Air Transport and Related Services Industries has increased while Railway Transport and Related Service Industries have experienced a drop. Trends in the absolute number of employees are presented in Figure 3.7. The important point to take from this figure is that the number of employees in Water Transport and Related Services Industries rose by 9% from 1990 and 2000.

Figure 3.4: Share of Employment (2000)

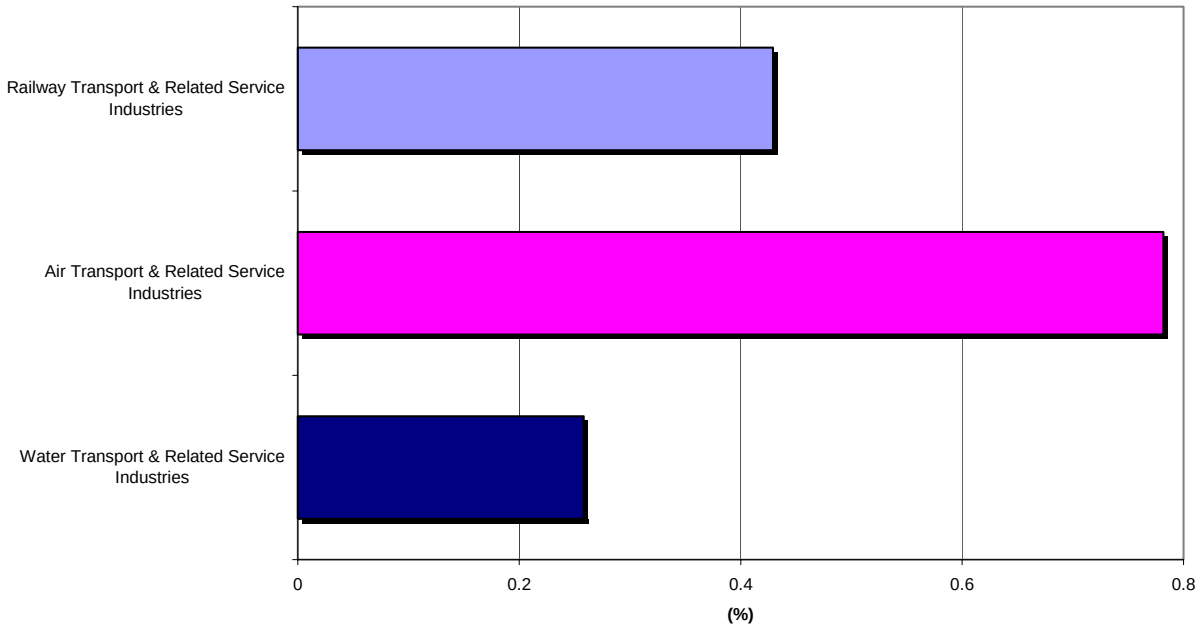


Figure 3.5: Number of Employees (end of 2000)

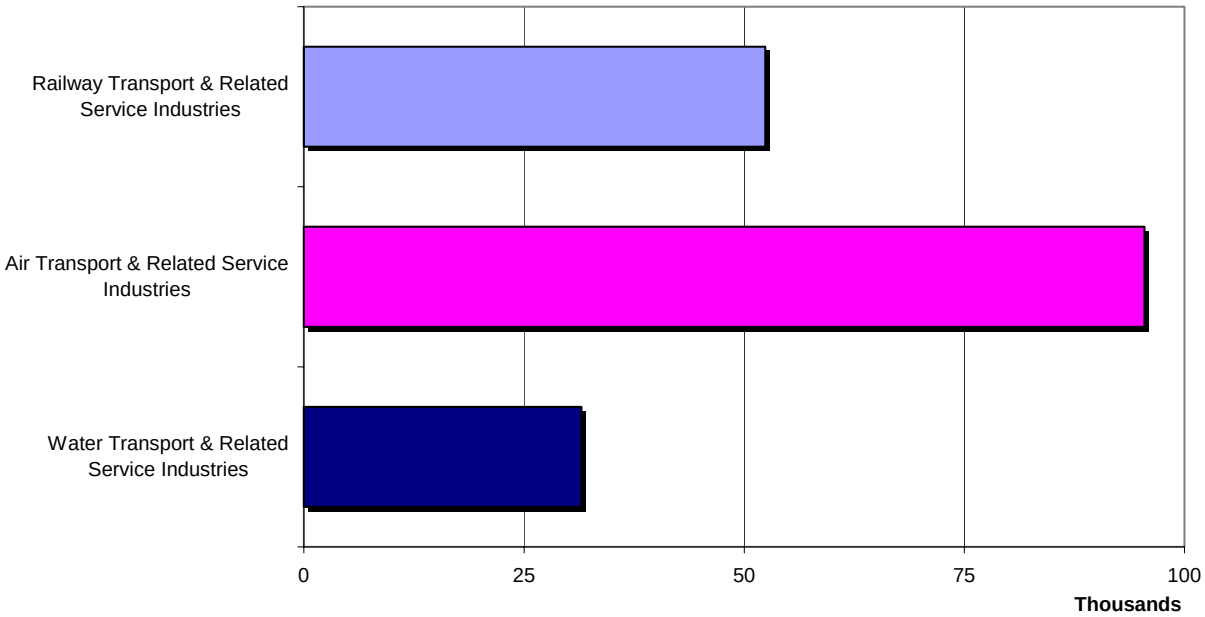


Figure 3.6: Share of Employment (1983-2000)

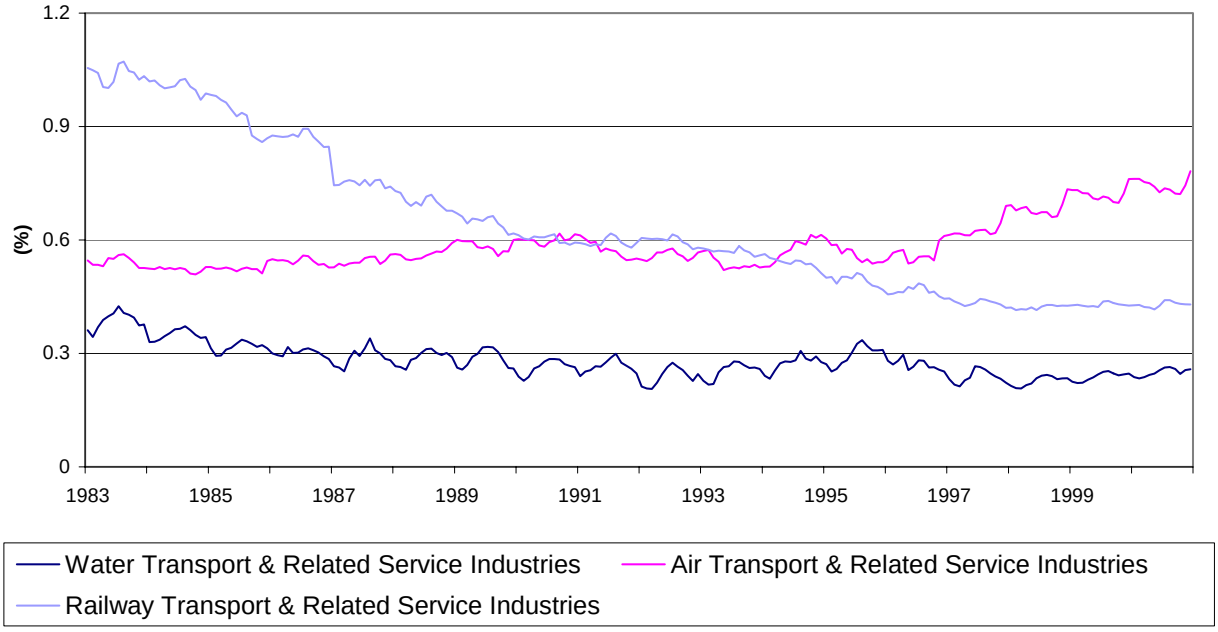
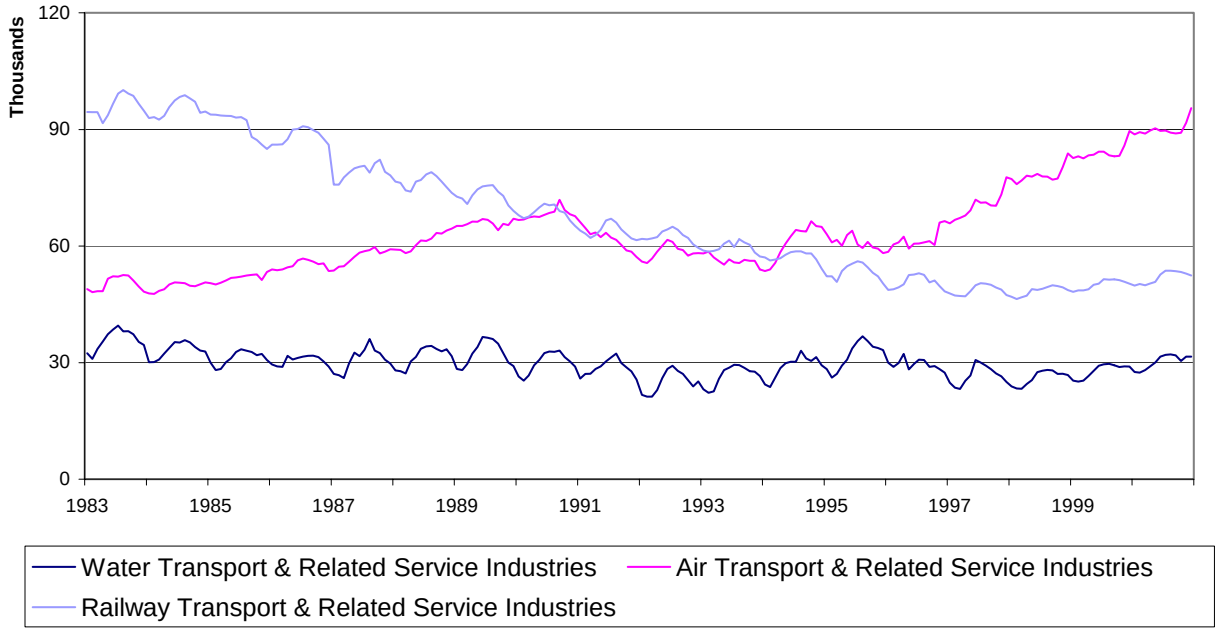


Figure 3.7: Number of Employees (1983-2000)



3.2.3 Revenue and Profits

Figures 3.8 and 3.9 give total revenues by industry in 1998 and over time, respectively. Trends in revenue are quite similar to corresponding movements in value added to GDP as the contribution of Water Transport and Related Service Industries is lower than other modes of transport.

Operating revenue per employee increased dramatically (almost 100%) for the industry from 1995 and 1997 and by roughly 46% from 1990

However, a different picture emerges when we look at operating revenue per employee. Figure 3.10 indicates that operating revenue per employee was the highest for Water Transport and Related Service Industries. Further, Figure 3.11 shows that this position is quite recent, as operating revenue per employee increased dramatically (almost 100%) for the industry from 1995 and 1997 and by roughly 46% from 1990.

Corresponding movements in aggregate operating profits and operating profits per employee are quite similar (Figures 3.12 and 3.13). Water Transport and Related Service Industries consistently demonstrate high levels of operating profits per employee (Figures 3.14 and 3.15).

Figure 3.8: Operating Revenue by Industry (1998)

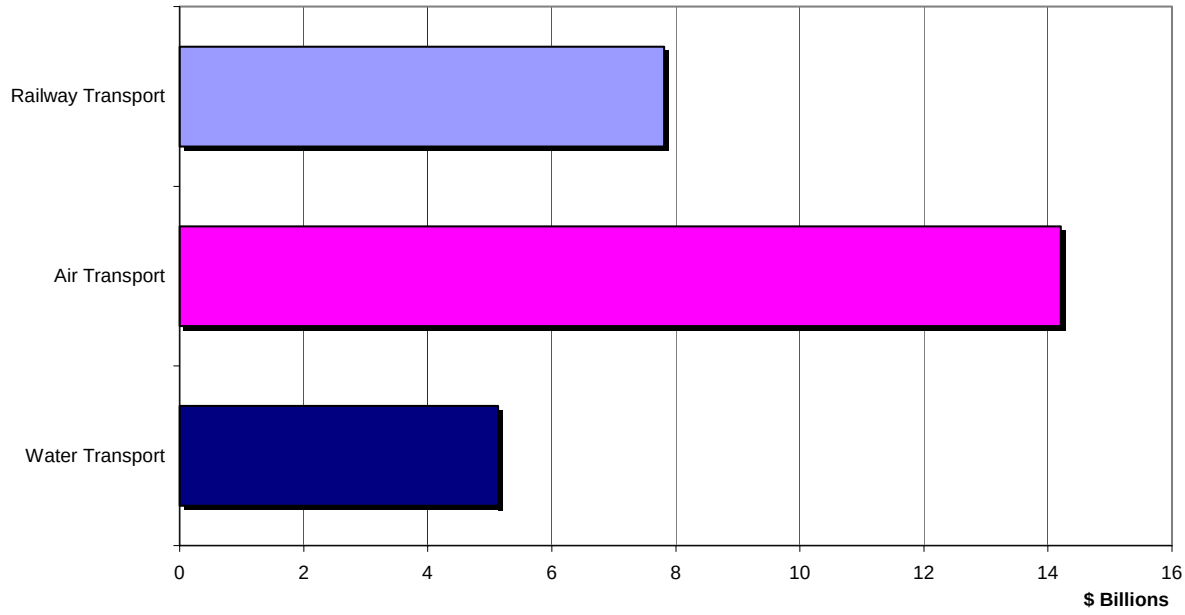


Figure 3.9: Operating Revenues by Industry (1988-1998)

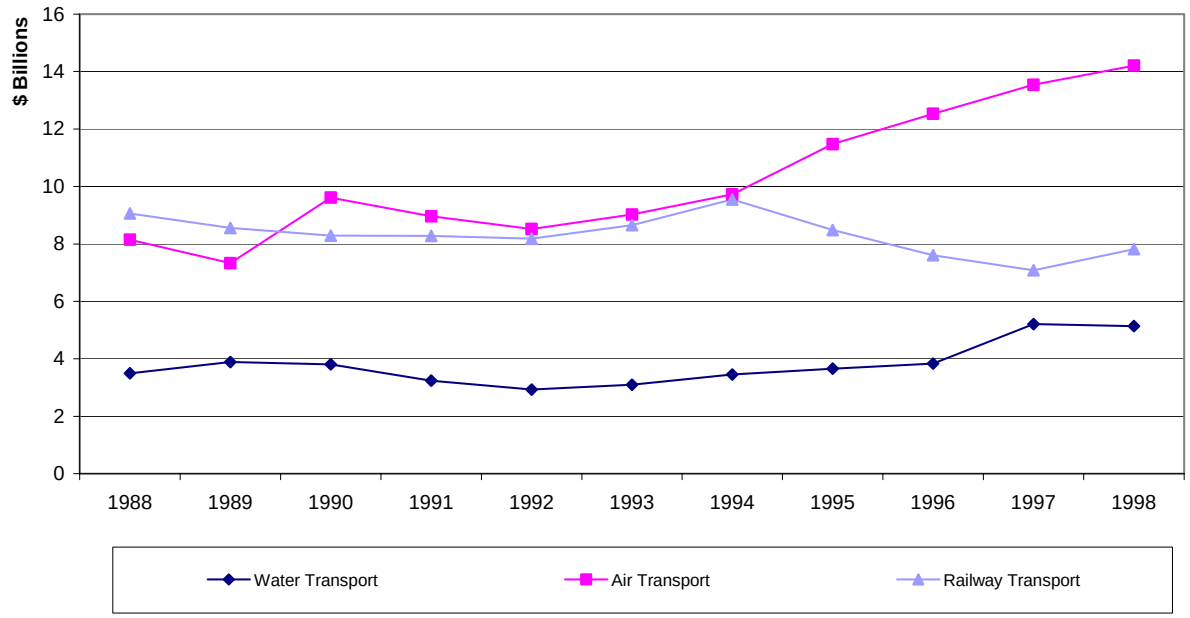


Figure 3.10: Operating Revenue Per Employee by Industry (1998)

