Truck Freight Crossing the Canada-U.S. Border

An Analysis of the Cross-Border Component of the 1999 Canadian National Roadside Study

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23 September 2002

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Preface

This study, produced by the Eastern Border Transportation Coalition (EBTC), is an assessment of the Canada-U.S. component of Transport Canada's 1999 National Roadside Study (NRS) of trucks traveling throughout Canada.

The NRS, coordinated by the Canadian Council of Motor Transport Administrators (CCMTA) and conducted by the individual provinces and territories, was also conducted in 1991 and 1995. Those studies were designed primarily to provide data on truck travel throughout Canada and, because most of the survey stations were located at weight stations and highway locations some distance from the border, they yielded only limited information on Canada-U.S. travel.

In order to obtain more comprehensive information on truck travel between Canada and the U.S., EBTC developed arrangements with CCMTA, Transport Canada and the Federal Highway Administration (FHWA) of the U.S. Department of Transportation to supplement the planned 1999 NRS with additional surveys at the U.S.-Canada border crossings and to retain a consultant to prepare this report. FHWA established a pooled account to finance the project with State Planning Research funds provided by the state transportation departments of Maine, Michigan, New York and Vermont, which are EBTC members, plus Minnesota and Washington. Transport Canada, FHWA, the Michigan Department of Transportation and the Southeast Michigan Council of Governments provided contractual and administrative support.

Truck travel in both directions was surveyed on the Canadian side of Maine's border crossings with New Brunswick and Quebec; Vermont's crossings with Quebec; New York's crossings with Quebec and Ontario; Michigan's crossings with Ontario; Minnesota's crossings with Ontario; and Washington's crossings with British Columbia.

The information in this report on U.S.-Canada truck freight covers origin and destination, major Canada-U.S. truck freight routes, commodity classification, weight and value and truck volumes by state/province and major border crossing. EBTC

plans to follow this report with a study of U.S.-Canada rail freight and a survey of freight moving through intermodal and freight transfer locations.

The period between administration of the truck freight surveys and the data processing, analysis and projection required for preparation of this report has seen a peaking of the longest period of substantial North American economic growth in history, followed by a decline from that peak — and a terrorist attack on the U.S. that has brought major changes in the inspection and processing of freight crossing the border. We are reminded forcefully that projecting the future is a risky endeavor. While a forecast of future demand is a key product of this study, it also helps us understand the trends and relationships that have contributed to current conditions — and the relationships and trends that we should monitor to help us improve our ability to predict.

Numerous agencies, organizations and individuals on both sides of the border have contributed to this project. Most importantly the members of the Eastern Border Transportation Coalition, who represent the state and provincial transportation agencies of Maine, Michigan, New Brunswick, Newfoundland and Labrador, Nova Scotia, New York, Ontario, Prince Edward Island, Quebec and Vermont; the metropolitan planning organizations of the Buffalo and Detroit areas; the Regional Municipality of Niagara; and the representatives of British Columbia, Minnesota and Washington who also participated in the study.

Current* and past EBTC Board members and representatives include:

- Maine: *Kevin Rousseau, past U.S. Co-Chair
- Michigan: *Kris Wisniewski, U.S. Co-Chair; Connie Morrison, Past Treasurer; Terry Gotts
- New Brunswick: * Doug Johnson, Canadian co-chair; Walter Steeves, past Treasurer
- Newfoundland and Labrador: *Tom Beckett, past Canadian Co-Chair
- New York: *Tim Gilchrist, Doug Spring, Treasurer; Jerry Cioffi
- Nova Scotia: *Don Stonehouse
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- Prince Edward Island *Jake Bartlett, Secretary; Gordon Tufts
- Quebec: *Benoit Cayouette, Jean-Francois Ryan, Louise Bourque, Rafael Sanchez
- Vermont: *Karen Songhurst, Bruce Bender
- Southeast Michigan Council of Governments: *Carmine Palombo, Alex Bourgeau
- Greater Buffalo-Niagara Regional Transportation Council: *Hal Morse, Tim Trabold
- Regional Municipality of Niagara: *Bob Johnson

Representatives of participating states and provinces:

- British Columbia: Toivo Suurkask, Patrick Cruickshank
- Minnesota: Bob Gale
- Washington: John Doyle, Greg Selstead

Particular mention must also be made of several key supporters and colleagues:
Harry Caldwell and Roger Petzold, Federal Highway Administration
Clement Thomas, Transport Canada
Bill Harbour, Canadian Council of Motor Transport Administrators
Rob Tardif, Ministry of Transportation of Ontario
Donald Fallu, Geneviève Cöté, France-Serge Julien, Johanne Thiffault, and Luc Deneault, Québec Ministry of Transportation

Special thanks as well to the members of the Bridge and Tunnel Operators Association and other crossing operators who permitted the use of their plazas and facilities to conduct the surveys; and to the Canadian customs and immigration officials whose cooperation was so important to carrying out the project.

I express my personal thanks and acknowledgement to our consultant, Rick Donnelly of Parsons Brinckerhoff. His expertise and professionalism throughout the project was matched only by his patience with the unanticipated delays occasioned by the need to be sure that the massive data base was ready for him to begin preparing this report.

Border Security

Border security was not an element of this study. However, the terrorist attacks of September 11, 2001 have required heightened security throughout the U.S. and Canada and brought major changes to the processing and inspection of individuals and vehicles crossing the border. These changes have increased the need for infrastructure, staffing and other border improvements considerably beyond those that will be required to meet the increased truck volumes this study forecasts.

It is imperative to increase security at the U.S.-Canada border: to apprehend terrorists and other illegals; to prevent the smuggling of explosives and other dangerous materials; and to protect the border crossing facilities and people who work at and travel through them.

These are by no means new requirements. The difference since September 11, 2001 is the degree of threat that must be dealt with while facilitating the legitimate movement of people and goods across the border as smoothly, speedily, and efficiently as possible.

The governmental responsibility for meeting these objectives is shared by a number of federal agencies in each nation as well as state/provincial and local entities. Private sector involvement ranges from border crossing operators, manufacturers and shippers and their organizations to individuals who cross the border for business and personal reasons. Cooperation and information sharing are critical.

The recommendations outlined in the U.S./Canada Smart Border Declaration[1] warrant most serious consideration as an important step in identifying funding and administrative actions to meet the added security imperatives, while maintaining projected growth in U.S.-Canada trade and facilitating the movement of people

and goods between the two nations. The terrorist attacks of September 11, 2001 targeted the entire North American economy, not solely the World Trade Center and the Pentagon. Combating terrorism requires the continuation of a strong economy, of which U.S.-Canada cross-border trade is an integral part.

Irving J. Rubin
Executive Director, Eastern Border Transportation Coalition
September, 2002

1. The Smart Border Declaration, signed December 12, 2001 by the Honorable John Manley, Canadian Minister of Foreign Affairs and Governor Tom Ridge, Director of the U.S. Office of Homeland Security. The declaration outlines a 30-point action plan to "...collaborate in identifying and addressing the security risks while efficiently and effectively expediting the legitimate flow of people and goods back and forth across the Canada-US. Border."

CHAPTER 1

Overview of the 1999 National Roadside Study

The United States and Canada are each others largest trading partner. Trade and traffic between the countries, especially by land transportation, has been increasing at a rapid rate over the past 25 years. In 1999 it exceeded US$1 billion per day. In fact, the growth rate and increase in total number of vehicles exceeds those crossing the U.S.-Mexico border, although the latter often receives more attention in the media and in Congress.

Due to this growth, several attempts have been made in recent years to learn more about the people and goods flowing across the U.S.-Canada border. The efforts described in this report have focused upon learning more about truck traffic between the two countries. A description of the data collection process and general statistical summaries are provided, followed by more detailed analyses and forecasts of flows by state, province, and the 22 major border crossings. Lastly, recommendations are presented for interpreting these findings and to aid future data collection efforts.

This study was funded by the Eastern Border Transportation Coalition (EBTC), a non-profit group of representatives of the constituent state and provincial transportation agencies from Michigan and Ontario eastward and two non-member states (Minnesota and Washington), with support from the two federal governments. The EBTC has enjoyed considerable interaction with other public and private groups along the border, making it an effective forum for advancing the knowledge and awareness of issues surrounding transportation between the two countries.

Data analyzed in this report were collected in Canada. The provinces were responsible for data collection under the direction of Transport Canada. The EBTC members and others provided financial support through state planning funds. Without this collaborative effort, this collection of trade-related data in both directions across our borders would not have been possible.

The findings of this study augments previous work in this area. In 1996 and 1997 the EBTC completed studies of trade and traffic flows across the eastern border

using publicly available foreign trade statistics provided by both countries. The resulting report, published in two volumes, attempted to portray a complete picture of surface transportation flows between the two countries, institutional and infrastructure constraints affecting such movements, and likely future demands upon the system. Several key findings of the earlier study focused on the limitations of the foreign trade data for transportation planning purposes. These data were more geographically abstract than required, lacked information about commodity or payload weight, and did not distinguish between individual crossings. Moreover, many logistics managers in the auto industry asserted that the data more accurately depicted the flow of dollars rather than the flow of goods. This seemed to be borne out by the analyses conducted for that report.

A key recommendation, both from the earlier EBTC reports and a subsequent conference held in Toronto in the summer of 1997, was that other avenues of data collection should be explored. The most promising source was the Canadian National Roadside Study (NRS), an intercept survey of truck operators conducted by the provinces about every four years. These surveys, coordinated by the Canadian Council of Motor Transport Administrators (CCMTA), sought to obtain a representative sample of data on truck movements on Canadian roadways.

Through subsequent discussions with the CCMTA and representatives of the various provincial Ministries of Transportation, it was determined that the NRS could be extended to improve the data on movements near or across the U.S.-Canada border. The EBTC members and Minnesota and Washington, working through the Federal Highway Administration, put in place funding in 1998 to collect data at these additional sites. The majority of the data from these sites were collected in September and October of 1999.

The survey collected comprehensive data about the time and place each survey was conducted; the observed physical characteristics of the truck; and responses about truck ownership, configuration, operation, cargo, origins, destinations, intermediate stops, weight, and other attributes. About 65,000 observations were collected nationwide across Canada, with up to 440 fields of data included for each. The process of editing, cleaning, and expanding these data was a complex and time-consuming undertaking. The EBTC contributed to this process in several areas, including the coding of commodities to the Standard Classification of Transportable Goods (SCTG) and the geocoding of U.S. place names. The final data were delivered to the EBTC at the end of September, 2001.

A total of 24,409 survey records were included in the EBTC dataset prepared by CCMTA. The data included observations collected at forty sites partially or wholly funded through the EBTC, as well as data collected at sites in the interior of Canada for trucks that crossed the U.S.-Canada border. A total of 213 observations from data collection sites in the interior of Canada were excluded because there was no evidence that the trip crossed the U.S.-Canada border. The EBTC survey locations are shown in Figure 1, and are listed in Table 1. By prior agreement between the parties, data that would identify the respondent, shipper, or recipient of the shipment were omitted. The exact address of the origin or destina-

Table 1: Major U.S.-Canada border crossings

Two-way annual trucks	Per-cent	Prov	Major Crossing	2000 two-way annual trucks[a]	Per-cent	State	Two-way annual trucks	Per-cent
446,508	3.7	NB	St Stephen-Calais	239,508	2.0	ME	567,616	4.7
			Woodstock-Houlton	207,000	1.7			
1,471,430	12.1	PQ	Saint-Theophile-Jackman	121,108	1.0	VT	574,322	4.7
			Rock Island-Derby Line	266,966	2.2			
			Saint-Armand-Highgate Springs	307,356	2.5			
8,753,203	71.8	ON	Lacolle-Champlain	776,000	6.4	NY	3,966,979	32.5
			Cornwall-Seaway Intl Bridge	131,203	1.1			
			Prescott-Ogdensburg	57,757	0.5			
			Lansdowne-Thousand Isl Bridge	542,703	4.5			
			Lewiston-Queenston Bridge	1,019,492	8.4			
			Peace Bridge	1,439,824	11.8			
			Ambassador Bridge	3,486,110	28.6	MI	5,405,768	44.3
			Detroit-Windsor Tunnel	205,015	1.7			
			Blue Water Bridge	1,576,839	12.9			
			Sault Ste Marie	137,804	1.1			
			Thunder Bay-Grand Portage	64,193	0.5	MN	352,870	2.9
			Fort Frances-International Falls	92,263	0.8			
196,414	1.6	MB	Emerson-Noyes	196,414	1.6			
1,323,966	10.9	BC	Osoyoos-Oroville	64,812	0.5	WA	1,323,966	10.9
			Huntingdon-Sumas	186,513	1.5			
			Aldergrove-Lynden	120,646	1.0			
			Douglas-Blaine	951,995	7.8			
12,191,521	100		Total[b]	12,191,521	100		12,191,521	100

a. Sources: BTOA (1999) for bridges and tunnels; NYSDOT (2001) for Lacolle-Champlain, Cornwall-Seaway, Prescott-Ogdensburg, and Lansdowne-Thousand Islands; and Mission Support Services, U.S. Customs Service (2001) for all other crossings.

b. Some percentages may not round exactly to 100 percent due to rounding.

tion also was not provided. Information on origins, destinations, and stops within Canada is limited to the Canadian Census Division of the trip end.

Many of the data attributes collected in the NRS were not used in our analyses. For example, data on axle spacing and configuration, detailed characteristics of the truck and trailer, and similar information are too detailed for our level of analyses. However, certain attributes were considered essential for use in our analyses. Each record had to contain valid information about the origin and destination of the trip, as well as weight and commodity carried. An additional 2,892 observations were excluded because they did not include these essential attributes, leaving 21,304 usable observations.

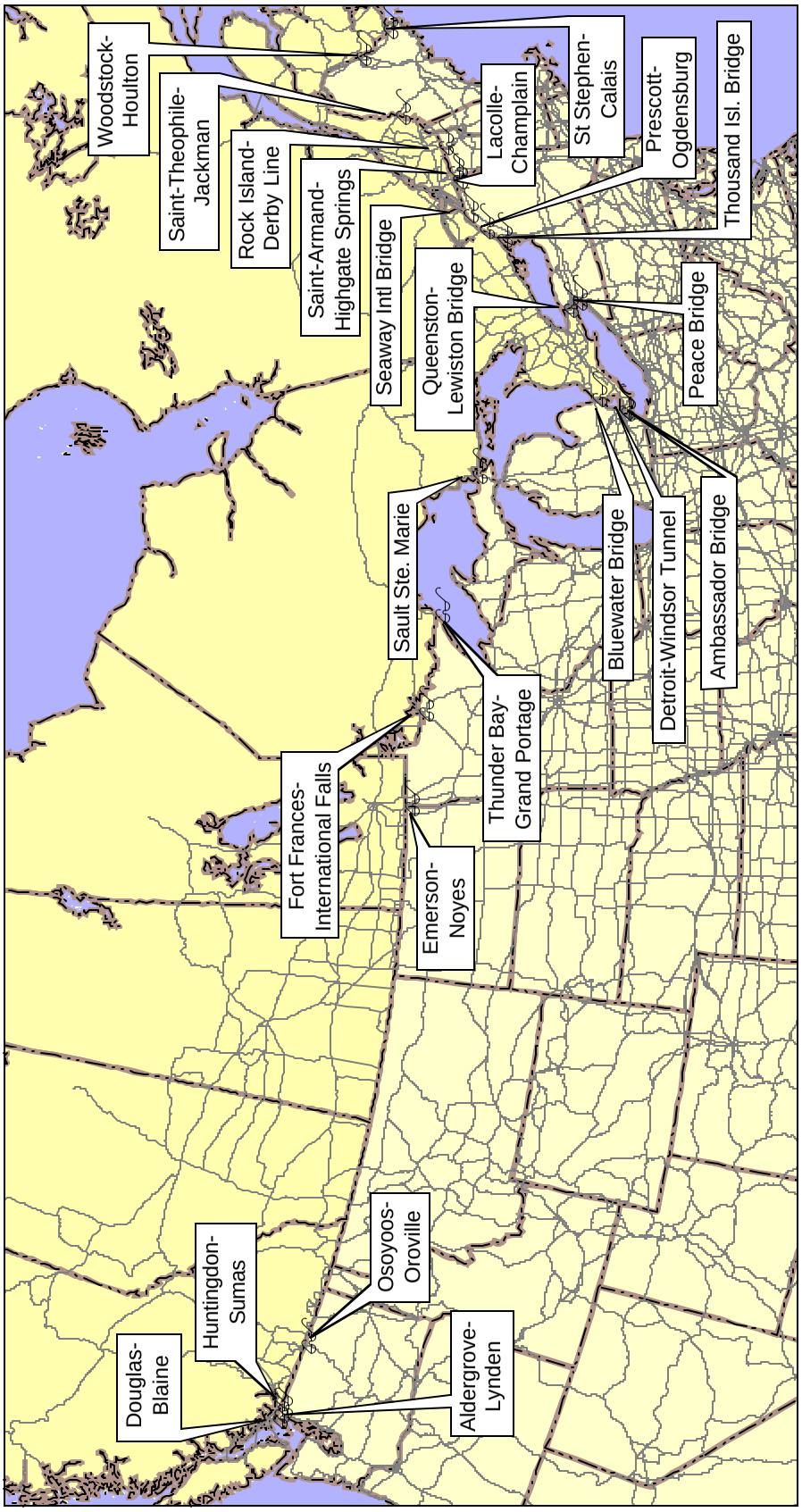

Figure 1: Major Canada-U.S. truck crossings

Additional processing of these data was required before we could begin our analyses. These steps included:

- *Consolidation of the data into a single database*. The CCMTA provided the data in several files, owing to the large number of columns and number of observations. A total of 44 attributes (database fields) were retained unaltered, and another seven fields were constructed by merging the place name and jurisdiction (state or province) for the truck base, commodity origin and destination, trip origin and destination, and previous and next stops. Finally, a revised commodity classification code was appended to each record.
- *Geocoding of the trip ends*. The trip ends include the data collection site (DCS), the place where the trip entered or left Canada, the place where the trip entered or left the province of the DCS, trip origin and destination, commodity origin and destination, and the previous and next stop. However, not all trip ends had been coded for all trips. Some trip reports did not include all places, and values were missing for other observations. Trip ends in Canada were already coded by the CCMTA to either DCS, port of entry or exit (to or from Canada or the province), or Canadian Census Division. The U.S. placenames on each record had to be coded to the U.S. county of the trip end. This process involved editing or correcting the spelling of about 15 percent of the data.
- *Decision about excluding the observation*. As previously noted, a valid origin, destination, weight, and commodity were required for all records to be used in our analyses. After geocoding it was possible to check whether these four key attributes were valid.
- *Geocoding of border crossings*. Half of the observations were collected at data collection sites at or very close to the border. Another quarter of the data included information in another field (place entering or leaving Canada, or entering or leaving the province) which revealed the border crossing used. The remaining quarter of the observations had to be manually coded to one or more border crossings. We used all of the geographic information available for each observation to infer the likely border crossing used.
- *Recalculating the expansion factors*. Site and national expansion factors for each observation were derived by the CCMTA. The methodology for the expansion was developed by Statistics Canada, and is complex owing to the need to account for trips potentially passing through two or more data collection sites. We used a simpler method to recalculate the expansion factors for each hour and direction with the rejected observations removed. It ensured that the sum of the recalculated expanded trips without the rejected observations equaled the sum of the original expanded trips with the rejected trips for each DCS.
- *Estimation of commodity value*. Information about the value of the commodity carried was not collected as part of the NRS. In most instances the driver did not know the value of the cargo. The value of shipments was estimated using, and ultimately constrained to, the foreign trade statistics reported in the USDOT Transborder Surface Freight Data for the same week(s) that the data were collected at each site.

The resulting database of cross-border movements was used for the analyses in this report. The database itself will be delivered to the EBTC, Minnesota and Washington transportation agencies, and the Federal Highway Administration, allowing further research and analyses by their members.

CHAPTER 2

Analysis of the Survey Data

A key goal of EBTC participation in the NRS was to gain a deeper and more meaningful insight into the dynamics of truck flows across the U.S.-Canada border. By collecting the typical information (origin, destination, commodity, etc.) at a greater level of detail, as well as many attributes never captured before, we can portray a much clearer picture than previously possible. The NRS data provides better and more precise information than available from foreign trade statistics or truck counts at border crossings. Because the NRS is a sample survey of the total flows across the border for a small time period, it is necessary to infer the characteristics of the entire population of truck movements across the border from these observations. Care must be taken when interpreting such statistics, especially when comparing them to published data based on the foreign trade data. Nonetheless, the relationships revealed in the NRS add considerably to our knowledge about cross-border truck flows.

The survey data were collected in the fall of 1999 at 238 sites throughout Canada, including 40 EBTC-funded sites at or near the border. Each site captured traffic flowing in one direction on the surveyed roadway. The data were collected within the span of one week at each location, although the hours of collection and sampling rate varied by location. Truck counts by direction were also collected at each site during the entire survey week. A weight is calculated for each observation such that the sum of the weights for any given period equals the counted trucks (both surveyed and not) passing by the survey location. This process, also known as survey expansion, is complicated in this case because each observation (surveyed truck trip) could have passed through more than one survey location. The expansion process has to take that into account in order to assign a truly representative weight to each observation.

The expansion factors calculated for this survey are quite variable. The mean expansion factor for the 21,304 observations used in our analyses was 12.3, while the median was 7.1. A mean factor of 12 means that, on average, an observation represents 12 trucks that were counted as having crossed the border during a survey period, but only one of them was sampled (surveyed). Sites with lower truck

volumes tended to have lower expansion factors, while higher volume sites had correspondingly higher expansion factors. These 21,304 observations represent about 262,800 trips that were estimated to cross the U.S.-Canada border during a typical week in the fall of 1999. The analyses reported in this chapter are based on that time period.

The remainder of this chapter focuses upon national trends portrayed in these data. A more detailed examination of these trends for individual states, provinces, and border crossings can be found in later chapters.

Flows by Border Crossing

A total of 40 data collection sites were located at or near the U.S.-Canada border crossings. Almost all of the truck flows across the border (some 97 percent) crossed at the 22 major crossings shown in Table 2. The dominance of the Detroit and Buffalo crossings is illustrated in Figure 2, which depicts the percentage of flows by major border crossings.

The weekly number of trucks and the cargo tonnage are shown in Table 2. Reliable data on weights, either for trucks or their contents, are not available from traditional trade flow statistics. The average cargo weight for tractor-trailer combinations (93 percent of the surveyed trucks) was 12.6 metric tons[1] (11.4 short tons). Combined with an average empty weight of 12.7 metric tons (11.5 short tons), the average tractor-trailer crossed the border weighing 25.3 metric tons (23.0 short tons, or 46,000 pounds). This was considerably lighter than reported on the U.S.-Mexico border. This was probably due to the higher value/weight ratio of goods crossing the northern border, as well as the large amount of just-in-time trucking supporting the auto industry.

Single-unit (straight) trucks encountered in the NRS were surveyed almost exclusively at the Detroit-Windsor and Buffalo-Niagara crossings. The average cargo weight was 2.3 metric tons (2.1 short tons, or 4,200 pounds). The average total vehicle weight for single-unit trucks was 6.4 metric tons (5.8 tons, or 11,600 pounds).

A summary of the value for each of the 22 major crossings is shown in Table 3. A comprehensive overview of the flows at each of the 22 major truck crossings can be found in Chapter 5.

Attribution of Trade Value

Data on the shipment value were not collected as part of the NRS. It was thought that drivers would not know the value of the shipment. Value-weight ratios from Statistics Canada trade data were initially used to impute the value of each ship-

1. The commodity weights were reported in kilograms; one metric tons is equal to 1000 kilograms, or 2204.6 pounds. U.S. trade flow statistics are commonly reported in short tons, which are equal to 2000 pounds.

Table 2: Weekly tonnage and trucks crossing at major Canada-U.S. border crossings

Metric tons	Percent	Trucks	Percent	Province	Crossing	Metric tons	Short tons	Percent	Trucks	Percent	State	Short tons	Percent	Trucks	Percent
71,423	2.6	7,254	2.8	NB	St Stephen-Calais	30,091	33,169	1.1	3,134	1.2	ME	101,914	3.4	8,875	3.4
					Woodstock-Houlton	41,332	45,560	1.5	4,120	1.6					
296,712	10.6	25,744	9.7	PQ	Saint-Theophile-Jackman	21,034	23,185	0.8	1,621	0.6					
					Rock Island-Derby Line	45,961	50,663	1.6	3,765	1.4	VT	109,109	3.5	9,063	3.4
					Saint-Armand-Highgate Springs	53,022	58,446	1.9	5,298	2					
					Lacolle-Champlain	176,695	194,771	6.3	15,060	5.7	NY	989,229	32.1	81,605	31.2
					Seaway International Bridge	23,319	25,704	0.8	2,516	1					
					Prescott-Ogdensburg	13,234	14,588	0.5	1,517	0.6					
					Thousand Island Bridge	161,131	177,615	5.8	11,789	4.5					
					Lewiston-Queenston Bridge	183,612	202,395	6.6	20,098	7.7					
					Peace Bridge	339,432	374,156	12.1	30,625	11.7					
1,887,219	67.6	184,247	70.3	ON	Ambassador Bridge	688,950	759,429	24.7	73,141	27.9	MI	1,198,944	39.0	108,086	41.2
					Detroit-Windsor Tunnel	37,235	41,044	1.3	3,672	1.4					
					Blue Water Bridge	318,104	350,646	11.4	28,896	11					
					Sault Ste Marie	43,387	47,825	1.6	2,377	0.9					
					Thunder Bay-Grand Portage	33,939	37,411	1.2	2,938	1.1	MN	193,689	6.3	15,744	5.9
					Fort Frances-International Falls	44,876	49,466	1.6	6,678	2.5					
96,899	3.5	6,128	2.3	MB	Emerson-Noyes	96,899	106,812	3.5	6,128	2.3					
					Osoyoos-Oroville	18,290	20,161	0.7	2,133	0.8					
306,158	11.0	30,082	11.4	BC	Huntingdon-Sumas	67,343	74,232	2.4	6,563	2.5	WA	337,478	11.0	30,082	11.4
					Aldergrove-Lynden	36,505	40,239	1.3	3,248	1.2					
					Douglas-Blaine	184,020	202,846	6.6	18,138	6.9					
136,163	4.9	9,142	3.5		All others[a]	136,163	150,093	4.9	9,142	3.5		150,093	4.9	9,142	3.5
2,794,574	100	262,597	100		Total[b]	2,794,574	3,080,456	100	262,597	100		3,080,456	100	262,597	100

a. Includes some small volume crossings in the states and provinces shown, as well as in states and provinces not otherwise listed.
b. Some percentages may not round exactly to 100 percent due to rounding. The totals shown include in-bond shipments passing through each country.

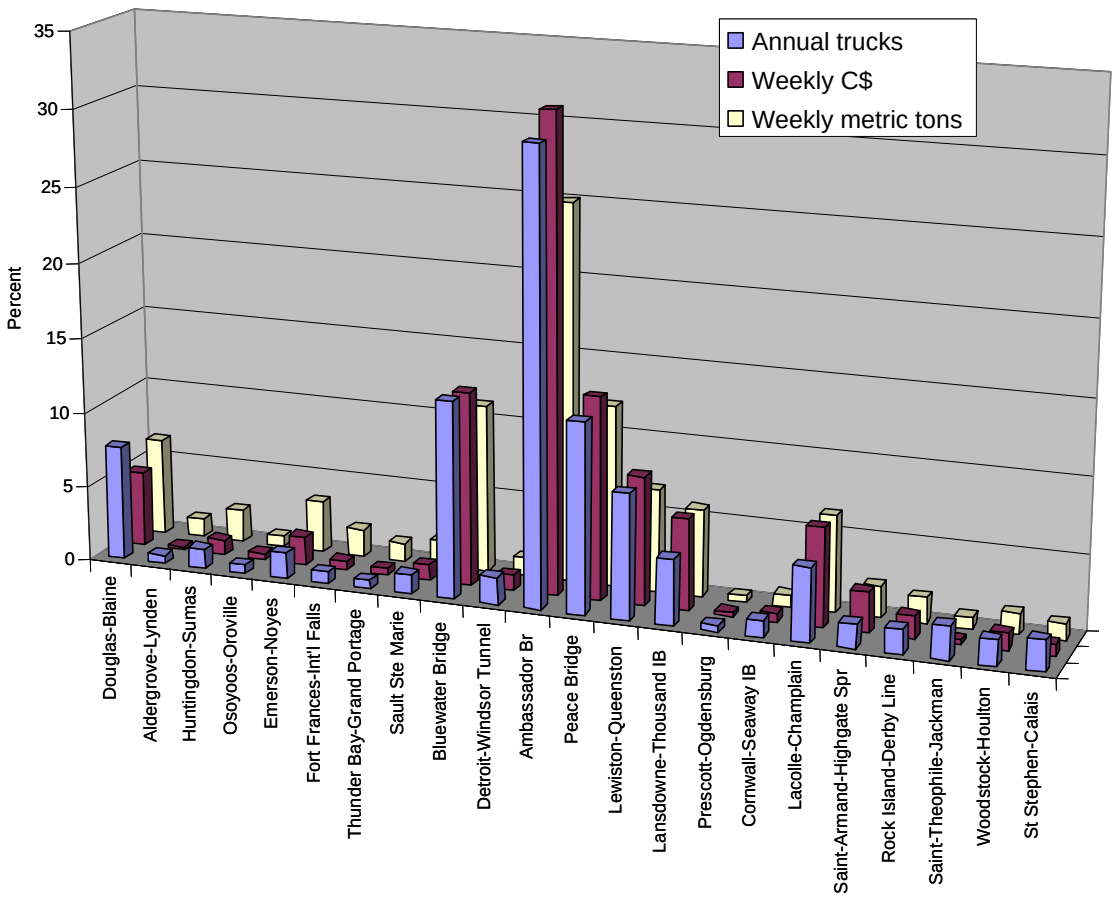

Figure 2: Bidirectional weekly flows at major Canada-U.S. truck crossings

ment. These ratios were derived for each commodity classification. When these values were attributed to the data the resulting estimate of bilateral trade was significantly higher than reported in the trade statistics for the same period.[2]

Some of the difference can be attributed to the re-export[3] of goods between Canada and the U.S. These flows are not subject to tariffs and not reported in the trade flow statistics. The apparent incidence of these re-export flows is quite significant. Almost all of the analyses of cross-border freight conducted to date have relied in part on published trade flow statistics. The economic value attached to border crossing improvements and other investments is predicated upon those published values. If the value imputed to the NRS data are accurate, it would appear that

2. Estimated from the USDOT Transborder Surface Freight Data for the months of July through December, 1999. The weekly average was obtained by assuming that the reported monthly flows occurred evenly over the month.
3. A re-exported good is one that is assembled in one country, wholly or partially from components manufactured in another country, and then exported back to the country the components came from. The auto industry is an example of this, where parts manufactured in the U.S. are assembled into automobiles in Canada. The assembled auto is then exported back into the U.S. The customs duties levied on such flows are only for the value added in Canada.

Table 3: Weekly value of motor freight crossing at major Canada-U.S. border crossings[a]

Value (Canadian $)	Percent	Province	Crossing	Value (Canadian $)	Value (U.S. $)[b]	Percent	State	Value (U.S. $)[b]	Percent
118,831,916	1.6	NB	St Stephen-Calais	62,818,026	42,382,790	0.9	ME	88,293,696	1.8
			Woodstock-Houlton	56,013,890	37,792,097	0.8			
694,504,238[c]	9.6	PQ	Saint-Theophile-Jackman	12,033,364	8,118,809	0.2	VT	168,502,734	3.4
			Rock Island-Derby Line	55,676,872	37,564,714	0.8			
			Saint-Armand-Highgate Springs	194,071,096	130,938,020	2.7			
			Lacolle-Champlain	432,722,906	291,954,481	6.0	NY	1,588,653,089	32.4
5,392,656,223	74.2	ON	Seaway International Bridge	16,382,444	11,053,096	0.2			
			Prescott-Ogdensburg	17,237,829	11,630,217	0.2			
			Thousand Island Bridge	314,331,468	212,076,780	4.3			
			Lewiston-Queenston Bridge	614,342,218	414,491,493	8.5			
			Peace Bridge	959,619,308	647,447,022	13.2			
			Ambassador Bridge	2,430,018,674	1,639,513,025	33.4	MI	2,329,197,068	47.5
			Detroit-Windsor Tunnel	77,873,318	52,540,468	1.1			
			Blue Water Bridge	901,357,819	608,138,489	12.4			
			Sault Ste Marie	42,990,144	29,005,086	0.6			
			Thunder Bay-Grand Portage	8,831,357	5,958,442	0.1	MN	15,087,671	0.3
			Fort Frances-International Falls	9,671,644	6,525,376	0.1			
3,859,324	0.1	MB	Emerson-Noyes	3,859,324	2,603,853	0.1			
374,509,221	5.2	BC	Osoyoos-Oroville	27,133,623	18,306,826	0.4	WA	252,678,201	5.2
			Huntingdon-Sumas	36,311,225	24,498,876	0.5			
			Aldergrove-Lynden	1,931,146	1,302,928	0.0			
			Douglas-Blaine	309,133,227	208,569,571	4.3			
681,695,633	9.4		All others[d]	681,695,633	459,934,378	9.4		459,934,378	9.4
7,266,056,555	100		Total[e]	7,266,056,555	4,902,346,837	100		4,902,346,837	100

a. Source: Average weekly values from USDOT Transborder Surface Trade Data for August through October, 1999. Unlike Table 2, the values shown do not include in-bond or tariff-exempt shipments between or passing through the two countries.
b. Assumed currency exchange rate of US$1=C$1.486. Source: http://www.bankofcanada.ca/en/exchange.htm.
c. The import portion of this value is lower than actual because imports from the U.S. are attributed to the province of clearance (where the freight enters Canada and is cleared), rather than to the province of destination. See pages 12 and 13 and footnotes 4 and 5 for detailed discussion.
d. Includes some small volume crossings in the states and provinces shown, as well as in states and provinces not otherwise listed.
e. Some percentages may not round exactly to 100 percent due to rounding.

analyses based upon trade data significantly understates the total value of goods flowing between the two countries. As free trade between the two countries expands these untracked movements will increase, further widening the gap between published trade statistics and actual movements across the U.S.-Canada border.

Despite the likely presence of re-exported goods (which can explain some but not all of the difference), it was felt that the value estimates were unacceptably high, which would distract from the important findings of the study. The Transborder Surface Freight Data (TSFD) published by the USDOT have been used in their place to assess the value of goods moving across the border. The discussion and reporting of value in this and subsequent chapters are based upon these data, while information about the weight and truck flows are derived from the NRS.

Province of Clearance[4]

Employing the TSFD in place of value estimates from the expanded NRS exposed a significant weakness in the trade statistics. Canada and the U.S. exchange trade data, resulting in a consistent reporting of trade between them. However, Statistics Canada and the Institut de la Statistique du Québec (ISQ) also produce statistics on trade between the U.S., Canada, and Québec. Although the TSFD and Statistics Canada trade data are usually in agreement, the ISQ trade data sometimes differ considerably from data published by these two sources. For that reason, the Québec Ministry of Transportation hired a consultant to examine the three methodologies used to estimate trade between the U.S., Canada, and Québec, and to make recommendations with respect to the adequacy of the data for analysis of commercial exchanges.

Although both Statistics Canada and the TSFD statistics are based on Customs data, they do not share the same data collection method. Statistics Canada's methodology for coding Canadian imports considers the province of clearance as the destination. The TSFD, by contrast, uses the actual destination state to code the import. Thus, the TSFD correctly attributes the state of destination but not the province of destination to which the goods are shipped. Since each country uses import data from the other in lieu of its own exports data, the end result is that Canada's imports (U.S. exports) do not always reflect the reality of economic flow between U.S. states and individual Canadian provinces. For example, Québec imports from the Midwest are usually attributed to Ontario destinations, since it is where these flows enter Canada. Since the TSFD use Statistics Canada imports data to report U.S. exports, they overestimate Ontario's economic exchanges with the U.S., whereas Québec's exchanges are underestimated.[5]

The ISQ corrects this bias by applying to imports data a series of adjustments based on consumption of final products and on the production of intermediate

4. This section was contributed by the Service de la modélisation des systémes de transport of the Québec Ministry of Transportation. A more complete discussion can be found in a technical report, "Québec/US trade statistics: Review of methodologies," which is available at http://www.mtq.gouv.qc.ca/documentation/statistiques/mobpers/qcustsr.pdf.

goods. The most important adjustment is based on the ratio Québec to Canada in terms of market share. In this sense, the ISQ data represents a better estimate of economic exchanges between Québec and the U.S. states than does the TSFD exports data (which are based on Statistics Canada imports data). Any analysis based on Statistics Canada or TSFD imports data should ideally have included the same type of adjustments as the ones applied by the ISQ.

In light of these limitations, care must be taken in the interpretation or use of the value estimates published for imports into the individual Canadian provinces. This is particularly true for Canadian imports into Québec and the Atlantic provinces.

Origin-Destination Patterns

Detailed data about the origin and destination of the trip were recorded in the survey. The driver was asked for this information for both the trip and the commodity carried. The trip origin and destination refers to where the intercepted truck began and intended to end its journey. The commodity origin and destination refer to the places where the transported goods began and ultimately end. The commodity may travel on another truck, or even another mode of transportation, for part of the trip. Conversely, a truck might travel empty from its origin to the commodity origin, pick up the shipment, deliver it, and then travel onward to its final destination. Thus, the relationship between the two are not straight-forward or consistent.

In many instances the trip origin was coded, but not the commodity origin, or vice-versa. A decision was made to use the trip origin data, if available, to represent the origin used in these analyses. If data on the trip origin were not available, the commodity origin was used to describe the origin. If both were missing, information from the last stop was used. In most cases the recorded trip itinerary was graphically checked to ensure that the assigned origin was reasonable. The same process was used to code the destinations used in this study.

The broad origin-destination patterns for all surveyed truck trips crossing the U.S.-Canada border are shown in Tables 4 and 5. The flows from Canada to the U.S. are shown in Table 4. The major states shown are comparable to those reported in previous studies. What is significant and new is the finding that several states have a larger share of the total tonnage rather than dollars. The flows from the U.S. to Canada are shown in Table 5. There are some dramatic differences by direction for some states. California and Washington, for example, are net exporters to Canada, while Michigan and New York appear to be net importers. Ohio is also a major

5. An example of the distortion caused by this practice is found in the reporting of Québec imports from Michigan. According to the TSFD, Québec's annual imports by truck from Michigan in 2000 amounted to US$72 million, whereas the ISQ estimate was equal to US$1.27 billion (a difference of close to US$1.2 billion). Given the importance of the auto industry in Québec's imports, it is apparent that the TSFD do not reflect the true economic interactions between Michigan and Québec. In this case, the ISQ adjustment is based on the percentage of North American autos sold in Québec compared to North American autos sold in Canada.

Table 4: Weekly 1999 Canada-to-U.S. motor transport flows

	Province or state	Weekly value[a]			Weekly tons[b]			Weekly trucks[b]	
		Weekly US$[c]	Weekly C$	Percent	Metric tons	Short tons	Percent	Trucks	Percent
Origins	Ontario	1,571,715,507	2,329,531,986	65.0	856,758	944,404	57.4	83,643	64.7
	Quebec	466,401,786	691,281,516	19.3	289,397	319,002	19.4	19,869	15.4
	British Columbia	139,198,253	206,313,917	5.8	177,450	195,603	11.9	14,622	11.3
	Alberta	90,436,212	134,040,828	3.7	51,849	57,153	3.5	3,025	2.3
	Manitoba	53,350,853	79,074,437	2.2	54,861	60,473	3.7	3,828	3.0
	New Brunswick	34,348,665	50,910,176	1.4	32,400	35,715	2.2	2,506	1.9
	Nova Scotia	27,686,511	41,035,806	1.1	10,691	11,785	0.7	679	0.5
	All other	33,936,516	50,299,306	1.4	19,756	21,777	1.3	1,167	0.9
	Total	*2,417,074,303*	*3,582,487,973*	*100*	*1,493,162*	*1,645,912*	*100*	*129,339*	*100*
Destinations	Michigan	525,221,744	778,462,035	21.7	240,273	264,853	16.1	29,203	22.6
	New York	321,447,928	476,436,878	13.3	215,058	237,058	14.4	19,332	14.9
	Ohio	140,641,197	208,452,589	5.8	99,945	110,169	6.7	10,688	8.3
	Illinois	128,574,922	190,568,453	5.3	75,937	83,705	5.1	4,771	3.7
	California	99,634,895	147,674,737	4.1	56,380	62,148	3.8	3,527	2.7
	Pennsylvania	91,855,384	136,144,267	3.8	91,849	101,245	6.2	6,027	4.7
	Washington	82,728,142	122,616,245	3.4	101,526	111,912	6.8	9,935	7.7
	Texas	68,276,934	101,197,259	2.8	34,017	37,497	2.3	2,276	1.8
	Massachusetts	67,858,161	100,576,571	2.8	39,095	43,094	2.6	2,833	2.2
	New Jersey	63,889,611	94,694,550	2.6	50,040	55,159	3.4	3,608	2.8
	Vermont	59,425,503	88,078,033	2.5	24,775	27,309	1.7	1,988	1.5
	Georgia	58,116,795	86,138,320	2.4	17,442	19,226	1.2	1,379	1.1
	Indiana	57,529,035	85,267,166	2.4	37,814	41,682	2.5	3,425	2.6
	Wisconsin	44,672,417	66,211,616	1.8	34,213	37,713	2.3	2,321	1.8
	Kentucky	43,415,151	64,348,149	1.8	25,680	28,307	1.7	1,968	1.5
	Minnesota	42,558,080	63,077,833	1.8	32,909	36,276	2.2	3,563	2.8
	North Carolina	36,690,155	54,380,636	1.5	22,434	24,729	1.5	1,707	1.3
	Florida	34,430,004	51,030,734	1.4	17,748	19,564	1.2	1,327	1.0
	Missouri	33,669,435	49,903,450	1.4	10,652	11,742	0.7	916	0.7
	Oregon	32,439,511	48,080,507	1.3	21,049	23,202	1.4	1,383	1.1
	South Carolina	32,347,751	47,944,504	1.3	11,859	13,072	0.8	775	0.6
	Virginia	31,549,110	46,760,791	1.3	22,572	24,881	1.5	1,452	1.1
	Tennessee	31,463,397	46,633,751	1.3	15,737	17,347	1.1	1,288	1.0
	Maine	22,648,627	33,568,862	0.9	30,382	33,490	2.0	2,535	2.0
	All others	233,550,903	346,159,528	9.7	142,727	157,328	9.6	9,729	7.5
	Total	*2,417,074,303*	*3,582,487,973*	*100*	*1,493,162*	*1,645,912*	*100*	*129,339*	*100*

a. Source: Average week derived from USDOT Transborder Surface Freight Data for August through November, 1999. Use caution when comparing value to tons or trucks, as the value does not include in-bond or tariff-exempt shipments, while the tons and trucks do.

b. Data derived from the 1999 NRS data.

c. Assumed currency exchange rate of US$1=C$1.486. Source: http://www.bankofcanada.ca/en/exchange.htm.

Table 5: Weekly 1999 U.S.-to-Canada motor transport flows

	State or province	Weekly value[a]			Weekly tons[b]			Weekly trucks[b]	
		Weekly US$[c]	Weekly C$	Percent	Metric tons	Short tons	Percent	Trucks	Percent
Origins	Michigan	370,832,479	549,632,626	14.9	155,152	171,024	12.9	23,432	19.2
	Ohio	240,894,959	357,044,586	9.7	100,764	111,072	8.4	8,785	7.2
	New York	183,058,193	271,321,313	7.4	130,354	143,689	10.9	17,989	14.8
	Illinois	173,585,002	257,280,540	7.0	93,267	102,808	7.8	5,056	4.1
	California	148,640,014	220,308,106	6.0	49,009	54,023	4.1	3,342	2.7
	Texas	132,065,077	195,741,417	5.3	20,644	22,756	1.7	1,535	1.3
	Indiana	130,514,938	193,443,865	5.3	34,957	38,533	2.9	3,156	2.6
	Pennsylvania	104,854,496	155,411,015	4.2	71,879	79,232	6.0	6,556	5.4
	North Carolina	80,281,962	118,990,617	3.2	17,435	19,219	1.5	1,453	1.2
	Wisconsin	76,009,606	112,658,307	3.1	29,099	32,076	2.4	2,252	1.8
	New Jersey	62,148,915	92,114,562	2.5	39,413	43,445	3.3	3,548	2.9
	Tennessee	57,598,031	85,369,429	2.3	14,814	16,329	1.2	1,584	1.3
	Washington	49,938,249	74,016,416	2.0	80,693	88,948	6.7	10,925	9.0
	Massachusetts	49,311,450	73,087,400	2.0	22,027	24,280	1.8	2,693	2.2
	Kentucky	45,922,665	68,064,683	1.8	19,119	21,075	1.6	1,660	1.4
	Missouri	45,423,149	67,324,320	1.8	14,557	16,046	1.2	1,107	0.9
	Minnesota	41,435,092	61,413,387	1.7	43,160	47,575	3.6	3,986	3.3
	Vermont	41,250,891	61,140,372	1.7	15,306	16,872	1.3	2,094	1.7
	Georgia	40,440,962	59,939,928	1.6	14,342	15,809	1.2	1,060	0.9
	South Carolina	40,073,139	59,394,756	1.6	9,870	10,880	0.8	1,036	0.8
	Virginia	39,972,417	59,245,470	1.6	13,254	14,610	1.1	1,216	1.0
	Oregon	29,273,736	43,388,326	1.2	23,769	26,201	2.0	1,587	1.3
	Maine	17,860,307	26,471,811	0.7	36,361	40,081	3.0	4,252	3.5
	All others	283,886,805	420,765,329	11.4	149,157	164,416	12.4	11,613	9.5
	Total	*2,485,272,534*	*3,683,568,582*	*100*	*1,198,402*	*1,320,999*	*100*	*121,917*	*100*
Destinations	Ontario	1,926,738,192	2,855,731,986	77.5	738,580	814,137	61.6	78,583	64.5
	Quebec[d]	203,168,689	301,128,262	8.2	198,300	218,586	16.5	18,152	14.9
	British Columbia	135,501,275	200,834,409	5.5	119,130	131,317	9.9	13,709	11.2
	Manitoba	83,356,388	123,547,405	3.4	51,718	57,009	4.3	2,962	2.4
	Alberta	63,469,300	94,071,582	2.6	47,985	52,894	4.0	3,278	2.7
	New Brunswick	29,080,464	43,101,866	1.2	20,120	22,178	1.7	2,960	2.4
	Nova Scotia[d]	1,405,931	2,083,813	0.1	13,544	14,930	1.1	1,252	1.0
	All others	42,552,295	63,069,259	1.7	9,025	9,948	0.8	1,021	0.8
	Total	*2,485,272,534*	*3,683,568,582*	*100*	*1,198,402*	*1,320,999*	*100*	*121,917*	*100*

a. Source: Average week derived from USDOT Transborder Surface Freight Data for August through November, 1999. Use caution when comparing value to tons or trucks, as the value does not include in-bond or tariff-exempt shipments, while the tons and trucks do.
b. Data derived from the 1999 NRS data.
c. Assumed currency exchange rate of US$1=C$1.486. Source: http://www.bankofcanada.ca/en/exchange.htm.
d. The import portion of this value is lower than actual because imports from the U.S. are attributed to the province of clearance (where the freight enters Canada and is cleared), rather than to the province of destination. See pages 12 and 13 and footnotes 4 and 5 for detailed discussion.

trading state, in large part because of the large number of auto assembly and supplier plants located there.

Distinguishing Between Trip and Commodity Trip Ends

The commodity origin and destination are more closely related to the origins and destinations reported in the trade flow statistics. Because it is the movement of these commodities that cause the truck trip to occur, it had been planned to use these data to analyze the origin-destination patterns in this study. However, concern was expressed that the commodity origin and destination information in the survey were not reliable, and should not be used for these types of analyses. Conversations with the interviewers revealed that truck drivers were not able to provide as accurate information about commodity origin and destination as they could for the trip. The analyses in this report are therefore based on trip origin and destination, rather than commodity origin and destination.

An analysis of the data revealed that this distinction is not as significant as originally thought. While the value of the shipments are reported, attention should be focused on the percentages reported. It can be seen that on a percentage basis there is not much difference between the percent of trips attributed to each state[6] when distinguishing between trip and commodity origins and destinations. The small difference between trip and commodity ends is due to the fact that most drivers were confident about the trip origin, but lacked definitive and reliable information on the commodity origin or destination. Thus, they commonly attributed the commodity origin or destination to the known trip origin or destination.

Trade Patterns Apparent in the Data

The NRS data depict different patterns of trade, depending on which attribute (value, tonnage, or truck trips) is used to tell the story. The conventional wisdom has long held that two-thirds of the goods moving across the border were bound to and from the border states. This could be supported by the trade statistics as recently as a decade ago. The more recent NRS data, however, paint a different picture. Half of the truck trips crossing the border are bound to and from the border states, but only about one third of the value and tonnage. Fourteen states not on the border produce 56 percent of the goods flowing into Canada and consume about 40 percent of the goods coming into the U.S.

This finding belies the perception that the border states are the primary benefactors of U.S.-Canada trade. Unlike the ambiguity surrounding the issue of trip and commodity places, there can be only one interpretation of this finding. While the trade flow data report the states in which the financial transactions took place, the NRS data reflect where the commodities actually moved to and from.

6. The comparison is carried out only for U.S. states, as most origins and destination in Canada are in the border provinces.

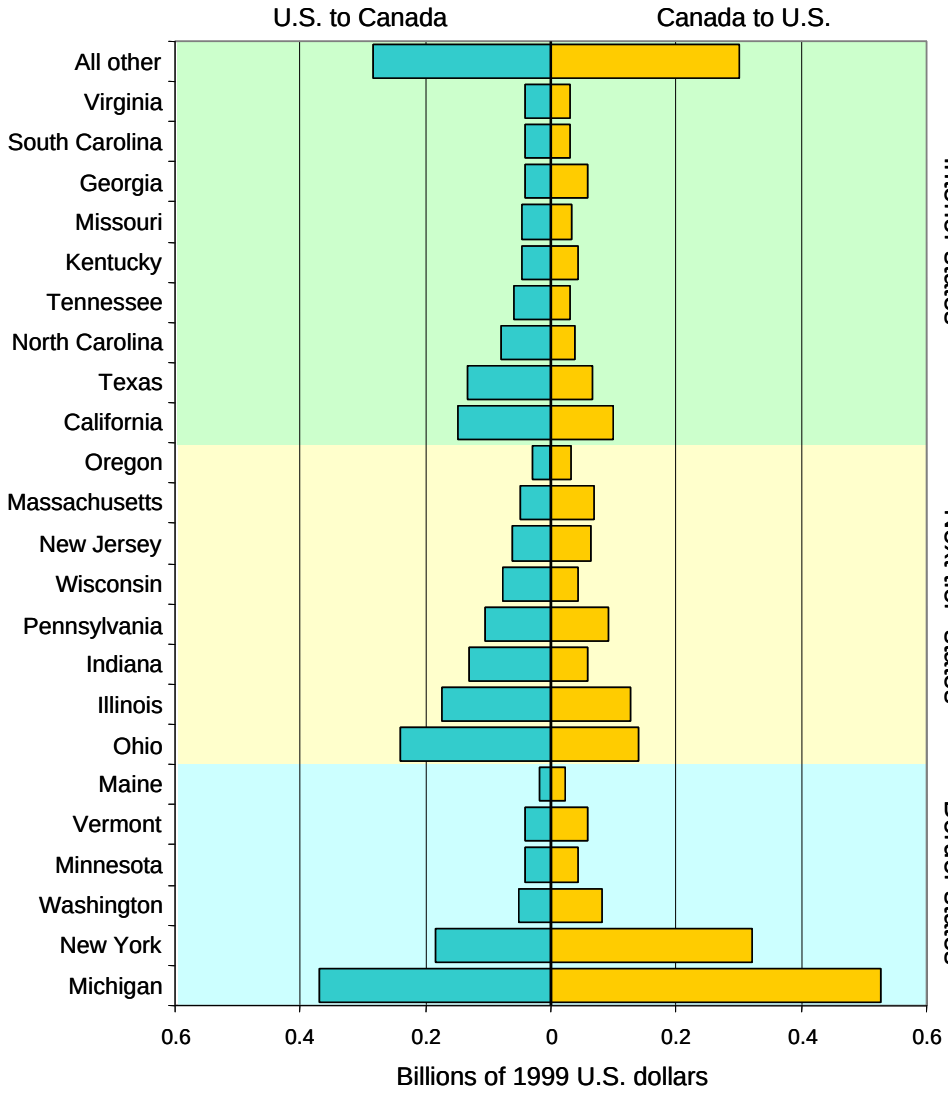

Figure 3: Balance of trade by U.S. state

The balance of trade by state, in weekly dollar terms, is shown in Figure 3. The bars on the left-hand side show the total U.S. exports by truck to Canada, while the right-hand bars show U.S. imports from Canada for the same states. The Figure is segmented by three sets of states:

- Those on the Canada-U.S. border;
- The "next tier" states, which are adjacent to border states; and
- The remaining states.

Most of the border states included in this study are net importers of goods from Canada. By contrast, almost all of the next tier and interior states are net exporters of goods to Canada. This underscores the extent of the economic integration between the two countries, and demonstrates the positive economic contribution of Canada-U.S. trade to states not adjacent to the border.

Table 6: Reported facility type at trip start and end

Facility type	Trip start		Trip end	
	Trucks	Percent	Trucks	Percent
Truck terminal	72,282	26.1	68,672	24.8
Rail terminal	3,826	1.4	2,541	0.9
Marine terminal	3,483	1.3	2,474	0.9
Airport	1,140	0.4	1,482	0.5
Warehouse/distribution center	42,011	15.2	59,614	21.5
Primary producer	19,992	7.2	8,208	3.0
Manufacturer	92,731	33.5	73,635	26.6
Retail	5,654	2.0	16,924	6.1
Other	19,765	7.1	16,649	6.0
Unknown	9,807	3.5	20,494	7.4
No response	6,352	2.3	6,350	2.3
Total	277,043	100	277,043	100

Other data within the survey seems to support the conclusion that most of the shipments went directly from their origin to destination, and in higher numbers to non-border states than previously documented. A summary of the facility types at the trip origin and destination are shown in Table 6. Among the interesting findings from these data are the fact that almost half of the trips begin or end in a transshipment point (either a terminal, warehouse, or distribution center). A transfer to or from a terminal suggests that the trip might be bound for areas even further away from the border, while transfers at warehouses and distribution centers serve a mixture of local, regional, and national markets.

Most of the remaining trips travel to or from their primary producer or manufacturing facility. This seems intuitive for trip starts, where goods are picked for delivery to further processing or final demand. The large incidence of manufacturer destinations, however, seems less intuitive. The auto industry in Ontario, Michigan and Ohio is highly integrated, with significant movements of components and partially assembled products between their plants. A surprisingly small number of shipments were bound for retail destinations or other final uses.

The large percentage of trips destined for terminals, distribution centers, warehouses, and manufacturing facilities carry goods that will wind up being distributed to other parts of the country, either directly (in the case of terminals) or in their final products (manufacturing). These data provide strong evidence that U.S.-Canada trade extends much further beyond the border states than previously thought.

Network Assignment

The expanded truck trips in the data were assigned to a highway network of the U.S. and Canada to visualize the origin-destination patterns in the data. The weekly flow of trucks across the border are shown in Figure 4. The routes selected

were based on the minimum travel time path between the origin and border crossing, and border crossing and destination. The bandwidths on the maps depict the volume on each link on the highway system.[7] The color of the bands delineate the country in which the flows occur.

The assignments clearly show a number of corridors serving Canada-U.S. trade. From east to west they are:

- Highway 1 and Highway 9 between Moncton, New Brunswick and Bangor, Maine, and then I-95 south to Boston, Massachusetts
- Highway 2 and I-95 from Fredericton, New Brunswick to Boston, Massachusetts
- Highway 55, Interstate 91, and Interstate 93 between Drummondville, Québec and Boston
- Highway 35 and Interstate 89 between Montréal, Québec and Boston
- Highway 15 and Interstate 87 between Montréal and the New York City area
- I-81 from Canada to Scranton, Pennsylvania, and I-476 between Scranton and Philadelphia
- Route 63 between I-90 and I-390 in western New York, and I-390 and Route 17 (I-86) from Route 63 to Highway 220 at Sayre, Pennsylvania
- The entire length of Highway 401 in Québec and Ontario
- The entire length of Highway 403 and the QEW freeway in the Toronto, Ontario area
- Interstate 90 between Buffalo and Boston, Massachusetts
- Interstate 90 between Buffalo and Toledo, Ohio
- Highway 402 in Ontario and Interstate 69 from Port Huron, Michigan to I-94 at Marshall, Michigan
- Interstate 75 from Detroit, Michigan to Cincinnati, Ohio; Interstate 71 from Cincinnati to Louisville, Kentucky; and Interstate 65 from Louisville to Nashville, Tennessee
- Interstate 94 from Detroit to Chicago, Illinois; and west to Fargo, North Dakota
- Interstate 29 and Highway 16 from Fargo, North Dakota to Winnipeg
- Highway 99 and Interstate 5 from Vancouver, British Columbia to Portland, Oregon

The most important “missing link” in this system is a relatively direct high capacity route in the Highway 219 corridor leading southeast from the Niagara region towards Philadelphia, Baltimore, and on to Florida.

The bandwidth in Figure 4 reveals the magnitude of the weekly flows in each of these corridors. They do not, however, depict the significance of these flows to the local and regional economies. There can be no doubt that the heavy flows along

7. Note that some states (North Dakota, Montana, and Idaho) and provinces (Manitoba, Saskatchewan, and Alberta) did not participate in this study and did not permit data for their crossings to be shared with the EBTC. Flows shown for those states are only those trips that were surveyed in one of the other provinces.