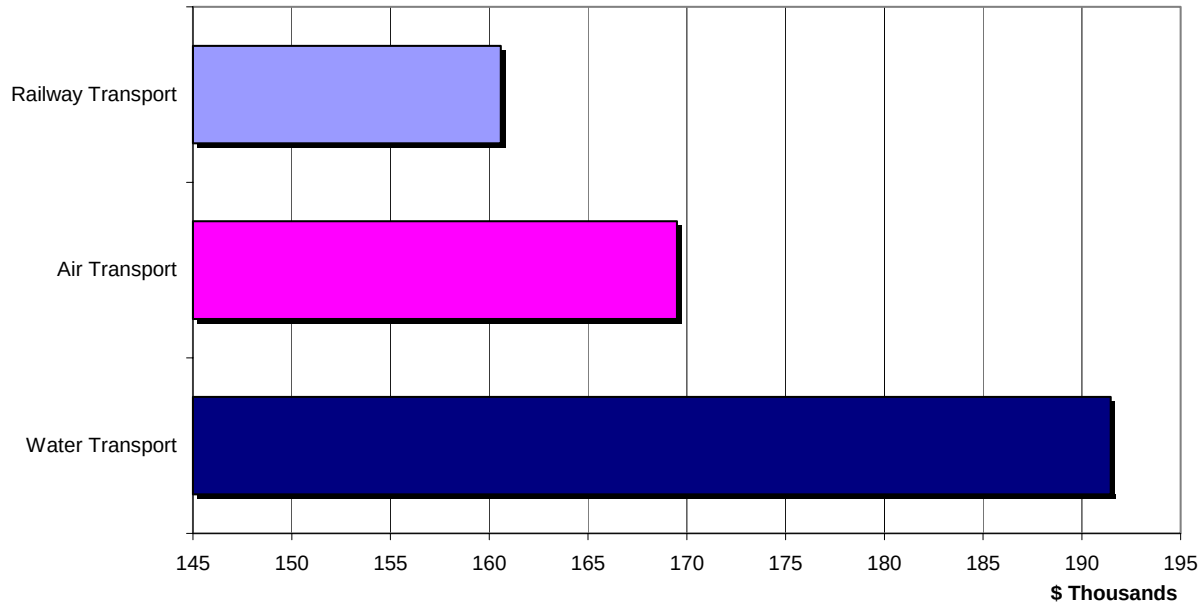


Figure 3.11: Operating Revenues Per Employee by Industry (1988-1998)

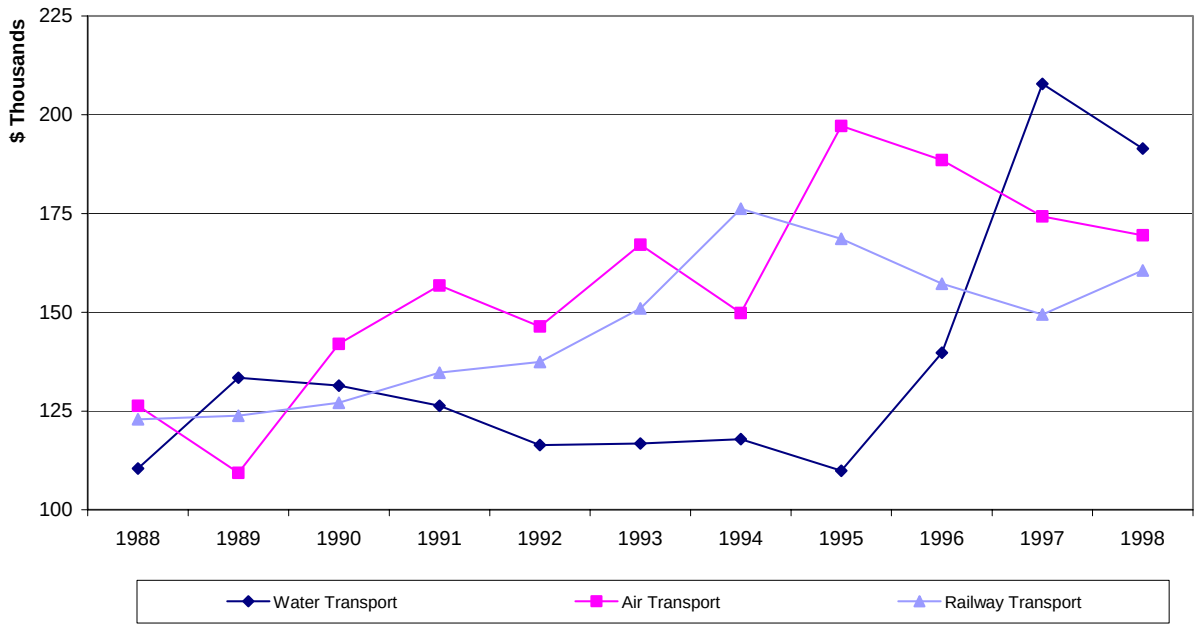


Figure 3.12: Operating Profit by Industry (1998)

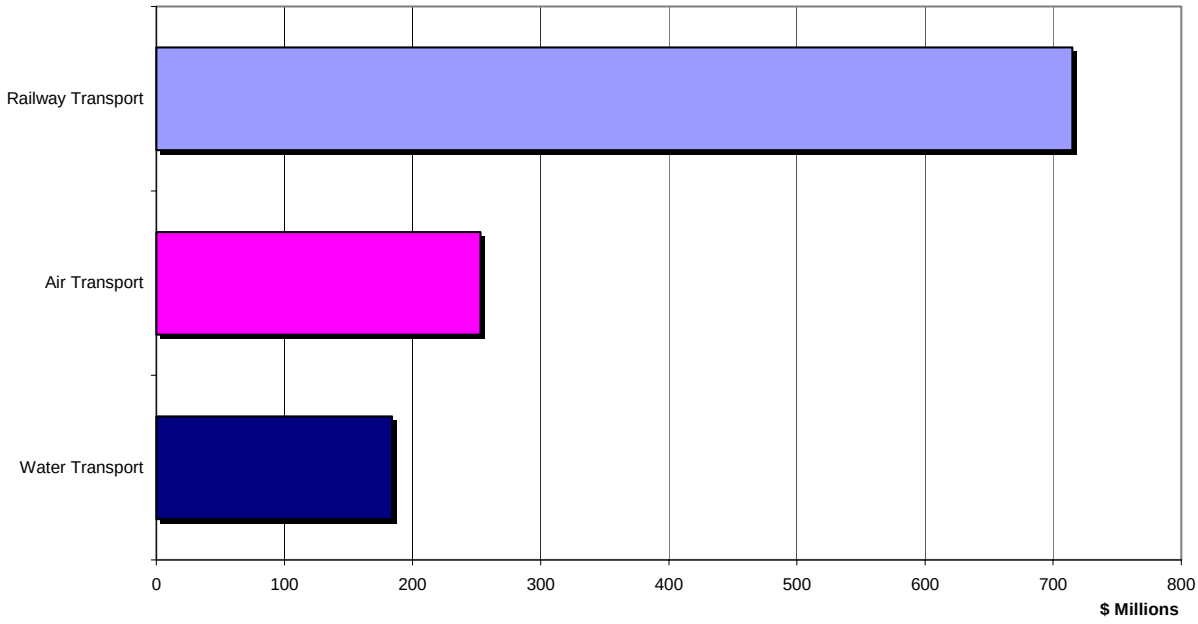


Figure 3.13: Operating Profit by Industry (1988-1998)

Figure 3.14: Operating Profit Per Employee by Industry (1998)

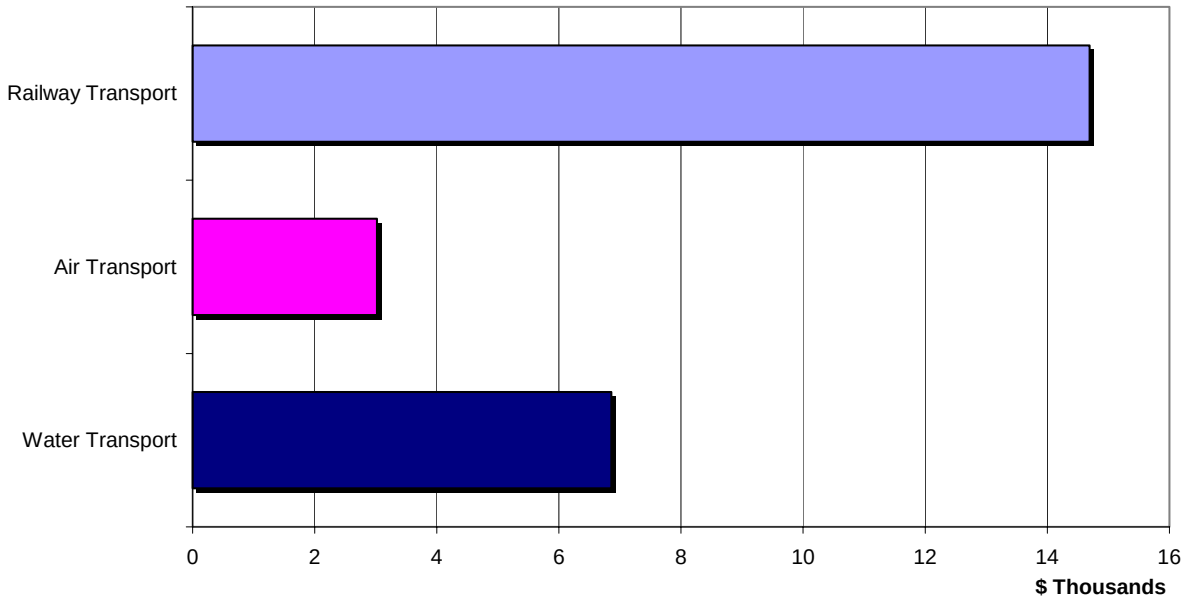
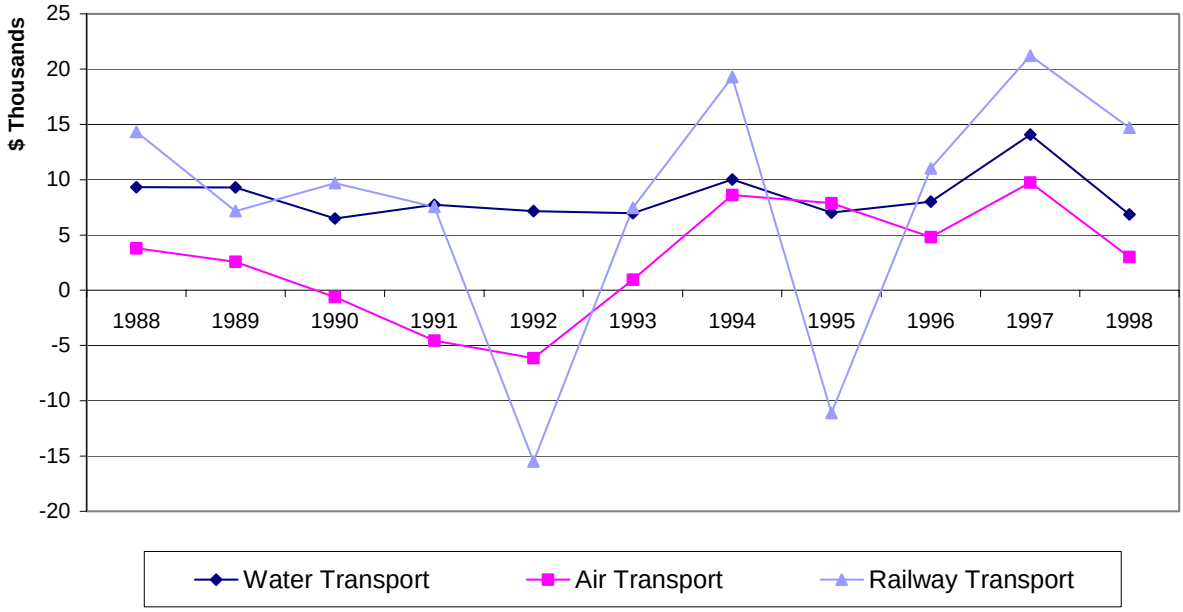


Figure 3.15: Operating Profit Per Employee by Industry (1988-1998)



3.2.4 Average Wages and Salaries

Not surprisingly the trends in operating revenues and profits per employee are reflected in average wages and salaries paid to employees. Figure 3.16 shows that average wages and salaries paid in Water Transport and Related Services Industries in 2000 are just ranked below Railway Transport and Related Service Industries. Further, Figure 3.17 shows that average wages and salaries paid in Water Transport and Related Service Industries have been among the top tier of transport-related industries over the past two decades.

Figure 3.16: Average Weekly Earnings incl. overtime (2000)

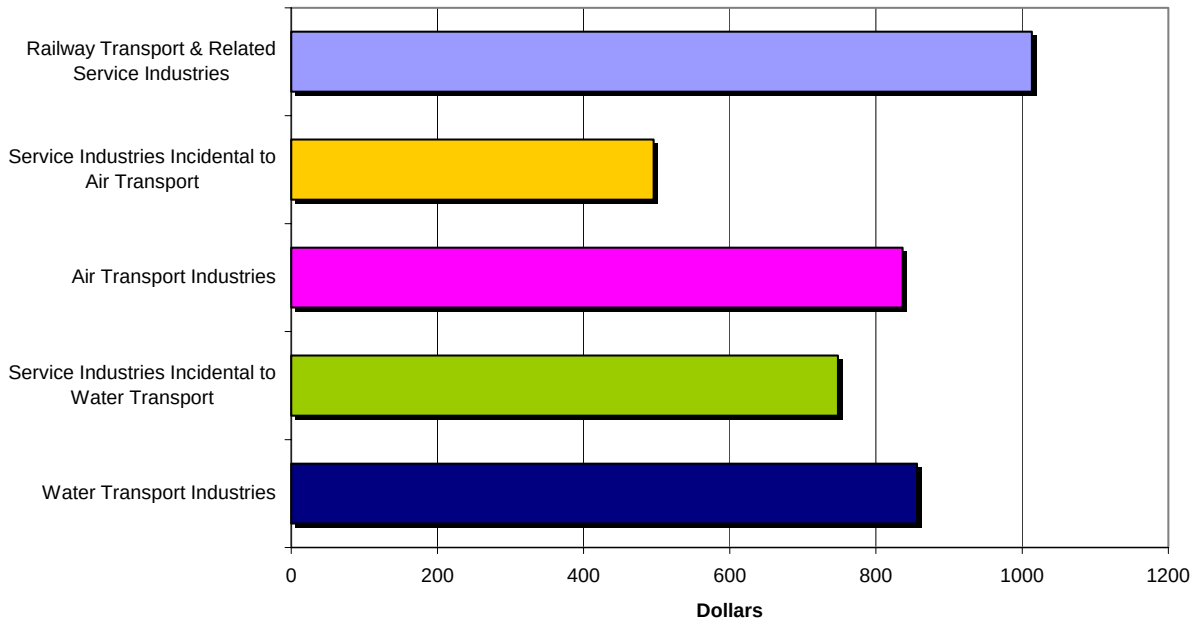
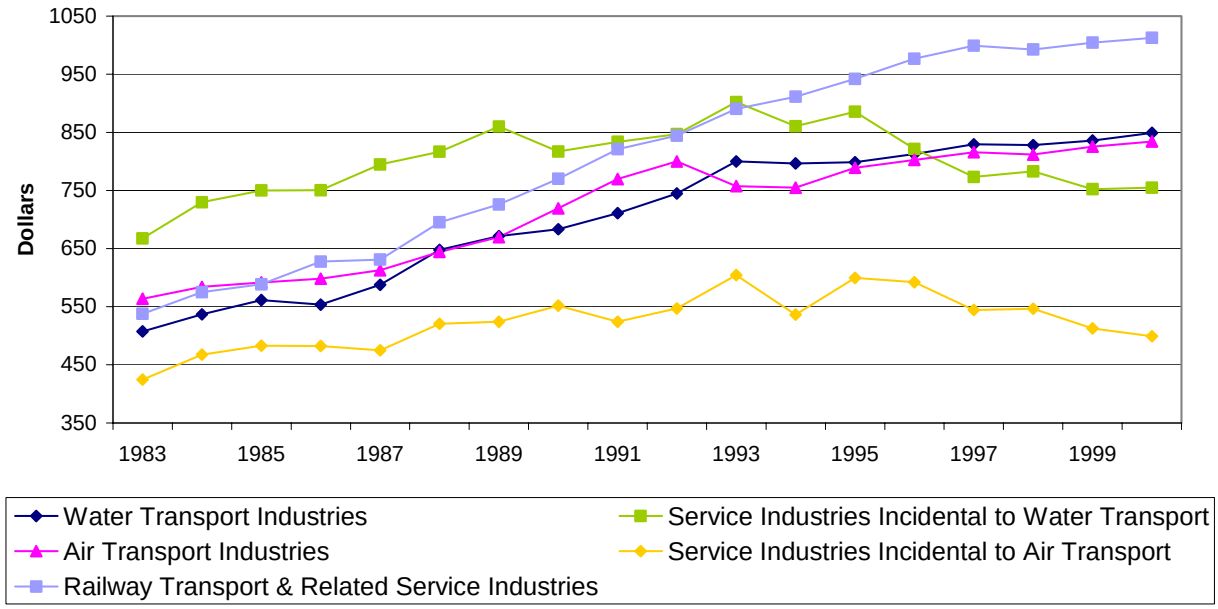


Figure 3.17: Average Weekly Earnings incl. Overtime (1983-2000)



3.2.5 Net Exports

Net exports from the Water Transport and Related Service Industries has increased by 211% between 1990-2000

Net exports are the difference in the value of goods exported through marine transport from the corresponding value of the value of goods imported through ships. Trends in net exports emphasize the contribution of Water Transport and Related Service Industries. Specifically, the bar graph (Figure 3.18) shows that the contribution of Water Transport and Related Service Industries in terms of net exports, relative to other industries, is the most significant at slightly lower than $1.7 billion in 2000. Further, as demonstrated in Figure 3.19, this has more or less been the case since the mid-1980s. What is even more impressive is that net exports from the Water Transport and Related Service Industries has increased by 211% between 1990-2000.