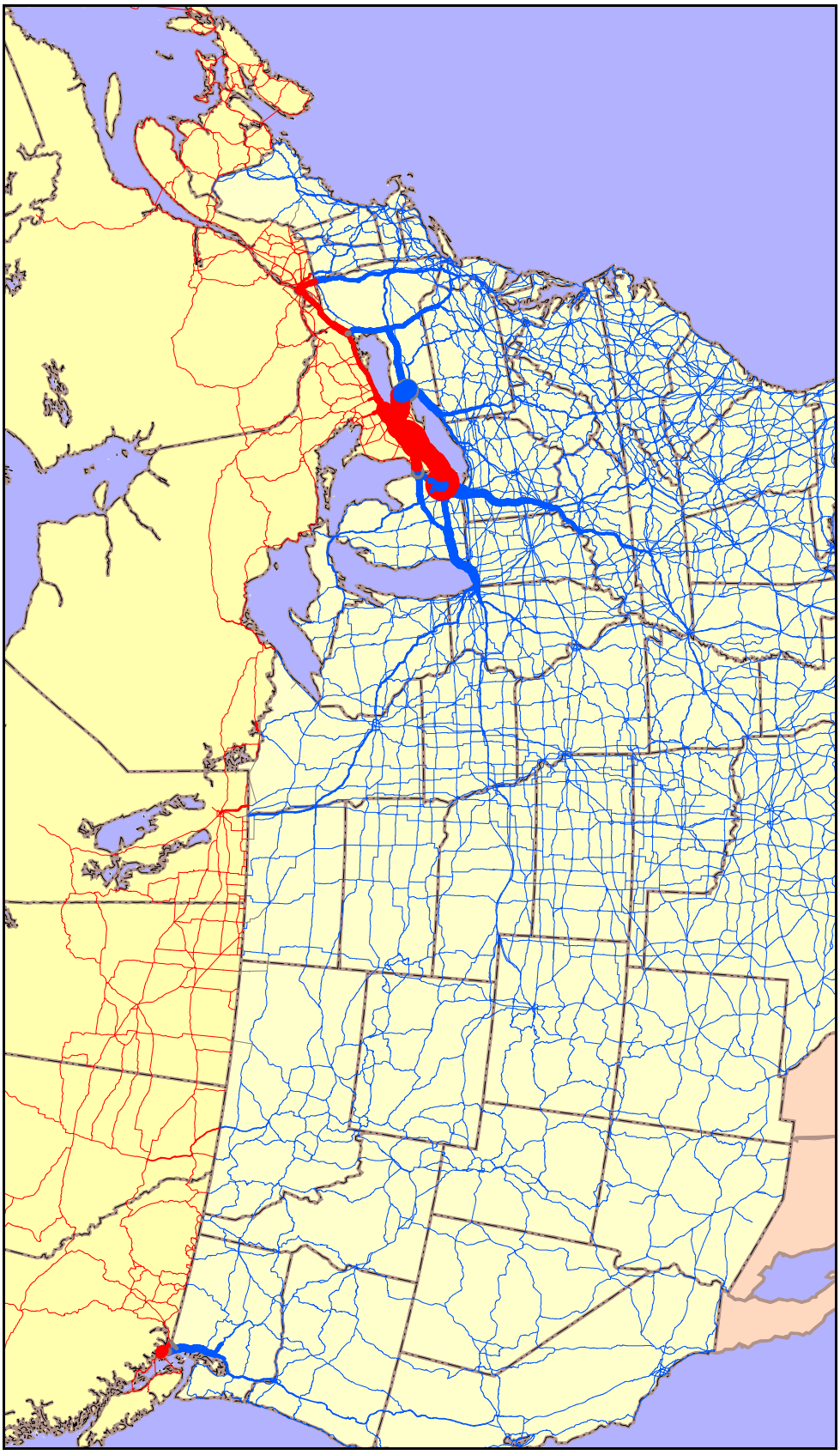

Figure 4: Weekly 1999 NRS truck trips crossing the Canada-U.S. border

Highway 401 in Ontario play a major role in the economies of Southwest Ontario, the Detroit region, and the Buffalo region. The flows between Saint John's, Newfoundland and Labrador, and Portland, Maine, for example, are smaller in absolute numbers, but their relative contribution to the local and regional economies may well be greater than in the more dominant trade corridors to the west.

Commodity Groups

The commodities are classified using the Standard Classification of Transportable Goods (SCTG), which has been jointly adopted by Canada and the U.S. for summarizing freight transportation. The system uses a varying number of digits to classify the article; the more digits used, the more precise the commodity description. While some of the observations in the NRS describe the commodity in enough detail to use the highest level of precision (five digits), most can only be classified less precisely (the more commonly used two digit scheme). A listing of the two digit SCTG classifications is shown in Appendix A. These can be further aggregated into nine commodity groups for a broad overview of commodities.

A summary of the commodities found in the NRS data, by total value, weight, and trucks and total weight, is shown in Table 7 and Figure 5. It is readily apparent that the majority of goods that move by truck across the border tend to be higher value, lower weight products than goods usually moved by rail or water. This is not surprising, given that trucking in general seems to capture most of these movements in the domestic markets of both countries. Three commodity groups account for the majority of goods moving across the border. In descending order by weight and number of trucks they are:

- Wood and wood products, textiles, and leather (SCTG 25-30)
- Metal products and machinery (SCTG 31-34)
- Electronic and electrical goods, vehicles, and precision instruments and apparatus (SCTG 35-38)

Note that the order is reversed when ranking by the value of goods transported. The mix of commodities makes sense in light of the dominance of the auto industry along the eastern border. In fact, goods in some of the other groups have been attributed to suppliers of the auto industry. For example, automobile seat fabrics and cushioning are classified as textiles, while car stereos are classified as electronic goods.[8] As noted in later chapters, however, the commodity mix varies considerably across the border.

The mix of commodities by weight and trucks by direction of travel across the border is shown in Tables 8 and 9. The residual category includes all trips not classified as a Canada-to-U.S. shipment or vice-versa, and includes in-bond shipments, U.S.-to-U.S. movements through Canada, etc. Comparable statistics for

8. In Ontario, surveyors were specifically instructed to ask the driver if the products were related to vehicle manufacturing. Unfortunately this approach was not taken by the other provinces, and thus we have an incomplete picture of the production and consumption of these related commodities by the auto industry.

Table 7: Weekly 1999 NRS trip trips by commodity group

SCTG	Description	Weekly value[a]			Weekly tons[b]			Weekly trucks[b]	
		U.S. dollars$	Canadian $	Per-cent	Metric tons	Short tons	Per-cent	Trucks	Per-cent
—	Empty	0	0	0	0	0	0	71,963	26.0
01-05	Agricultural products and fish	201,170,303	298,166,337	4.1	319,824	352,542	10.5	18,405	6.6
06-09	Grains, alcoholic beverages and tobacco	130,422,405	193,306,717	2.7	177,617	195,787	5.8	10,447	3.8
10-14	Stone, minerals and ores	7,444,948	11,034,595	0.2	86,445	95,288	2.8	4,163	1.5
15-20	Coal and petroleum products	77,372,510	114,678,347	1.6	171,999	189,595	5.6	8,874	3.2
21-24	Pharmaceutical and chemical products	461,181,650	683,544,446	9.4	164,514	181,344	5.4	13,255	4.8
25-30	Wood products, textiles, and leather	552,361,481	818,687,435	11.3	748,708	825,301	24.6	42,393	15.3
31-34	Metal products and machinery	1,270,755,015	1,883,460,741	25.9	620,724	684,224	20.4	39,627	14.3
35-38	Electronics, vehicles, and precision goods	1,605,244,486	2,379,227,257	32.7	345,333	380,660	11.3	35,677	12.9
39-43	Furniture and miscellaneous products	596,394,039	883,950,679	12.2	107,926	118,967	3.5	10,038	3.6
—	Unclassified or unknown	0	0	0	303,301	334,329	10.0	22,201	8.0
Total		4,902,346,837	7,266,056,554	100	3,046,393	3,358,037	100	277,043	100

a. Source: Average weekly flows from USDOT Transborder Surface Freight Data for August through October, 1999.
b. Summarized from the 1999 NRS data.

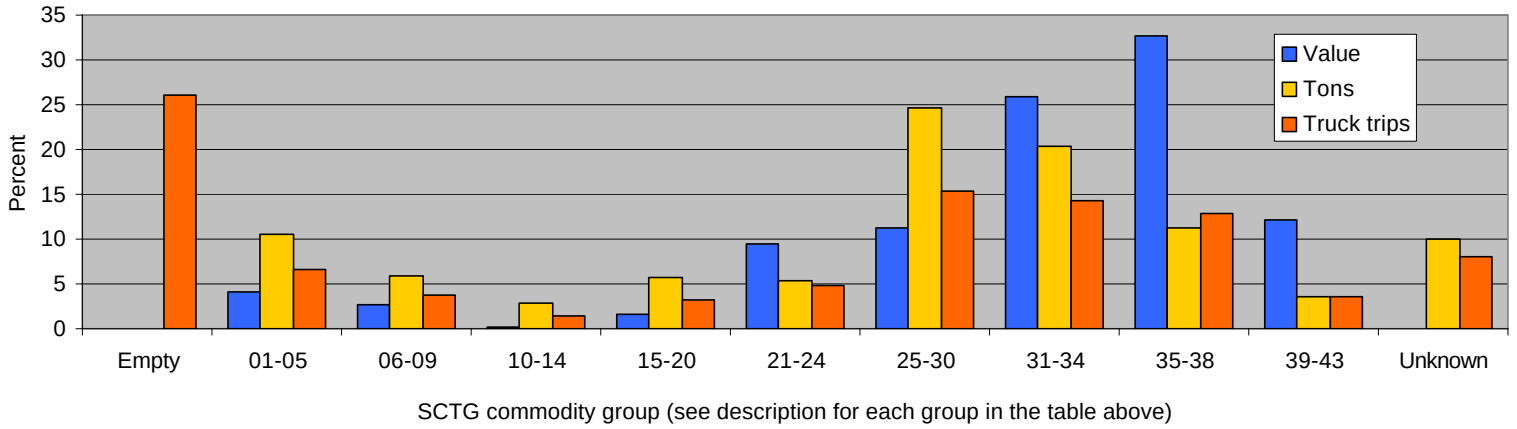

Figure 5: Percent of weekly 1999 NRS cross-border trips by value, weight, and trucks

value of shipment are not available, as the trade statistics do not reveal these trips. The residual category of trips accounts for approximately 12 percent of the tons crossing the border, and nine percent of the truck trips.

Two-digit Commodities

Summarizing these same data by two-digit SCTG provides greater insight into the mix of commodities crossing the border, at the expense of more information from which to extract meaningful comparisons. A listing of two-digit commodities by direction are shown in Appendix A. Half of the total value of goods moving between the two countries belong to just five commodities. In descending order by weight they are:

- Vehicles (SCTG 36)
- Wood products (SCTG 26)
- Pulp, newsprint, paper, and paperboard (SCTG 27)
- Base metal (SCTG 32)
- Articles of base metal (SCTG 33)

A different order emerges when ranking the commodities by value:

- Vehicles (SCTG 36)
- Electronic and electrical equipment and components (SCTG 35)
- Machinery (SCTG 34)
- Articles of base metal (SCTG 33)
- Textiles and leather articles (SCTG 30)

The relatively small contribution of vehicles to the total commodity mix is significant. While it only accounts for 12 percent of both the weight and value of goods crossing the border by truck, it is the largest commodity to do so by either of these measures. Assembled autos comprised over a third of the value of goods shipped between the two countries as recently as five years ago. This trend is also reflected in recent trade statistics.

Three factors appear to be influencing this trend. The “Big Three” automakers started using containers to transport finished automobiles in 1997, and accelerated their use of them in recent years. The shift was designed to reduce the incidence of theft and vandalism to the vehicles rather than to reduce the cost of shipping. The majority of assembled automobiles now pass from Canada to the U.S. by intermodal rail service. There is still a large movement of semi-finished and finished autos by truck, but these data lend evidence to the notion that the number of vehicles transported by truck between the countries is declining.

The decline in vehicle shipments as a percentage of total goods shipped can also be attributed to the establishment of production facilities in other parts of the country. Several assembly plants have been idled in the northeast in recent years, while several new factories have opened in the south and southwest. This mirrors gradual but unmistakable trends in auto manufacturing worldwide, where firms are consolidating, cutting back production in the face of excess capacity, and mak-

Table 8: Weekly 1999 NRS tons by commodity group and direction of travel

SCTG	Description	Canada to U.S.		U.S. to Canada		Residual[a]		Total	
		Metric tons	Percent	Metric tons	Percent	Metric tons	Percent	Metric tons	Percent
—	Empty	0	0.0	0	0.0	0	0.0	0	0.0
01-05	Agricultural products and fish	144,862	9.7	160,206	13.4	14,757	4.2	319,824	10.5
06-09	Grains, alcoholic beverages and tobacco	97,973	6.6	69,792	5.8	9,853	2.8	177,617	5.8
10-14	Stone, minerals and ores	36,645	2.5	38,436	3.2	11,364	3.2	86,445	2.8
15-20	Coal and petroleum products	91,988	6.2	66,896	5.6	13,115	3.7	171,999	5.6
21-24	Pharmaceutical and chemical products	90,719	6.1	69,529	5.8	4,267	1.2	164,514	5.4
25-30	Wood products, textiles, and leather	435,705	29.2	242,234	20.2	70,769	19.9	748,708	24.6
31-34	Metal products and machinery	296,786	19.9	282,388	23.6	41,550	11.7	620,724	20.4
35-38	Electronics, vehicles, and precision goods	174,610	11.7	150,680	12.6	20,043	5.6	345,333	11.3
39-43	Furniture and miscellaneous products	53,356	3.6	49,271	4.1	5,299	1.5	107,926	3.5
—	Unclassified or unknown	70,518	4.7	68,972	5.8	163,811	46.2	303,301	10.0
Total		1,493,162	100	1,198,402	100	354,829	100	3,046,393	100

a. Includes Canada-to-Canada, U.S.-to-U.S., and in-bond shipments.

Table 9: Weekly 1999 NRS truck trips by commodity group and direction of travel

SCTG	Description	Canada to U.S.		U.S. to Canada		Residual[a]		Total	
		Trucks	Percent	Trucks	Percent	Trucks	Percent	Trucks	Percent
—	Empty	29,764	23.0	37,852	31.0	4,347	16.9	71,963	26.0
01-05	Agricultural products and fish	8,782	6.8	8,754	7.2	869	3.4	18,405	6.6
06-09	Grains, alcoholic beverages and tobacco	5,672	4.4	4,121	3.4	654	2.5	10,447	3.8
10-14	Stone, minerals and ores	1,761	1.4	1,790	1.5	612	2.4	4,163	1.5
15-20	Coal and petroleum products	4,371	3.4	3,845	3.2	658	2.6	8,874	3.2
21-24	Pharmaceutical and chemical products	6,919	5.3	5,743	4.7	593	2.3	13,255	4.8
25-30	Wood products, textiles, and leather	23,595	18.2	14,906	12.2	3,892	15.1	42,393	15.3
31-34	Metal products and machinery	20,121	15.6	17,261	14.2	2,245	8.7	39,627	14.3
35-38	Electronics, vehicles, and precision goods	17,337	13.4	16,255	13.3	2,085	8.1	35,677	12.9
39-43	Furniture and miscellaneous products	4,902	3.8	4,715	3.9	421	1.6	10,038	3.6
—	Unclassified or unknown	6,117	4.7	6,674	5.5	9,410	36.5	22,201	8.0
Total		129,341	100	121,916	100	25,786	100	277,043	100

ing more effective use of supply-chain logistics. The latter has increased the use of third-party suppliers, located across both countries.

The other largest commodities, in value terms, are also important inputs to the auto industry. The increased reliance on supply-chain logistics has increased the flow of components, rather than assembled final products, through the system. The parallel shift towards just-in-time production has resulted in lower shipment sizes, a fact reflected in the lower average payload weights discussed earlier.

This list of commodities by weight also illuminates the large movement of timber and forest products from central and western Canada to the U.S., which flow primarily through crossings in Minnesota and Washington. Paper and paper products follow similar patterns. Canada-U.S. trade in these commodities has increased substantially over the past two decades. U.S. exports to Canada in wood products overall have increased almost sixfold (in constant 1999 U.S. dollars) from 1967, which U.S. imports have doubled. The U.S. is a net importer of wood and paper products from Canada in value terms, with the volume of imports being slightly more than twice that of exports.

There are some interesting effects of the imbalance in wood and paper trade. A large number of empty trucks were encountered at those crossings where this was a major commodity. This was partially due to the specialized nature of timber hauler trucks, which cannot accept backhauls of different products. Moreover, different types of wood products (timber, raw lumber, finished wood and paper goods) tended to flow in one dominant direction across the border, although this differed by crossing.

Trans-shipment Through the U.S. and Canada

In previous work an effort was made to quantify the extent of freight moving through the U.S. and Canada but not destined to it. These movements, known as in-bond shipments, are not reflected in the published trade statistics. It has been suggested that these movements are a significant but unreported element of cross-border truck traffic. The NRS data shed light on both of these topics.

In-bond movements within the U.S. crossing the Canadian border would fall into one of four categories:

- Canada-to-Canada shipments,
- Shipments from Canada to U.S. marine ports,
- Shipments from the U.S. to Canadian marine ports, and
- Canada-Mexico flows.

There were a negligible number of observations in the data satisfying these criteria. Canada-to-Canada truck movements, when they occurred, were from British Columbia to the Atlantic Provinces. Since the majority of such movements reported in the data stayed on Canadian roadways, it does not appear that such a movement offered a travel time or cost savings to Canadian carri-

ers. There were very few shipments (less than 10) in the data from Canada to Mexico. Although a significant number of trips were destined to U.S. counties with marine ports, only a small number of them appeared to be bound directly to the ports (see Table 6). The same was true for flows from the U.S. to Canadian marine ports.

Trans-shipments from a U.S. origin to U.S. destination through Canada were found more frequently. They made up the majority of the "Residual" category of trips shown in Tables 8 and 9. They represented approximately 12 percent of the tons and nine percent of the trucks crossing the U.S.-Canada border. Half of these movements found in the data were flows between Southeast Michigan and destinations in New York, as shown in Figure 6. A number of "linked trips" between Michigan and New York have the same effect (e.g., a trip from Detroit to London, Ontario, where the trailer is transfered to another tractor which then completes the trip to Toronto).

There were also significant trans-shipment flows from Indiana to New York (although not in the opposite direction), between locations in Minnesota, from New York to Illinois (but not the opposite), and between locations in Washington. There were also a significant number of trips from other states, although none of the other individual states had an appreciable volume of truck flows.

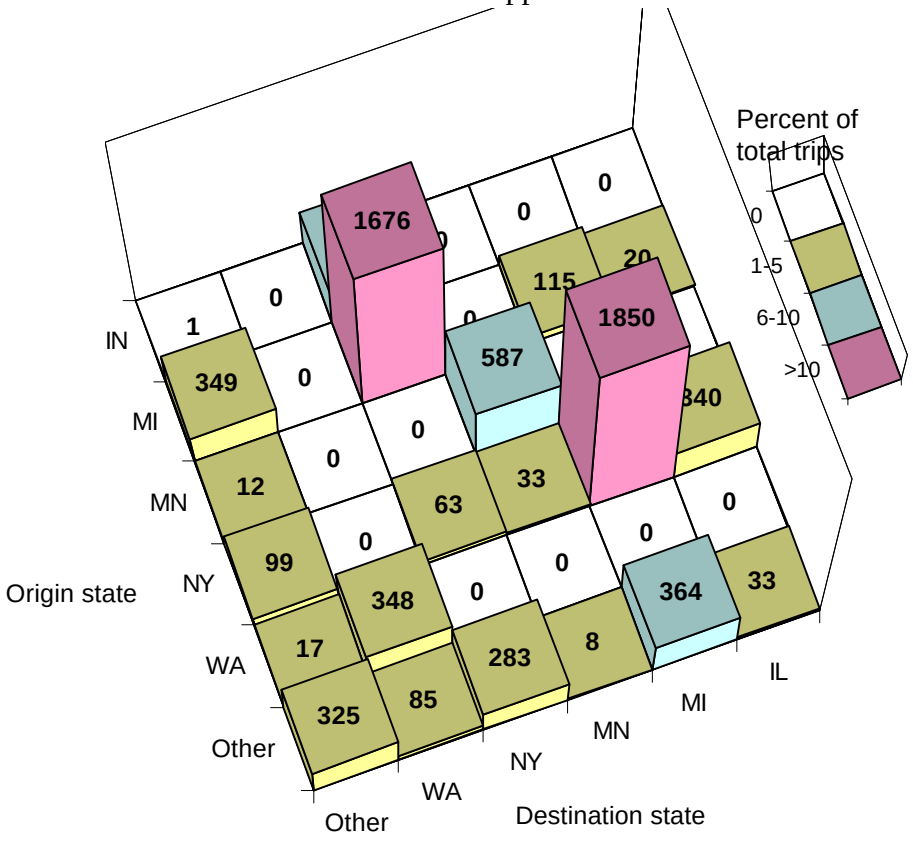

Figure 6: Origin-destination patterns of U.S.-to-U.S. truck trips

CHAPTER 3

Summaries of Trade by States

Canada-U.S. trade is the largest such relationship in the world. As previously noted, it plays a prominent role in the economies of both countries. It accounts for as much as twenty-five percent of the Canadian GDP, a proportion that has grown progressively over the past forty years. The majority of trade transported by truck involves three Canadian provinces: Ontario, Québec, and British Columbia. In fact, most of the trade-related activities in Canada take place within 100 kilometers of the border, where most of Canada's population and industry are concentrated. Trade is much more diffused on the U.S. side of the border, with only about half of it bound to and from the border states. While the border states facilitate cross-border trade carried by truck, the extent and character of their trade with Canada varies considerably. In this chapter several of the border states are profiled, from east to west.

Maine

Maine serves as the gateway to the Canadian Atlantic provinces. These provinces, in turn, serve as marine gateways to Europe and Africa. Thus, Maine serves as the conduit for goods produced abroad as well as inter-regional trade.

Maine Exports to Canada by Truck

A summary of commodities originating in and destined to Maine is shown in Table 10. In value terms, 80 percent of the goods exported from Maine to Canada fall into two commodity groups:

- SCTG 25-30: Wood, textile, and leather products (40 percent)
- SCTG 01-05: Agricultural products and fish (40 percent)

The picture is somewhat different from a tonnage standpoint, with wood, textile, and leather products accounting for almost two-thirds of the export tonnage. Agricultural products and fish accounts for another ten percent. The contrast between value, tons, and truck trips is shown in Figure 7.

Table 10: Weekly 1999 Maine exports and imports by commodity group

Weekly flows originating in Maine						Commodity Group		Weekly flows destined to Maine					
Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent
0	0	0	0	1,377	32.0	—	Empty[b]	0	0	0	0	524	20.6
6,762,868	39.7	3,278	9.8	343	8.0	1-5	Agricultural products and fish	4,662,356	22.0	3,349	12.1	438	17.2
105,878	0.6	303	0.9	15	0.4	6-9	Grains, alcoholic beverages and tobacco	298,465	1.4	877	3.2	63	2.5
42,793	0.3	58	0.2	3	0.1	10-14	Stone, minerals and ores	510,883	2.4	1,323	4.8	70	2.7
40,520	0.2	803	2.4	47	1.1	15-20	Coal and petroleum products	917,894	4.3	3,425	12.4	153	6.0
432,046	2.5	99	0.3	61	1.4	21-24	Pharmaceutical and chemical products	1,260,731	5.9	661	2.4	49	1.9
6,670,290	39.1	22,088	66.0	1,149	26.7	25-30	Wood, textile, and leather products	6,779,291	32.0	13,652	49.2	768	30.1
1,377,116	8.1	911	2.7	169	3.9	31-34	Metal products and machinery	2,293,633	10.8	2,992	10.8	270	10.6
1,053,010	6.2	1,090	3.3	455	10.6	35-38	Electronics, vehicles, and precision goods	2,483,491	11.7	296	1.1	114	4.5
72,909	0.4	222	0.7	42	1.0	39-43	Furniture and miscellaneous products	596,492	2.8	252	0.9	27	1.1
492,319	2.9	4,628	13.8	642	14.9	—	Unclassified or unknown	1,412,629	6.7	900	3.2	71	2.8
17,049,749	100	33,480	100	4,303	100	Total[c]		21,215,865	100	27,727	100	2,547	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by d irection. All other data are from the 1999 National Roadside Study.
b. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.
c. Percentages may not total exactly 100 percent due to rounding.

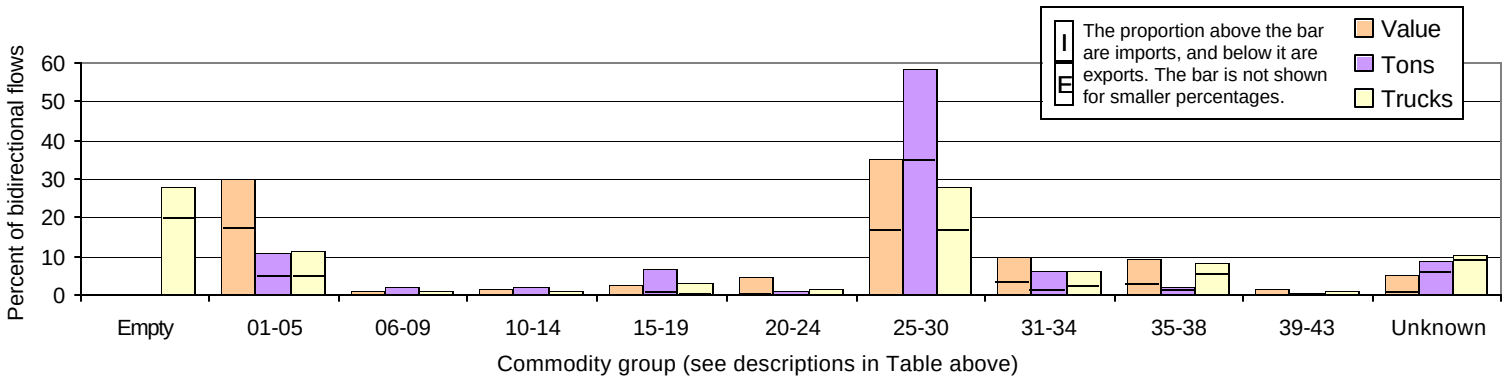

Figure 7: Weekly 1999 Maine bidirectional flow percentages by commodity group and unit of measure

Empty trucks account for almost one-third of the trucks passing from Maine to Canada. Almost one-third of the trucks originating in Maine carry wood, textile, and leather products, the same group that accounts for two-thirds of the total tons shipped. Electronics, vehicles, and precision goods account for another eleven percent of the truck trips, although their weight only accounts for three percent of the tons shipped.

Maine Imports from Canada by Truck

A somewhat similar pattern is found in the commodity mix of goods destined to Maine. These patterns are also summarized in Table 10. Wood, textile, and leather products (SCTG 25-30) and agricultural products and fish (SCTG 01-05) are still the dominant flows by value, but only account for a little more than half of the flows. Technology goods and finished products, which played a small role in Maine exports, play a much more significant role in imports. These commodity groups (SCTG 31-43) account for another quarter of the value of imported goods.

From a tonnage perspective, wood, textile, and leather products are still the major flows. They account for almost half of all imports (compared to two-thirds of exports by tonnage). The other commodities that account for significant tonnages include:

- SCTG 15-20: Coal and petroleum products (12 percent)
- SCTG 01-05: Agricultural products and fish (12 percent)
- SCTG 31-34: Metal products and machinery (11 percent)

Wood, textile, and leather products are also the dominant commodities in terms of truck trips. Another 20 percent of the trucks destined for Maine were empty. As with the tons imported, trucks carrying agricultural products and fish (SCTG 01-05) and coal and petroleum products (SCTG 15-20) were the most frequent commodities in the remaining half of the trucks surveyed.

Two-thirds of Maine's exports and 83 percent of imports by tonnage are to and from Québec and New Brunswick, as shown in Table 11. In value terms, a large number of Maine exports are bound for New Brunswick (about one-half of the flows in dollar terms). About 10 percent of the dollar flows from Maine and 20 percent of them into Maine are bound to and from Ontario. In tonnage and truck trips, however, the flows from Ontario are less significant.

Maine is a net importer of motor carrier trade from Canada in dollar terms. The imports shown in Table 10 are about 25 percent higher than exports. When measured in tonnage the reverse is true; Maine exports approximately 20 percent more tons of goods than it imports. Many forest, agricultural, and seafood products are exported to Canada, where they are processed and have value added, and are then imported back to Maine for consumption. A larger number of trucks leave Maine carrying goods than return to it, suggesting that many outbound truck movements serve single destinations, while inbound trucks serve multiple destinations in the U.S.

Table 11: Origin-destination patterns for Maine exports and imports

Flows originating in Maine (exports)

Destination	Value (US $)[a]	Percent	Short tons	Percent	Trucks	Percent
Québec	6,344,265	37.2	12,818	38.3	1,316	30.6
New Brunswick	8,599,045	50.4	9,080	27.1	1,946	45.2
Nova Scotia	52,423	0.3	7,148	21.3	692	16.1
Ontario	1,812,774	10.6	3,527	10.5	274	6.4
Prince Edward Island	3,103	0.0	411	1.2	24	0.6
All other	238,138	1.4	496	1.5	52	1.2
Total	17,049,748	100	33,480	100	4,303	100

Flows destined for Maine (imports)

Origin	Value (US $)[a]	Percent	Short tons	Percent	Trucks	Percent
Québec	6,296,913	29.7	12,202	44.0	952	37.4
New Brunswick	6,473,319	30.5	11,026	39.8	1,259	49.4
Ontario	4,571,168	21.5	2,022	7.3	148	5.8
Nova Scotia	1,433,169	6.8	1,854	6.7	136	5.3
Prince Edward Island	646,220	3.0	312	1.1	32	1.2
All other	1,795,074	8.5	311	1.1	20	0.8
Total	21,215,863	100	27,727	100	2,546	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 NRS.