Figure 3.18: Trade Balance* by Industry (1961-2000)

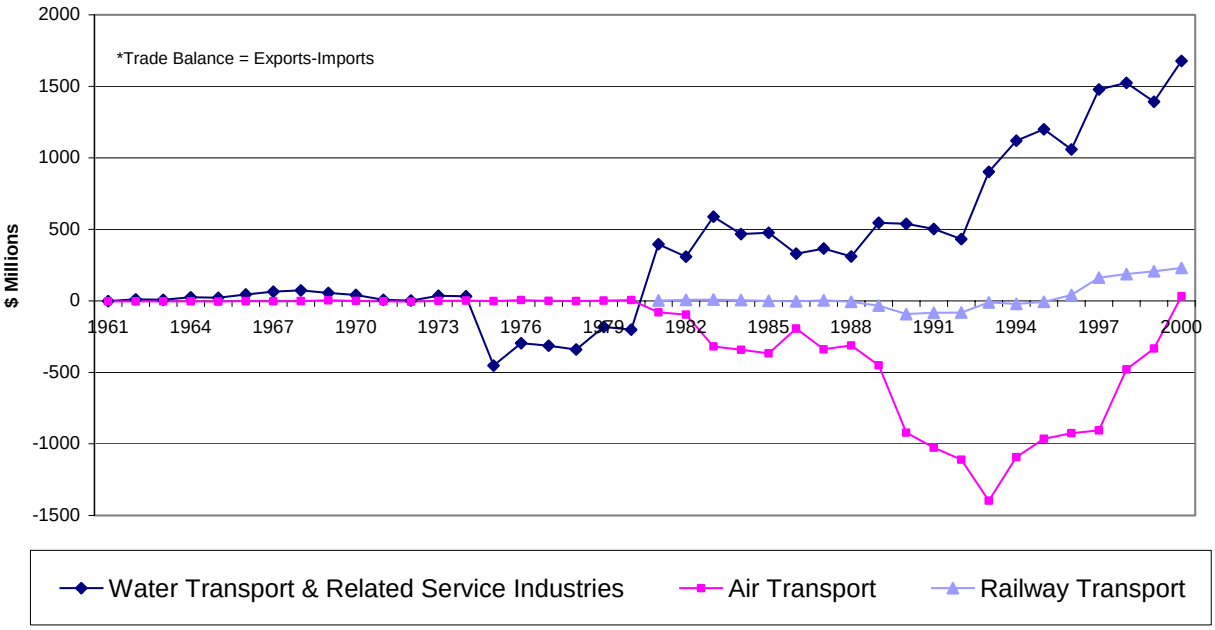
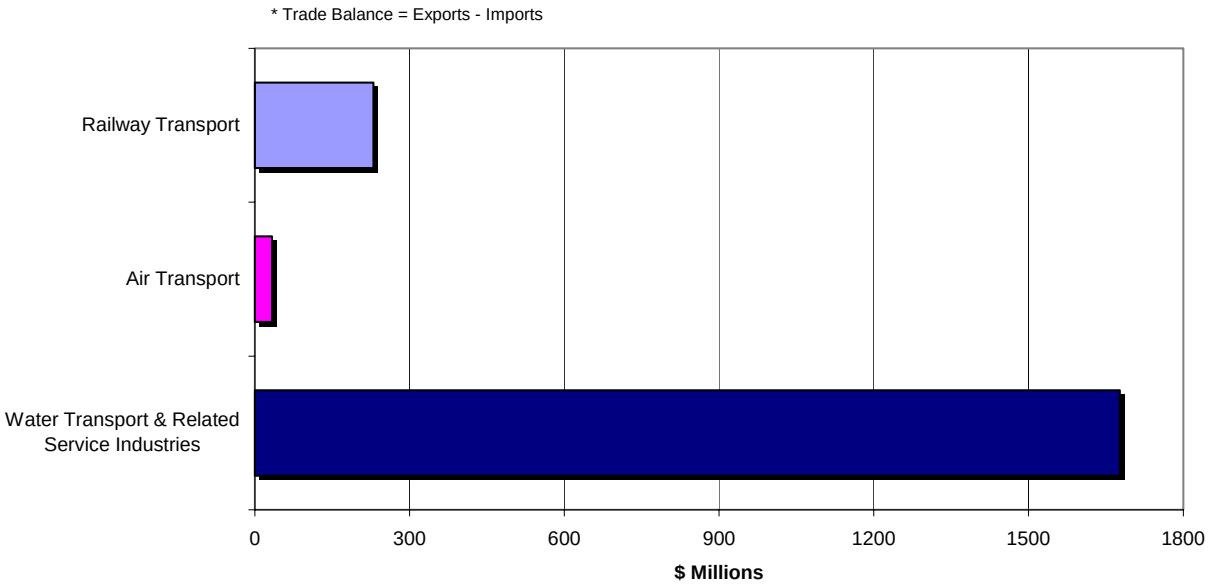


Figure 3.19: Trade Balance* by Industry (2000)



3.2.6 Discussion

The direct impacts of the industry with respect to GDP and employment have certainly been large and growth rates are consistent with overall trends in the economy

The direct impacts of the industry with respect to GDP and employment have certainly been large and growth rates are consistent with overall trends in the economy. Further, job creation in this industry seems to be of high quality, as average wages in many years have been consistently higher than in other transport industries.

The other important finding is the tremendous increase in operating revenues per employee and net exports. What are possible factors behind this growth? We advance the following hypotheses:

- The explosion in the industry's contribution to net exports could be correlated with the increase in trade movements between Vancouver-Asia routes, which in turn have certainly been helped by the depreciation in the Canadian dollar following the 1996 referendum in Quebec. As a consequence, export services offered by the Canadian shippers have increased.

- The introduction of NAFTA could have resulted in lower barriers for Canadian shippers, and hence easier access to certain U.S. and Mexican markets that are best serviced by marine transport. Examples of goods that are primarily exported to the U.S. by

marine transport include agricultural products (oil seeds, peas, beans, lentils), aluminum (from the West Coast), softwood lumber (Maritimes and the West Coast, to some extent Quebec), grain (wheat, barley, oats, rye), gypsum, and stone, sand, and gravel.

- The vast increase in operating revenues per employee could be a consequence of productivity shocks. The nineteen-nineties saw the introduction of larger ships across different trade routes, particularly in the container trades, which required little increase in staff. For example, the capacity of vessels operated by Canada Maritime in Montreal, has increased from 2,200 TEUs to over 4,000 TEUs containers over the past decade. A larger amount of cargo is thus being "handled" by the same number of employees, which is consistent with an increase in operating revenues per employee. But there are other potential explanations for the increase in per capita operating revenues. It could be a reflection of mergers and consolidations within the industry. It could also be a consequence of increased mechanization within ports.

The economic impact of Water Transport and Related Service Industries has far exceeded corresponding performance from other similar industries

In conclusion, the contribution of Water Transport and Related Service Industries to national GDP and Employment statistics has been significant and comparable to other transport-related industries. However, if economic impact can be measured through different metrics such as operating revenues and profits per employee, average wages and salaries, and net exports then the economic impact of Water Transport and Related Service Industries has far exceeded corresponding performance from other similar industries. In particular, its contribution to net exports has been particularly impressive. Given that it has been the conduit, which has made the significant expansion in trade with Asia (from Vancouver, in particular) possible, the industry can truly be viewed as an "engine of growth".

Chapter 4. Backward Linkages: The Impact of the Marine Transport Industry on Supplier Industries and Provinces

'Indirect' impacts are defined as the impacts one economic sector can have on others through its demands on those sectors' goods and services as inputs for its own production processes

This chapter describes the calculations of the indirect or upstream impacts of the marine transport industry for Canada and the provinces. As described Chapter 2, 'indirect' impacts are defined as the impacts one economic sector can have on others through its demands on those sectors' goods and services as inputs for its own production processes. Supplier industries in turn have industries that supply them, and so on back along the production chain. To repeat a previous example, the Marine Transport Industry often needs goods and services from the ship manufacturing and repair industry, which in turn requires raw inputs from the steel industry. Indirect effects capture the sum of these economic impacts.

An Input/Output (I/O) model can capture all of these backward linkages, and we have calculated the indirect impacts of the marine transport industry by using Statistics Canada's inter-provincial I/O model for the year 2000 (the latest currently available).

A total of seven sets of calculations were performed with the I/O model – one each for Newfoundland, Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia. It was for these seven provinces only that detail on gross domestic product (GDP) and employment for the marine transport industry were available (and then only through 1999). It was hoped that Manitoba (marine activity through the port of Churchill) and the territories (coastal supply and transport) could be included as well, but all data on GDP and employment are unavailable due to confidentiality.[18] [19]

Section 4.1 describes the simulations that were conducted in order to calculate indirect impacts, while section 4.3 contains a detailed description of the indirect impacts of the Marine Transport Industry on provincial GDP and employment that were obtained through our

[18] There are some gaps for particular years and data items for some of the maritime provinces as well, but adequate estimates for these items could be calculated.

[19] When reporting on the I/O calculations below we will show indirect impacts for Manitoba and the territories, and the reader might wonder why we have these impacts but not basic GDP or employment data for marine transport. The reason is that Statistics Canada permits calculations to be done with ratios or coefficients derived from confidential data as long as the data themselves will not be revealed in, or cannot be extracted from, the results.

analysis. Readers who are interested in the magnitude of indirect impacts can go directly to section 4.3.

4.1 Generalized Input-Output Calculations

For each province the model was used to calculate the direct and indirect impacts of a $10 million change in domestic expenditures on marine transport

For maximum generality, we engaged Statistics Canada to perform the same representative calculation for each of the seven provinces available. Specifically, for each province the model was used to calculate the direct and indirect impacts of a $10 million change in domestic expenditures on marine transport (and its ancillary services) in the province. By domestic expenditures, we mean that no imports from outside Canada are used to satisfy the initial $10 million direct demand. While it is the case that each province does use some imported marine transport services, we are trying to estimate the economic impact of the *domestic* marine transport sector, and so imported marine transport services were excluded from the calculation[20].

However, we did allow for inter-provincial imports of marine transport services. This turns out to be important, for in several provinces - most notably Newfoundland and Prince Edward Island - a considerable portion of the demand for marine transport services is actually satisfied by the industries in adjoining provinces. Most importantly, Nova Scotia supplies considerable marine transport and ancillary services to its three Atlantic neighbours.

The results of these seven $10 million shocks to expenditure are summarized in tables 4.1 and 4.2. Table 4.1 shows the impact on GDP (technically, for the year 2000), while table 4.2 shows impacts on employment.

Table 4.1 is divided into two subsections: the first (4.1a) measures GDP at 'basic prices', while the second (4.1b) measures GDP at 'market prices'. The latter is what is more commonly meant by 'GDP', but a number of different data sources and analytical results are often only available for GDP at basic prices[21]. The distinction

[20] At its most detailed level, the I/O system distinguishes four types of 'commodities' related to the marine transport industry: passenger marine transport, freight marine transport, other marine transport, and services ancillary to marine transport. The $10 million change in expenditure was allocated by Statistics Canada across these four 'commodities' in each province according to their 2000 shares within the province. Again, see footnote above, the ratios could be revealed but not the data themselves.

between the two is simply that GDP at market prices also includes all indirect taxes minus any subsidies paid on, or given to, 'products'. Indirect taxes on 'products' include items like provincial sales taxes and net federal GST, while subsidies on products are those given to offset costs in providing goods or services - for example, the substantial subsidies given to ferry services at both the federal and provincial levels.

The distinction between basic prices and market prices when examining marine transport turns out to be important because in some provinces marine transport is supported by significant government subsidies

The distinction between basic prices and market prices when examining marine transport turns out to be important because in some provinces marine transport is supported by significant government subsidies. Subsidies actually reduce market prices relative to basic prices – in effect they let the providers of marine transport charge a lower price to the public or to their industrial customers that they would otherwise have to. This actually reduces GDP when measured at market prices – that is, at the prices at which goods and services are actually sold.

Looking at table 4.1a more closely, the figures can be interpreted as follows: Each row shows the GDP impact of a $10 million expenditure on domestic marine transport made in the province named at the left-hand side of the row. The columns show the impact on the GDP of the province of that column. Thus, for example, an expenditure of $10 million on domestic marine transport (not imported) in Newfoundland has an impact on direct and indirect (or 'upstream') GDP at basic prices in Newfoundland itself of $4.320 million. There is an impact of just over $1.8 million in Nova Scotia and of $1.1 million in Québec. The especially large impact in Nova Scotia is in part due to the running of major ferry services between Newfoundland and Nova Scotia. Just under $600,000 of impact occurs in Ontario - from the provision of manufactured elements required in repair and maintenance, and from indirect inputs to activities in other provinces perhaps three or four levels up the supply chain. There is even an impact of $68,000 on Alberta, primarily due to the supply of petroleum products to other upstream production that eventually reaches marine transport services in Newfoundland. (Marine transport in Newfoundland itself uses some petroleum products from the province, and some that are imported). The total impact on Canada is just over $8.3 million at basic prices. This amount is less than the original $10 million because, although there

[21] For example, the direct and indirect impacts by industrial sector presented in the Appendix to this chapter.

[22] Ontario is, in fact, the only province for which the GDP impact at market prices is actually higher than the impact at basic prices, indicating that in Ontario alone sales taxes are greater than subsidies.

are no international imports satisfying the *initial* $10 million of expenditure on marine transport, there are plenty of indirect international imports that occur back along the supply chain.

Table 4.1b has a similar interpretation, except that the impacts are at market prices. For example, a $10 million expenditure domestic on marine transport in Ontario generates direct and indirect GDP at market prices of almost $5.5 million in Ontario, another $1 million in Québec, $258,000 in Alberta, and just over $7.2 million for Canada as a whole. Note the much larger impact on Alberta for Ontario expenditure: petroleum needs are supplied largely by Alberta west of the Ottawa valley, so that most marine fuel oil used in Ontario will have its origin in Alberta. The Ontario impact for Canada is, by a small margin, the lowest of the seven provinces. Evidently, the nature of the production mix, and the proximity to the United States, lead to higher international import leakages from Ontario than occur for the same amount of expenditure on marine transport in any of the other six provinces.

For example, a $10 million domestic expenditure on marine transport in B.C. requires 113 direct and indirect jobs in B.C. itself, another 6 in Ontario and 4 in Alberta, and a total of 125 in Canada as a whole

Comparing Tables 4.1a and 4.1b, we also note that the GDP at basic prices and GDP at market prices are most similar for Ontario and B.C., indicating that there is relatively little *net* effect from indirect taxes and subsidies[22]. On the other hand, impacts on GDP at basic prices are significantly higher than impacts at market prices for Newfoundland and for Prince Edward Island, as a result of the higher levels of subsidization of marine transport (above all, the ferry services) in those provinces.

Finally, table 4.2 summarizes the generalized I/O calculations by employment impact. Again, each row is for a $10 million domestic expenditure on marine transport in the province at the left and the employment impacts for each province and for Canada are shown across the row. Thus, for example, a $10 million domestic expenditure on marine transport in B.C. requires 113 direct and indirect jobs in B.C. itself, another 6 in Ontario and 4 in Alberta, and a total of 125 in Canada as a whole.

4.2 Impacts by Industry and Province

As noted in Chapter 2, the I/O model system from which these results were generated actually consists of about 300 industries. This report will not dwell on the direct and indirect impacts by industry, but they

are available as a byproduct of the I/O calculations. In the appendix to this chapter we provide tables for each province for the generalized $10 million expenditure shock showing GDP impacts at basic prices (the only measure available at the industry level) for 16 aggregated industry groups by province. Electronic files submitted with this report include files with the full 300-industry disaggregation by province.

4.3 Direct plus Indirect Impacts for Canada and the Provinces

The next task is to combine these generalized impacts from the I/O model with data on the actual GDP at basic prices in the marine transport industry in each of the identifiable provinces. The latest GDP data we could obtain, because of confidentiality problems, were for 1999, but we have converted these to year 2000 values for compatibility with the year 2000 I/O results. Knowing the impact of a typical $10 million of expenditure on GDP, and also what actual GDP in marine transport is by province, we can calculate what the total direct and indirect impacts on GDP are by province. Knowing the relationship of GDP to employment from the I/O calculations, we can also then calculate the total direct and indirect impacts on employment by province[23]. Technically, these results are for the year 2000, and for GDP are in year 2000 prices. The results of these calculations are shown in tables 4.3 (for GDP) and 4.4 (for employment).

Table 4.3, for the direct plus indirect impacts of the marine transport industry on GDP, has three major sections. The first, which is one line only, shows by province our estimates for the *direct* GDP of the marine transport sector[24]. These figures are also shown in an accompanying bar graph (Figure 4.1). As has been noted, no figures

[23] As a technical point, the calculations are not completely straightforward, because the observed GDPs for marine transport in each province are, in most cases, not simply the result of expenditure in that province, but also, to a varying extent, the result of expenditure in other provinces as well. (This is especially the case for Nova Scotia). An iterative adjustment procedure is therefore required to reconcile the observed GDPs with the generalized I/O results to obtain an estimate of actual direct and indirect impacts.

[24] The estimates have been generated based on unpublished data obtained by request from Statistics Canada. Some gaps due to confidentiality have been estimated where sufficient collateral data were available. As noted, no data were provided for Manitoba or the territories, and insufficient additional data were available on which to base a reliable estimate. Note also, that the direct estimates of GDP are on the basis of GDP at 'factor cost', which is very similar to GDP at basic prices, but which excludes indirect taxes, less subsidies, on 'factors of production' – an element which is typically fairly small.

could be obtained or generated for Manitoba or the territories. However, by comparing the national total, which we do know, and our estimates for the seven provinces for which an estimate could be made, we can see that about $144 million of GDP (or about 6% of the total) could not be allocated to a particular province or territory. This amount must necessarily be dropped from our subsequent estimates, but it should be noted as another source of downward or conservative bias to our impact estimates.

The total GDP for marine transport for Canada in 2000 is just over $2.7 billion

As can be seen from this first line, the total GDP for marine transport for Canada in 2000 is just over $2.7 billion. Of this, almost 40%, or just over $1 billion, is earned in B.C., with the next largest contributor being Québec at about $0.5 billion. Following Québec are Ontario and Nova Scotia in that order, with the GDP of marine transport in Newfoundland, PEI and New Brunswick all being about $100 million.

The second panel of table 4.3 shows our estimate of the combined direct and indirect GDP at basic prices attributable to marine transport, with our estimate of the individual provincial contributions to these impacts listed just below. The third panel repeats the second panel, but for GDP at market prices. The results for Direct plus Indirect GDP at market prices are also shown in the form of a bar graph (Figure 4.2).

The estimated direct and indirect impact of marine transport on the Canadian economy is just under $4 billion

As can be seen from the tables and figures, the estimated direct and indirect impact of marine transport on the Canadian economy is just under $4 billion.

B.C. is the largest single province in terms of impact, but note how, when *indirect* impacts are included, the GDP impact on Ontario is virtually the same as that for Québec. The reason, of course, is that Ontario provides many of the indirect inputs back up the production chain. This can be clearly seen in the 'contributions' section of the panel. For B.C., for example, there is virtually no contribution by other provinces to B.C.'s GDP impact. That is, marine transport generates considerable additional indirect activity in the province (almost $400 million worth, the difference between 1460 and 1078) but, not surprisingly, gains very little from marine transport activity on the Great Lakes or the east coast. Ontario, by contrast, gains only about $130 million from upstream inputs to its own marine transport sector (533-394) but gains $62 million from providing indirect inputs to Québec and $79 million from providing inputs to B.C. Alberta has its GDP boosted by $150 million from indirect supplies to marine

transport – the bulk of it to BC, but a sizeable amount also to Ontario. Nova Scotia also has very sizeable impacts from the marine transport activity in other provinces, but in the case of Nova Scotia this is partly from providing the marine transport services themselves (with ferries to Newfoundland and PEI), as well as from indirect inputs.

We acknowledge that a further discussion of these indirect impacts would be very helpful from a public policy perspective. For example, how is it that Ontario gains $62 million from providing indirect inputs to Québec? How much of it is associated with iron ore that is shipped from Labrador first by rail to ports on the lower St. Lawrence River and then by ship to the steel mills of Hamilton, Ontario? Or is some portion due to water taxis that transfer people for work as well as pleasure between the two provinces? Unfortunately, the aggregate nature of the data prevents us from making these specific inferences.

As we noted in studying the generalized impacts above, impacts for almost all provinces (except Ontario), and especially for Newfoundland and PEI, are lower when estimated for GDP at market prices (compared to GDP at basic prices) due to the presence of subsidies for the marine transport sector, and especially for ferry services. Of course, this also is evident when we examine the sum of direct and indirect impacts. However, because the indirect inputs typically have only small subsidies, the differences for the sum of direct plus indirect impacts are smaller. Indeed, for New Brunswick the effect of providing intermediate inputs is such as to push the estimate of the GDP at market prices impact very slightly *above* the impact at basic prices.

Table 4.4 shows direct and the sum of direct and indirect impacts for employment. However, the three sections of this table differ from those of table 4.3. The reason is that we have *two* estimates of the direct employment attributable to marine transport. The first, directly from the Survey of Employment, Earnings and Hours (SEPH) is based on a payroll survey. However, this survey misses some establishments, especially smaller ones, and routinely shows a lower aggregate employment figure than the Labour Force Survey (LFS) from which the commonly-quoted monthly employment and unemployment statistics come. Unfortunately, the LFS, though more wide ranging, does not report, or even collect, detail at the fine industrial breakdown employed in the SEPH. However, as part of the work of constructing the I/O data base and system, an attempt is made to reconcile SEPH detail and LFS totals. We can thereby get a roundabout measurement of what the direct employment in the

marine transport industry would be, both nationally and by province, in a form equivalent to the 'full' coverage of the labour force found in the LFS.

The second line of Table 4.4 shows these LFS equivalent estimates obtained indirectly via the I/O calculations that have been prepared for this study. As can be seen, the differences can be considerable. The national total is over 20% larger, but some of the provincial totals are considerably bigger. Especially unusual is that fact that the employment figure for Québec is actually smaller under the I/O estimate. However, the 'outlier' here appears to be the SEPH estimate, since, when combined with our direct GDP figures, it gives a very different estimate (much lower) of GDP per employee than is the case for any of the other provinces. On the whole, our judgement is that the I/O estimate is superior, but the fact that the employment data are open to question needs to be kept in mind. The employment estimates are graphed in Figure 4.3.

With the I/O estimate of direct employment, we can actually get a breakdown of the individual provincial contributions, and these are shown in the panel below line 2. Most direct employment in the marine transport sector of a province is, of course, due to activity within that province, but there are some spillovers – most notably from Newfoundland, PEI and New Brunswick to Nova Scotia.

Directly and indirectly, the marine transport sector generates just under 59,000 jobs in Canada, with almost 23,000 of those in B.C., 11,600 in Québec and almost 10,000 in Ontario

The third panel of table 4.4 shows the sum of the direct and indirect employment impacts, where the direct impacts are those from the I/O system and not from the SEPH. Directly and indirectly (via all upstream activity) the marine transport sector generates just under 59,000 jobs in Canada, with almost 23,000 of those in B.C., 11,600 in Québec and almost 10,000 in Ontario. In the Atlantic region the largest employment impact is in Nova Scotia, with 5,400 jobs generated directly and indirectly. These estimates are graphed in Figure 4.4 and shown as shares of the national total.

Note that there is considerable job 'spillover' from province to province – especially in the Atlantic region. Thus, the marine transport expenditures in Nova Scotia generated 2,182 jobs (column on the far right), while marine transport expenditures in Newfoundland generated 4,216 jobs across Canada. However, many of the jobs generated by the Newfoundland expenditures are actually located in Nova Scotia and Québec, so that the final number of jobs associated directly or indirectly with marine transport in Newfoundland by the activity in all provinces (2,722) actually comes

out lower than the number of jobs in Nova Scotia (5,403). Marine transport activity in B.C. however generates the largest number of jobs across the country, and more than twice as many as any other province. Of these, a very large share remains in B.C., with Ontario actually being the next largest gainer.

Again, it is important to emphasize the aggregate nature of the data does not permit us to pinpoint exactly which industry or sector in located in Nova Scotia and Québec is benefiting from expenditures generated by the Marine Transport Industry in Newfoundland.

Concluding, we have found significant direct and indirect impacts of marine transport on the GDP and employment levels of Canada and a number of its provinces. It remains to add the induced economic impacts to obtain the total picture, and this we do in the following chapter.

Table 4.1a

Input-Output Summary: Impact on Direct and Indirect GDP at Basic Prices for $10 mill expenditure on Marine Transport and Services in 2000
(thousands of year 2000 dollars)

	Impacts on:													
	NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN	CANADA
Expenditure in:														
NF	4,320	28	1,827	267	1,135	592	16	11	68	42	0	1	0	8,307
PEI	154	4,106	3,153	410	626	590	17	13	63	42	0	1	0	9,176
NS	88	25	6,471	322	290	643	14	11	59	40	0	4	0	7,969
NB	82	48	1,567	4,425	523	704	14	10	52	38	0	1	0	7,465
QUE	36	4	291	48	6,410	737	20	14	92	36	0	16	0	7,703
ONT	52	10	225	42	1,123	5,284	28	65	258	53	0	24	0	7,164
BC	4	1	9	7	94	390	27	44	546	7,161	4	6	0	8,293

Table 4.1b

Input-Output Summary: Impact on Direct and Indirect GDP at Market Prices for $10 mill expenditure on Marine Transport and Services in 2000
(thousands of year 2000 dollars)

	Impacts on:													
	NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN	CANADA
Expenditure in:														
NF	3,833	21	1,715	268	1,024	605	16	11	68	43	0	1	0	7,606
PEI	142	2,921	2,895	411	571	602	17	12	63	43	0	1	0	7,680
NS	83	20	5,982	325	279	659	14	11	59	41	0	5	0	7,477
NB	80	45	1,481	4,443	500	721	15	10	52	39	0	1	0	7,386
QUE	34	4	269	48	6,088	754	20	14	92	36	0	16	0	7,377
ONT	49	7	202	42	1,053	5,450	28	65	258	54	0	24	0	7,234
BC	4	1	9	7	93	398	27	45	548	7,106	4	6	0	8,247

Table 4.2
Input-Output Summary: Impact on Direct and Indirect Employment for $10 mill expenditure on Marine Transport and Services in 2000
(employment in persons)

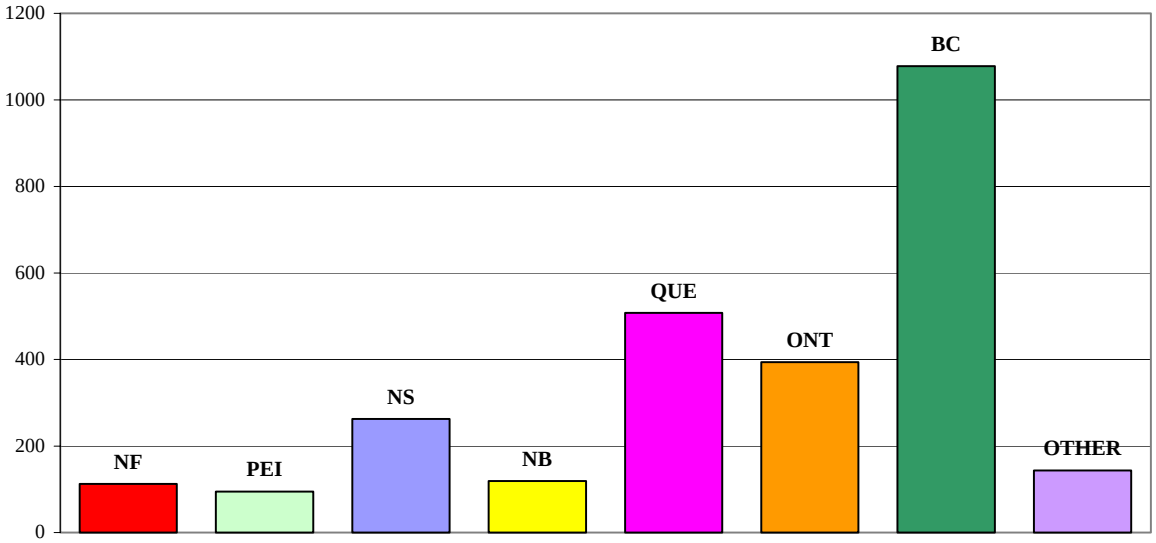
	Impacts on:													
	NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN	CANADA
Expenditure in:														
NF	87	1	31	5	17	9	0	0	1	1	0	0	0	150
PEI	3	70	50	7	9	9	0	0	1	1	0	0	0	150
NS	1	1	105	6	5	9	0	0	1	1	0	0	0	128
NB	1	1	27	86	8	10	0	0	1	1	0	0	0	135
QUE	1	0	5	1	102	11	0	0	1	1	0	0	0	120
ONT	1	0	3	1	17	69	0	0	1	1	0	0	0	94
BC	0	0	0	0	2	6	0	0	4	113	0	0	0	125

Table 4.3
Direct and Indirect GDP for Marine Transport and Services 1999/2000
(millions of year 2000 dollars)

	NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN	OTHER	CANADA
Direct GDP (at Factor Cost)	112	95	263	119	508	394				1,078				144	2,713
Direct plus Indirect GDP at Basic Prices	138	107	333	156	739	736	11	18	150	1,460	1	5	0	0	3,854
Contributed from Activity in:															
NF	122	1	51	8	32	17	0	0	2	1	0	0	0	0	234
PEI	4	103	79	10	16	15	0	0	2	1	0	0	0	0	230
NS	1	0	110	5	5	11	0	0	1	1	0	0	0	0	136
NB	2	1	44	123	15	20	0	0	1	1	0	0	0	0	208
QUE	3	0	24	4	539	62	2	1	8	3	0	1	0	0	648
ONT	5	1	23	4	113	533	3	7	26	5	0	2	0	0	722
BC	1	0	2	1	19	79	5	9	110	1,448	1	1	0	0	1,677
Direct plus Indirect GDP at Market Prices	124	77	309	157	699	757	11	18	150	1,449	1	5	0	0	3,757
Contributed from Activity in:															
NF	108	1	48	8	29	17	0	0	2	1	0	0	0	0	214
PEI	4	73	73	10	14	15	0	0	2	1	0	0	0	0	193
NS	1	0	102	6	5	11	0	0	1	1	0	0	0	0	127
NB	2	1	41	124	14	20	0	0	1	1	0	0	0	0	205
QUE	3	0	23	4	512	63	2	1	8	3	0	1	0	0	621
ONT	5	1	20	4	106	549	3	7	26	5	0	2	0	0	729
BC	1	0	2	1	19	80	5	9	111	1,437	1	1	0	0	1,667

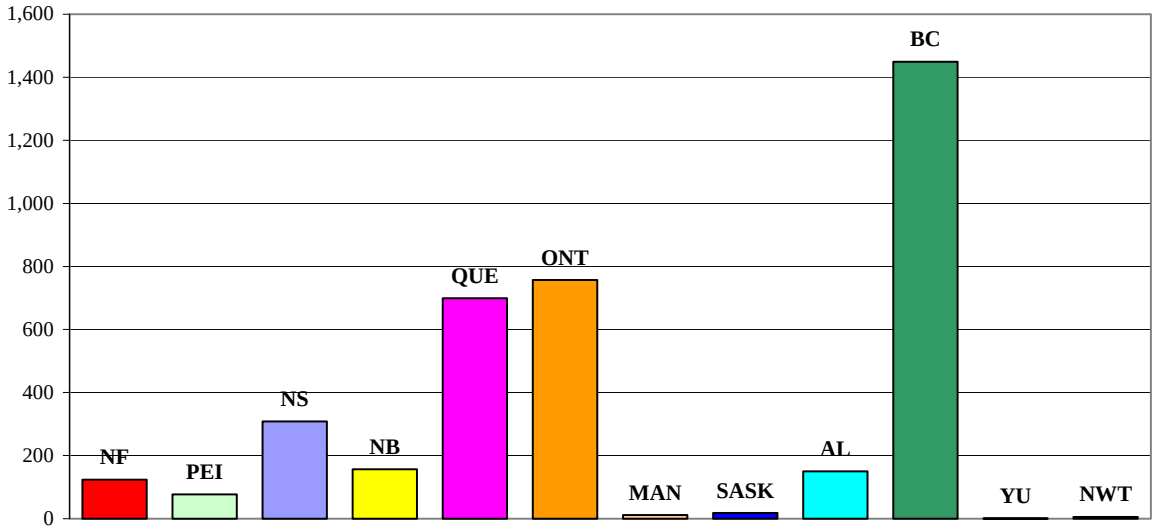
Direct and Indirect GDP at Market Prices

Figure 4.1 - Direct GDP at Factor Cost (2000)
(Millions of year 2000 dollars)



Canada Total = $2,713

Figure 4.2 - Direct plus Indirect GDP at Market Prices (2000)
(Millions of year 2000 dollars)