More truck trip origins in Maine start from warehousing and distributing centers than in most other states, although the pattern is not appreciably different from other border states. Imports to Maine are destined to primary producers in larger proportions than almost any other state (about 14 percent of all trucks destined for Maine). Primary producers are those in the mining and extraction, agriculture, and raw material production sectors. The distribution of trips by state and facility type at the trip origin and destination is shown in Figure 8. This Figure will be referred to in the discussion for the other states. Note that on the average about half of the truck origins and destinations are at terminals[1] and warehousing and distribution centers. Maine follows these national trends, although the percentage of trips destined for such facilities in Maine is somewhat lower than for other states.

Vermont

Vermont is a predominately rural state, but with large industrial production located in the Burlington area. The pattern of imports and exports is markedly different than for Maine or New York.

1. Terminals include truck terminals, marine terminals, and airports.

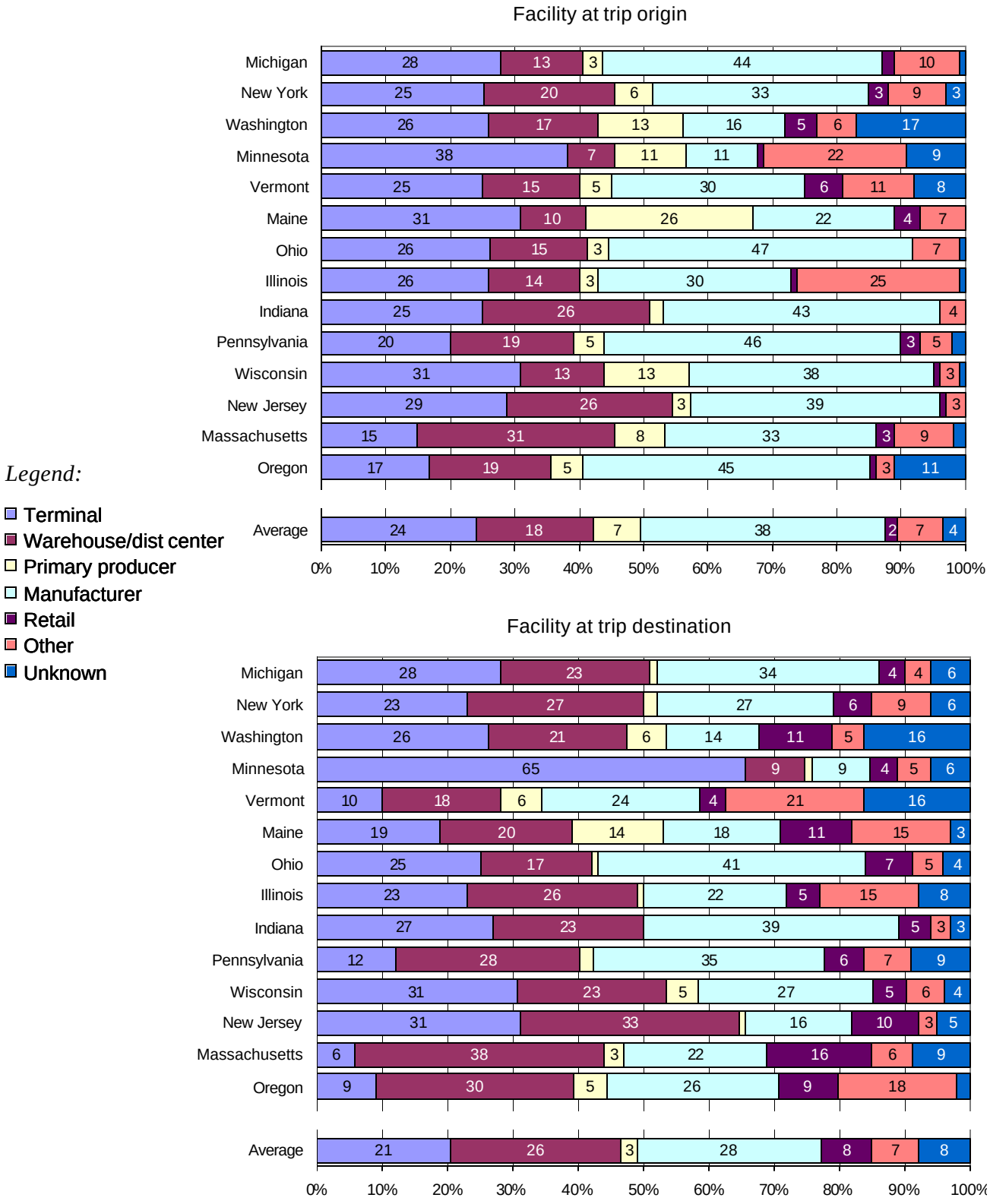

Figure 8: Facility type at trip origin and destination by state

About a third of the truck trips originating in Vermont do so at manufacturing facilities, as shown in Figure 8. In fact, the character of trip origins in Vermont looks more like Michigan and New York than might be expected for a smaller and predominately rural state.

Like most of the border states, Vermont is a net importer of goods from Canada. In dollar terms, Vermont primarily exports electronics, vehicles, and precision goods (SCTG 35-38) by motor carrier. They account for 86 percent of the flows to Canada. The remaining flows are varied, as shown in Table 12 and Figure 9. From an export tonnage standpoint the picture is quite different. Wood, textile, and leather products (SCTG 25-30) account for almost two-thirds of the tons shipped by motor carrier from Vermont. Electronics, vehicles, and precision goods, which dominated exports in dollar terms, accounts for only about eight percent of the tons shipped. Over half of the trucks entering Canada from Vermont origins are empty; the next largest commodity carried in terms of the number of trucks is wood products, textiles, and leather goods (SCTG 25-30). The remainder of the truck trips are distributed over the remainder of the commodity families, as shown in Table 12.

The flows from Canada into Vermont have somewhat different characteristics. In dollar terms three commodity groups make up over 80 percent of the goods imported into the state by motor carrier:

- SCTG 35-38: Electronics, vehicles, and precision goods (56 percent)
- SCTG 25-30: Wood, textile, and leather products (13 percent)
- SCTG 31-34: Metal products and machinery (11 percent)

In terms of imported tonnage and number of truck trips the dominant commodities are:

- SCTG 25-30: Wood, textile, and leather products (22 percent)
- SCTG 15-20: Coal and petroleum products (12 to 21 percent)
- SCTG 01-05: Agricultural products and fish (11 to 21 percent)
- SCTG 31-34: Metal products and machinery (13 to 17 percent)

Approximately 18 percent of the trucks entering Vermont from Canada are empty. It is interesting to note that in percentage terms Vermont exports and imports more electronic, vehicles, and precision goods (SCTG 35-38) than any other border state except Michigan. While Vermont has undoubtedly seen a decline in trade since the devaluation of high technology stocks over the past two years, it appears well positioned to dramatically increase trade level once the economy rebounds.

Almost all of Vermont's motor carrier trade with Canada involves two provinces: Québec and Ontario. The state-level summaries are shown in Table 13. Virtually all of the exports are destined for Québec, and 92 percent of the imports originate there.

Table 12: Weekly 1999 Vermont exports and imports by commodity group

Weekly flows originating in Vermont						Commodity Group		Weekly flows destined to Vermont					
Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent
0	0	0	0	1,144	53.3	—	Empty[b]	0	0	0	0	361	18.0
478,940	1.1	960	6.8	58	2.7	1-5	Agricultural products and fish	3,253,195	5.5	4,655	20.6	224	11.1
23,845	0.1	567	4.0	49	2.3	6-9	Grains, alcoholic beverages and tobacco	503,103	0.9	2,313	10.2	184	9.1
153,813	0.2	914	6.4	54	2.5	10-14	Stone, minerals and ores	507,714	0.9	1,285	5.7	70	3.5
437	0.0	78	0.5	4	0.2	15-20	Coal and petroleum products	1,045,622	1.8	4,707	20.8	244	12.1
611,144	1.4	982	6.9	55	2.5	21-24	Pharmaceutical and chemical products	604,501	1.0	240	1.1	48	2.4
2,325,871	5.3	8,769	61.8	552	25.7	25-30	Wood, textile, and leather products	7,683,647	13.1	4,928	21.8	449	22.3
2,003,967	4.6	425	3.0	33	1.5	31-34	Metal products and machinery	6,349,589	10.8	3,831	16.9	259	12.9
37,734,756	86.2	1,079	7.6	117	5.5	35-38	Electronics, vehicles, and precision goods	33,218,257	56.4	287	1.3	91	4.5
228,792	0.5	316	2.2	40	1.9	39-43	Furniture and miscellaneous products	1,324,181	2.2	178	0.8	48	2.4
229,806	0.5	104	0.7	41	1.9	—	Unclassified or unknown	4,364,732	7.4	213	0.9	32	1.6
43,791,371	100	14,194	100	2,147	100	Total		58,854,541	100	22,637	100	2,010	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.

b. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.

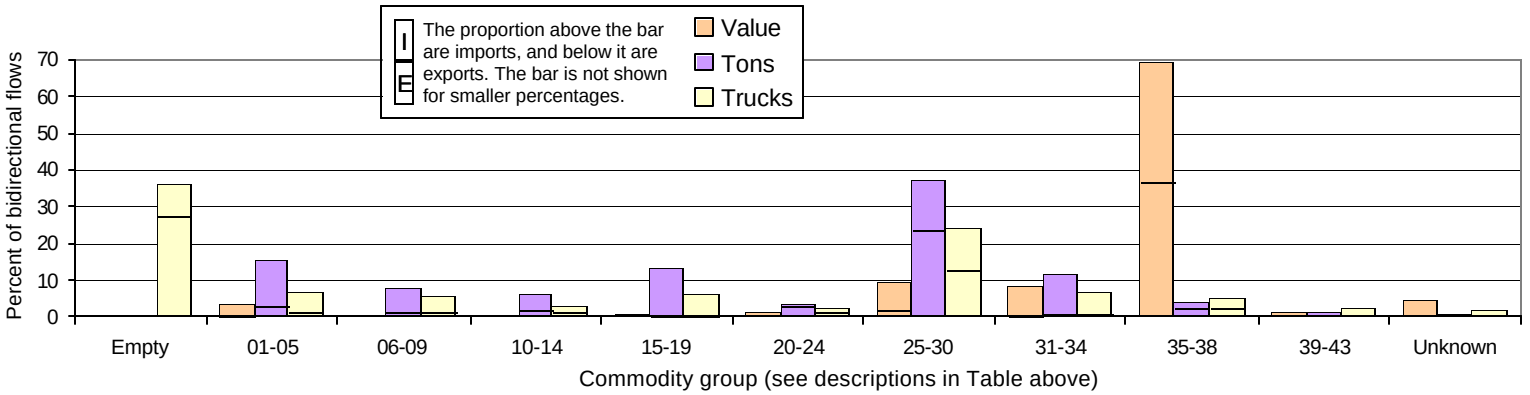

Figure 9: Weekly 1999 Vermont bidirectional flow percentages by commodity group and unit of measure

Table 13: Origin-destination patterns for Vermont exports and imports

Flows originating in Vermont (exports)

Destination	Value (US $)[a]	Percent	Short tons	Percent	Trucks	Percent
Québec	42,152,857	96.3	6,640	46.8	1,477	68.8
Ontario	1,496,103	3.4	6,129	43.2	532	24.8
New Brunswick	19,435	0.0	1,107	7.8	84	3.9
Oregon	0	0	162	1.1	9	0.4
All other	122,977	0.3	157	1.1	45	2.1
Total	43,791,372	100	14,194	100	2,147	100

Flows destined for Vermont (imports)

Origin	Value (US$)[a]	Percent	Short tons	Percent	Trucks	Percent
Québec	48,517,186	92.0	18,749	82.8	1,757	87.3
Ontario	9,251,638	7.1	3,370	14.9	212	10.5
New Brunswick	163,837	0.4	295	1.3	16	0.8
All other	921,881	0.5	223	1.0	27	1.4
Total	58,854,542	100	22,637	100	2,012	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 NRS.

New York

New York's trade with Canada accounts for approximately 30 percent of total Canada-U.S. trade transported by motor carriers. Compared to most states the commodity mix of both exports and imports is more varied and less dominated by a small number of commodity groups.

In dollar terms New York's exports to Canada by motor carrier cover the entire range of processed and manufactured goods, ranging from pharmaceuticals and chemicals (SCTG 21-24) to furniture and miscellaneous products (SCTG 39-43). These flows are summarized in Table 14. Indeed, the only products that are not traded in large numbers are agricultural, mineral, and bulk raw materials. In terms of tonnage the same broad patterns of commodity exports are present, although two commodity groups (wood, textile, and leather products [SCTG 25-30] and metal products and machinery [SCTG 31-34]) account for almost half of the tons exported by truck. These patterns are contrasted in Figure 10. The same patterns are present for truck trips originating in New York, although electronics, vehicles, and precision goods (SCTG 35-38) also comprise a significant number of the total truck origins. Almost 44 percent of the truck trips originating in New York are empty.

A similar pattern to exports is found for the commodity mix of imports, measured in dollar terms. Four commodity groups account for about 80 percent of the imports from Canada carried by truck:

Table 14: Weekly 1999 New York exports and imports by commodity group

Weekly flows originating in New York						Commodity Group		Weekly flows destined to New York					
Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent
0	0	0	0	8,954	43.9	—	Empty[b]	0	0	0	0	4,641	21.3
5,963,495	3.3	3,747	2.6	370	1.8	1-5	Agricultural products and fish	13,641,636	4.4	16,505	7.1	1,080	5.0
2,012,582	1.1	11,396	7.9	689	3.4	6-9	Grains, alcoholic beverages and tobacco	4,541,260	1.5	17,349	7.5	1,081	5.0
2,034,405	1.1	6,403	4.4	384	1.9	10-14	Stone, minerals and ores	4,219,004	1.4	8,850	3.8	444	2.0
1,327,857	0.7	11,904	8.2	583	2.9	15-20	Coal and petroleum products	3,242,003	1.0	20,254	8.7	1,043	4.8
20,594,240	11.5	7,839	5.4	731	3.6	21-24	Pharmaceutical and chemical products	21,181,697	6.8	14,474	6.2	1,312	6.0
21,686,330	12.1	38,419	26.6	2,490	12.2	25-30	Wood, textile, and leather products	51,842,125	16.7	43,060	18.5	3,097	14.2
50,594,962	28.2	27,075	18.8	1,878	9.2	31-34	Metal products and machinery	58,854,246	18.9	69,120	29.7	4,066	18.7
48,003,499	26.8	13,230	9.2	1,990	9.8	35-38	Electronics, vehicles, and precision goods	97,491,068	31.4	25,363	10.9	2,708	12.5
3,734,424	2.1	10,749	7.4	848	4.2	39-43	Furniture and miscellaneous products	35,729,247	11.5	7,329	3.2	830	3.8
23,423,562	13.1	13,596	9.4	1,459	7.2	—	Unclassified or unknown	20,082,355	6.5	10,237	4.4	1,447	6.7
179,375,356	100	144,358	100	20,376	100	Total		310,824,641	100	232,541	100	21,749	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.

b. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.

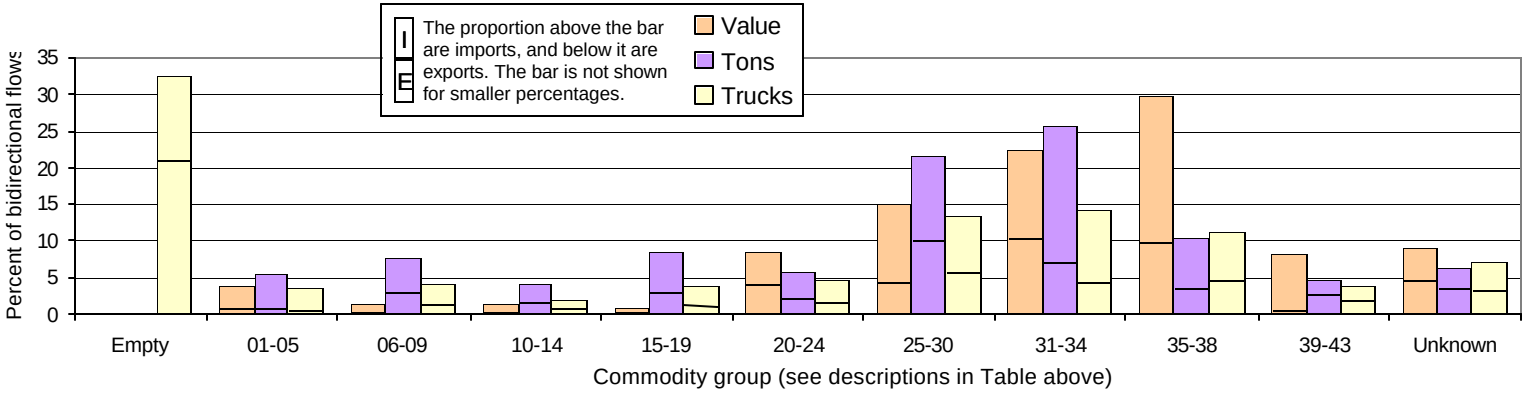

Figure 10: Weekly 1999 New York bidirectional flow percentages by commodity group and unit of measure

- SCTG 35-38: Electronics, vehicles, and precision goods (31 percent)
- SCTG 31-34: Metal products and machinery (19 percent)
- SCTG 25-30: Wood, textile, and leather products (17 percent)
- SCTG 39-43: Furniture and miscellaneous products (12 percent)

A much more varied commodity mix is found when considering trade flows measured in tonnage rather than value, as shown in Table 14. From a tonnage standpoint only two commodity groups are not imported in significant numbers. The largest import by weight (metal products and machinery) accounts for only one-third of the total imports into New York. The same is true for total truck trips destined for New York, with the above four commodity groups accounting for half of the total inbound truck trips.

New York is a net importer of goods transported by motor carrier from Canada. New York imports 75 percent more goods than it exports in dollar terms, and 60 percent more in tonnage terms. However, the number of truck trips into and out of the state are almost balanced.

Table 15: Origin-destination patterns for New York exports and imports

Flows originating in New York (exports)

Destination	Value (US $)[a]	Percent	Short tons	Percent	Trucks	Percent
Ontario	141,817,488	79.1	77,620	53.8	13,169	64.6
Québec[b]	26,889,125	15.0	38,236	26.5	4,560	22.4
Michigan	0	0	19,628	13.6	1,850	9.1
Illinois	0	0	4,145	2.9	340	1.7
All other	10,668,743	5.9	4,729	3.3	454	2.2
Total	179,375,356	100	144,358	100	20,374	100

Flows destined to New York (imports)

Origin	Value (US$)[a]	Percent	Short tons	Percent	Trucks	Percent
Ontario	191,895,540	61.7	130,773	56.2	13,710	63.0
Québec	98,219,801	31.6	60,553	26.0	5,400	24.8
Michigan	0	0	14,759	6.3	1,676	7.7
Indiana	0	0	14,024	6.0	395	1.8
Illinois	0	0	3,750	1.6	134	0.6
Ohio	0	0	3,522	1.5	107	0.5
All other	20,709,302	6.7	5,159	2.2	328	1.5
Total	310,824,643	100	232,541	100	21,749	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 NRS.
b. The import portion of this value is lower than actual because imports from the U.S. are attributed to the province of clearance (where the freight enters Canada and is cleared), rather than to the province of destination. See pages 12 and 13 and footnotes 4 and 5 for detailed discussion.

Almost all of New York's motor freight exports and imports to Canada, in value terms, are bound to and from Ontario and Québec. While the traditional trade data (from which the value of exports and imports were derived) do not record such movements, the NRS data reveals that approximately 11 to 16 percent of the total tons and truck trips leaving New York, respectively, are bound to Michigan and Illinois. These flows are summarized in Table 15. Most of the remaining exports from New York are destined for the Canadian Atlantic provinces.

A similar geographic pattern of Canadian origins is evident for New York motor carrier imports from Canada. Ontario and Québec account for 93 percent of the imports by value, 82 percent of the imports by tonnage, and 88 percent of the inbound truck trips. Trips from Michigan, Indiana, Illinois, and Ohio traveling across Ontario into New York account for another 11 percent of the truck trips and 15 percent of the total imported weekly tons.New York looks quite similar to the national patterns of facility type at the trip origins and destinations, as shown in Figure 8. Almost one-half of the trips originate in or are destined to transportation and distribution centers, from which they flow to other parts of the country.

Michigan

Michigan is Canada's largest trading partner in dollar terms, accounting for over 50 percent of the motor carrier trade. A large percentage of this trade is generated by the counties in Southeast Michigan. Historically this trade has been heavily dominated by the auto industries in Michigan and Ontario. In recent years the advent of supply chain logistics has allowed components to be manufactured in several locations, with semi-assembled autos traveling between specialized plants for completion. That trend is certainly evident in the NRS data, as only two commodity groups account for about 85 percent of both imports and exports, measured in dollar terms:

- SCTG 35-38: Electronics, vehicles, and precision goods (50 to 66 percent)
- SCTG 31-34: Metal products and machinery (17 to 35 percent)

This specialization in commodity exports and imports is more pronounced in Michigan than in any other border state. A summary of Michigan's trade by commodity group is shown in Table 16 and Figure 11.

The same two commodity groups also dominate the number of total tons exported and imported, although to a somewhat smaller extent (60 percent of exports and imports). From a tonnage standpoint two other commodities account for another 20 percent of the shipments both into and out of Michigan:

- SCTG 25-30: Wood, textile, and leather products (9 to 14 percent)
- SCTG 01-05: Agricultural products and fish (8 to 10 percent)

In contrast to the dominant auto-oriented commodities which are produced in the southern part of the lower peninsula, these commodities originate in and are destined to counties all across the state.

Table 16: Weekly 1999 Michigan exports and imports by commodity group

Weekly flows originating in Michigan						Commodity Group		Weekly flows destined to Michigan					
Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent
0	0	0	0	11,133	43.5	—	Empty[b]	0	0	0	0	11,377	36.1
1,690,445	0.5	15,744	9.9	665	2.6	1-5	Agricultural products and fish	5,009,095	1.0	18,598	7.7	924	2.9
3,043,021	0.9	4,902	3.1	339	1.3	6-9	Grains, alcoholic beverages and tobacco	2,248,443	0.4	13,929	5.8	713	2.3
6,755,900	1.9	1,675	1.0	67	0.3	10-14	Stone, minerals and ores	4,074,749	0.8	3,594	1.5	159	0.5
981,975	0.3	4,998	3.1	490	1.9	15-20	Coal and petroleum products	1,307,682	0.3	10,495	4.4	479	1.5
18,562,500	5.2	4,831	3.0	595	2.3	21-24	Pharmaceutical and chemical products	15,210,072	3.0	7,452	3.1	933	3.0
4,932,666	1.4	14,371	9.0	1,042	4.1	25-30	Wood, textile, and leather products	22,484,851	4.4	32,483	13.5	1,832	5.8
125,104,747	35.2	51,050	31.9	4,201	16.4	31-34	Metal products and machinery	88,693,715	17.3	62,138	25.9	5,495	17.4
176,470,345	49.6	47,501	29.7	5,443	21.3	35-38	Electronics, vehicles, and precision goods	340,256,990	66.3	72,272	30.1	7,952	25.2
15,635,481	4.4	7,127	4.5	588	2.3	39-43	Furniture and miscellaneous products	13,541,023	2.6	11,570	4.8	701	2.2
2,664,260	0.7	7,602	4.8	1,030	4.0	—	Unclassified or unknown	20,143,822	3.9	7,615	3.2	968	3.1
355,841,340	100	159,801	100	25,593	100	Total[c]		512,970,442	100	240,146	100	31,533	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.

b. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.

c. Percentages may not total exactly 100 percent due to rounding.

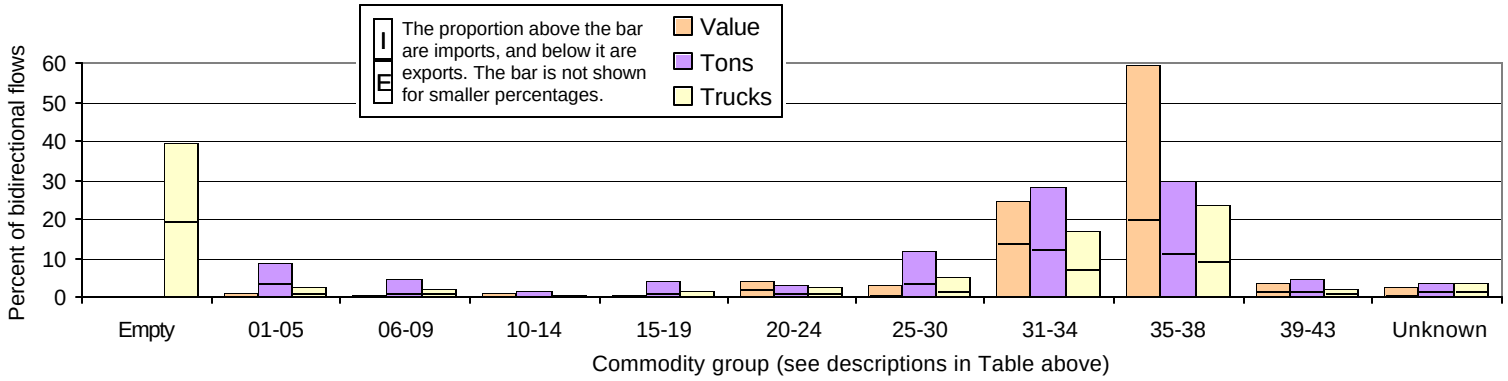

Figure 11: Weekly 1999 Michigan bidirectional flow percentages by commodity group and unit of measure

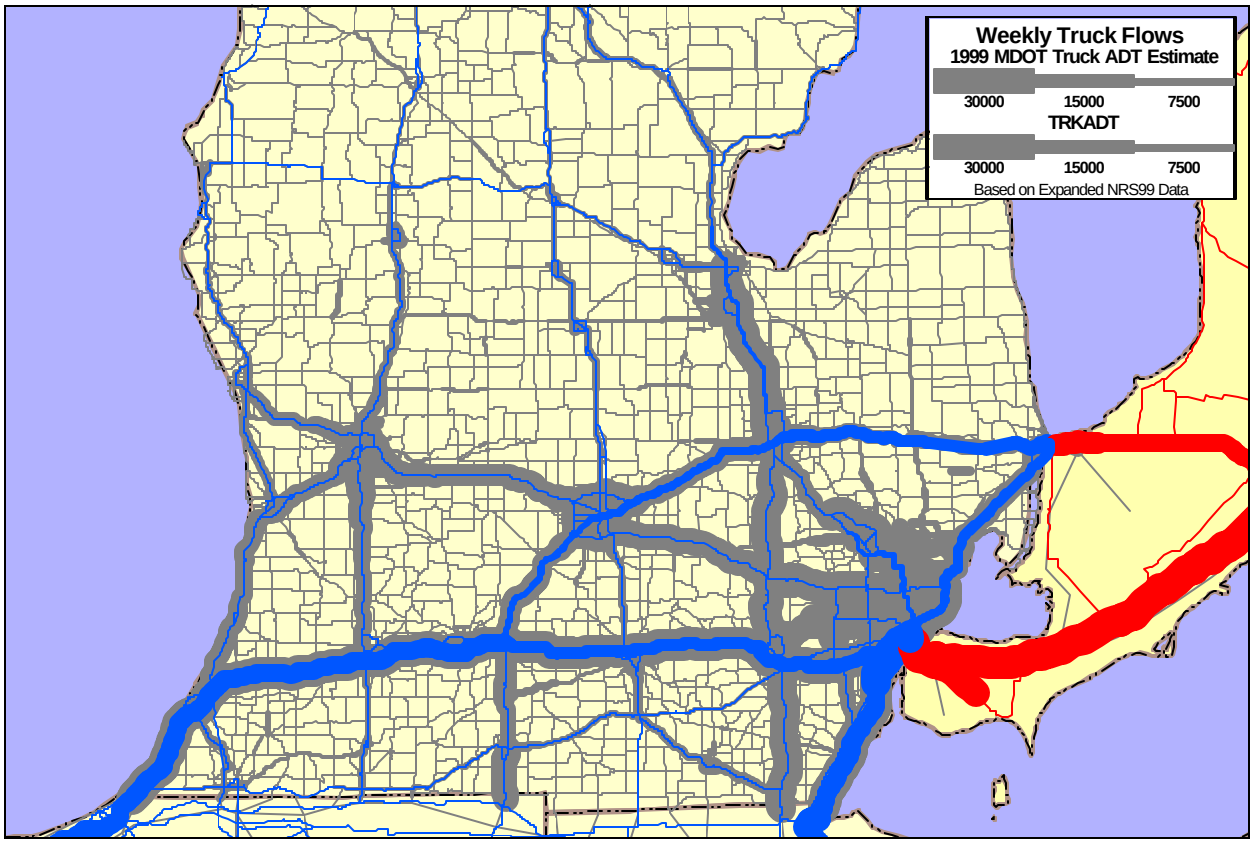

Figure 12: 1999 weekly Michigan export and import truck flows on Michigan highways

Truck trips to and from Michigan show the same pattern of commodity mix as the summaries by value and tonnage. Like the other border states, a large number of empty trucks originate in and are destined to Michigan (44 percent and 36 percent, respectively). Those aside, three of the four commodities identified above account for the majority of truck trips between Michigan and Canada:

- SCTG 35-38: Electronics, vehicles, and precision goods (21 to 25 percent)
- SCTG 31-34: Metal products and machinery (16 to 17 percent)
- SCTG 25-30: Wood, textile, and leather products (4 to 6 percent)

Almost all of Michigan's motor carrier trade is with Ontario, as shown in Table 17. In dollar terms about 98 percent of Michigan's exports and 95 percent of their imports flow to and from Ontario. In tonnage terms the mix is about the same; Ontario accounts for roughly 85 percent of Michigan's total export and import tons. The share of truck trips is about 90 percent in both directions. Michigan's trade with Canada is clearly very closely linked with Ontario's economy. Flows from Michigan to and from New York are the next largest flow, accounting for between 6 and 9 percent of the flows, measured in tonnage and truck trip terms, respectively.