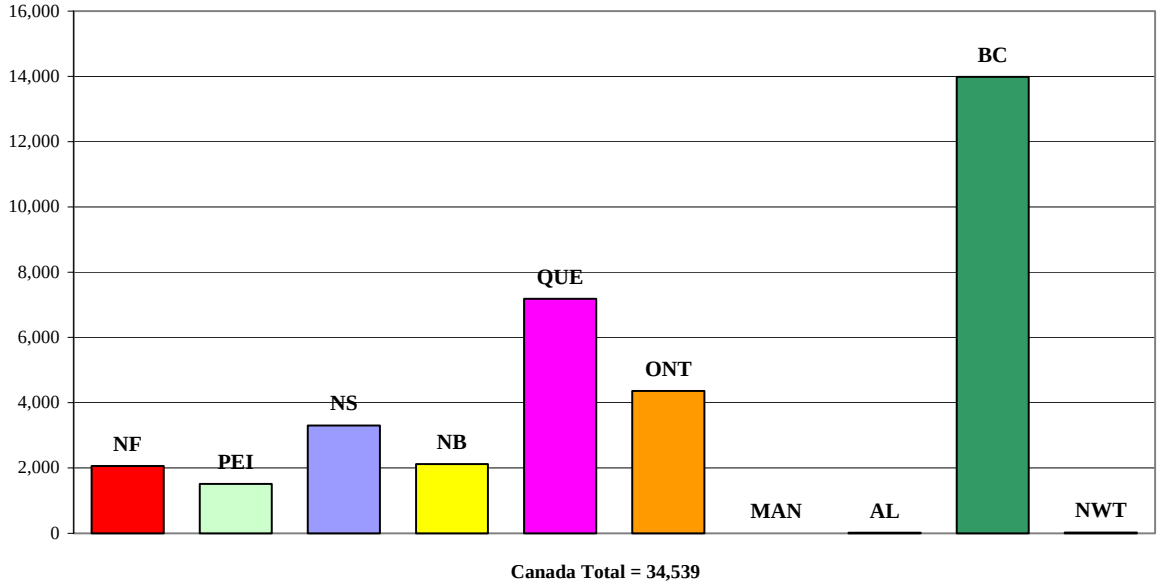
Canada Total = $3,757

Table 4.4
Direct and Indirect Employment for Marine Transport and Services 1999/2000
(persons employed, part-time or full-time)

	NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN	OTHER	CANADA
Direct Employment from SEPH	770	650	2,641	1,038	8,792	4,006				9,800				214	27,911
Direct Employment from I/O Estimates	2,061	1,509	3,301	2,124	7,182	4,364	1	0	15	13,982	0	20	0	0	34,559
Contributed from Activity in:															
NF	1,888	9	472	59	201	30	0	0	0	1	0	0	0	0	2,659
PEI	33	1,465	664	79	80	17	0	0	0	0	0	0	0	0	2,340
NS	14	4	1,250	59	17	24	0	0	0	0	0	1	0	0	1,368
NB	26	14	475	1,858	84	57	0	0	0	0	0	0	0	0	2,514
QUE	36	4	251	33	5,900	287	0	0	2	2	0	14	0	0	6,528
ONT	58	12	181	32	887	3,884	0	0	4	6	0	4	0	0	5,069
BC	7	2	7	5	13	65	0	0	8	13,973	0	1	0	0	14,082
Direct plus Indirect Employment	2,722	1,838	5,403	2,989	11,611	9,913	186	141	964	22,931	4	35	1	0	58,739
Contributed from Activity in:															
NF	2,448	15	862	131	466	248	7	4	18	16	0	0	0	0	4,216
PEI	63	1,757	1,253	188	231	220	7	4	16	15	0	0	0	0	3,754
NS	23	9	1,783	104	78	158	4	2	10	10	0	1	0	0	2,182
NB	40	28	746	2,398	230	283	7	3	14	15	0	0	0	0	3,765
QUE	52	7	393	72	8,548	904	24	12	54	47	0	19	0	0	10,134
ONT	82	18	338	74	1,755	6,940	42	33	133	77	0	10	0	0	9,502
BC	13	4	29	23	303	1,159	95	82	717	22,750	3	5	0	0	25,186

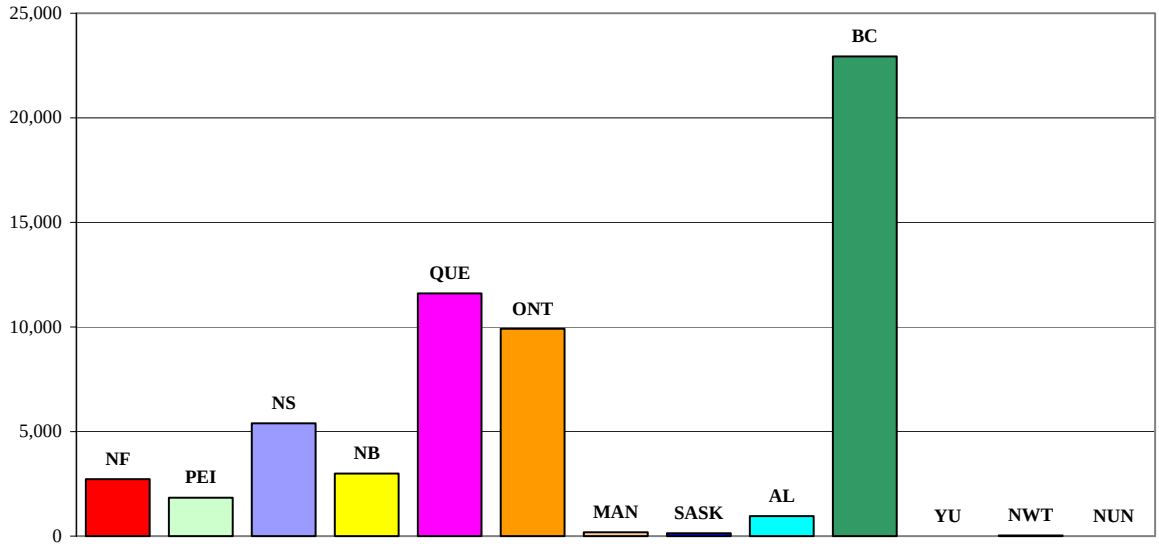
Contribution to Direct plus Indirect Employment

Figure 4.3 - Direct Employment from I/O Estimates (2000)
(Persons employed, full-time or part-time)



Canada Total = 34,539

Figure 4.4 - Direct plus Indirect Employment (2000)
(Persons employed, full-time or part-time)



Canada Total = 58,739

Chapter 5. Induced Impacts, and the Total Impact of the Marine Transport Industry on the Economies of Canada and the Provinces

In chapter five we take the direct and indirect estimates of the previous chapter and add the final impact component -- the induced impacts

In chapter five we take the direct and indirect estimates of the previous chapter and add the final impact component – the induced impacts. As explained in Chapter 2, for this last impact measure we use the FOCUS macroeconometric model developed and maintained at the University of Toronto. The impacts we are trying to measure here are those created in the economy when the workers in both the marine transport industry, and also in its supplier industries at every step up the supply chain, spend their wages and salaries on consumer goods. Profits earned in marine transport and in supplier industries may also impact the economy by being distributed as income or by creating additional demand for investment goods. To the extent that this spending creates new economic activity and new jobs, then there will be additional induced effects as the incomes earned in these activities are in turn re-spent. The FOCUS model is used to capture the economic activity that is created (or 'induced') by these rounds of re-spending set off by the direct economic activity in the marine transport sector and the indirect impacts these have on its upstream suppliers. It can also tell us, but only at the national level, the impact of all three levels of activity (direct, indirect and induced) on government revenues and balances by level of government. The FOCUS model is described in greater detail in chapter two.

At this point, it is important to recall that we are using the FOCUS model to calculate 'induced' effects only; FOCUS (and in fact any other Canadian macroeconometric model) is not sufficiently disaggregated by industrial sector as to distinguish marine transport separately within its structure. This is why we use different methods, already described in Chapter 4, to calculate the direct and indirect impacts of marine transport. Briefly, the direct impacts, at least by province, had to be collected from unpublished Statistics Canada sources, and the indirect impacts are from the Input-Output model, which is far more disaggregated than any macro-econometric model.

However, as explained in Chapter 2, the I/O system cannot account for induced effects (the re-spending of wages or profits), and that is where the FOCUS model plays its role: In the absence of any more detailed information, we must assume, not unreasonably, that workers in marine transport and in its supplier sectors spend their incomes in the same way as the average Canadian worker, and that profits in the industry, and in its suppliers, are distributed or re-invested much as in the economy as a whole. Again, in the absence of any further information, we assume that workers and industries in marine

To capture the induced effects from marine transport, it is sufficient to use a good model of the average Canadian economy, carefully built to capture all the major income feedback loops and tax and import leakages from general consumption or investment demand

transport and its suppliers pay income and corporate taxes or receive government benefits at the economy-wide average. (Special subsidies and indirect tax payments *are* industry specific, but these are captured at the I/O model stage). Therefore, to capture the induced effects from marine transport (or indeed from any other industry) it is sufficient to use a good model of the average Canadian economy, carefully built to capture all the major income feedback loops and tax and import leakages from general consumption or investment demand. This the FOCUS model can do. In order to use it for this purpose, the direct and indirect impacts for GDP, employment, wages and salaries, returns to capital ('profits' in a broad sense) and indirect taxes and subsidies all determined in Chapter 4 must be inserted in FOCUS, and the induced impacts resulting from them can then be observed. Finally, we add the induced impacts to the direct and indirect impacts to obtain a measure of the 'total' economic impact of marine transport.

The FOCUS model is run for two years (2000 and 2001), in order to let the lags in the model and the re-spending sequence work themselves out. To be conservative, the results reported are the average of these two years. In the present case, given the size of the direct and indirect impacts, and that there is little likelihood the services of marine transport could be anywhere completely replaced by imports, the model was run with no change in the Bank of Canada's set interest rates, and no change in the exchange rate.

FOCUS is a national model, but the induced impacts generated have been allocated to the provinces on the basis of provincial consumption impacts generated with a smaller version of the Statistics Canada inter-provincial I/O system. This mechanism allows us to identify induced, and therefore total, impacts on provincial GDPs and employment, but we do not have detailed models of the tax systems by level of government in each province by which we could estimate province-specific impacts on government revenues and balances. The national estimates are all that can be provided.

The results of the calculations and the sum of direct, indirect and induced impacts of the marine transport industry for 2000 are shown in tables 5.1, 5.3 and 5.5 below. Table 5.1 summarizes the national impacts, and includes government revenue and balance estimates. Tables 5.2 and 5.3 show provincial impacts for GDP and employment respectively.

As explained at various points in this report, our major calculations could not be performed for any year past 2000, due to key data being unavailable past that year. However, it was requested that we make

the best attempt we could to estimate the impacts of marine transport for a more recent year, and we do that also in this chapter, making a rough projection of our year 2000 impacts forward to the year 2003.

To project 'real' (excluding inflation) impacts forward to 2003, we have used the 2000-2003 growth rate of real domestic product for 'Water Transport' in the new NAICS classification

To project 'real' (excluding inflation) impacts forward to 2003, we have used the 2000-2003 growth rate of real domestic product for 'Water Transport' in the new NAICS classification. This category does not include 'service incidental to marine (or water) transport', which is also included in our definition of the industry, but the latter component is unavailable. We must assume, therefore, that these services have grown in line with marine transport itself over the 2000-2003 period. The total growth rate over 2000-2003 of real domestic product in water transport is 3.0% (which compares with growth of 7.06% in total real GDP over the same period).

To project elements involving inflation over the 2000-2003 period we use the growth rate of the 'deflator' or 'price' of GDP that is part of Statistics Canada's system of national accounts. This item grew 5.4% over the 2000-2003 span. While it might have been preferable to use a price or deflator related to marine transport, there was non available, and, moreover, the prices of many items included in our impacts (including all indirect and induced impacts) will have different price behaviour, and so using a generalized rate of price change is to be preferred.

Finally, to project items that have both a real and an inflation component – for example, impacts on GDP at market prices for 2003 – we simply use the combination of the impacts for real GDP (3.0%) and for inflation (5.4%), for a final multiple of 8.56%. Where comparisons are made to the levels of, say, provincial GDP or employment, or federal revenues at the national level, actual 2003 data are used for the comparison.

The impact estimates thus projected to 2003 are shown in Tables 5.4, 5.5 and 5.6 below.

5.1 Impacts on Canada

Panel A of table 5.1 repeats the direct impacts we estimated in Chapter 4. Panel B repeats our national estimates for direct plus indirect GDP impacts at basic prices and market prices and for employment, which we also obtained in Chapter 4. In panel C, we add our estimate of induced impacts to the direct and indirect impacts to obtain our estimate of the total impact of the marine transport sector on the Canadian economy.

We estimate that marine transport accounted in 2003 for just over $8.7 billion of GDP at basic prices and just over $9.1 billion at market prices. The estimate for the total impact on employment is just over 93,000 jobs

Table 5.4 follows the same format as for Table 5.1, but with all estimates projected up to 2003 using the multiples described immediately above. We will concentrate our discussion of the results on the 2003 estimates in Table 5.4.

The Marine Transport industry in Canada is highly diverse, encompassing freight transport, the operation of ports, canals and aids to navigation, an extensive ferry service on both coasts, and even recreational cruising and pleasure boating. As can be seen, we estimate that marine transport accounted in 2003 for just over $8.7 billion of GDP at basic prices and just over $9.1 billion at market prices[25]. The estimate for the total impact on employment is just over 93,000 jobs. It is worth repeating that these figures, significant as they are in themselves, only account for the economic activity of Marine Transport (and its indirect and induced effects) as a 'producing' industry. They take no account of the economic activity in Canada that is 'facilitated' or made possible by the presence of marine transportation activity and its underlying services and infrastructure. These would obviously be much larger impacts, but they are impossible to quantify with precision.

With the total (direct + indirect + induced) estimates, we can compare the impact of the Marine transport industry to the economy as a whole. This is done in the right hand column of table 5.4. As can be seen, measured in market prices the GDP impact of the marine transport sector in 2003 is estimated to be three-quarters of 1% of GDP. The employment impact is just under 0.6% of total employment in 2003.

The implication of finding a smaller impact for employment than for GDP, is that, in its impact on the economy is a whole, marine transport is of *above-average* productivity

The implication of finding a smaller impact for employment than for GDP, is that, in its impact on the economy is a whole, marine transport is of *above-average* productivity. That is, not only at the direct level (as was noted in Chapter 4) but also in its indirect and induced impacts, the sector causes more GDP to be generated per employee then is true for the economy on average.

The remaining section of panel C shows our estimates of impacts on government revenues and government balances. Two estimates of revenues are provided: the first is simply what is obtained from the FOCUS model simulation. The second is made to be especially conservative: This because the FOCUS model simulation generates a small amount of inflation when we enter the direct and indirect

[25] It might be noted that now that final expenditures like consumption are involved, which typically attract considerable indirect taxation, the estimate of GDP at market prices comfortably exceeds GDP at basic prices despite the subsidies that are paid directly to marine transport.

impacts and calculate the induced impacts of marine transport. This additional price movement serves to increase government revenues, but it is not, strictly speaking, due to the extra real economic activity attributable to marine transport. We have therefore generated a second set of revenue impact estimates by using the price impacts observed from the model to adjust downward our estimates of government revenues. In our view, the second estimate is an especially conservative one.

Taking both estimates into account, we find that marine transport generates between about $1.7 billion and $2.4 billion of additional government revenue at the federal level and between $1.7 billion and $2.6 billion at the provincial level

Taking both estimates into account, we find that marine transport generates between about $1.7 billion and $2.4 billion of additional government revenue at the federal level and between $1.7 billion and $2.6 billion at the provincial level. Again, to be conservative, our revenue impact estimates *include* the effect of subsidies on the marine transport sector even though these are not, strictly speaking, revenues. We also show the impact on revenues as a percent of total revenues by level of government in the year 2003. The federal figure exceeds the share of GDP at market prices - and this despite the subsidies that are paid at the federal level. The provincial impact, as a share of total provincial revenue, is somewhat smaller than the GDP share, but it must be remembered that a significant portion of provincial revenues come from royalties on energy and other resources, while the marine transport sector, of course, generates no such revenue stream.

The basic story is that the marine transport sector, directly, and through its impacts on the rest of the economy, generates revenues for governments as a whole roughly in line with its GDP impacts – and this is net of the subsidies that are paid to it.

The final section of Table 5.4 shows impacts on government balances. These are not adjusted for inflation affects, since inflation also affects government expenditures, which then tend to make government balances worse. The bottom line, if we can put it that way, is that marine transport, through its impact on the economy, makes the federal balance over $2.8 billion higher than it otherwise would be, and the provincial balances across the nation about $2.4 billion higher. An additional sum of just under $200 million is contributed to the balances of the local governments and the public pension plans.

In studies of this sort, it is common to indicate the size of the ‘multiplier’. We prefer not to do so, since the term is an extremely loose one and there is by no means common agreement on how the ‘multiplier’ should be calculated. For example, we could calculate the multiplier of direct GDP on total GDP at market prices (9134/2945 = 3.10), or of the sum of direct and indirect GDP on GDP at market

prices (9134/4078 = 2.24), or of direct or direct-plus-indirect employment on total employment (93.2/35.6 = 2.62 or 93.2/60.5 = 1.54). When multipliers of this sort are calculated, it is important that they not be considered 'too large' or 'too small' when compared to multipliers from other studies, simply because it is *different* multipliers that are being compared. That is why it is sometimes better, in our opinion, simply to state the impacts and refrain from calculating multipliers altogether.

Nonetheless, for our study, the closest equivalent to the standard macroeconomic multiplier that appears in economics textbooks would be the ratio of GDP at market prices to domestic final expenditure (9134/5013 = 1.82). However, even this measure would be too large, compared to a true expenditure multiplier, since in our study the domestic final expenditure is exclusively on domestic goods - that is, the imported component has already been removed. The standard macroeconomic multiplier, by contrast, is usually *gross* of imports. From some calculations we have done, we estimate that total final expenditure on marine transport has approximately a 10% import content. Were we to take this into account, our calculations of the standard macro economic multiplier would be (9134/(5013*1.1) = 1.66 - a figure, in our opinion, not at all unreasonable as a short-term impact multiplier.

5.2 Provincial impacts

Tables 5.2 and 5.5 show our estimate of the total impact on GDP at market prices by province, with the first table giving our original calculations for the year 2000, and the second showing the projection forward to the year 2003. The tables also summarize, from Chapter 4, the final expenditures, direct, and direct-plus-indirect GDP that we have earlier obtained. Finally, the tables also show the estimated total impacts as a percent of the 2000 or 2003 GDPs of the individual provinces. Figure 5.1 plots the provincial GDP impacts for 2003 side-by-side for comparison, and shows each province's share of the total national impacts.

The provincial estimates for employment impacts are shown in Tables 5.3 and 5.6, again for both 2000 and projected forward to 2003. Again, as we mentioned above, these impacts tend to be smaller as a share of total provincial employment than are the GDP impacts of total GDP because the marine transport sector, and its suppliers and induced impacts, tend to generate a higher amount of GDP per employee - that is, they are more productive than the average employee in the economy. Figure 5.2 plots the employment impacts by province side-by-side and portrays provincial shares of

the national employment impact.

As for the national results, we will concentrate our discussion on the projected estimates for 2003.

Newfoundland and Labrador

We estimate that marine transport activity in Newfoundland generated about $265 million of GDP at market prices, or almost 1.5% of total provincial GDP. It also accounted for just under 3,700 jobs, or almost 1.7% of total Newfoundland employment

Marine transport activity in Newfoundland is widely diversified. A key component is the large-scale year-round ferry service between Cape Breton and Channel-Port-aux-Basques and the seasonal service to Argentia – an activity that also generates considerable GDP and employment in Nova Scotia. St. John's is an important port and aids to navigation in along the coast, together with coastal monitoring add to the marine activity. Servicing offshore oil production and exploration also adds to marine transport activity – although some of this economic impact will not be captured in the available data as it is included under the contribution of oil production or exploration if it is conducted by the producing or exploration firms themselves. And, of course, the availability of marine transport – and above all the ferry service – facilitates much additional economic activity in the province and the maintenance of the population there, although we cannot include this impact with any precision in our estimates. Confined instead to the data available, and to direct production impacts, we estimate that marine transport activity in Newfoundland generated about $265 million of GDP at market prices, or almost 1.5% of total provincial GDP. It also accounted for just under 3,700 jobs, or almost 1.7% of total Newfoundland employment.

Prince Edward Island

$159 million in real GDP generated by the industry in PEI is 4.1% of the island's total GDP – the largest contribution for any province

Despite the fixed link now connecting PEI to New Brunswick, the ports of Charlottetown and other smaller ports around the Island still provide an important avenue for the transport of goods to and from the Island, while twon important ferry connection remain to Nova Scotia and the Magdalen Islands – and add to the economy of those provinces as well. Maintenance of aids to navigation are important for supporting fishing activity around the Island and in the Northumberland Strait, as they are for Newfoundland and the other Atlantic provinces. Again, from the restricted data available, and counting only production of the Marine Transport industry itself , and not its 'facilitating' elements, we find and important impact in PEI. Indeed, the $159 million in real GDP generated by the industry in PEI is 4.1% of the island's total GDP – the largest contribution for any province. This total could also be related to the fact that Northumberland Ferries Ltd. and its subsidiary Bay Ferries Ltd. have their headquarters in Charlottetown. Directly, indirectly and from

induced impacts, over 2,500 jobs are made possible by the industry – 3.7% of the island's total employment.

Nova Scotia

Marine transport in Nova Scotia is extremely diverse, encompassing the activity of the major ports of Halifax, the Strait of Canso and Sydney, aids to navigation on a major part of the Atlantic coast, provision of ferry services to both Newfoundland and PEI (and across the Bay of Fundy to New Brunswick and the U.S.), the operation of a canal and lock in Cape Breton, and the activities, some recreational, of a number of smaller ports and harbours. This broad range of activity adds up, in its own right, to well over a half-billion dollars worth of GDP ($648 billion), or over 2% of Nova Scotia's GDP (2.25%), and this, to repeat, excludes all the activity that Marine Transport infrastructure makes possible in the province. Employment generated is just under 8,000 jobs, or 1.8% of total employment in the province.

Employment generated is just under 8,000 jobs, or 1.8% of total employment in the province

New Brunswick

Marine transport in New Brunswick displays many of the same features as for Nova Scotia, but on a somewhat smaller scale. The port of Saint John, which actually handles the greatest amount of tonnage in the region and is the second largest by tonnage in the country, generates considerable activity, navigation for both commerce and fishing is supported in both the Bay of Fundy and the Northumberland Strait. The Fundy coast and Grand Manan require a number of ferries, and recreational /passenger ships and boats operate from both coasts. Again, purely from production of the sector, the net result is activity of $342 million in 2003, or 1.5% of New Brunswick's provincial product. The industry made possible over 4,300 jobs, or almost 1.3% of total provincial employment.

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Québec

Marine transport in Québec might be thought to center on the port of Montreal, but it also includes the operation of additional ports, including Québec City, down the St. Lawrence and out into the Gulf of St. Lawrence, and extensive support for navigation both on the river and in the Gulf itself. Moreover, Montreal encompasses the entire lower end of the St. Lawrence Seaway system, with four of the system's seven locks and all the attendant canal operation and maintenance. Together, this activity generates over $1.7 billion in GDP or about 0.7% of total Québec provincial GDP, and just over 18,600 jobs (or 0.5% of the province's employment).

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Ontario

The Great Lakes/St. Lawrence waterway gives Ontario a very-important Marine Transport industry, despite its being hundreds of miles from the Atlantic. The ports of Toronto, Hamilton and Thunder Bay handle heavy traffic and, while Ontario only encompasses the very upper end of the Seaway itself (including the Iroquois lock), the entire Welland canal system is within its borders and it shares maintenance of the system of locks between Lake Superior and the lower lakes at Sault Ste. Marie with the U.S. Together, this extensive array of activities generated by itself over $2.2 billion of provincial GDP in 2003 (or 0.45% of total Ontario GDP) and over 18,000 jobs. Once again, this estimate is only a measure of what the industry contributed as a 'producer'; no doubt massive amounts of industrial and commercial activity in Ontario would not have been possible without marine transport to carry in raw materials and carry away finished goods, but how much this activity was is not possible to estimate with any precision.

This extensive array of activities generated by itself over $2.2 billion of provincial GDP in 2003 (or 0.45% of total Ontario GDP) and over 18,000 jobs

Manitoba

As we noted previously, we were unable to obtain any information on direct GDP of the Marine Transport industry in Manitoba from Statistics Canada. Nonetheless, there clearly is such activity, centered on the port of Churchill on Hudson's Bay, and with some ferry services on the Manitoba lakes. The results we have obtained for Manitoba are purely indirect and induced impacts from the activity in other provinces. Even these effects, however, amount to $59 million of GDP and 527 jobs.

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Saskatchewan and Alberta

The estimated impacts for Saskatchewan and Alberta are entirely for indirect and induced impacts. For Saskatchewan, not surprisingly, these are very small, but indirect and induced impacts on Alberta amount to a GDP impact of just under a half-billion dollars, or a quarter of one per cent of Alberta GDP. In turn, this yields almost 2,400 jobs in the province. Much of this is centered on the provision of fuel or fuel feedstocks to the Marine Transport activity of B.C., and to some extent also to Ontario and Québec.

This yields almost 2,400 jobs in the province

British Columbia

Marine transport activity in B.C. is the largest of any single province. As on the Atlantic coast, it is broad-based, including the operation of

All of this activity, when direct, indirect and induced impacts are counted, adds a contribution of almost $3.2 billion to the B.C economy and accounts for over 34,000 jobs

the port of Vancouver, the country's largest, and of smaller ports from Victoria up through Prince Rupert. There is extensive intra-coastal commerce, although some of this will be counted by Statistics Canada as part of the output of the forestry or pulp and paper industries and not of Marine Transport proper, if it is conducted by the producing companies themselves. There is also, of course, a very large ferry service covering the entire coast, and considerable activity in maintaining navigation in a very complex, and sometimes hazardous, coastal and island system. All of this activity, when direct, indirect and induced impacts are counted, adds a contribution of almost $3.2 billion to the B.C economy (over 2.2% of B.C. GDP) and accounts for over 34,000 jobs (1.7% of B.C. employment).

Table 5.1 - Canada: Summary of Direct, Indirect and Total Economic Impacts
Reference Year 2000

A. Direct Impacts on:		Per Cent of 2000 Actual
Domestic Final Expenditure - Domestic Sales by Marine Transport & Services	4,618	
Gross Domestic Product (GDP) at Factor Cost ($2000 Millions)	2,713	
Employment (Input-Output Estimate) ('000)	34.5	
B. Direct plus Indirect Impacts on:		
Gross Domestic Product (GDP) at Basic Prices ($2000 Millions)	3,854	
Gross Domestic Product (GDP) at Market Prices ($2000 Millions)	3,757	
Employment ('000)	58.7	
C. Total Impacts (Direct+Indirect+Induced) on:		
Gross Domestic Product (GDP) at Basic Prices ($2000 Millions)	8,049	0.81
Gross Domestic Product (GDP) at Market Prices ($2000 Millions)	8,414	0.78
Employment ('000)	90.5	0.61
Government Revenues ($ 2000 Millions)		
Federal	2,220	1.14
Provincial	2,349	1.03
Total: (includes local and pension plans)	5,008	1.07
Government Revenues ($ 2000 Millions) (Adjusted for Induced Inflation)		
Federal	1,550	0.80
Provincial	1,561	0.68
Total: (includes local and pension plans)	3,391	0.72
Government Balances (Surplus/Deficit) ($ 2000 Millions)		
Federal	2,635	
Provincial	2,198	
Total: (includes local and pension plans)	5,007	

Table 5.2 - Provinces: Summary of Direct, Indirect and Total Economic Impacts on GDP
Year 2000 Reference; Estimates in Millions of Year 2000 dollars

	NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN	OTHER	CANADA
Final Expenditure - Sales by Marine Transport*	269	243	157	251	757	984				1,959	0	0	0	0	4,618
Direct GDP (at Factor Cost)	112	95	263	119	508	394				1,078				144	2,713
Direct plus Indirect GDP at Basic Prices	138	107	333	156	739	736	11	18	150	1,460	1	5	0	0	3,854
Direct plus Indirect GDP at Market Prices	124	77	309	157	699	757	11	18	150	1,449	1	5	0	0	3,757
Total Impact on GDP at Market Prices	244	147	597	315	1,604	2,042	54	56	413	2,927	3	9	2	0	8,414
Total Impact as Per Cent of 2000 GDP	1.76	4.39	2.41	1.56	0.71	0.46	0.16	0.17	0.29	2.23					0.78

* Final Expenditures exclude foreign imports, but include inter-provincial imports.

Table 5.3 - Provinces: Summary of Direct, Indirect and Total Economic Impacts on Employment
Year 2000 Reference; Persons employed, full-time or part-time

	NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN	CANADA
Direct Employment from I/O Estimates	2,061	1,509	3,301	2,124	7,182	4,364	1	0	15	13,982	0	20	0	34,539
Direct plus Indirect Employment	2,722	1,838	5,403	2,989	11,611	9,913	186	141	964	22,931	4	35	1	58,739
Total Impact on Employment	3,557	2,472	7,687	4,219	18,081	17,932	512	401	2,324	33,225	4	35	1	90,450
Total Impact as Per Cent of 2000 Employment	1.74	3.83	1.83	1.26	0.53	0.31	0.09	0.08	0.15	1.70				0.61

Table 5.4 - Canada: Summary of Direct, Indirect and Total Economic Impacts
Reference Year 2003 - From Table 5.1 via 2003 Expansion factors

A. Direct Impacts on:		Per Cent of 2003 Actual
Domestic Final Expenditure - Domestic Sales by Water Transport & Services	5,013	
Gross Domestic Product (GDP) at Factor Cost ($2003 Millions)	2,945	
Employment (Input-Output Estimate) ('000)	36	
B. Direct plus Indirect Impacts on:		
Gross Domestic Product (GDP) at Basic Prices ($2003 Millions)	4,184	
Gross Domestic Product (GDP) at Market Prices ($2003 Millions)	4,078	
Employment ('000)	60	
C. Total Impacts (Direct+Indirect+Induced) on:		
Gross Domestic Product (GDP) at Basic Prices ($2003 Millions)	8,738	0.77
Gross Domestic Product (GDP) at Market Prices ($2003 Millions)	9,134	0.75
Employment ('000)	93	0.59
Government Revenues ($ 2003 Millions)		
Federal	2,409	1.21
Provincial	2,550	1.03
Total: (includes local government and pension plans)	5,437	1.09
Government Revenues ($ 2003 Millions) (Adjusted for Induced Inflation)		
Federal	1,683	0.84
Provincial	1,695	0.68
Total: (includes local government and pension plans)	3,681	0.74
Government Balances (Surplus/Deficit) ($ 2003 Millions)		
Federal	2,860	
Provincial	2,386	
Total: (includes local government and pension plans)	5,435	

Table 5.5 - Provinces: Summary of Direct, Indirect and Total Economic Impacts on GDP
Year 2003 Reference; Estimates in Millions of Year 2003 dollars

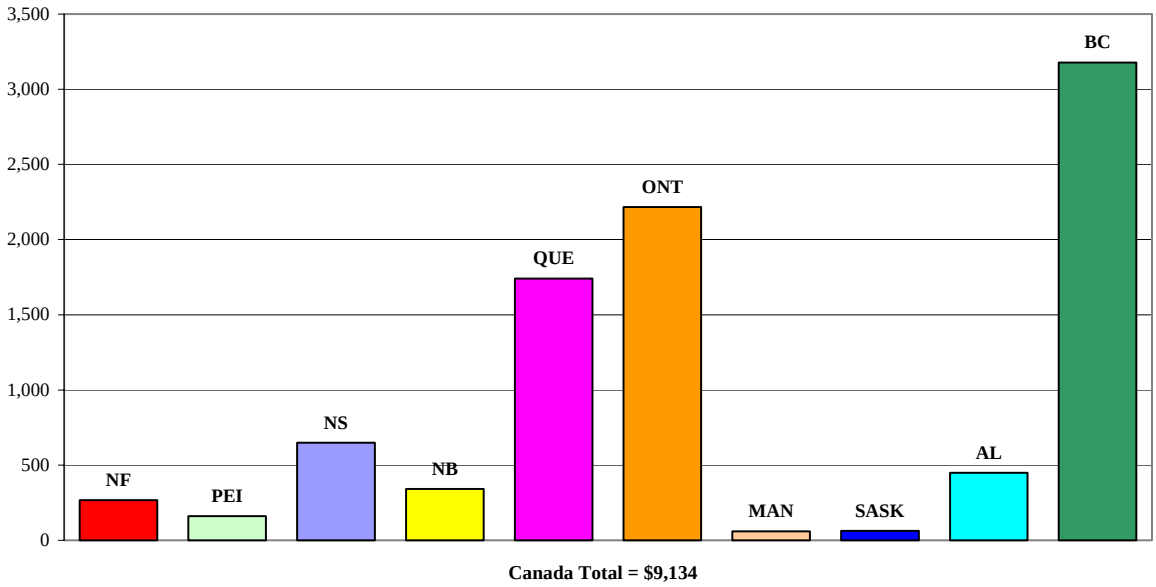
	NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN	OTHER	CANADA
Final Expenditure - Sales by Water Transport*	292	264	171	272	822	1,068				2,127	0	0	0	0	5,013
Direct GDP (at Factor Cost)	122	103	285	129	552	427				1,171	0	0	0	156	2,945
Direct plus Indirect GDP at Basic Prices	150	116	362	169	802	798	12	19	163	1,585	1	6	0	0	4,184
Direct plus Indirect GDP at Market Prices	134	83	335	170	759	821	12	19	163	1,573	1	6	0	0	4,078
Total Impact on GDP at Market Prices	265	159	648	342	1,741	2,216	59	61	449	3,178	3	10	2	0	9,134
Total Impact as Per Cent of 2003 GDP	1.47	4.11	2.25	1.53	0.68	0.45	0.15	0.17	0.26	2.23					0.75

* Final Expenditures exclude foreign imports, but include inter-provincial imports.