Michigan maintains a statewide transportation database and travel forecasting model in a GIS framework. This permits an assessment of the contribution of Can-

Table 17: Origin-destination patterns for Michigan exports and imports

Flows originating in Michigan (exports)

Destination	Value (US $)[a]	Percent	Short tons	Percent	Trucks	Percent
Ontario	348,071,120	97.8	136,835	85.6	23,060	90.1
New York	0	0	14,759	9.2	1,676	6.5
Québec[b]	1,790,709	0.5	3,329	2.1	329	1.3
All other	5,979,511	1.7	4,878	3.1	527	2.1
Total	355,841,340	100	159,801	100	25,592	100

Flows destined to Michigan (imports)

Origin	Value (US$)[a]	Percent	Short tons	Percent	Trucks	Percent
Ontario	488,606,460	95.3	201,133	83.8	28,342	89.9
New York	0	0	19,628	8.2	1,850	5.9
Québec	17,892,009	3.5	13,624	5.7	683	2.2
All other	6,471,972	1.3	5,761	2.4	657	2.1
Total	512,970,441	100	240,146	100	31,533	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 NRS.
b. The import portion of this value is lower than actual because imports from the U.S. are attributed to the province of clearance (where the freight enters Canada and is cleared), rather than to the province of destination. See pages 12 and 13 and footnotes 4 and 5 for detailed discussion.

ada-U.S. trade to highway volumes in Michigan. This comparison is shown in Figure 12. The grey bands show 1999 average weekly truck volumes, while the blue bands superimposed over them are the 1999 weekly NRS flows assigned to the same network. There are several instances where the truck flows represent the majority of trucks on the roadways, including I-69 between Flint and the Blue Water Bridge, all of I-94, and I-75 from Detroit south to the Ohio border. It is likely that international truck traffic in the other border states have a similar impact upon the roadway system. The availability of Michigan's statewide modeling system provides the first demonstrable indication of such.

Minnesota

Minnesota's trade with Canada is diverse, both in terms of commodity mix and origin-destination patterns. A summary of Canada-U.S. trade by commodity group and value, weight, and trucks is shown in Table 18. Over two-thirds of Minnesota's exports to Canada in dollar terms are from three commodity groups:

- SCTG 35-38: Electronics, vehicles, and precision goods (35 percent)
- SCTG 31-34: Metal products and machinery (26 percent)
- SCTG 06-09: Grains, alcoholic beverages, and tobacco (9 percent)

Almost all of the other commodity groups are represented as well, with the exception of some raw minerals and energy products. A remarkably different pattern

Table 18: Weekly 1999 Minnesota exports and imports by commodity group

Weekly flows originating in Minnesota						Commodity Group		Weekly flows destined to Minnesota					
Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent
0	0	0	0	2,093	45.7	—	Empty[b]	0	0	0	0	2,039	48.7
2,835,541	7.5	4,256	10.4	225	4.9	1-5	Agricultural products and fish	2,646,158	6.1	3,823	12.0	238	5.7
3,567,945	9.4	1,298	3.2	83	1.8	6-9	Grains, alcoholic beverages and tobacco	1,317,417	3.0	612	1.9	39	0.9
832,104	2.2	319	0.8	15	0.3	10-14	Stone, minerals and ores	2,176,431	5.0	181	0.6	10	0.2
75,775	0.2	2,042	5.0	202	4.4	15-20	Coal and petroleum products	814,580	1.9	1,125	3.5	67	1.6
2,516,223	6.6	1,576	3.9	90	2.0	21-24	Pharmaceutical and chemical products	6,070,361	13.9	2,925	9.2	177	4.2
2,294,925	6.0	25,413	62.2	1,309	28.6	25-30	Wood, textile, and leather products	8,166,400	18.7	16,186	50.9	875	20.9
9,840,222	25.9	3,242	7.9	202	4.4	31-34	Metal products and machinery	6,387,177	14.6	2,318	7.3	254	6.1
13,206,861	34.7	767	1.9	174	3.8	35-38	Electronics, vehicles, and precision goods	10,428,377	23.9	1,020	3.2	172	4.1
1,145,377	3.0	847	2.1	82	1.8	39-43	Furniture and miscellaneous products	2,120,181	4.9	299	0.9	44	1.1
1,744,000	4.6	1,094	2.7	109	2.4	—	Unclassified or unknown	3,557,869	8.1	3,326	10.5	277	6.6
38,058,973	100	40,854	100	4,584	100	Total[c]		43,684,951	100	31,815	100	4,192	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.
b. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.
c. Percentages may not total exactly 100 percent due to rounding.

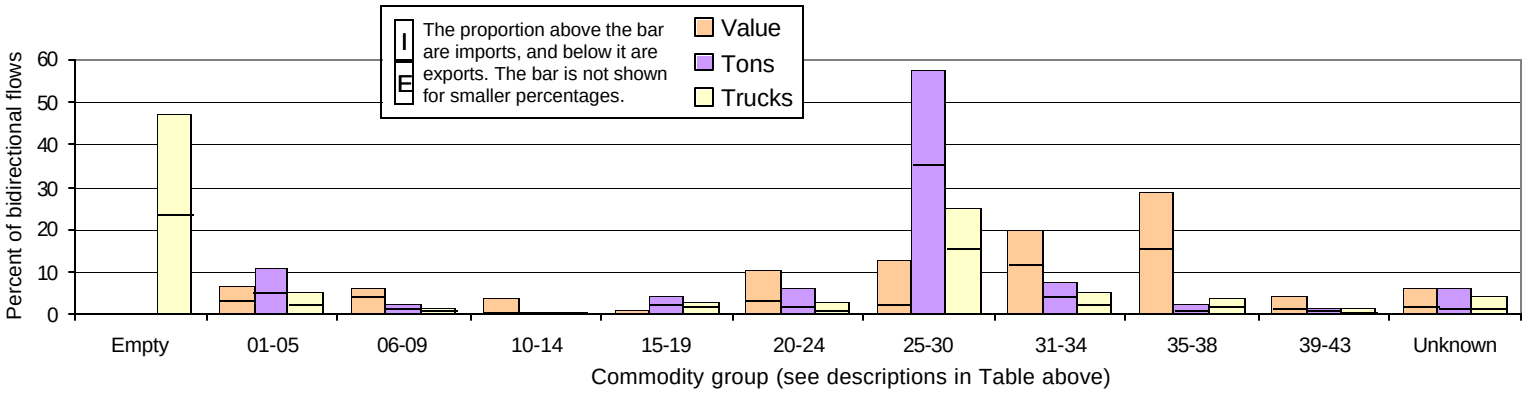

Figure 13: Weekly 1999 Minnesota bidirectional flow percentages by commodity group and unit of measure

emerges when evaluating Minnesota's exports in tonnage terms, as shown in Figure 13. Wood, textile, and leather products (SCTG 25-30) represent almost two-thirds of the exports by tonnage, although they account for only six percent of the exports by value. Agricultural products and fish (SCTG 01-05) are the second largest, accounting for 10 percent of Minnesota's exports by weight.

Almost half of the trucks leaving Minnesota for Canadian destinations are empty. Of the remaining trucks, about half carry wood, textile, and leather products (SCTG 25-30), which is roughly comparable to the percentage of exports by weight. The remaining trucks carry almost all of the other commodity groups, as shown in Table 18.

Minnesota's imports from Canada are quite varied when viewed in value terms, as shown in Table 18. Four commodity groups account for almost three-quarters of the imports:

- SCTG 35-38: Electronics, vehicles, and precision goods (24 percent)
- SCTG 25-30: Wood, textile, and leather products (19 percent)
- SCTG 31-34: Metal products and machinery (15 percent)
- SCTG 21-24: Pharmaceutical and chemical products (14 percent)

Table 19: Origin-destination patterns for Minnesota exports and imports

Flows originating in Minnesota (exports)

Destination	Value (US $)[a]	Percent	Short tons	Percent	Trucks	Percent
Ontario	21,583,818	56.7	30,842	75.5	3,318	72.4
Manitoba	12,078,322	31.7	6,107	14.9	496	10.8
Saskatchewan	1,597,191	4.2	791	1.9	42	0.9
Québec[b]	691,090	1.8	741	1.8	67	1.5
Alberta	1,085,249	2.9	458	1.1	39	0.9
All other	1,023,303	2.7	1,914	4.7	623	13.6
Total	38,058,973	100	40,854	100	4,585	100

Flows destined to Minnesota (imports)

Origin	Value (US$)[a]	Percent	Short tons	Percent	Trucks	Percent
Ontario	21,736,255	49.8	14,713	46.2	2,381	56.8
Manitoba	11,422,833	26.1	11,716	36.8	919	21.9
Québec	4,946,453	11.3	1,926	6.1	146	3.5
Alberta	2,138,644	4.9	1,001	3.1	76	1.8
All other	3,440,765	7.9	2,459	7.7	669	16.0
Total	43,684,950	100	31,815	100	4,191	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 NRS.

b. The import portion of this value is lower than actual because imports from the U.S. are attributed to the province of clearance (where the freight enters Canada and is cleared), rather than to the province of destination. See pages 12 and 13 and footnotes 4 and 5 for detailed discussion.

When considering imports in terms of tonnage, a different picture emerges. Wood, textile, and leather products (SCTG 25-30) account for over half of the total tons imported by truck from Canada. Agricultural products and fish (SCTG 01-05) are the second largest commodity group by weight, amounting to 12 percent of the total flow.

As with exports, almost half of the trucks entering Minnesota from Canada are empty. Of the remainder, about 40 percent carry wood, textile, and leather products (SCTG 25-30). The remainder are spread across the other commodity groups, with the pattern more closely resembling the distribution of imported commodities by weight rather than value.

Minnesota has an interesting pattern of trading relationships with Canadian provinces. These relationships are shown in Table 19. Almost 60 percent of their exports in dollar terms are bound to Ontario, with another 32 percent to Manitoba. The relationship is also as pronounced when measured in terms of tons, with 90 percent of the exported goods bound for Ontario and Manitoba. The percentage is slightly lower (83 percent) for these two provinces when measuring the flows as truck volumes.

The patterns are different for imports from Canada. Ontario is the largest origin of goods to Minnesota, accounting for almost one half of the value of imports. Ontario, the dominant destination for Minnesota exports, accounts for half of the imported value. The relationship is similar when measuring the imports in tonnage or truck volume terms. Ontario accounts for roughly half of the trips destined for Minnesota, while Manitoba accounts for between 22 percent (for trucks) to 37 percent (for tonnage) of the flows.

Minnesota has the highest percentage of trips originating at truck, marine, and air terminals of any state, as shown in Figure 8. This suggests that a large amount of the goods exported from Minnesota to Canada are produced elsewhere and staged at these terminals for export shipment. An even larger proportion — 65 percent — of the goods imported to Minnesota are destined for terminals. Another nine percent of the import flows are destined for warehousing and distributions centers. Thus, three-quarters of the goods imported into Minnesota are being handled for re-shipment. The only other state that comes close to this proportion of intermediate destinations is New Jersey, where a large volume of the imported goods are destined for marine terminals and freight forwarders.

Washington

The State of Washington is a major gateway to the Pacific Rim, as well as the center of a strong regional economy. The eastern part of the state is predominately rural, and is heavily invested in agriculture and forestry. The western part of the state, especially in the Seattle-Tacoma region, is heavily diversified in high technology, manufacturing, and aerospace industries. The mix of commodities traded with Canada is as broad as the economy of the state itself.

Table 20: Weekly 1999 Washington exports and imports by commodity group

Weekly flows originating in Washington						Commodity Group		Weekly flows destined to Washington					
Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent
0	0	0	0	4,906	43.5	—	Empty[b]	0	0	0	0	3,841	37.1
9,871,677	20.2	15,942	21.5	1,200	10.6	1-5	Agricultural products and fish	17,173,828	20.5	15,853	17.0	1,295	12.5
1,273,438	2.6	2,023	2.7	170	1.5	6-9	Grains, alcoholic beverages and tobacco	1,439,862	1.7	4,372	4.7	219	2.1
814,020	1.7	7,364	9.9	295	2.6	10-14	Stone, minerals and ores	1,651,258	2.0	3,899	4.2	183	1.8
1,544,465	3.2	9,166	12.4	653	5.8	15-20	Coal and petroleum products	467,211	0.6	1,676	1.8	73	0.7
3,452,725	7.1	367	0.5	58	0.5	21-24	Pharmaceutical and chemical products	3,367,626	4.0	693	0.7	43	0.4
6,163,514	12.6	9,768	13.2	1,006	8.9	25-30	Wood, textile, and leather products	18,923,378	22.6	45,331	48.7	2,693	26.0
10,768,596	22.0	14,455	19.5	1,014	9.0	31-34	Metal products and machinery	6,486,973	7.8	4,616	5.0	294	2.8
9,283,759	19.0	1,388	1.9	205	1.8	35-38	Electronics, vehicles, and precision goods	17,488,229	20.9	1,385	1.5	245	2.4
4,338,733	8.9	2,212	3.0	876	7.8	39-43	Furniture and miscellaneous products	2,650,686	3.2	3,020	3.2	522	5.0
1,375,597	2.8	11,389	15.4	906	8.0	—	Unclassified or unknown	14,006,393	16.7	12,309	13.2	958	9.2
48,886,524	100	74,074	100	11,289	100	Total[c]		83,655,444	100	93,154	100	10,366	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.

b. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.

c. Percentages may not total exactly 100 percent due to rounding.

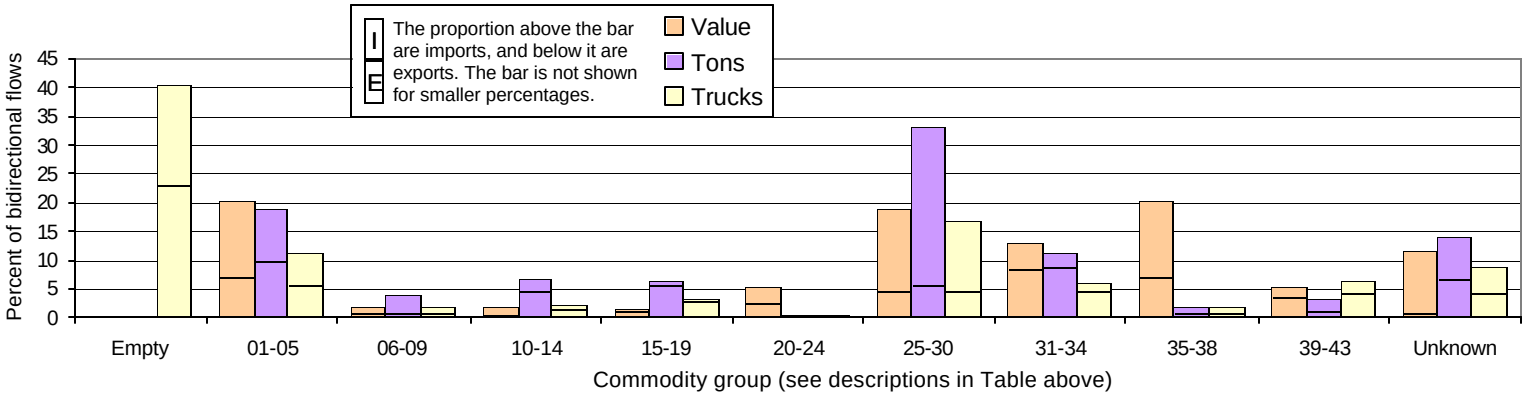

Figure 14: Weekly 1999 Washington bidirectional flow percentages by commodity group and unit of measure

Washington Exports to Canada

Metal products and machinery (SCTG 31-34) are the largest commodities by value exported to Canada. Almost one-quarter of the total exports by value are in this category. Agricultural products and fish (SCTG 05-09) is the second largest export commodity by value, accounting for 20 percent of the flows. Almost all of the former are produced in the western part of the state, while the latter are primarily exported from eastern Washington. These two commodity groups account for a little more than 40 percent of the export flows by value, as shown in Table 20. Another 40 percent by value consists of three commodity groups:

- SCTG 35-38: Electronics, vehicles, and precision goods (19 percent)
- SCTG 25-30: Wood, textile, and leather products (13 percent)
- SCTG 39-43: Furniture and miscellaneous products (9 percent)

From a weight perspective the commodity mix is somewhat different. Agricultural products and fish (SCTG 01-05) and metal products and machinery (SCTG 31-34) still account for 40 percent of the total export flows. However, wood, textile, and leather products (SCTG 25-30) and coal and petroleum products (SCTG 15-20) are the next highest tonnage volumes, each accounting for roughly 13 percent of the export flows.

Empty trucks account for 44 percent of the total truck flows between Washington and Canada. Of the remainder, the dominant commodities are:

- SCTG 01-05: Agricultural products and fish (11 percent)
- SCTG 31-34: Metal products and machinery (9 percent)
- SCTG 25-30: Wood, textiles, and leather products (9 percent)
- SCTG 39-43: Furniture and miscellaneous products (8 percent)

The destination for 80 percent of Washington's exports is British Columbia, as shown in Table 21. The percentage is higher (90 percent) for tonnage and truck trips bound to British Columbia. This is true regardless of whether the commodities are measured in value, weight, or truck terms, as shown in Table 21. A significant number of trips are to Ontario, with the remainder primarily destined for Alberta.

Exports from Washington by facility type are shown in Figure 8. Over a third of the originating trips in the NRS started at manufacturing facilities. This percentage is much lower (16 percent) in Washington, with a higher percentage coming from primary producers. The latter includes agriculture and forestry products, which are the principal exports from the eastern part of the state.

Washington Imports from Canada

Almost three-quarters of Washington's imports from Canada by value fall into three commodity groups:

- SCTG 25-30: Wood, textiles, and leather products (23 percent)
- SCTG 35-38: Electronics, vehicles, and precision goods (21 percent)
- SCTG 01-05: Agricultural products and fish (21 percent)

In weight and truck volume terms, wood, textile, and leather products (SCTG 25-30) comprise almost half of the goods imported from Canada. Agricultural products and fish account for another 17 percent, with the remainder spread across the other commodity categories. Empty trucks account for 37 percent of the trucks destined to Washington from Canada. The import flows are summarized in Table 20.

The origin of imports into Washington are shown in Table 21. Half of the value of Washington's imports by truck originate in British Columbia, a smaller percentage than for exports. Another 12 percent by value originate in Alberta. This is sensible, in that Washington is a net importer of agricultural products and fish, the origins of which are more evenly distributed between British Columbia and Alberta. The same pattern holds true when measured in weight or truck volume terms, with British Columbia's share increasing to between 87 and 89 percent of the imported commodities.

Table 21: Origin-destination patterns for Washington exports and imports

Flows originating in Washington (exports)

Destination	Value (US $)[a]	Percent	Short tons	Percent	Trucks	Percent
British Columbia	38,955,755	79.7	67,462	91.1	10,522	93.2
Alberta	865,515	1.8	4,384	5.9	304	2.7
Ontario	6,343,722	13.0	744	1.0	60	0.5
All other	2,721,533	5.6	1,484	2.0	404	3.6
Total	48,886,525	100	74,074	100	11,290	100

Flows destined for Washington (imports)

Origin	Value (US$)[a]	Percent	Short tons	Percent	Trucks	Percent
British Columbia	40,646,583	48.6	80,540	86.5	9,231	89.0
Alberta	9,866,173	11.8	9,477	10.2	537	5.2
Québec	3,127,520	3.7	977	1.0	71	0.7
All other	30,015,168	35.9	2,160	2.3	529	5.1
Total	83,655,444	100	93,154	100	10,367	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 NRS.

CHAPTER 4

Summaries of Trade by Province

Almost all of Canada's population lives within 50 kilometers of the Canada-U.S. border. Each of the provinces exhibit markedly different trade characteristics. Almost all of Canada's motor carrier exports to and imports from the U.S. involve three provinces: Ontario, Québec, and British Columbia. This is hardly surprising, as these three provinces contribute over 74 percent of Canada's gross domestic product (Statistics Canada, 2001).

One can obtain markedly different pictures of motor carrier trade, depending on the unit of measure employed. These pictures appear more distorted in the Atlantic provinces of Canada than anywhere else. For example, the traditional trade statistics report that the average weekly exports from Newfoundland and Labrador for September and October, 1999, amounted to C$9.4 million. Average weekly motor carrier imports, however, shown as only C$0.3 million, probably due largely to the Province of Clearance problem discussed on pages 12-13. When summarizing trade in tonnage or truck trip terms the difference is far more balanced. Newfoundland and Labrador is still a net exporter of goods carried by truck, but the data collected in the NRS report that Newfoundland and Labrador only exports about eight percent more tons of freight by truck than it imports, while the total number of trucks are equal.

As noted in the first chapter, data on the value of shipment were not collected as part of the NRS. Several different methods of imputing these data were explored before deciding to use the official trade statistics compiled jointly by both countries. The most easily accessible source of these data are the Transborder Surface Freight Data (TSFD), published by the U.S. Department of Transportation. These data are tabulations of, and therefore consistent with, published statistics and data on exports and imports from both countries.

We calculated the average weekly exports and imports (the same duration of time covered by the NRS surveys) from the TSFD data, which should allow us to directly contrast TSFD and NRS data covering the same period of time. A cursory

inspection of the results suggests that the data appear different for the Atlantic provinces, although they look quite reasonable and intuitive for the rest of Canada.

There are several plausible explanations for the striking imbalance in trade suggested by the published trade statistics, and their apparent divergence from the NRS survey findings:

- Canadian Customs codes the destination of imports as the province of clearance, rather than the true destination. This understates the value of imports attributed to Québec and the Atlantic provinces, as many of the imports destined there enter Canada through Ontario.
- The TSFD and NRS are different sources of information. The TSFD are foreign trade data, which usually represent the origin and destination of the commodity[1], except for the previously noted province of clearance problem (see pages 12 and 13). The NRS, by contrast, is better suited towards understanding the origin and destination of the truck trips crossing the border. This trip may not represent the entire journey of the goods carried (see Figure 15).
- The TSFD is a complete accounting of Canada-U.S. trade, but at a rather abstract level of geography. It is based on documentation supplied by shippers of the goods. The NRS is a very detailed microscale survey of carriers, but only from a sample of the traffic streams at selected locations across Canada collected in a single week. Differing modal and origin-destination coding practices may further frustrate efforts to fuse these data.
- The number of NRS samples in Newfoundland and Labrador, Nova Scotia, and Prince Edward Island are all very small. While the truck and commodity patterns reported for them in this chapter appear to be reasonable, care should be exercised in interpreting or using the reported data due to the small sample size.
- Some significant dynamics are not readily apparent from inspecting either set of data. For example, the Canadian National (CN) railway no longer provides rates to and from Newfoundland and Labrador. Truck or marine modes are used to complete the journey. Because the shipper describes the mode of transport at the trip origin, outbound intermodal shipments from Newfoundland and Labrador are coded as truck in the trade statistics, although they travel predominately by rail to their destination. Similar circumstances occur when movements which start out by truck on the Island of Newfoundland but are actually delivered to the receiver by a marine service. These arrangements partially explain the high ratio of export to import value for Newfoundland and Labrador. Similar unique transportation services affect the other Atlantic provinces.
- Some goods are imported into the Atlantic provinces, and re-exported to the U.S. after some repackaging or consolidation. This does not explain a large amount of the variance, as most of the shipments from the Atlantic provinces

1. As noted in previous EBTC reports, there is some evidence that the trade data often reflect the endpoints of the financial transactions involved, rather than the true origin and destination of the shipment. This is particularly true in the auto industry, where one of the “Big Three” companies in Southeast Michigan may be both the shipper and cosignee, but is handling the transaction on behalf of subsidiaries or plants located elsewhere. This makes the trade data even less useful for tracking the true origin and destination of the physical shipments.

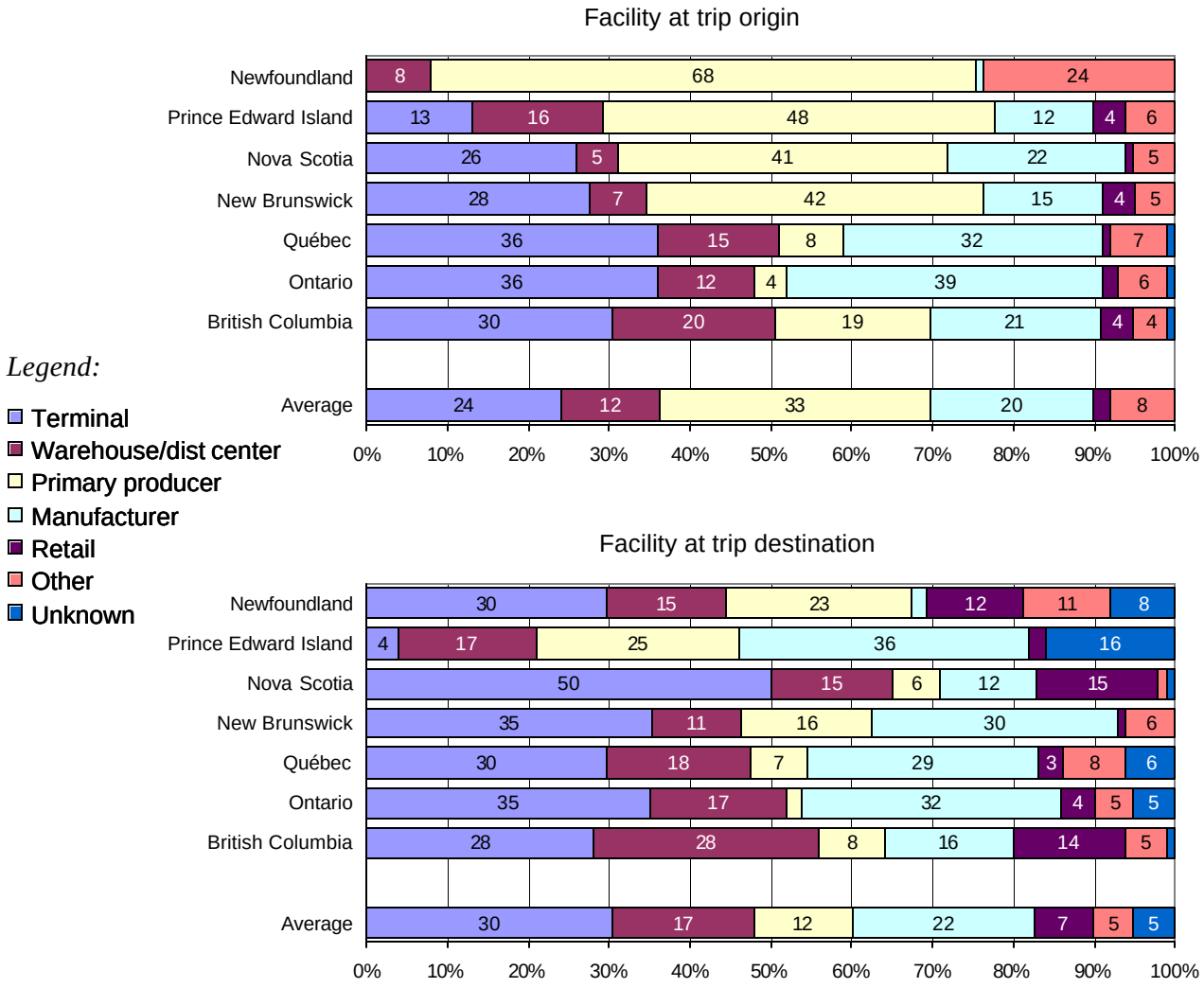

Figure 15: Facility type at trip origin and destination by province

originate at primary producers, as shown in Figure 15. In fact, the percentage of truck trips originating at terminals, warehouses, and distribution centers is generally lower in the Atlantic provinces than for Canada as a whole.

In light of these factors, considerable care should be taken when examining and interpreting the results presented for Québec and the Atlantic provinces. Despite the limitations noted, we believe that both sets of data convey useful information about motor carrier flows in the Atlantic provinces. It should also be noted that these differences are not apparent in the data reported for the other Canadian provinces.

A discussion follows about each of the provinces included in this study, from east to west. Several of the midwestern provinces that did not release their NRS for our use are not covered. As a result, there are not enough data available to us from

which to describe trade with these provinces. A detailed examination of some of the major crossings in these provinces appears in the following chapter.

Newfoundland and Labrador

Newfoundland and Labrador is the easternmost province in Canada. In trade dollar terms the province is a net exporter of motor freight to the U.S., as shown in Table 22. One commodity group, agricultural products and fish (SCTG 01-05) accounts for 94 percent of the total value of goods exported by truck. It is likely that the trade statistics mis-classifies the mode of transport of these goods, which probably travel by some combination of rail and air (the latter for high-value seafood products). Without this large attribution of value trade traveling by truck between Newfoundland and Labrador and the U.S. would be more balanced, although the province would still export 80 percent more products by truck than it imports.

The commodity mix is somewhat different when looking at truck exports in tonnage or truck trip terms. Agricultural products and fish still dominate, accounting for two-thirds of total weekly tons exported by truck. The next largest commodity group is furniture and miscellaneous goods, which accounts for only 9 percent of total exports by tonnage. The same pattern emerges when classifying exports by truck trips, although pharmaceutical and chemical products account for slightly more export truck trips than furniture and miscellaneous products. More significantly, the imbalance between exports and imports reported in the NRS is far less than the amount suggested in the trade statistics.

The origin-destination pattern of Newfoundland and Labrador exports and imports is shown in Table 23. The Table is sorted in descending order based on total tons exported. All destinations accounting for more than one percent of total exports by tonnage are shown. Massachusetts is the largest export destination, accounting for 65 percent of the truck exports by value, and 50 percent by tonnage and truck trips. A large number of states not shown in the Table receive small shares of the total truck exports, but collectively they account for a little more than one-quarter of the total flows by value. In tonnage and truck share terms, four other states — Maine, New York, Illinois, and South Carolina — account for the majority of truck exports not shipped to Massachusetts.

Newfoundland and Labrador's primary imports are metal products and machinery (SCTG 31-34) and electronics, vehicles, and precision goods (SCTG 35-38) in value terms, as shown in Table 22. These two commodity groups account for over three-quarters of the total goods imported by truck. Pharmaceutical and chemical products make up an additional 11 percent of the imported goods by value. The pattern is different in tonnage or truck trip terms. Three commodity groups account for almost 70 percent (for truck trips) to 80 percent (tonnage) of imports by truck:

- SCTG 01-05: Agricultural products and fish (29 to 34 percent)
- SCTG 21-24: Pharmaceutical and chemical products (27 to 31 percent)
- SCTG 06-09: Grains, alcoholic beverages, and tobacco (12 to 15 percent)

Table 22: Weekly 1999 Newfoundland and Labrador exports and imports by commodity group

Weekly flows originating in Newfoundland						Commodity group		Weekly flows destined to Newfoundland[a]					
Value (C$)[b]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
0	0.0	0	0	0	0	—	Empty[c]	0	0.0	0	0	0	0
8,905,686	94.1	403	66.2	22	68.3	1-5	Agricultural products and fish	2,174	0.7	193	34.4	10	29.4
17,499	0.2	0	0	0	0	6-9	Grains, alcoholic beverages and tobacco	6,377	2.1	83	14.8	4	12.4
6,645	0.1	0	0	0	0	10-14	Stone, minerals and ores	0	0.0	0	0	0	0
17,051	0.2	0	0	0	0	15-20	Coal and petroleum products	1501	0.5	28	4.9	2	5.4
16,880	0.2	47	7.8	3	8.1	21-24	Pharmaceutical and chemical products	32,722	10.6	172	30.7	9	26.5
322,305	3.4	38	6.2	1	4.0	25-30	Wood, textile, and leather products	21,827	7.0	0	0	0	0
39,824	0.4	5	0.8	1	1.8	31-34	Metal products and machinery	178,958	57.8	21	3.8	2	5.9
103,331	1.1	0	0	0	0	35-38	Electronics, vehicles, and precision goods	51,515	16.6	8	1.3	2	5.4
34,383	0.4	55	9.1	2	7.5	39-43	Furniture and miscellaneous products	7,118	2.3	35	6.3	3	8.7
0	0.0	60	9.9	3	10.3	—	Unclassified or unknown	7,602	2.5	21	3.7	2	6.2
9,463,604	100	608	100	32	100	Total[d]		309,794	100	561	100	34	100

a. The import portion of this value is lower than actual because imports from the U.S. are attributed to the province of clearance (where the freight enters Canada and is cleared), rather than to the province of destination. See pages 12 and 13 and footnotes 4 and 5 for detailed discussion.
b. Data for value are from the USDOT Transborder Surface Freight Data for September and October, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.
c. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.
d. Percentages may not total exactly to 100 percent due to rounding.

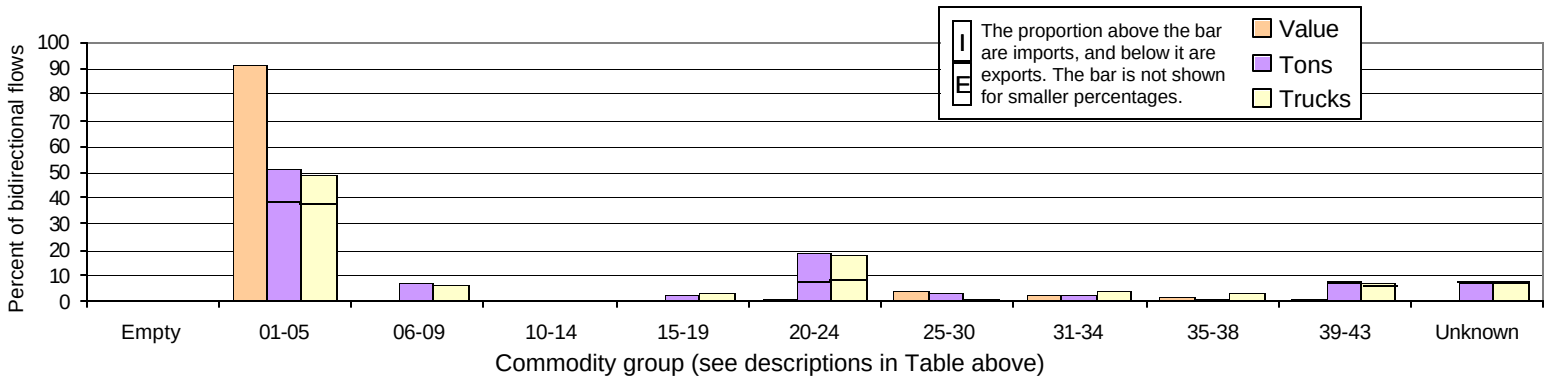

Figure 16: Weekly 1999 Newfoundland and Labrador bidirectional flow percentages by commodity group and unit of measure

Table 23: Origin-destination patterns for Newfoundland exports and imports

Flows originating in Newfoundland (exports)

Destination	Value (C$)[a]	Percent	Metric tons	Percent	Trucks	Percent
Massachusetts	6,102,249	64.5	295	48.5	16	50.5
Maine	98,946	1.0	82	13.5	3	10.4
New York	259,695	2.7	63	10.4	3	10.3
Illinois	128,905	1.4	56	9.2	2	7.6
South Carolina	7,098	0.1	47	7.8	3	8.2
Indiana	84,787	0.9	14	2.3	1	2.5
Pennsylvania	164,095	1.7	12	2.0	1	1.8
Michigan	111,652	1.2	8	1.3	1	1.8
All other	2,506,177	26.5	31	5.0	2	6.8
Total	9,463,604	100	608	100	32	100

Flows destined for Newfoundland (imports)[b]

Origin	Value (C$)[a]	Percent	Metric tons	Percent	Trucks	Percent
Texas	53,124	17.1	164	29.1	9	26.5
Rhode Island	866	0.3	132	23.6	7	19.6
Massachusetts	16,111	5.2	83	14.8	4	12.4
Delaware	2,174	0.7	51	9.0	3	8.2
Ohio	22,821	7.4	41	7.3	2	6.4
Mississippi	2,511	0.8	35	6.3	3	8.7
North Carolina	4,303	1.4	21	3.7	2	6.2
Pennsylvania	88,660	28.6	17	3.0	2	5.0
New Jersey	4,743	1.5	10	1.8	1	1.7
Minnesota	1,109	0.4	6	1.0	1	2.5
All other	113,371	36.6	2	0.3	1	2.9
Total	309,793	100	561	100	33	100

a. Data for value from USDOT Transborder Surface Freight Data for weekly average from September and October 1999. All other data from the 1999 NRS.

b. The import portion of this value is lower than actual because imports from the U.S. are attributed to the province of clearance (where the freight enters Canada and is cleared), rather than to the province of destination. See pages 12 and 13 and footnotes 4 and 5 for detailed discussion.

Truck imports from Pennsylvania comprise the largest share by value (29 percent), as shown in Table 23. Texas, contributing 17 percent of the value of truck imports, is the only other state with a large share of the import traffic. From a tonnage and truck trip standpoint, Texas, Rhode Island, Massachusetts, and Delaware account for two-thirds of origins of truck imports into Newfoundland and Labrador.

Table 24: Weekly 1999 Nova Scotia exports and imports by commodity group

Weekly flows originating in Nova Scotia						Commodity group		Weekly flows destined to Nova Scotia[a]					
Value (C$)[b]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
0	0.0	0	0	89	12.9	—	Empty[c]	0	0.0	0	0	162	12.9
11,423,255	28.0	2,558	23.9	199	29.0	1-5	Agricultural products and fish	155,849	9.3	1,874	13.7	166	13.2
577,953	1.4	215	2.0	13	1.9	6-9	Grains, alcoholic beverages and tobacco	96,419	5.8	892	6.5	48	3.8
193,308	0.5	535	5.0	21	3.0	10-14	Stone, minerals and ores	56,469	3.4	0	0	0	0
22,559	0.1	431	4.0	21	3.0	15-20	Coal and petroleum products	15,223	0.9	19	0.1	1	0.1
17,285,583	42.4	1,150	10.8	54	7.9	21-24	Pharmaceutical and chemical products	119,831	7.2	820	6.0	50	3.9
5,705,733	14.0	4,268	39.9	176	25.7	25-30	Wood, textile, and leather products	51,309	3.1	5,018	36.8	307	24.4
2,763,542	6.8	336	3.1	24	3.4	31-34	Metal products and machinery	646,921	38.6	1,543	11.3	123	9.8
2,214,512	5.4	641	6.0	46	6.6	35-38	Electronics, vehicles, and precision goods	391,904	23.4	537	3.9	58	4.6
601,667	1.5	212	2.0	11	1.7	39-43	Furniture and miscellaneous products	63,737	3.8	27	0.2	5	0.4
19,048	0.0	345	3.2	33	4.9	—	Unclassified or unknown	77,306	4.6	2,906	21.3	337	26.8
40,807,160	100	10,691	100	687	100	Total[d]		1,674,968	100	13,636	100	1,257	100

a. The import portion of this value is lower than actual because imports from the U.S. are attributed to the province of clearance (where the freight enters Canada and is cleared), rather than to the province of destination. See pages 12 and 13 and footnotes 4 and 5 for detailed discussion.
b. Data for value are from the USDOT Transborder Surface Freight Data for September and October, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.
c. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.
d. Percentages may not total exactly to 100 percent due to rounding.

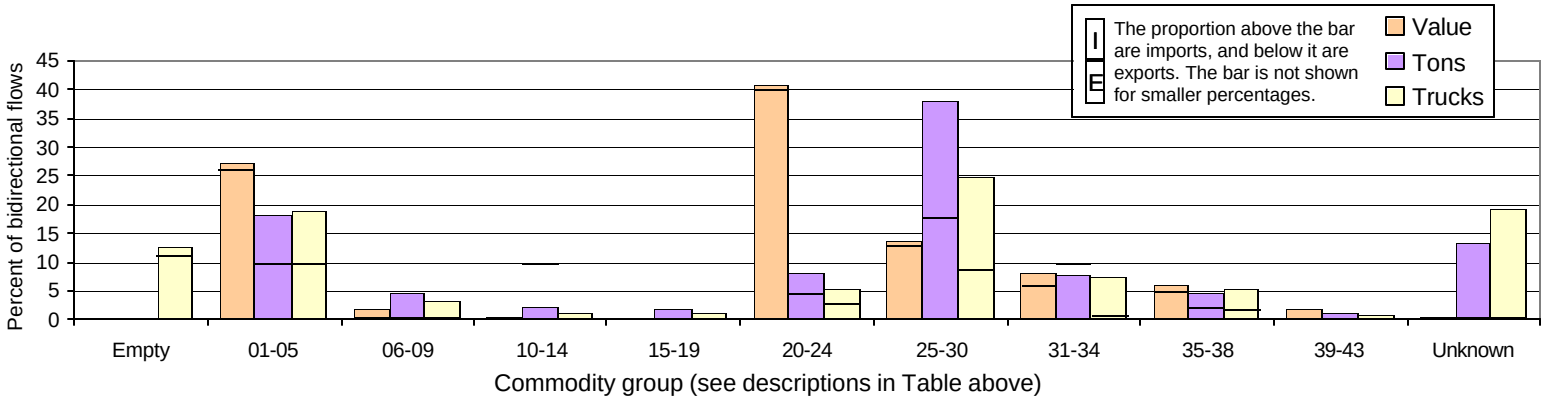

Figure 17: Weekly 1999 Nova Scotia bidirectional flow percentages by commodity group and unit of measure

Nova Scotia

Nova Scotia is the next Atlantic province to the west. It is also a large net exporter of truck trade in value terms, as shown in Table 24. Export value by truck is 24 times higher than import value, although in tonnage and truck trip terms the province is a net importer (albeit by a much smaller margin). Truck exports from Nova Scotia have a somewhat different commodity mix than the other Atlantic provinces. Three commodity groups account for almost 85 percent of the truck exports by value:

- SCTG 21-24: Pharmaceutical and chemical products (42 percent)
- SCTG 01-05: Agricultural products and fish (28 percent)
- SCTG 25-30: Wood, textile, and leather products (14 percent)

The same three commodities dominate the export picture in tonnage and truck trip terms, although wood, textile, and leather products are the largest commodity group by weight. These three commodities account for 63 percent of the truck trips and 75 percent of the export tons from Nova Scotia. A surprisingly small number of truck trips are empty (13 percent in both directions).

The destination of Nova Scotia exports is shown in Table 25. The dominant destinations are Maine, Massachusetts, and South Carolina. In value terms these states consume almost two-thirds of the truck exports. In tonnage and truck trip terms they consume about half of the export flows, with another 11 to 14 percent consumed by New Jersey and Pennsylvania.

Nova Scotia's imports by truck are somewhat more diversified. Like most other provinces, metal products and machinery (SCTG 31-34) and electronics, vehicles, and precision goods (SCTG 35-38) are the dominant imports by value. They account for a little less than two-thirds of the imports flows. In tonnage and truck trip terms the breakdown across commodities is more even, with metal products and machinery accounting for about a third of the truck import tons and a quarter of the truck trips. The remainder are spread across several categories of commodities, although a quarter of the inbound truck trips carry furniture and miscellaneous products.

The origins of truck imports into Nova Scotia are shown in Table 25. The pattern is different depending on how the flows are measured. Maine, Pennsylvania, Massachusetts, and South Carolina produce almost three-quarters of the truck imports by weight or truckload, but only about 28 percent of the value. The remainder of the origins are from states in the Upper Ohio Valley and New England, although none contribute more than 10 percent of the flows individually.

Prince Edward Island

The smallest province in land area is Prince Edward Island, located east of New Brunswick and north of Nova Scotia. Trucks travel to the island via the Confederation Bridge, which opened in May, 1997.

Table 25: Origin-destination patterns for Nova Scotia exports and imports

Flows originating in Nova Scotia (exports)

Destination	Value (C$)[b]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
Maine	2,117,894	5.2	2,044	19.1	136	19.7
Massachusetts	7,696,565	18.9	1,835	17.2	168	24.5
South Carolina	15,517,570	38.0	1,286	12.0	69	10.1
New Jersey	1,402,476	3.4	789	7.4	42	6.1
Pennsylvania	1,752,760	4.3	732	6.8	35	5.1
Maryland	521,359	1.3	452	4.2	18	2.6
Michigan	420,501	1.0	339	3.2	11	1.7
New York	1,895,038	4.6	322	3.0	23	3.4
Texas	614,346	1.5	294	2.8	18	2.6
Ohio	1,500,421	3.7	290	2.7	14	2.1
Florida	670,614	1.6	254	2.4	19	2.7
Connecticut	407,091	1.0	252	2.4	7	1.0
North Carolina	247,715	0.6	220	2.1	10	1.5
Kentucky	256,958	0.6	219	2.1	16	2.3
Utah	69,004	0.2	141	1.3	8	1.1
Mississippi	103,916	0.3	133	1.2	6	0.9
Georgia	560,190	1.4	124	1.2	6	0.9
West Virginia	90,786	0.2	120	1.1	10	1.5
All other	4,970,957	12.2	845	7.9	69	10.1
Total	40,816,161	100	10,691	100	687	100

Flows destined for Nova Scotia (imports)[a]

Origin	Value (C$)	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
Maine	77,468	4.6	7,879	57.8	692	55.1
Pennsylvania	181,223	10.8	968	7.1	77	6.1
Massachusetts	200,792	12.0	844	6.2	99	7.9
South Carolina	17,427	1.0	550	4.0	37	3.0
Delaware	4,182	0.2	535	3.9	29	2.3
New York	82,013	4.9	504	3.7	139	11.0
Florida	29,109	1.7	437	3.2	24	1.9
New Jersey	56,394	3.4	257	1.9	19	1.5
Indiana	16,068	1.0	239	1.8	14	1.1
Louisiana	32,367	1.9	184	1.4	10	0.8
Ohio	110,431	6.6	184	1.3	20	1.6
Alabama	5,236	0.3	138	1.0	9	0.7
All other	862,258	51.5	918	6.7	88	7.0
Total	1,674,968	100	13,637	100	1,257	100

a. The import portion of this value is lower than actual because imports from the U.S. are attributed to the province of clearance (where the freight enters Canada and is cleared), rather than to the province of destination. See pages 12 and 13 and footnotes 4 and 5 for detailed discussion.

b. Data for value from USDOT Transborder Surface Freight Data for weekly average from September and October 1999. All other data from the 1999 NRS.

From a value perspective Prince Edward Island is also a net exporter of goods by truck, with export flows 131 times higher than imports reported in the trade statistics. As with the other Atlantic provinces, this anomaly must be due to accounting standards used in the reporting of seaborne trade into the province, re-exported to the U.S. by truck. The breakdown of motor freight exports by value is shown in Table 26. Agricultural products and fish account for over three-quarters for the export value, with the remainder being spread across most categories of manufactured products. Agricultural products and fish also dominate PEI exports in tonnage and truck trip terms, accounting for 77 and 66 percent of the flows, respectively. The second largest export commodity group in tonnage and truckload terms is grains, alcoholic beverages, and tobacco (approximately 15 percent of the flows).

The geographic pattern of export destinations is shown in Table 27. In value terms the largest export partner is Massachusetts, which receives over a third of the value of PEI truck exports. New Jersey, Florida, and Maine are the only other large destinations in value terms. From a tonnage and truck trip perspective five states consume three-quarters of the PEI truck exports: New York, Maine, North Carolina, Pennsylvania, and Massachusetts. Although consuming over a third of the exports by value, Massachusetts only consumes one-tenth of the exports in tonnage or truckload terms.

Prince Edward Island imports a variety of goods, with three commodity groups accounting for almost 85 percent of the flows in dollar terms:

- SCTG 31-34: Metal products and machinery (43 percent)
- SCTG 21-24: Pharmaceutical and chemical products (24 percent)
- SCTG 06-09: Grains, alcoholic beverages, and tobacco (18 percent)

Expressed in tonnage and truckload terms the picture is different. Agricultural products and fish (SCTG 01-05) and grains, alcoholic beverages, and tobacco (SCTG 06-09) account for 86 percent of the truck imports by tons, and 68 percent of the truck trips.

Goods are imported by truck from only a small number of U.S. states. In value terms truck imports from New Jersey, California, and Pennsylvania account for about 40 percent of the flows, with all other states contributing smaller amounts. In tonnage terms Maine accounts for 81 percent of the truck imports, and 65 percent of the truck trips. Most of these shipments are low value, high weight commodities, as Maine accounts for only five percent of the imports by value. All other states contribute a small portion of the PEI truck imports by weight.

New Brunswick

New Brunswick lies east of Maine, and represents the western edge of the Atlantic provinces. It is a net exporter of truck trade to the U.S., although only by a small margin. A summary of trade by commodity group is shown in Table 28. Two commodity groups (wood, textile, and leather products and agricultural products and fish) constitute 80 percent of the value of exports by truck. The remainder are

Table 26: Weekly 1999 Prince Edward Island exports and imports by commodity group

Weekly flows originating on Prince Edward Island						Commodity group		Weekly flows destined to Prince Edward Island[a]					
Value (C$)[b]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
0	0.0	0	0	13	11.8	—	Empty[c]	0	0	0	0	5	14.0
8,770,578	78.4	1,402	77.4	72	65.9	1-5	Agricultural products and fish	0	0	418	74.5	22	61.0
48,104	0.4	286	15.8	16	14.6	6-9	Grains, alcoholic beverages and tobacco	14,980	17.7	62	11.1	3	7.2
8,436	0.1	0	0	0	0	10-14	Stone, minerals and ores	571	0.7	0	0	0	0
27,305	0.2	11	0.6	1	0.6	15-20	Coal and petroleum products	0	0	0	0	0	0
331,086	3.0	0	0	0	0	21-24	Pharmaceutical and chemical products	20,200	23.8	0	0	0	0
218,184	2.0	82	4.5	3	2.3	25-30	Wood, textile, and leather products	3,209	3.8	27	4.9	1	4.0
647,916	5.8	14	0.8	3	3.2	31-34	Metal products and machinery	36,279	42.8	20	3.6	1	4.0
290,937	2.6	14	0.8	1	0.8	35-38	Electronics, vehicles, and precision goods	9,002	10.6	33	6.0	4	9.8
7,971	0.1	2	0.1	1	0.8	39-43	Furniture and miscellaneous products	506	0.6	0	0	0	0
834,642	7.5	0	0	0	0	—	Unclassified or unknown	0	0	0	0	0	0
11,185,159	100	1,811	100	110	100	Total[d]		84,747	100	560	100	36	100

a. The import portion of this value is lower than actual because imports from the U.S. are attributed to the province of clearance (where the freight enters Canada and is cleared), rather than to the province of destination. See pages 12 and 13 and footnotes 4 and 5 for detailed discussion.
b. Data for value are from the USDOT Transborder Surface Freight Data for September and October, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.
c. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.
d. Percentages may not total exactly to 100 percent due to rounding.

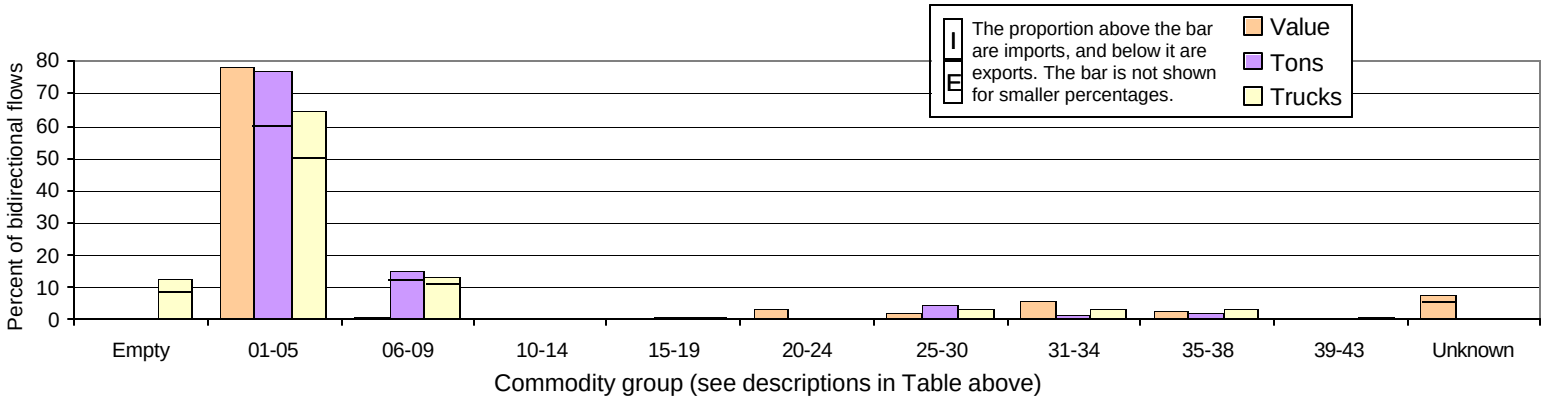

Figure 18: Weekly 1999 Prince Edward Island bidirectional flow percentages by commodity group and unit of measure

Table 27: Origin-destination patterns for Prince Edward Isl. exports and imports

Flows originating on Prince Edward Island (exports)

Destination	Value (C$)[a]	Percent	Metric tons	Percent	Trucks	Percent
New York	556,120	5.0	365	20.2	18	16.6
Maine	954,964	8.5	344	19.0	32	28.8
North Carolina	385,987	3.5	232	12.8	12	10.8
Pennsylvania	847,655	7.6	215	11.9	11	10.4
Massachusetts	3,847,645	34.4	198	10.9	11	10.3
New Jersey	983,333	8.8	176	9.7	9	8.0
New Hampshire	35,987	0.3	61	3.4	3	2.3
Maryland	130,570	1.2	59	3.2	4	3.3
Georgia	292,590	2.6	40	2.2	2	2.0
Michigan	255,618	2.3	38	2.1	2	1.5
Florida	969,782	8.7	32	1.8	2	1.5
All other	1,924,908	17.2	51	2.8	5	4.4
Total	11,185,159	100	1,812	100	110	100

Flows destined for Prince Edward Island (imports)[b]

Origin	Value (C$)[a]	Percent	Metric tons	Percent	Trucks	Percent
Maine	4,586	5.4	454	80.9	24	65.0
Iowa	0	0.0	47	8.4	2	6.7
Maryland	558	0.7	17	3.1	1	2.3
Michigan	0	0.0	15	2.7	1	2.2
Kentucky	3,452	4.1	12	2.1	1	1.8
Washington	2,663	3.1	12	2.1	1	1.6
All other	73,488	86.7	4	0.8	7	20.4
Total	84,747	100	561	100	37	100

a. Data for value from USDOT Transborder Surface Freight Data for weekly average from September and October 1999. All other data from the 1999 NRS.

b. The import portion of this value is lower than actual because imports from the U.S. are attributed to the province of clearance (where the freight enters Canada and is cleared), rather than to the province of destination. See pages 12 and 13 and footnotes 4 and 5 for detailed discussion.

spread almost evenly among the other commodity groups. These same two commodity groups account for 74 and 65 percent of the tons and truckloads exported from New Brunswick, respectively. Only about 8 percent of the trucks crossing into the U.S. from New Brunswick were empty.

Maine, Massachusetts, Pennsylvania, and New York are the destination of about 70 percent of the export truck trips, and about 60 percent of the flows measured in dollar and tonnage terms. The only other state consuming more than five percent of the export truck flows is New Hampshire, the destination of eight percent of the flows by value, but only two percent of the tonnage or truck trips.

Table 28: Weekly 1999 New Brunswick exports and imports by commodity group

Weekly flows originating in New Brunswick						Commodity group		Weekly flows destined to New Brunswick					
Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
0	0.0	0	0	206	7.8	—	Empty[b]	0	0.0	0	0	955	31.0
16,297,780	33.8	6,687	20.3	751	28.6	1-5	Agricultural products and fish	12,838,730	29.5	5,023	24.2	479	15.5
736,764	1.5	455	1.4	32	1.2	6-9	Grains, alcoholic beverages and tobacco	249,008	0.6	1,720	8.3	84	2.7
732,740	1.5	244	0.7	12	0.5	10-14	Stone, minerals and ores	335,871	0.8	271	1.3	12	0.4
1,810,612	3.8	3,515	10.7	158	6.0	15-20	Coal and petroleum products	443,657	1.0	1,078	5.2	79	2.6
811,297	1.7	424	1.3	26	1.0	21-24	Pharmaceutical and chemical products	4,666,264	10.7	515	2.5	32	1.0
22,912,429	47.5	17,654	53.5	946	36.1	25-30	Wood, textile, and leather products	6,138,444	14.1	6,626	31.9	343	11.1
2,476,629	5.1	1,113	3.4	147	5.6	31-34	Metal products and machinery	9,728,530	22.4	2,288	11.0	231	7.5
1,366,042	2.8	771	2.3	132	5.0	35-38	Electronics, vehicles, and precision goods	7,483,139	17.2	468	2.3	413	13.4
1,025,200	2.1	248	0.8	24	0.9	39-43	Furniture and miscellaneous products	646,190	1.5	312	1.5	61	2.0
53,550	0.1	1,883	5.7	188	7.2	—	Unclassified or unknown	947,334	2.2	2,447	11.8	397	12.9
48,223,043	100	32,994	100	2,622	100	Total[c]		43,477,167	100	20,748	100	3,086	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September and October, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.

b. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.

c. Percentages may not total exactly to 100 percent due to rounding.