Table 5.6 - Provinces: Summary of Direct, Indirect and Total Economic Impacts on Employment
Year 2003 Reference; Persons employed, full-time or part-time

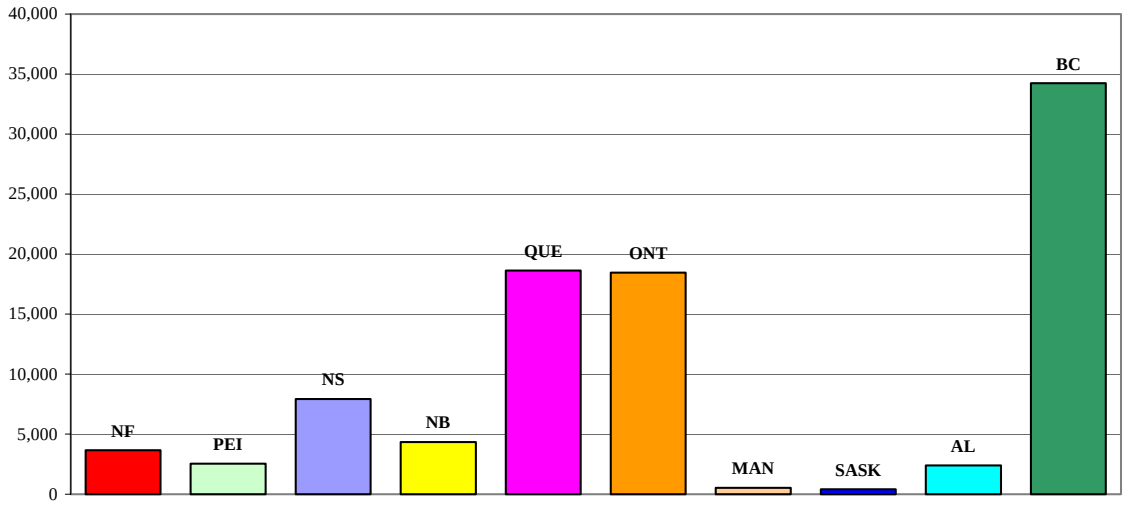
	NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN	CANADA
Direct Employment from I/O Estimates	2,123	1,555	3,400	2,188	7,397	4,495	1	0	15	14,402	0	21	0	35,575
Direct plus Indirect Employment	2,804	1,893	5,565	3,079	11,959	10,210	191	145	993	23,618	4	37	1	60,500
Total Impact on Employment	3,663	2,546	7,918	4,346	18,623	18,470	527	413	2,393	34,221	4	37	1	93,162
Total Impact as Per Cent of 2003 Employment	1.68	3.70	1.82	1.26	0.51	0.30	0.09	0.08	0.14	1.69				0.59

Figure 5.1 Impacts on GDP at Market Prices by Province (2003)
(Millions of year 2003 dollars)



Canada Total = $9,134

Figure 5.2 Impacts on Employment by Province (2003)
(Persons employed, full-time or part-time)



Canada Total = 93,162

6. Conclusions

This study attempts to quantify the economic impacts of the Marine Transport Industry. This is particularly difficult given the need for: (1) comparable data across the country; (2) a rigorous methodology accepted by the economics literature (in other words, the calculation of direct, indirect, and induced impacts); and (3) a comprehensive macro-econometric model. Given these necessary conditions, it is unsurprising that there are no estimates of the national effects of marine transport.

Consequently, this study is a significant contribution to the existing literature. Our analysis suggests that the Marine Transport Industry has considerable economic impacts. We summarize our findings as follows:

1. **The direct effects of the Marine Transport Industry with respect to national Gross Domestic Product (GDP) in 2003 was $3 billion while the total number of industry employees in the same year was roughly 30,000.**

2. **The indirect effects of the industry are nontrivial as they constitute another $1 billion in GDP and an additional 30,000 jobs.**

3. **The induced effects of the Marine Transport Industry are considerable in magnitude. Our results suggest that the induced impacts of the Marine Transport Industry are significant. Specifically, industry specific effects in terms of GDP are $5 billion in GDP and 33,000 jobs in terms of employment.**

4. **In summary, combined direct, indirect, and induced impacts imply that marine transport accounted in 2003 for roughly $9.1 billion of GDP at market prices. The estimate for the total impact on employment is just over 93,000 jobs.**

5. **Finally, our estimates reveal that the Marine Transport Industry generates between $1.68 to $2.4 billion of additional government revenue at the federal level and $1.69 to $2.5 billion at the provincial level.**

6. **The performance of the Marine Transport Industry with respect to other indicators has also been impressive. Operating revenues per employee grew by 46% over the**

same time period, which is significantly higher than other comparable transport sectors. Even more impressive is the fact that net exports from the marine transport sector increased by 211% from 1990 and 2000. In this respect, the industry is truly an "engine of growth".

But there is ample evidence to suggest that the above estimates are in fact an understatement of the true economic impacts of the Marine Transport Industry. This is primarily because of our inability to extract the economic impacts of other marine related activities due to specific data classification protocols followed by Statistics Canada. Nonetheless, the economic impacts of the industry are still significant. And they are even more impressive when one considers various other benefits that the industry confers on society. For example, research by Environment Canada suggests that greenhouse gas emissions by domestic marine transport are far lower than aviation, road, and rail[26]. Unfortunately, quantifying these types of benefits is beyond the scope of this study.

[26] http://www.ec.gc.ca/pdb/ghg/1990_00_report/appe11_e.cfm

7. Data Appendix

7.1 Data Description

Table A.1 Water Transport Industries

1980 SIC-E Code	Industry
454	**Water Transport Industries**
	Establishments primarily engaged in the operation of vessels for the transportation of freight and passengers, in ferry operation (exc. railway ferry), marine towing, ship chartering and other water transportation.
4541	**Freight and Passenger Water Transport Industry**
	Establishments primarily engaged in the operation of vessels for the transportation of freight and passengers whether overseas or on inland and coastal waterways.
4542	**Ferry Industry**
	Establishments primarily engaged in the operation of ferries. Typically, ferries operate across relatively narrow stretches of water on regular schedules. Establishments primarily engaged in ferrying railway cars are classified in 4532 - Service Industry Incidental to Railway Transport.
4543	**Marine Towing Industry**
	Establishments primarily engaged in the operation of barges, lighters and other harbour vessels or in marine towing and tugboat services.
4544	**Ship Chartering Industry**
	Establishments primarily engaged in bareboat, time and voyage charters of ships.
4549	**Other Water Transport Industries**
	Establishments primarily engaged in water transport not elsewhere classified.
455	**Service Industries Incidental to Water Transport**
	Establishments primarily engaged in marine cargo handling, harbour and port operation, marine salvage, piloting ships, operating shipping agencies and furnishing other services incidental to water transport.
4551	**Marine Cargo Handling Industry**
	Establishments primarily engaged in providing stevedoring and other marine cargo handling ser-vices.
4552	**Harbour and Port Operation Industry**
	Establishments primarily engaged in operating harbour and port facilities and services.
4553	**Marine Salvage Industry**
	Establishments primarily engaged in salvaging ships and their cargoes.
4554	**Piloting Service, Water Transport Industry**
	Establishments primarily engaged in providing piloting service to ships when entering or leaving harbour or where required by law.
4555	**Marine Shipping Agencies Industry**
	Establishments primarily engaged in representing shipping lines, arranging for the taking on of cargo and transacting other business in port on behalf of ship owners and charterers. Freight forwarders are classified in 4592 - Freight Forwarding Industry.
4559	**Other Service Industries Incidental to Water Transport**
	Establishments primarily engaged in providing services incidental to water transport not elsewhere classified. Establishments primarily engaged in dredging are classified in 4129 - Other Heavy Construction.

Table A.2 Air Transport Industries & Service Industries Incidental to Air Transport

1980 SIC-E Code	Industry
451	**Air Transport Industries**
	Establishments primarily engaged in scheduled, non-scheduled chartered and non-scheduled specialty air transport.
4511	**Scheduled Air Transport Industry**
	Establishments primarily engaged in the transportation of passengers, freight, express and mail, by air, at a toll per unit of traffic (i.e. passenger or specific quantity of goods) on a specified route.
4512	**Non-Scheduled Air Transport, Chartered, Industry**
	Establishments primarily engaged in the transportation of passengers and goods by air, at a toll per mile or per hour for the charter of the aircraft. Included are establishments primarily engaged in the charter of aircraft for purposes other than transportation where the pilot is not usually involved in the activity, for example, if a news photographer wished to take aerial photos. Establishments primarily engaged in providing flying and a number of other services combined are classified in 4513 - Non-Scheduled Air Transport, Specialty, Industry.
4513	**Non-Scheduled Air Transport, Specialty, Industry**
	Establishments primarily engaged in the provision of a combination of specialty flying services. Flying clubs are classified in this industry.
452	**Service Industries Incidental to Air Transport**
	Establishments primarily engaged in airport operations, aircraft rental, aircraft servicing and other services incidental to air transport.
4521	**Airport Operations Industry**
	Establishments primarily engaged in operating and maintaining civil airports.
4522	**Aircraft Rental Industry**
	Establishments primarily engaged in the rental of aircraft on both short term and long term bases, including the leasing of aircraft. Establishments primarily engaged in renting machinery and equipment are classified in Industry Group 991 - Machinery and Equipment Rental and Leasing Services and those primarily engaged in finance leasing are classified in 7124 - Financial Leasing Companies.
4523	**Aircraft Servicing Industry**
	Establishments primarily engaged in the servicing and maintenance of civil aircraft. Establishments primarily engaged in overhauling or rebuilding aircraft or aircraft engines are classified in 3211 - Aircraft and Aircraft Parts Industry and those primarily engaged in the repair and overhaul of electronic equipment are classified in 3359 - Other Communication and Electronic Equipment Industries.
4529	**Other Service Industries Incidental to Air Transport**
	Establishments primarily engaged in services incidental to air transport not elsewhere classified. Establishments primarily engaged in operating airport limousine services are classified in 4575 - Limousine Service to Airports and Stations Industry.

Table A.3 Railway Transport Industries & Related Service Industries

1980 SIC-E Code	Industry
453	**Railway Transport and Related Service Industries**
	Establishments primarily engaged in the operation of railways. Included are establishments primarily engaged in providing services incidental to railway transport.
4531	**Railway Transport Industry**
	Establishments primarily engaged in the operation of railways for the transport of freight and passengers. This includes interurban railways but excludes street railways and urban rapid transit. Excluded from this industry are establishments operated by railways and primarily engaged in providing telecommunications, bus and water transport services, operating hotels or operating shops for the building and major overhauling of railway rolling stock. Establishments primarily engaged in the above activities are classified in 4821 - Telecommunication Carriers Industry, in 9111 - Hotels and Motor Hotels, in Industry Group 454 - Water Transport Industries or in - Railroad Rolling Stock Industry. Establishments primarily engaged in railway construction are classified in 4129 - Other Heavy Construction and those primarily engaged in operating street railways are classified in 4571 - Urban Transit Systems Industry.
4532	**Service Industry Incidental to Railway Transport**
	Establishments primarily engaged in providing services incidental to railway transport.

The following tables document the Statistics Canada data that will be employed to evaluate the direct impacts of the marine transport industry relative to the air, rail, and trucking transport industries.

Table A.4 Data on Value Added to Gross Domestic Product

1980 SIC-E Code	Industry	Description	CANSIM Series	Range	Freq
454	Water Transport Industries	Gross Domestic Product (GDP) at Factor Cost in 1992 constant dollars, Dollars; Canada; Water Transportation and Related Services Industries	V328820	1961-2000	Annual
451	Air Transport Industries	Gross Domestic Product (GDP) at Factor Cost in 1992 constant dollars, Dollars; Canada; Air Transportation and Related Services Industries	V328818	1961-2000	Annual
453	Railway Transport and Related Service Industries	Gross Domestic Product (GDP) at Factor Cost in 1992 constant dollars, Dollars; Canada; Railway Transportation and Related Services Industries	V328819	1961-2000	Annual

Table A.5 Data on Industry Revenue (Sales)

1980 SIC-E Code	Industry	Description	CANSIM Series	Range	Freq
454	Water Transport Industries	Operating Revenue; Water Transport	V231809	1988-1998	Annual
451	Air Transport Industries	Operating Revenue; Air Transport	V231611	1988-1998	Annual
453	Railway Transport and Related Service Industries	Operating Revenue; Rail Transport	V231710	1988-1998	Annual

Table A.6 Data on Industry Costs

1980 SIC E Code	Industry	Description	CANSIM Series	Range	Freq
454	Water Transport Industries	Operating Expenses; Water Transport	V231812	1988-1998	Annual
451	Air Transport Industries	Operating Expenses; Air Transport	V231614	1988-1998	Annual
453	Railway Transport and Related Service Industries	Operating Expenses; Rail Transport	V231713	1988-1998	Annual

Table A.7 Data on Wages

1980 SIC E Code	Industry	Description	CANSIM Series	Range	Freq
454	Water Transport Industries	Average Weekly Earnings (SEPH), Dollars; Canada; All Employees; Including Overtime; Water Transport Industries; Unadjusted	V250662	1983-2000	Monthly
455	Service Industries Incidental to Water Transport	Average Weekly Earnings (SEPH), Dollars; Canada; All Employees; Including Overtime; Service Industries Incidental to Water Transport; Unadjusted	V250663	1983-2000	Monthly
451	Air Transport Industries	Average Weekly Earnings (SEPH), Dollars; Canada; All Employees; Including Overtime; Air Transport Industries; Unadjusted	V250659	1983-2000	Monthly
452	Service Industries Incidental to Air Transport	Average Weekly Earnings (SEPH), Dollars; Canada; All Employees; Including Overtime; Service Industries Incidental to Air Transport; Unadjusted	V250660	1983-2000	Monthly
453	Railway Transport and Related Service Industries	Average Weekly Earnings (SEPH), Dollars; Canada; All Employees; Including Overtime; Railway Transport and Related Service Industries; Unadjusted	V250661	1983-2000	Monthly

Table A.8 Data on Exports

1980 SIC E Code	Industry	Description	CANSIM Series	Range	Freq
454	Water Transport Industries	Canada; Domestic Exports; Water Transport	V4410442	1961-2000	Annual
455	Service Industries Incidental to Water Transport	Canada; Domestic Exports; Services Incidental to Water Transport	V4410443	1983-2000	Annual
451	Air Transport Industries	Canada; Domestic Exports; Air Transportation	V4410439	1961-2000	Annual
453	Railway Transport and Related Service Industries	Canada; Domestic Exports; Railway Transportation	V4410444	1961-2000	Annual

Table A.9 Data on Imports

1980 SIC E Code	Industry	Description	CANSIM Series	Range	Freq
454	Water Transport Industries	Canada; Imports; Water Transport	V4411183	1961-2000	Annual
455	Service Industries Incidental to Water Transport	Canada; Imports; Services Incidental to Water Transport	V4411184	1961-2000	Annual
451	Air Transport Industries	Canada; Imports; Air Transportation	V4411180	1961-2000	Annual
453	Railway Transport and Related Service Industries	Canada; Imports; Railway Transportation	V4411185	1981-2000	Annual

Table A.10 Data on Number of Employees

1980 SIC-E Code	Code	Description	CANSIM Series	Range	Freq
454	Water Transport Industries	Employees; Canada; All Employees; Water Transport Industries; Unadjusted	V248972	1983-2000	Monthly
455	Service Industries Incidental to Water Transport	Employees; Canada; All Employees; Service Industries Incidental to Water Transport; Unadjusted	V248973	1983-2000	Monthly
451	Air Transport Industries	Employees; Canada; All Employees; Air Transport Industries; Unadjusted	V248969	1983-2000	Monthly
452	Service Industries Incidental to Air Transport	Employees; Canada; All Employees; Service Industries Incidental to Air Transport; Unadjusted	V248970	1983-2000	Monthly
453	Railway Transport and Related Service Industries	Employees; Canada; All Employees; Railway Transport and Related Service Industries; Unadjusted	V248971	1983-2000	Monthly

7.2 Detailed I/O Analysis by Province

Table A4.1
Newfoundland and Labrador: Impact of $10 Million Expenditure on Water Transport and Services

DIRECT AND INDIRECT GDP AT BASIC PRICES ($ Thousands)		NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN
INDUSTRIES (SMALL AGGREGATION)														
1	Crop and Animal Production	2	1	3	1	5	4	1	2	2	0	0	0	0
2	Forestry and Logging	0	0	1	0	1	0	0	0	0	0	0	0	0
3	Fishing, Hunting and Trapping	1	0	0	0	0	0	0	0	0	0	0	0	0
4	Support Activities for Agriculture and Forestry	1	0	0	0	0	0	0	0	0	0	0	0	0
5	Mining and Oil and Gas Extraction	26	0	5	0	2	1	0	3	26	7	0	1	0
6	Utilities	28	0	9	3	12	10	0	0	1	0	0	0	0
7	Construction	15	0	19	2	19	4	0	0	1	1	0	0	0
8	Manufacturing	65	1	56	42	74	96	5	2	8	5	0	0	0
9	Wholesale Trade	47	1	36	9	46	80	2	1	6	6	0	0	0
10	Retail Trade	24	0	13	3	9	9	0	0	1	1	0	0	0
11	Transportation and Warehousing	3,701	21	1,438	170	763	120	3	2	5	6	0	0	0
12	Information and Cultural Industries	48	0	26	5	24	28	1	1	3	4	0	0	0
13	Finance, Insurance, Real Estate and Renting and Leasing	129	1	90	14	65	146	1	1	7	6	0	0	0
14	Professional, Scientific and Technical Services	32	0	19	4	23	43	0	0	4	2	0	0	0
15	Administrative and Support, Waste Management and Remediation Services	16	0	13	3	21	21	0	0	2	2	0	0	0
16	Education Services	2	0	1	0	1	0	0	0	0	0	0	0	0
17	Health Care and Social Assistance	9	0	6	0	3	1	0	0	0	0	0	0	0
18	Arts, Entertainment and Recreation	1	0	1	0	1	1	0	0	0	0	0	0	0
19	Accommodation and Food Services	10	0	8	2	6	8	0	0	1	1	0	0	0
20	Other Services (Except Public Administration)	13	0	8	1	7	7	0	0	1	0	0	0	0
21	Operating, Office, Cafeteria and Laboratory Supplies	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Travel, Entertainment, Advertising and Promotion	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Transportation Margins	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Non-Profit Institutions Serving Households	0	0	0	0	0	0	0	0	0	0	0	0	0
25	Government Sector	149	0	74	8	54	14	0	0	1	1	0	0	0
26	TOTAL	**4,320**	**28**	**1,827**	**267**	**1,135**	**592**	**16**	**11**	**68**	**42**	**0**	**1**	**0**

Table A4.2

Prince Edward Island: Impact of $10 Million Expenditure on Water Transport and Services

DIRECT AND INDIRECT GDP AT BASIC PRICES ($ Thousands)		NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN
INDUSTRIES (SMALL AGGREGATION)														
1	Crop and Animal Production	0	6	4	2	4	4	1	2	2	0	0	0	0
2	Forestry and Logging	0	0	1	1	1	0	0	0	0	0	0	0	0
3	Fishing, Hunting and Trapping	0	1	1	0	0	0	0	0	0	0	0	0	0
4	Support Activities for Agriculture and Forestry	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Mining and Oil and Gas Extraction	31	0	7	1	2	1	0	2	23	6	0	1	0
6	Utilities	1	4	15	10	8	10	0	0	1	0	0	0	0
7	Construction	1	12	29	4	10	5	0	0	1	1	0	0	0
8	Manufacturing	18	29	98	47	74	92	4	2	8	5	0	0	0
9	Wholesale Trade	3	30	54	15	39	90	2	1	5	5	0	0	0
10	Retail Trade	1	22	21	5	6	9	0	0	1	1	0	0	0
11	Transportation and Warehousing	84	3,730	2,531	265	361	104	6	3	7	9	0	0	0
12	Information and Cultural Industries	2	36	40	6	16	28	1	1	3	4	0	0	0
13	Finance, Insurance, Real Estate and Renting and Leasing	5	101	145	21	39	146	1	1	7	5	0	0	0
14	Professional, Scientific and Technical Services	2	23	32	7	16	46	0	0	2	2	0	0	0
15	Administrative and Support, Waste Management and Remediation Services	1	12	19	7	14	22	0	0	2	2	0	0	0
16	Education Services	0	1	1	0	0	0	0	0	0	0	0	0	0
17	Health Care and Social Assistance	0	6	11	1	2	1	0	0	0	0	0	0	0
18	Arts, Entertainment and Recreation	0	1	1	0	1	1	0	0	0	0	0	0	0
19	Accommodation and Food Services	1	8	12	3	4	8	0	0	1	1	0	0	0
20	Other Services (Except Public Administration)	1	12	13	2	5	7	0	0	1	1	0	0	0
21	Operating, Office, Cafeteria and Laboratory Supplies	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Travel, Entertainment, Advertising and Promotion	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Transportation Margins	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Non-Profit Institutions Serving Households	0	0	0	0	0	0	0	0	0	0	0	0	0
25	Government Sector	4	71	118	13	24	13	0	0	1	1	0	0	0
26	TOTAL	**154**	**4,106**	**3,153**	**410**	**626**	**590**	**17**	**13**	**63**	**42**	**0**	**1**	**0**

Table A4.3

Nova Scotia: Impact of $10 Million Expenditure on Water Transport and Services

DIRECT AND INDIRECT GDP AT BASIC PRICES ($ Thousands)		NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN
INDUSTRIES (SMALL AGGREGATION)														
1	Crop and Animal Production	0	1	5	2	3	3	1	1	1	0	0	0	0
2	Forestry and Logging	0	0	2	0	0	0	0	0	0	0	0	0	0
3	Fishing, Hunting and Trapping	0	0	1	0	0	0	0	0	0	0	0	0	0
4	Support Activities for Agriculture and Forestry	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Mining and Oil and Gas Extraction	27	0	12	0	1	1	0	3	22	4	0	1	0
6	Utilities	1	0	29	3	5	11	0	0	1	0	0	0	0
7	Construction	0	0	63	3	3	4	0	0	0	1	0	0	0
8	Manufacturing	3	1	124	30	56	86	4	2	8	5	0	0	0
9	Wholesale Trade	2	1	92	10	24	76	2	1	4	5	0	0	0
10	Retail Trade	1	0	41	3	4	9	0	0	1	1	0	0	0
11	Transportation and Warehousing	44	18	5,294	225	114	175	3	2	6	8	0	3	0
12	Information and Cultural Industries	2	0	83	6	13	28	1	1	3	4	0	0	0
13	Finance, Insurance, Real Estate and Renting and Leasing	3	1	298	16	25	149	1	1	5	5	0	0	0
14	Professional, Scientific and Technical Services	1	0	59	5	12	43	0	0	2	2	0	0	0
15	Administrative and Support, Waste Management and Remediation Services	1	0	38	3	12	23	0	0	2	3	0	0	0
16	Education Services	0	0	3	0	0	0	0	0	0	0	0	0	0
17	Health Care and Social Assistance	0	0	22	0	1	2	0	0	0	0	0	0	0
18	Arts, Entertainment and Recreation	0	0	2	0	0	1	0	0	0	0	0	0	0
19	Accommodation and Food Services	0	1	23	2	2	7	0	0	1	1	0	0	0
20	Other Services (Except Public Administration)	0	0	25	2	4	7	0	0	1	1	0	0	0
21	Operating, Office, Cafeteria and Laboratory Supplies	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Travel, Entertainment, Advertising and Promotion	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Transportation Margins	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Non-Profit Institutions Serving Households	0	0	1	0	0	0	0	0	0	0	0	0	0
25	Government Sector	2	0	255	10	10	17	0	0	1	1	0	0	0
26	TOTAL	**88**	**25**	**6,471**	**322**	**290**	**643**	**14**	**11**	**59**	**40**	**0**	**4**	**0**

Table A4.4

New Brunswick: Impact of $10 Million Expenditure on Water Transport and Services

DIRECT AND INDIRECT GDP AT BASIC PRICES ($ Thousands)		NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN
INDUSTRIES (SMALL AGGREGATION)														
1	Crop and Animal Production	0	1	2	3	4	3	1	1	1	0	0	0	0
2	Forestry and Logging	0	0	1	2	1	0	0	0	0	0	0	0	0
3	Fishing, Hunting and Trapping	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Support Activities for Agriculture and Forestry	0	0	0	1	0	0	0	0	0	0	0	0	0
5	Mining and Oil and Gas Extraction	14	0	4	2	2	2	0	3	19	7	0	1	0
6	Utilities	1	0	8	21	9	10	0	0	1	0	0	0	0
7	Construction	0	1	17	40	7	6	0	0	1	1	0	0	0
8	Manufacturing	2	2	51	67	63	79	3	1	6	4	0	0	0
9	Wholesale Trade	2	1	29	54	38	71	2	1	4	5	0	0	0
10	Retail Trade	1	1	11	31	6	10	0	0	1	1	0	0	0
11	Transportation and Warehousing	50	32	1,229	3,672	265	229	3	2	6	6	0	0	0
12	Information and Cultural Industries	3	2	23	63	18	30	1	1	3	4	0	0	0
13	Finance, Insurance, Real Estate and Renting and Leasing	3	4	77	192	39	157	2	1	5	6	0	0	0
14	Professional, Scientific and Technical Services	1	1	17	49	19	43	0	0	2	2	0	0	0
15	Administrative and Support, Waste Management and Remediation Services	1	1	10	22	18	23	0	0	2	2	0	0	0
16	Education Services	0	0	1	3	0	1	0	0	0	0	0	0	0
17	Health Care and Social Assistance	0	0	5	5	1	2	0	0	0	0	0	0	0
18	Arts, Entertainment and Recreation	0	0	1	1	1	1	0	0	0	0	0	0	0
19	Accommodation and Food Services	1	1	8	20	4	9	0	0	1	1	0	0	0
20	Other Services (Except Public Administration)	0	1	7	16	6	8	0	0	1	0	0	0	0
21	Operating, Office, Cafeteria and Laboratory Supplies	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Travel, Entertainment, Advertising and Promotion	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Transportation Margins	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Non-Profit Institutions Serving Households	0	0	0	0	0	0	0	0	0	0	0	0	0
25	Government Sector	3	1	64	160	24	22	0	0	1	0	0	0	0
26	TOTAL	**82**	**48**	**1,567**	**4,425**	**523**	**704**	**14**	**10**	**52**	**38**	**0**	**1**	**0**

Table A4.5

Quebec: Impact of $10 Million Expenditure on Water Transport and Services

DIRECT AND INDIRECT GDP AT BASIC PRICES ($ Thousands)		NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN
INDUSTRIES (SMALL AGGREGATION)														
1	Crop and Animal Production	0	0	0	0	8	3	1	1	1	0	0	0	0
2	Forestry and Logging	0	0	0	0	1	0	0	0	0	0	0	0	0
3	Fishing, Hunting and Trapping	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Support Activities for Agriculture and Forestry	0	0	0	0	1	0	0	0	0	0	0	0	0
5	Mining and Oil and Gas Extraction	6	0	1	0	6	3	0	4	53	2	0	2	0
6	Utilities	1	0	1	1	64	9	0	0	1	0	0	0	0
7	Construction	0	0	3	0	102	5	0	0	1	1	0	0	0
8	Manufacturing	1	0	9	8	159	100	3	1	6	4	0	0	0
9	Wholesale Trade	0	0	5	2	112	59	2	1	5	4	0	0	0
10	Retail Trade	0	0	2	0	55	10	0	0	1	1	0	0	0
11	Transportation and Warehousing	22	3	231	28	4,650	310	7	4	8	8	0	12	0
12	Information and Cultural Industries	1	0	5	1	136	28	1	1	4	4	0	0	0
13	Finance, Insurance, Real Estate and Renting and Leasing	1	0	14	3	363	107	3	1	6	6	0	1	0
14	Professional, Scientific and Technical Services	1	0	3	1	130	39	0	0	3	2	0	0	0
15	Administrative and Support, Waste Management and Remediation Services	0	0	2	1	82	22	0	0	2	1	0	0	0
16	Education Services	0	0	0	0	4	0	0	0	0	0	0	0	0
17	Health Care and Social Assistance	0	0	1	0	13	3	0	0	0	0	0	0	0
18	Arts, Entertainment and Recreation	0	0	0	0	5	1	0	0	0	0	0	0	0
19	Accommodation and Food Services	0	0	1	1	40	8	1	0	1	1	0	0	0
20	Other Services (Except Public Administration)	0	0	1	0	41	8	0	0	1	0	0	0	0
21	Operating, Office, Cafeteria and Laboratory Supplies	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Travel, Entertainment, Advertising and Promotion	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Transportation Margins	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Non-Profit Institutions Serving Households	0	0	0	0	1	0	0	0	0	0	0	0	0
25	Government Sector	1	0	11	1	437	22	0	0	1	1	0	1	0
26	TOTAL	**36**	**4**	**291**	**48**	**6,410**	**737**	**20**	**14**	**92**	**36**	**0**	**16**	**0**

Table A4.6

Ontario: Impact of $10 Million Expenditure on Water Transport and Services

DIRECT AND INDIRECT GDP AT BASIC PRICES ($ Thousands)		NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN
INDUSTRIES (SMALL AGGREGATION)														
1	Crop and Animal Production	0	0	0	0	4	9	2	2	2	0	0	0	0
2	Forestry and Logging	0	0	0	0	0	1	0	0	0	0	0	0	0
3	Fishing, Hunting and Trapping	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Support Activities for Agriculture and Forestry	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Mining and Oil and Gas Extraction	17	0	1	0	2	9	1	40	183	6	0	18	0
6	Utilities	0	0	1	0	13	55	1	1	2	0	0	0	0
7	Construction	0	0	2	0	17	40	0	1	2	1	0	0	0
8	Manufacturing	1	0	8	6	64	335	5	2	11	5	0	0	0
9	Wholesale Trade	1	0	4	1	35	161	3	2	9	5	0	0	0
10	Retail Trade	0	0	1	0	10	43	0	0	2	1	0	0	0
11	Transportation and Warehousing	27	8	179	25	751	3,650	10	11	17	14	0	4	0
12	Information and Cultural Industries	1	0	3	1	28	94	1	1	4	4	0	0	0
13	Finance, Insurance, Real Estate and Renting and Leasing	2	0	11	3	68	401	3	3	13	8	0	1	0
14	Professional, Scientific and Technical Services	0	0	2	1	26	111	1	1	6	3	0	0	0
15	Administrative and Support, Waste Management and Remediation Services	0	0	1	1	19	61	1	0	4	2	0	0	0
16	Education Services	0	0	0	0	1	3	0	0	0	0	0	0	0
17	Health Care and Social Assistance	0	0	1	0	3	33	0	0	0	0	0	0	0
18	Arts, Entertainment and Recreation	0	0	0	0	1	2	0	0	0	0	0	0	0
19	Accommodation and Food Services	0	0	1	0	7	28	1	0	1	1	0	0	0
20	Other Services (Except Public Administration)	0	0	1	0	8	32	0	0	1	1	0	0	0
21	Operating, Office, Cafeteria and Laboratory Supplies	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Travel, Entertainment, Advertising and Promotion	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Transportation Margins	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Non-Profit Institutions Serving Households	0	0	0	0	0	2	0	0	0	0	0	0	0
25	Government Sector	2	0	8	1	65	214	0	0	1	1	0	0	0
26	TOTAL	**52**	**10**	**225**	**42**	**1,123**	**5,284**	**28**	**65**	**258**	**53**	**0**	**24**	**0**

Table A4.7

British Columbia: Impact of $10 Million Expenditure on Water Transport and Services

DIRECT AND INDIRECT GDP AT BASIC PRICES ($ Thousands)		NF	PEI	NS	NB	QUE	ONT	MAN	SASK	AL	BC	YU	NWT	NUN
INDUSTRIES (SMALL AGGREGATION)														
1	Crop and Animal Production	0	0	0	0	1	2	1	2	5	7	0	0	0
2	Forestry and Logging	0	0	0	0	0	0	0	0	0	4	0	0	0
3	Fishing, Hunting and Trapping	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Support Activities for Agriculture and Forestry	0	0	0	0	0	0	0	0	0	5	0	0	0
5	Mining and Oil and Gas Extraction	1	0	0	0	1	1	0	18	307	93	3	5	0
6	Utilities	0	0	0	0	2	5	0	1	8	45	0	0	0
7	Construction	0	0	0	0	1	3	0	1	4	97	0	0	0
8	Manufacturing	0	0	2	2	22	105	8	8	75	179	0	0	0
9	Wholesale Trade	0	0	1	0	13	44	4	2	29	150	0	0	0
10	Retail Trade	0	0	0	0	1	5	0	0	5	57	0	0	0
11	Transportation and Warehousing	2	1	4	2	12	49	5	5	42	5,413	0	1	0
12	Information and Cultural Industries	1	0	1	1	9	22	1	1	8	110	0	0	0
13	Finance, Insurance, Real Estate and Renting and Leasing	0	0	1	0	16	87	3	2	28	421	0	0	0
14	Professional, Scientific and Technical Services	0	0	0	0	4	31	1	1	15	109	0	0	0
15	Administrative and Support, Waste Management and Remediation Services	0	0	0	0	6	18	1	0	8	65	0	0	0
16	Education Services	0	0	0	0	0	0	0	0	0	3	0	0	0
17	Health Care and Social Assistance	0	0	0	0	0	1	0	0	0	16	0	0	0
18	Arts, Entertainment and Recreation	0	0	0	0	0	0	0	0	0	4	0	0	0
19	Accommodation and Food Services	0	0	0	0	1	4	1	0	4	38	0	0	0
20	Other Services (Except Public Administration)	0	0	0	0	1	5	0	0	4	41	0	0	0
21	Operating, Office, Cafeteria and Laboratory Supplies	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Travel, Entertainment, Advertising and Promotion	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Transportation Margins	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Non-Profit Institutions Serving Households	0	0	0	0	0	0	0	0	0	1	0	0	0
25	Government Sector	0	0	0	0	3	7	0	0	3	304	0	0	0
26	TOTAL	**4**	**1**	**9**	**7**	**94**	**390**	**27**	**44**	**546**	**7,161**	**4**	**6**	**0**