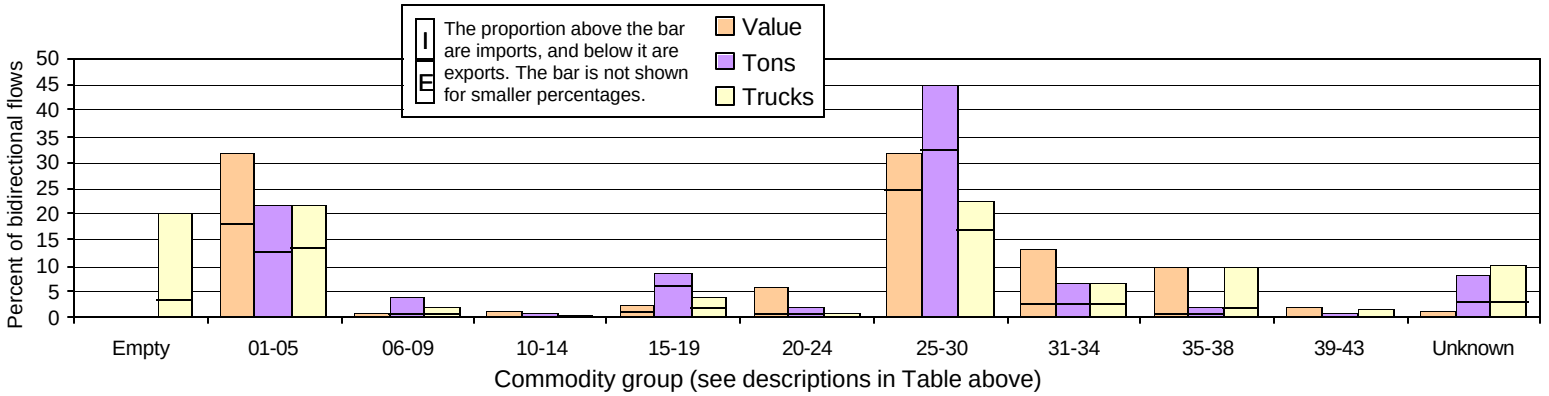

Figure 19: Weekly 1999 New Brunswick bidirectional flow percentages by commodity group and unit of measure

Table 29: Origin-destination patterns for New Brunswick exports and imports

Flows originating in New Brunswick (exports)

Destination	Value (C$)[a]	Percent	Metric tons	Percent	Trucks	Percent
Maine	9,566,077	19.8	12,154	36.8	1,259	48.0
Massachusetts	11,199,583	23.2	3,252	9.9	328	12.5
Pennsylvania	3,089,442	6.4	2,764	8.4	139	5.3
New York	3,215,009	6.7	2,338	7.1	117	4.5
New Jersey	945,699	2.0	1,529	4.6	84	3.2
Connecticut	904,998	1.9	1,295	3.9	75	2.9
Virginia	970,313	2.0	1,061	3.2	53	2.0
Indiana	853,333	1.8	874	2.6	28	1.1
New Hampshire	3,820,825	7.9	752	2.3	56	2.1
Georgia	539,134	1.1	735	2.2	40	1.5
Delaware	124,887	0.3	692	2.1	36	1.4
Florida	725,798	1.5	664	2.0	39	1.5
Maryland	941,797	2.0	546	1.7	33	1.3
Ohio	1,867,191	3.9	532	1.6	29	1.1
All other	9,458,960	19.6	3,807	11.6	307	11.8
Total	48,223,046	100	32,994	100	2,622	100

Flows destined for New Brunswick (imports)

Origin	Value (C$)[a]	Percent	Metric tons	Percent	Trucks	Percent
Maine	12,707,411	29.2	10,010	48.2	1,946	63.1
Massachusetts	2,361,944	5.4	1,354	6.5	236	7.7
Vermont	28,720	0.1	1,220	5.9	84	2.7
New York	1,525,920	3.5	1,074	5.2	84	2.7
Pennsylvania	2,392,831	5.5	755	3.6	61	2.0
New Jersey	1,063,868	2.4	629	3.0	85	2.8
Virginia	1,630,498	3.8	583	2.8	64	2.1
Connecticut	386,422	0.9	570	2.7	47	1.5
North Carolina	1,110,357	2.6	468	2.3	60	1.9
Delaware	298,673	0.7	439	2.1	24	0.8
Maryland	229,226	0.5	396	1.9	32	1.0
Mississippi	115,989	0.3	358	1.7	31	1.0
Florida	705,121	1.6	347	1.7	19	0.6
Illinois	1,324,174	3.0	317	1.5	31	1.0
Kentucky	268,451	0.6	294	1.4	16	0.5
New Hampshire	625,146	1.4	269	1.3	21	0.7
All other	16,702,417	38.4	1,667	8.1	24.3	7.9
Total	43,477,168	100	20,749	100	3,086	100

a. Data for value from USDOT Transborder Surface Freight Data for weekly average from September and October 1999. All other data from the 1999 NRS.

The mixture of imports carried by truck is more diverse than in the other Atlantic provinces, as shown in Table 28. The largest commodity by value, agricultural products and fish, account for less than one-third of the value of truck imports. The remaining imports by value are spread widely across the range of manufactured products, with the notable exception of furniture and miscellaneous products.

The picture is different when depicted in tonnage or truck trip terms. Three commodity groups account for two-thirds of the tons imported by truck:

- SCTG 25-30: Wood, textile, and leather products (32 percent)
- SCTG 01-05: Agricultural products and fish (24 percent)
- SCTG 31-34: Metal products and machinery (11 percent)

Unknown or unclassified goods account for another 12 percent of the goods. These same commodities make up the majority of the truck trips carrying imports, with electronics, vehicles, and precision goods an important truck import. Empty trucks entering New Brunswick from the U.S. accounted for 31 percent of the trips, a high percentage compared to other Atlantic provinces.

Over a third of the value of imports by trucks originated in Maine, Massachusetts, Vermont, and New York, as shown in Table 29. These four states accounted for two-thirds of the imports by weight. However, they only account for less than 40 percent of the imports by value. South Carolina and Pennsylvania, which contributed less than two percent of the imports by tonnage or truck trips, accounted for another 15 percent of the value. The large number of states contributed the balance, none of which individually were as large as the states noted.

Québec

Québec is the second largest Canadian province in population and economic terms, with a large share of its gross product related to trade with the U.S. The value of Québec exports by truck is over twice that shown for imports in Table 30. The size of the imbalance is probably due to the province of clearance problem (see pages 12 and 13). In value terms three-quarters of the truck exports are from the durables manufacturing sectors:

- SCTG 25-30: Wood, textile, and leather products (28 percent)
- SCTG 35-38: Electronics, vehicles, and precision goods (25 percent)
- SCTG 31-34: Metal products and machinery (22 percent)

Two of these commodities — wood, textile, and leather products and metal products and machinery — account for a little more than half of the tons exported to the U.S. by truck. The remainder cut across all of the remaining commodity groups almost evenly. A similar pattern is found for truck trips, with 11 percent of the truck trips from Québec to the U.S. being empty.

Exports from Québec are shipped to a large number of states, as shown in Table 31. About half of the flows in value and weight terms went to New York, Pennsylvania, New Jersey, Vermont, and Massachusetts. Almost 60 percent of the truck

Table 30: Weekly 1999 Québec exports and imports by commodity group

Weekly flows originating in Québec						Commodity group		Weekly flows destined to Québec					
Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
0	0.0	0	0	2,276	11.2	—	Empty[b]	0	0.0	0	0	5,594	30.1
28,118,375	4.1	25,685	8.8	1,503	7.4	1-5	Agricultural products and fish	9,649,680	3.2	14,225	7.1	872	4.7
8,081,527	1.2	16,671	5.7	1,074	5.3	6-9	Grains, alcoholic beverages and tobacco	2,462,632	0.8	14,088	7.0	845	4.5
10,685,589	1.6	12,075	4.1	585	2.9	10-14	Stone, minerals and ores	3,168,134	1.1	8,384	4.2	406	2.2
5,506,825	0.8	19,494	6.7	934	4.6	15-20	Coal and petroleum products	559,011	0.2	8,034	4.0	422	2.3
59,921,751	8.8	23,603	8.1	1,730	8.5	21-24	Pharmaceutical and chemical products	46,559,992	15.6	12,779	6.4	1,134	6.1
188,990,339	27.7	113,666	39.0	6,235	30.7	25-30	Wood, textile, and leather products	45,528,571	15.3	83,763	41.7	4,640	25.0
149,907,988	22.0	46,836	16.1	2,673	13.2	31-34	Metal products and machinery	58,745,775	19.7	27,791	13.8	1,968	10.6
172,577,767	25.3	12,350	4.2	1,399	6.9	35-38	Electronics, vehicles, and precision goods	114,283,963	38.3	11,618	5.8	1,124	6.1
51,893,710	7.6	10,711	3.7	987	4.9	39-43	Furniture and miscellaneous products	7,000,907	2.3	10,548	5.3	709	3.8
6,763,055	1.0	10,415	3.6	882	4.4	—	Unclassified or unknown	10,500,699	3.5	9,523	4.7	861	4.6
682,446,926	100	291,506	100	20,278	100		Total[c]	298,459,364[d]	100	200,753	100	18,575	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September and October, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.
b. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.
c. Percentages may not total exactly to 100 percent due to rounding.
d. This value is lower than actual because imports from the U.S. are attributed to the province of clearance rather than to the province of destination. See pages 12 and 13 for detailed discussion.

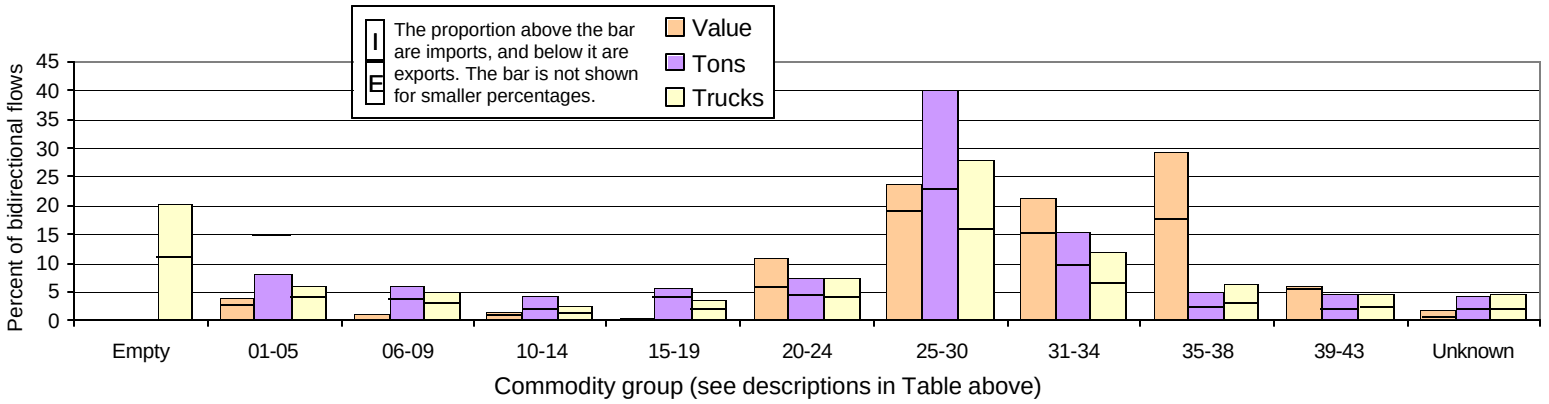

Figure 20: Weekly 1999 Québec bidirectional flow percentages by commodity group and unit of measure

Table 31: Origin-destination patterns for Québec exports and imports

Flows originating in Québec (exports)

Destination	Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
New York	145,146,275	21.3	66,748	22.9	5,400	26.6
Pennsylvania	37,696,128	5.5	29,768	10.2	1,743	8.6
New Jersey	30,119,112	4.4	26,140	9.0	1,713	8.4
Vermont	71,697,242	10.5	20,666	7.1	1,757	8.7
Massachusetts	29,940,211	4.4	19,941	6.8	1,364	6.7
Michigan	26,440,274	3.9	15,017	5.2	683	3.4
Maine	9,305,389	1.4	13,450	4.6	952	4.7
Ohio	28,444,421	4.2	10,596	3.6	645	3.2
Illinois	33,705,755	4.9	7,643	2.6	478	2.4
Connecticut	11,064,545	1.6	7,176	2.5	436	2.1
New Hampshire	9,801,435	1.4	6,965	2.4	430	2.1
Virginia	12,777,583	1.9	6,185	2.1	327	1.6
Florida	15,529,468	2.3	5,842	2.0	387	1.9
Wisconsin	10,853,573	1.6	5,394	1.9	312	1.5
North Carolina	14,189,319	2.1	4,718	1.6	382	1.9
Maryland	9,847,326	1.4	4,345	1.5	285	1.4
California	16,731,952	2.5	4,246	1.5	317	1.6
Texas	16,107,689	2.4	4,212	1.4	274	1.4
Georgia	37,746,128	5.5	4,000	1.4	256	1.3
Indiana	13,555,556	2.0	3,093	1.1	204	1.0
All other	101,747,546	14.9	25,360	8.7	1,934	9.5
Total	682,446,927	100	291,506	100	20,279	100

Flows destined for Québec (imports)

Origin	Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
New York	39,735,943	13.3	42,147	21.0	4,560	24.5
Pennsylvania	15,188,159	5.1	19,424	9.7	1,517	8.2
New Jersey	23,778,635	8.0	16,113	8.0	1,469	7.9
Maine	9,375,365	3.1	14,129	7.0	1,316	7.1
Massachusetts	31,834,073	10.7	11,867	5.9	1,544	8.3
Ohio	4,805,880	1.6	9,516	4.7	670	3.6
Vermont	62,292,228	20.9	7,319	3.6	1,477	8.0
Illinois	5,892,761	2.0	6,087	3.0	396	2.1
North Carolina	14,427,167	4.8	5,516	2.7	387	2.1
Connecticut	10,078,826	3.4	5,247	2.6	492	2.6
New Hampshire	6,290,842	2.1	5,148	2.6	482	2.6
California	9,433,014	3.2	4,740	2.4	278	1.5
Virginia	4,444,142	1.5	4,152	2.1	308	1.7
Michigan	2,646,257	0.9	3,669	1.8	329	1.8
Indiana	2,015,759	0.7	3,638	1.8	204	1.1
West Virginia	180,861	0.1	3,595	1.8	187	1.0
Tennessee	2,499,249	0.8	3,434	1.7	228	1.2
Delaware	2,086,793	0.7	3,202	1.6	185	1.0
South Carolina	5,428,958	1.8	3,014	1.5	193	1.0
Kentucky	2,310,251	0.8	2,923	1.5	205	1.1
Georgia	5,449,435	1.8	2,686	1.3	196	1.1
Texas	3,903,460	1.3	2,599	1.3	177	1.0
Wisconsin	2,498,924	0.8	2,271	1.1	170	0.9
All other	31,862,382	10.7	18,318	9.1	1,604	8.6
Total	298,459,364[b]	100	200,753	100	18,575	100

a. Data for value from USDOT Transborder Surface Freight Data for weekly average from September and October 1999. All other data from the 1999 NRS.
b. This value is lower than actual because imports from the U.S. are attributed to the province of clearance rather than to the province of destination. See pages 12 and 13 for detailed discussion.

trips were bound for these five states. Other dominant destinations included Michigan[2], Maine, and Ohio.

Measured in dollar terms, Québec's imports come from across the full spectrum of manufactured products. Four groups account for almost 90 percent of truck imports by value:

- SCTG 35-38: Electronics, vehicles, and precision goods (38 percent)
- SCTG 31-34: Metal products and machinery (20 percent)
- SCTG 21-24: Pharmaceutical and chemical products (16 percent)
- SCTG 25-30: Wood, textile, and leather products (15 percent)

In tonnage and truck trip terms the picture is different: Wood, textile, and leather products are the dominant import commodities, accounting for 42 percent of the imported tons by truck and 25 percent of the truck trips. Metal products and machinery are the second largest commodities, accounting for 14 percent of imported tons and 11 percent of inbound truck trips. Almost a third of the trucks entering Québec from the U.S. are empty.

The origins of truck imports into Québec are as varied as the export destinations. Five states (New York, Pennsylvania, New Jersey, Maine, and Massachusetts) account for 40 percent of the truck imports by value, 52 percent by weight, and 56 percent of the truck trips. Vermont contributes another 21 percent of the imports by value, although its share of tonnage (four percent) and truck trips (eight percent) is much lower. A large number of states contribute smaller shares of the goods imported by truck into Québec.

Ontario

Ontario is the only Canadian province that is a net importer in value terms of goods trucked from the U.S. A large portion of Ontario's economy is oriented towards the high technology sectors, particularly automobile and vehicle component manufacturing. However, the reliance on the automobile industry appears to be declining, and its contribution to Ontario's trade with the U.S. continues to diminish over time. Electronics, vehicles, and precision goods (SCTG 35-38) account for slightly more than 40 percent of the truck exports by value. Metal products and machinery account for another 21 percent, as shown in Table 32.

A significant number of truck exports by value (10 percent) are listed as "special classification" in the trade statistics. These primarily include re-exported goods covered under special trade treaties. In this instance they are primarily automotive parts and components finished in Canada and then re-exported to the U.S. Thus,

2. Trade between Québec and Michigan must travel through Ontario, where some may be handled through third parties, distribution hubs, carrier transfers, etc. These "breaks in the chain" are known to occur, but no data are available to quantify their incidence. Thus, some of the flows from Ontario to Michigan (and vice-versa) are likely to eventually travel to Québec, but are not reflected in our results. Note that imports are also understated due to the province of clearance issue noted earlier in this chapter.

Table 32: Weekly 1999 Ontario exports and imports by commodity group

Weekly flows originating in Ontario						Commodity group		Weekly flows destined to Ontario					
Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
0	0.0	0	0	24,279	28.2	—	Empty[b]	0	0.0	0	0	26,683	33
63,468,574	2.8	56,549	6.5	3,151	3.7	1-5	Agricultural products and fish	98,775,918	3.5	53,024	7.1	2,912	3.6
37,862,395	1.6	63,350	7.3	3,628	4.2	6-9	Grains, alcoholic beverages and tobacco	28,944,681	1.0	38,682	5.2	2,335	2.9
31,131,271	1.4	18,113	2.1	889	1.0	10-14	Stone, minerals and ores	47,575,064	1.7	17,069	2.3	911	1.1
8,127,533	0.4	46,671	5.4	2,259	2.6	15-20	Coal and petroleum products	8,650,413	0.3	44,883	6.0	2,497	3.1
191,882,331	8.4	60,005	6.9	4,765	5.5	21-24	Pharmaceutical and chemical products	337,871,973	11.9	50,588	6.8	4,123	5.1
173,215,910	7.5	165,698	19.1	9,491	11.0	25-30	Wood, textile, and leather products	198,365,793	7.0	123,828	16.5	8,009	9.9
474,059,420	20.6	230,288	26.5	16,074	18.7	31-34	Metal products and machinery	854,474,683	30.2	220,056	29.4	12,890	15.9
957,962,603	41.7	156,218	18.0	15,025	17.4	35-38	Electronics, vehicles, and precision goods	1,112,146,548	39.3	130,217	17.4	13,876	17.1
138,296,269	6.0	37,535	4.3	3,172	3.7	39-43	Furniture and miscellaneous products	99,775,068	3.5	32,879	4.4	2,775	3.4
220,934,821	9.6	33,223	3.8	3,399	3.9	—	Unclassified or unknown	42,019,710	1.5	37,113	5.0	3,935	4.9
2,296,941,127	100	867,650	100	86,132	100		Total[c]	2,828,599,851	100	748,339	100	80,946	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September and October, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.
b. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.
c. Percentages may not total exactly to 100 percent due to rounding.

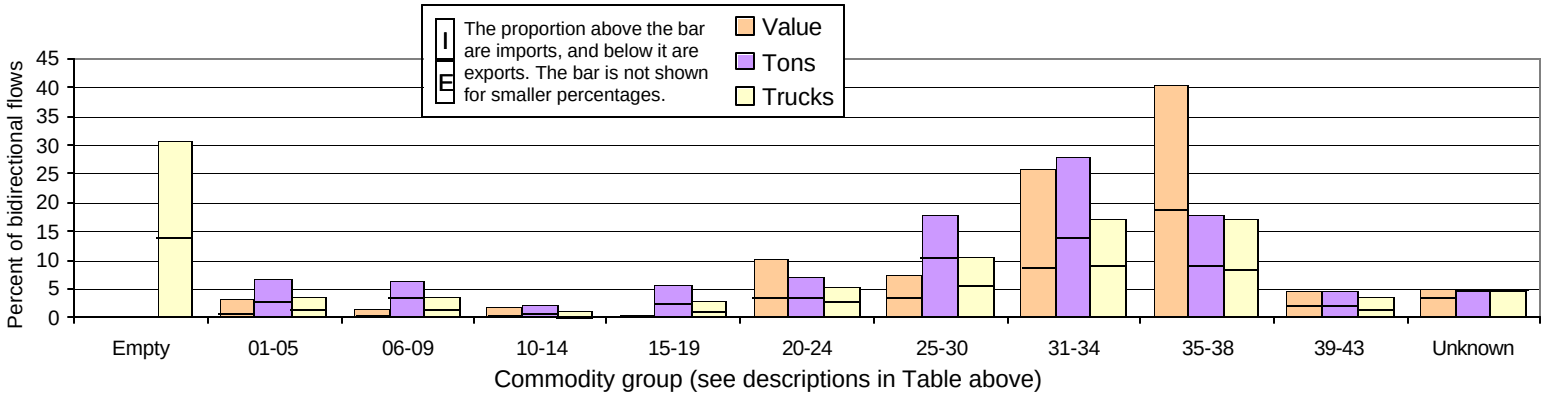

Figure 21: Weekly 1999 Ontario bidirectional flow percentages by commodity group and unit of measure

the automobile industry may account for as much as 50 percent of the exports by value, and together with metal products and machinery account for almost two-thirds of Ontario's truck exports by value.

A similar pattern is found when classifying truck exports in tonnage and truck trip terms. Three commodity groups account for the majority of truck exports:

- SCTG 31-34: Metal products and machinery (27 percent)
- SCTG 25-30: Wood, textile, and leather products (19 percent)
- SCTG 35-38: Electronics, vehicles, and precision goods (18 percent)

Many auto manufacturers have switched from truck to specialized rail containers for shipping finished autos in recent years, which explains why vehicles do not constitute a larger share of the truck exports, as they have in the past. Almost 30 percent of the trucks leaving Ontario for the U.S. are empty.

One-third of the value and tonnage of Ontario truck exports are bound for Michigan, as shown in Table 33. New York and Ohio are the destination of another 19 percent of Ontario's truck exports. The remaining 50 percent of the export destinations by value and weight are concentrated primarily in the Upper Ohio Valley, although most of the states in the eastern U.S. are included. The same three dominant states by value (Michigan, New York, and Ohio) are also the destination of 60 percent of the trips originating in Ontario. Three-quarters of the truck destinations are in these states, along with Illinois, Pennsylvania, Indiana, and Wisconsin.

Ontario's imports by truck are as specialized as its exports, and in the same commodity groups. Electronics, vehicles, and precision goods and metal products and machinery account for 70 percent of the value of truck imports, as shown in Table 32. The same two commodities dominate truck imports by tonnage and truck trips, although to a lesser degree (47 and 33 percent, respectively). The remaining commodities are spread across all commodity groups. About one-third of the trucks entering Canada from the U.S. are empty, almost the same percentage moving in the opposite direction.

A summary of the states these goods are traded with is shown in Table 33. Roughly half the goods by value come from Michigan, Ohio, New York, Illinois, Pennsylvania, and Minnesota. These same six states account for two-thirds of the import origins by weight, and 70 percent of the truck trip origins.

British Columbia

British Columbia has almost balanced truck trade with the U.S. In value terms four commodity groups account for about 85 percent of the goods exported by truck:

- SCTG 25-30: Wood, textile, and leather products (45 percent)
- SCTG 35-38: Electronics, vehicles, and precision goods (16 percent)
- SCTG 31-34: Metal products and machinery (14 percent)
- SCTG 01-05: Agricultural products and fish (12 percent)

Table 33: Origin-destination patterns for Ontario exports and imports

Flows originating in Ontario (exports)

Destination	Value (C$)[a]	Percent	Metric tons	Percent	Trucks	Percent
Michigan	722,047,969	31.4	221,706	25.6	28,342	32.9
New York	283,577,471	12.3	144,151	16.6	13,710	15.9
Ohio	163,089,712	7.1	87,014	10.0	9,672	11.2
Illinois	138,453,151	6.0	62,068	7.2	3,916	4.5
Pennsylvania	88,633,282	3.9	57,490	6.6	4,047	4.7
Indiana	63,577,480	2.8	33,004	3.8	3,119	3.6
Wisconsin	41,757,404	1.8	22,360	2.6	1,703	2.0
Kentucky	45,909,853	2.0	21,727	2.5	1,698	2.0
New Jersey	57,488,643	2.5	20,789	2.4	1,733	2.0
Minnesota	32,121,185	1.4	16,218	1.9	2,381	2.8
North Carolina	37,962,961	1.7	16,131	1.9	1,239	1.4
Texas	57,723,795	2.5	14,619	1.7	1,188	1.4
Massachusetts	37,014,604	1.6	13,450	1.6	935	1.1
Tennessee	32,120,940	1.4	13,127	1.5	1,119	1.3
Virginia	26,338,422	1.1	12,625	1.5	931	1.1
Georgia	35,865,190	1.6	11,770	1.4	1,026	1.2
Florida	28,500,876	1.2	10,303	1.2	798	0.9
Maryland	16,284,049	0.7	10,015	1.2	713	0.8
All other	388,474,142	16.9	79,080	9.1	7,862	9.1
Total	2,296,941,129	100	867,649	100	86,133	100

Flows destined for Ontario (imports)

Origin	Value (C$)[a]	Percent	Metric tons	Percent	Trucks	Percent
Michigan	514,369,059	18.2	150,834	20.2	23,060	28.5
Ohio	326,751,917	11.6	88,602	11.8	7,949	9.8
New York	209,573,630	7.4	85,560	11.4	13,169	16.3
Illinois	225,550,704	8.0	84,851	11.3	4,451	5.5
Pennsylvania	118,806,365	4.2	50,375	6.7	4,873	6.0
Minnesota	31,895,919	1.1	33,997	4.5	3,318	4.1
Indiana	176,005,759	6.2	27,908	3.7	2,760	3.4
Wisconsin	88,473,674	3.1	24,011	3.2	1,879	2.3
New Jersey	58,533,843	2.1	21,742	2.9	1,927	2.4
Kentucky	58,761,853	2.1	14,542	1.9	1,307	1.6
California	156,685,612	5.5	12,836	1.7	918	1.1
Texas	151,395,237	5.4	12,412	1.7	1,012	1.2
Missouri	62,860,285	2.2	11,008	1.5	897	1.1
Tennessee	75,992,703	2.7	10,709	1.4	1,309	1.6
North Carolina	88,363,813	3.1	10,652	1.4	956	1.2
Georgia	44,835,640	1.6	10,599	1.4	797	1.0
Virginia	42,407,818	1.5	8,505	1.1	837	1.0
Massachusetts	34,301,963	1.2	7,798	1.0	784	1.0
All other	363,034,056	12.8	81,397	10.9	8,743	10.8
Total	2,828,599,850	100	748,338	100	80,946	100

a. Data for value from USDOT Transborder Surface Freight Data for weekly average from September and October 1999. All other data from the 1999 NRS.

The picture is different in tonnage terms, as shown in Table 34. About 60 percent of the goods exported by truck are wood, textile, and leather products (SCTG 25-30). An additional 13 percent are agricultural products and fish (SCTG 01-05). These same commodities also dominate truck trips leaving British Columbia to the U.S., although empty trucks are the second largest share by commodity class.

The majority of goods exported from British Columbia are bound for Washington, California, and Oregon, as shown in Table 35. These three states attract over half of the truck exports in value terms, and three-quarters of the exports in tonnage and trip terms. Truck trips leaving British Columbia, driving through parts of Washington, and back into British Columbia were also identified in large numbers, although their share of the export value and weight was insignificant. In value terms over a third of the exports were bound for states east of the Rocky Mountains, although the flows were much smaller when measured in tons or truck trips.

The same four commodity groups listed above as dominant exports by value hold the same position in truck imports. They comprise three-quarters of the total truck imports by value, with the remainder spread across all of the commodities. They also dominate in terms of truck trips. Over one-third of the trucks crossing into British Columbia from the U.S. are empty, as shown in Table 34.

The geographic pattern of truck import origins is very similar to that of exports, as reported in Table 35. Flows from Washington, California, and Oregon accounted for 60 percent of the truck imports in dollar terms, and over 85 percent of the weight and truck trips. Almost 40 percent of the value of the truck imports were attributed to states with very small shares of the weight or truck trips. Most of these states were east of the Rocky Mountains.

Table 34: Weekly 1999 British Columbia exports and imports by commodity group

Weekly flows originating in British Columbia						Commodity group		Weekly flows destined to British Columbia					
Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent	SCTG	Description	Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
0	0	0	0	4,212	26.6	—	Empty[b]	0	0	0	0	5,401	36.2
24,374,540	12.1	23,412	12.8	1,670	10.5	1-5	Agricultural products and fish	27,760,374	14.1	33,375	26.9	2,143	14.3
4,440,538	2.2	10,606	5.8	659	4.2	6-9	Grains, alcoholic beverages and tobacco	4,399,447	2.2	5,441	4.4	369	2.5
5,026,371	2.5	3,851	2.1	168	1.1	10-14	Stone, minerals and ores	4,057,325	2.1	9,387	7.6	359	2.4
374,153	0.2	4,172	2.3	228	1.4	15-20	Coal and petroleum products	3,210,759	1.6	10,100	8.1	687	4.6
9,911,996	4.9	380	0.2	205	1.3	21-24	Pharmaceutical and chemical products	18,389,081	9.3	1,528	1.2	318	2.1
89,710,706	44.6	110,195	60.4	5,812	36.7	25-30	Wood, textile, and leather products	24,546,927	12.5	19,997	16.1	1,614	10.8
27,646,309	13.7	10,305	5.7	759	4.8	31-34	Metal products and machinery	52,653,366	26.8	23,685	19.1	1,594	10.7
31,864,260	15.8	1,320	0.7	328	2.1	35-38	Electronics, vehicles, and precision goods	46,386,416	23.6	5,196	4.2	513	3.4
7,148,754	3.6	3,454	1.9	546	3.4	39-43	Furniture and miscellaneous products	9,517,911	4.8	3,139	2.5	934	6.3
833,350	0.4	14,658	8.0	1,267	8.0	—	Unclassified or unknown	5,782,445	2.9	12,171	9.8	1,006	6.7
201,330,977	100	182,353	100	15,854	100	Total[c]		196,704,051	100	124,019	100	14,938	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September and October, 1999. Data shown are average weekly flows by direction. All other data are from the 1999 National Roadside Study.
b. Empty vehicles may carry empty shipping containers or pallets, the weight of which are not included in these summaries.
c. Percentages may not total exactly to 100 percent due to rounding.

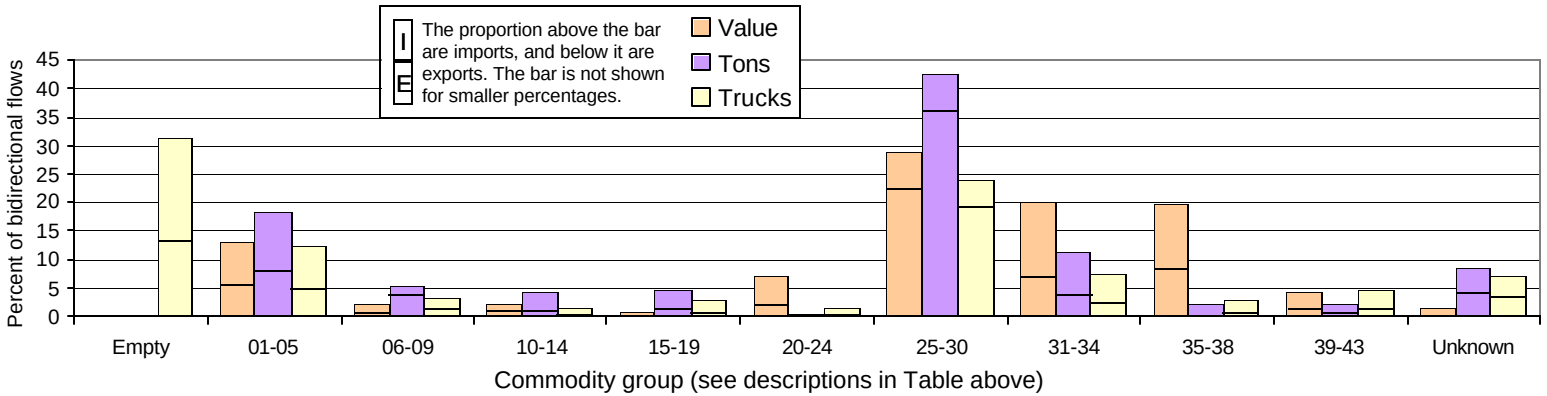

Figure 22: Weekly 1999 British Columbia bidirectional flow percentages by commodity group and unit of measure

Table 35: Origin-destination patterns for British Columbia exports and imports

Flows originating in British Columbia (exports)

Destination	Value (C$)[a]	Percent	Metric tons	Percent	Trucks	Percent
Washington	60,066,301	29.8	88,778	48.7	9,231	58.2
California	31,820,529	15.8	33,010	18.1	1,957	12.3
Oregon	18,140,375	9.0	15,703	8.6	1,110	7.0
Texas	6,777,484	3.4	8,596	4.7	433	2.7
Arizona	2,290,680	1.1	6,876	3.8	338	2.1
Idaho	4,525,249	2.2	4,796	2.6	308	1.9
British Columbia	0	0	4,513	2.5	1,190	7.5
Wisconsin	3,323,286	1.7	2,444	1.3	122	0.8
Utah	1,653,225	0.8	2,210	1.2	120	0.8
New Mexico	224,601	0.1	2,080	1.1	96	0.6
Colorado	2,453,859	1.2	1,952	1.1	121	0.8
All other	70,055,389	34.8	11,397	6.2	829	5.2
Total	201,330,978	100	182,354	100	15,855	100

Flows destined to British Columbia (imports)

Origin	Value (C$)[a]	Percent	Metric tons	Percent	Trucks	Percent
Washington	57,567,647	29.3	74,364	60.0	10,522	70.4
California	41,350,362	21.0	18,578	15.0	1,245	8.3
Oregon	19,018,841	9.7	15,418	12.4	1,067	7.1
British Columbia	0	0	4,513	3.6	1,190	8.0
Indiana	2,545,942	1.3	1,355	1.1	70	0.5
All other	76,221,258	38.7	9,790	7.9	843	5.6
Total	196,704,050	100	124,018	100	14,938	100

a. Data for value from USDOT Transborder Surface Freight Data for weekly average from September and October 1999. All other data from the 1999 NRS.

CHAPTER 5

Summary of Trade by Major Crossings

The impacts of Canada-U.S. truck flows on the transportation system are most apparent at the border crossings. Most of the flows across the roughly 4,000 mile border cross the border at 22 principal truck crossings. Many of the larger crossings are congested, resulting in queues of idling trucks awaiting processing and clearance, especially since the September 11th terrorist attacks. The NRS provided a wealth of information about the flows at border crossings, much of which was not known beforehand. Reliable and consistent data on the commodities moving through each crossing are available for the first time, as well as robust estimates of the shipment weights.

This chapter includes a brief description of each of the 22 major truck crossings identified in Chapter 1. The total weekly value, tonnage, and truck trips for each crossing during its NRS survey week are presented in Tables 36 (Canadian measures) and 37 (U.S. measures).

The 22 major crossings have been grouped into six regions for the sake of reporting. Information is presented on the commodities and origin-destination patterns of trips passing through each crossing. Tables summarizing the tonnage and truckloads by commodity group are reported for each crossing. Note that estimates of the value for each commodity group are not available. The value information presented in this report is based on tabulations of the Transborder Surface Freight Data, which report exports and imports to and from Canada either by commodity or by crossing, but not by both. Maps showing the flows assigned to the major highway system in both countries are also included. Note that the bandwidth scales differ from map to map. The regions and crossings are reported from east to west.

Atlantic Region

The Atlantic region includes crossings between states in New England and Québec and the Atlantic provinces. Five crossings in this region have significant

Table 36: Weekly 1999 truck border crossing movements by major crossing (Canadian measures)

Region	Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
Atlantic	380,613,248	5.8	190,487	7.3	17,885	7.1
St. Lawrence	780,674,647	11.9	374,109	14.3	30,852	12.3
Niagara	1,573,961,526	23.9	503,834	19.2	49,224	19.7
St. Clair	3,409,249,811	51.8	1,025,057	39.1	104,181	41.6
Superior	65,352,469	1.0	218,207	8.3	18,071	7.2
Pacific	374,509,221	5.7	306,144	11.7	30,079	12.0
Total	6,584,360,922	100	2,617,838	100	250,292	100

Crossing	Value (C$)[a]	Per-cent	Metric tons	Per-cent	Trucks	Per-cent
St Stephen NB-Calais ME	62,818,026	1.0	30,091	1.1	3,134	1.3
Woodstock NB-Houlton ME	56,013,890	0.9	41,332	1.6	4,120	1.6
Saint-Theophile PQ-Jackman ME	12,033,364	0.2	21,034	0.8	1,621	0.6
Rock Island PQ-Derby Line VT	55,676,872	0.8	45,044	1.7	3,714	1.5
Saint-Armand PQ-Highgate Springs VT	194,071,096	2.9	52,986	2.0	5,296	2.1
Lacolle PQ-Champlain NY	432,722,906	6.6	176,695	6.8	15,058	6.0
Cornwall ON-Seaway Intl NY	16,382,444	0.2	23,234	0.9	2,511	1.0
Prescott ON-Ogdensburg NY	17,237,829	0.3	13,193	0.5	1,514	0.6
Lansdowne ON-Thousand Isl NY	314,331,468	4.8	160,987	6.2	11,769	4.7
Lewiston-Queenston Bridge	614,342,218	9.3	174,348	6.7	19,173	7.7
Peace Bridge	959,619,308	14.6	329,486	12.6	30,051	12.0
Ambassador Bridge	2,430,018,674	36.9	679,616	26.0	72,618	29.0
Detroit-Windsor Tunnel	77,873,318	1.2	37,235	1.4	3,672	1.5
Blue Water Bridge	901,357,819	13.7	308,206	11.8	27,891	11.1
Sault Ste Marie ON-MI	42,990,144	0.7	42,498	1.6	2,329	0.9
Thunder Bay ON-Grand Portage MN	8,831,357	0.1	33,939	1.3	2,938	1.2
Fort Frances ON-Intl Falls MN	9,671,644	0.1	44,876	1.7	6,678	2.7
Emerson MB-Noyes MN	3,859,324	0.1	96,894	3.7	6,126	2.4
Osoyoos BC-Oroville WA	27,133,623	0.4	18,290	0.7	2,133	0.9
Huntingdon BC-Sumas WA	36,311,225	0.6	67,343	2.6	6,562	2.6
Aldergrove BC-Lynden WA	1,931,146	0.0	36,505	1.4	3,247	1.3
Douglas BC-Blaine WA	309,133,227	4.7	184,006	7.0	18,137	7.2
Total[b]	6,584,360,922	100	2,617,838	100	250,292	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September and October, 1999. Data shown are average weekly bidirectional flows. All other data are from the 1999 National Roadside Study.

b. Percentages may not total exactly 100 percent due to rounding.

Table 37: Weekly 1999 truck border crossing movements by major crossing (U.S. measures)

Region	Value (US$)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent
Atlantic	256,796,430	5.8	209,972	7.3	17,885	7.1
St. Lawrence	526,714,574	11.9	412,381	14.3	30,852	12.3
Niagara	1,061,938,515	23.9	555,376	19.2	49,224	19.7
St. Clair	2,300,191,982	51.8	1,129,920	39.1	104,181	41.6
Superior	44,092,757	1.0	240,530	8.3	18,071	7.2
Pacific	252,678,201	5.7	337,462	11.7	30,079	12.0
Total	4,442,412,459	100	2,885,641	100	250,292	100

Crossing	Value (US $)[a]	Per-cent	Short tons	Per-cent	Trucks	Per-cent
St Stephen NB-Calais ME	42,382,790	1.0	33,168	1.1	3,134	1.3
Woodstock NB-Houlton ME	37,792,097	0.9	45,560	1.6	4,120	1.6
Saint-Theophile PQ-Jackman ME	8,118,809	0.2	23,186	0.8	1,621	0.6
Rock Island PQ-Derby Line VT	37,564,714	0.8	49,652	1.7	3,714	1.5
Saint-Armand PQ-Highgate Springs VT	130,938,020	2.9	58,406	2.0	5,296	2.1
Lacolle PQ-Champlain NY	291,954,481	6.6	194,771	6.8	15,058	6.0
Cornwall ON-Seaway Intl NY	11,053,096	0.2	25,611	0.9	2,511	1.0
Prescott ON-Ogdensburg NY	11,630,217	0.3	14,543	0.5	1,514	0.6
Lansdowne ON-Thousand Isl NY	212,076,780	4.8	177,456	6.2	11,769	4.7
Lewiston-Queenston Bridge	414,491,493	9.3	192,184	6.7	19,173	7.7
Peace Bridge	647,447,022	14.6	363,192	12.6	30,051	12.0
Ambassador Bridge	1,639,513,025	36.9	749,141	26.0	72,618	29.0
Detroit-Windsor Tunnel	52,540,468	1.2	41,044	1.4	3,672	1.5
Blue Water Bridge	608,138,489	13.7	339,735	11.8	27,891	11.1
Sault Ste Marie ON-MI	29,005,086	0.7	46,846	1.6	2,329	0.9
Thunder Bay ON-Grand Portage MN	5,958,442	0.1	37,411	1.3	2,938	1.2
Fort Frances ON-Intl Falls MN	6,525,376	0.1	49,467	1.7	6,678	2.7
Emerson MB-Noyes MN	2,603,853	0.1	106,806	3.7	6,126	2.4
Osoyoos BC-Oroville WA	18,306,826	0.4	20,161	0.7	2,133	0.9
Huntingdon BC-Sumas WA	24,498,876	0.6	74,232	2.6	6,562	2.6
Aldergrove BC-Lynden WA	1,302,928	0.0	40,239	1.4	3,247	1.3
Douglas BC-Blaine WA	208,569,571	4.7	202,830	7.0	18,137	7.2
Total[b]	4,442,412,459	100	2,885,641	100	250,292	100

a. Data for value are from the USDOT Transborder Surface Freight Data for September and October, 1999. Data shown are average weekly bidirectional flows. All other data are from the 1999 National Roadside Study.

b. Percentages may not total exactly 100 percent due to rounding.

truck volumes, as listed in Tables 36 and 37. All of the crossings in this region were distinguished by the fact that the commodities moving across them were lower value, higher weight shipments. Six percent of the value, and over seven percent of the tons and trucks between the Canada and the U.S. moved across these crossings.

Wood, textile, and leather products dominate the commodities moving in both directions across the Atlantic region crossings. Several interesting patterns were apparent in the data. The majority of these goods were wood products, which include raw timber, lumber, and wood products (excluding assembled furniture). A large number of trips entered the U.S. carrying timber and forest products, and returned to Canada empty. The majority of these trucks were specialized timber haulers, which cannot find return hauls. Some of these products were processed in the U.S. and returned to Canada in the form of lumber and wood products, where they were further processed or consumed. However, just the opposite occurred in Maine, where the value was added in Canada and returned to the U.S. Finished wood products were more likely to be carried in standard trailers, which can more readily handle backhauls. With the notable exception of St. Stephen-Calais, the Atlantic region crossings have a much larger number of empty trucks entering Canada than the U.S., as compared to other border crossings.

St. Stephen, NB-Calais ME

The St. Stephen-Calais crossing is in the middle of the Atlantic region in terms of tonnage and truck volumes. During the survey week it handled approximately 3,100 trucks. Wood, textile, and leather products dominated the tons crossing into Canada at St. Stephen-Calais, as shown in Table 38. They accounted for slightly more than a third of the eastbound movements. Agricultural products and fish accounted for another 24 percent of the flows by weight. In terms of truck trips, agricultural products and fish were the largest flows, again comprising 24 percent of the truck volumes. Together with three other commodities (electronics, vehicles, and precision goods; wood, textile, and leather products; and metal products and machinery), they comprised almost three-quarters of the eastbound truck trips. Approximately 11 percent of the trucks were empty.

Over half of the trucks entering Canada at St. Stephen-Calais originated in Maine (50 percent by weight, 58 percent of truck trips). Another quarter came from Massachusetts, New York, and Pennsylvania. The remainder originated in other New England and Atlantic seaboard states. Two-thirds were destined for New Brunswick, with another quarter to Nova Scotia.

Agricultural products and fish were the dominant southbound flows at St. Stephen-Calais, accounting for 36 percent of the tons and 39 percent of the truck trips. Wood, textile, and leather products accounted for another 33 percent of the weight and 26 percent of the truck trips. Empty trucks and metal products and machinery each accounted for 10 percent of the truck trips entering the U.S.

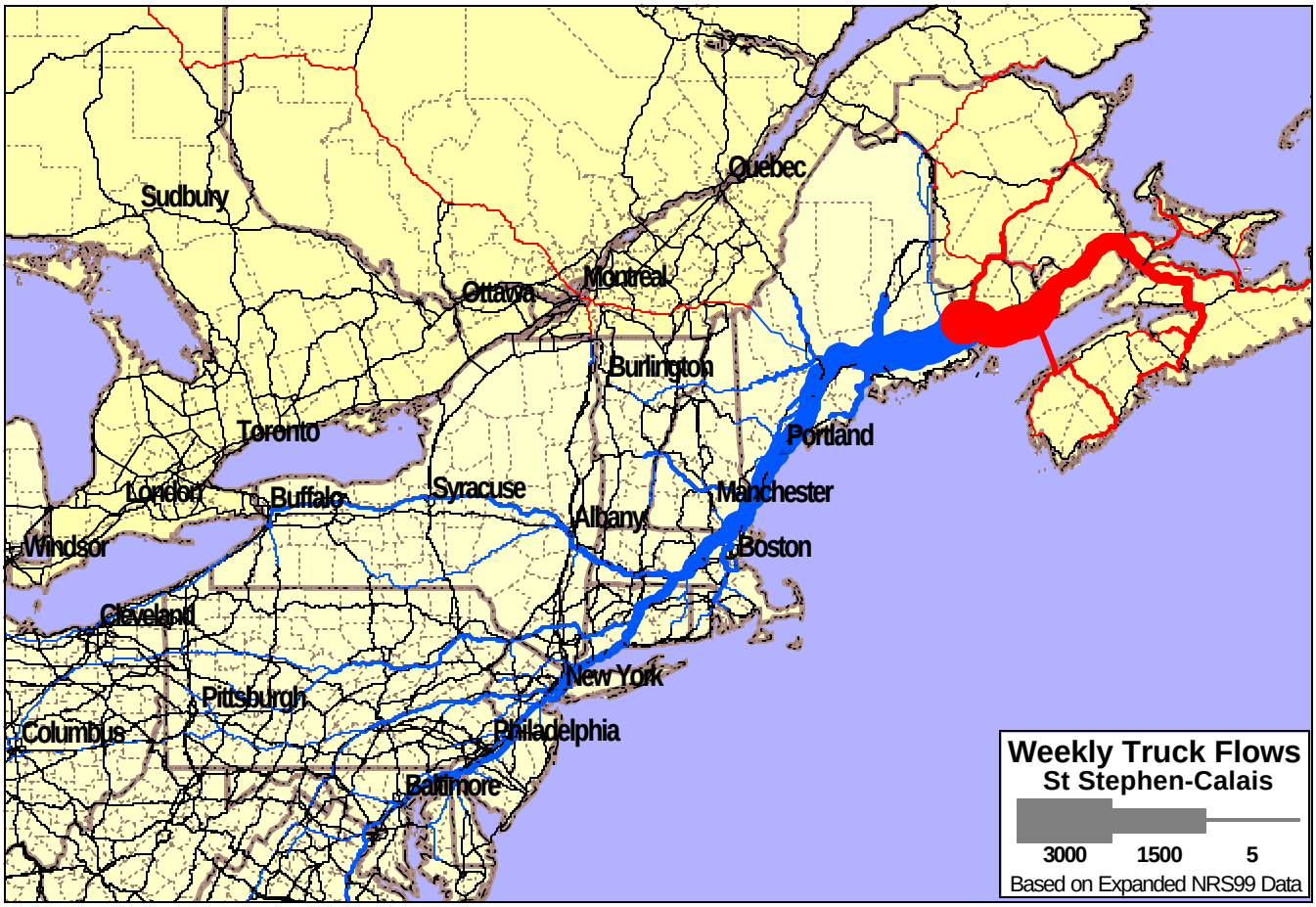

Figure 23: Weekly 1999 truck flows through St. Stephen-Calais

Table 38: Weekly 1999 St. Stephen-Calais crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	220	11.4	--	Empty	0	0	0.0	122	10.2
4,070	4,486	23.9	461	23.8	01-05	Agricultural products and fish	4,676	5,154	35.8	466	38.9
1,534	1,691	9.0	72	3.7	06-09	Grains, alcoholic beverages and tobacco	377	415	2.9	28	2.3
269	297	1.6	12	0.6	10-14	Stone, minerals and ores	0	0	0.0	0	0.0
923	1,017	5.4	51	2.6	15-20	Coal and petroleum products	774	853	5.9	30	2.5
968	1,067	5.7	58	3.0	21-24	Pharmaceutical and chemical products	748	825	5.7	36	3.0
5,769	6,359	33.9	304	15.7	25-30	Wood, textile, and leather products	4,352	4,797	33.3	305	25.5
2,182	2,405	12.8	242	12.5	31-34	Metal products and machinery	459	506	3.5	117	9.8
342	377	2.0	421	21.7	35-38	Electronics, vehicles, and precision goods	203	224	1.6	10	0.8
233	257	1.4	32	1.7	39-43	Furniture and miscellaneous products	92	101	0.7	8	0.7
740	816	4.3	65	3.4	--	Unclassified or unknown	1,382	1,523	10.6	75	6.3
17,030	18,772	100	1,938	100		Total[a]	13,063	14,354	100	1,198	100

a. Percentages may not total exactly 100 percent due to rounding.

The majority of goods coming into the U.S. at St. Stephen-Calais originated in New Brunswick (53 percent of tons, 64 percent of truck trips). As with eastbound flows, flows from Nova Scotia made up most of the remainder. Maine was the destination of 42 percent of the tons, and 58 percent of the truck trips. About 15 percent of the remaining flows were bound for Massachusetts, with the rest destined in smaller shares to New England and Atlantic seaboard states.

Woodstock, NB-Houlton, ME

Woodstock-Houlton had the second highest truck crossing volume in the Atlantic region, although it was in the middle of the group in terms of value and tonnage. Most of the cross-border flows were of relatively short distance, as shown in Figure 24. The origin-destination patterns of flows through Woodstock-Houlton were quite different, depending on the direction of flow.

Two-thirds of the flows entering Canada by tonnage, and almost three-quarters of the truck trips, originated in Maine. The remaining origins were in other New England and Atlantic seaboard states. About half (by tons) to two-thirds (truck trips) were destined for New Brunswick, with almost all of the remainder destined for Nova Scotia. Most of the flows were agricultural products and fish and wood, textile, and leather products. However, the commodity was not classified in over a quarter of the surveys conducted there, as shown in Table 39. About 40 percent of the trucks entering Canada were empty.

Wood, textile, and leather products constituted half of the goods by weight entering the U.S. through Woodstock-Houlton. Agricultural products and fish constituted about another quarter, as shown in Table 39. Approximately eight percent of the trucks entering the U.S. were empty. About 85 percent of the goods originated in New Brunswick, a much higher percentage than goods destined to it the other direction. Almost all of the remainder originated in Nova Scotia. The destinations were quite varied. Maine accounted for only a third of the destinations of flows entering the U.S. Flows to Massachusetts, Pennsylvania, and New Jersey accounted for another third. The remainder were destined for other New England and Atlantic seaboard states.

Saint-Theophile, PQ-Jackman, ME

The Saint-Theophile-Jackman crossing handled the smallest truck flows of the five major truck ports of entry in the region. The flows by commodity are summarized in Table 40. Almost all of the flows in tonnage terms entering Canada there were wood, textile, and leather products. These accounted for about half of the truck trips, with an almost equal number of empty trucks entering Canada. Maine was the origin of almost all trips entering Canada at Saint-Theophile-Jackman, and Québec was almost the exclusive destination.

The flows in the opposite direction followed similar patterns but were not as pronounced. Québec was the origin of about 95 percent of the flows entering the U.S. there, with the balance coming from Ontario. Maine was the primary destination,

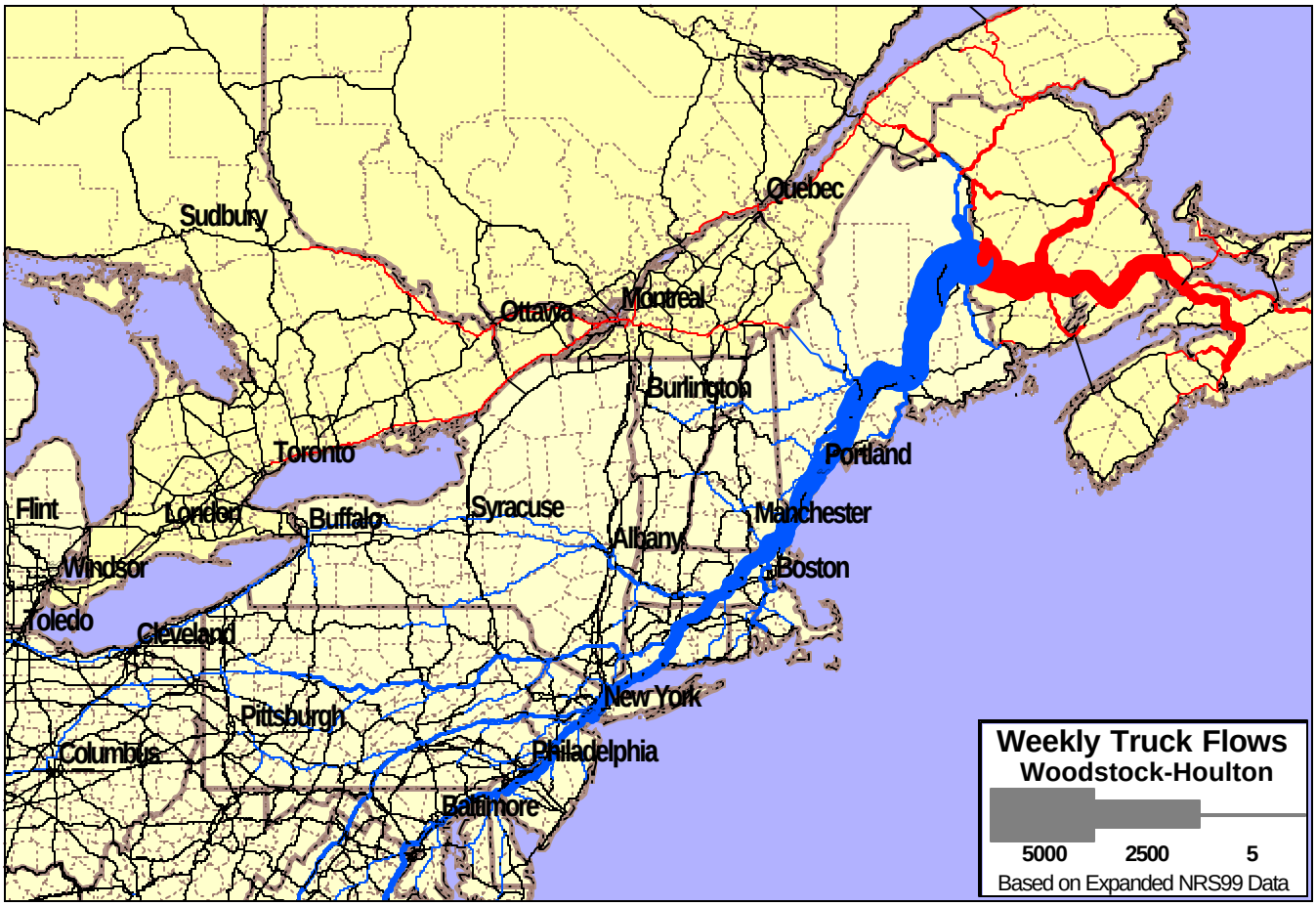

Figure 24: Weekly 1999 truck flows at Woodstock-Houlton

Table 39: Weekly 1999 Woodstock-Houlton crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	941	42.1	--	Empty	0	0	0.0	164	8.7
3,057	3,370	19.8	177	7.9	01-05	Agricultural products and fish	5,708	6,292	22.0	558	29.6
1,013	1,117	6.6	57	2.5	06-09	Grains, alcoholic beverages and tobacco	483	532	1.9	26	1.4
0	0	0.0	0	0.0	10-14	Stone, minerals and ores	246	271	0.9	11	0.6
95	105	0.6	25	1.1	15-20	Coal and petroleum products	2,768	3,051	10.7	132	7.0
237	261	1.5	14	0.6	21-24	Pharmaceutical and chemical products	399	440	1.5	21	1.1
5,023	5,537	32.6	306	13.7	25-30	Wood, textile, and leather products	13,365	14,732	51.6	651	34.6
820	904	5.3	63	2.8	31-34	Metal products and machinery	638	703	2.5	32	1.7
567	625	3.7	50	2.2	35-38	Electronics, vehicles, and precision goods	764	842	2.9	131	7.0
38	42	0.3	19	0.8	39-43	Furniture and miscellaneous products	344	379	1.3	28	1.5
4,557	5,023	29.6	584	26.1	--	Unclassified or unknown	1,208	1,332	4.7	129	6.9
15,407	16,984	100	2,236	100	Total[a]		25,923	28,574	100	1,883	100

a. Percentages may not total exactly 100 percent due to rounding.

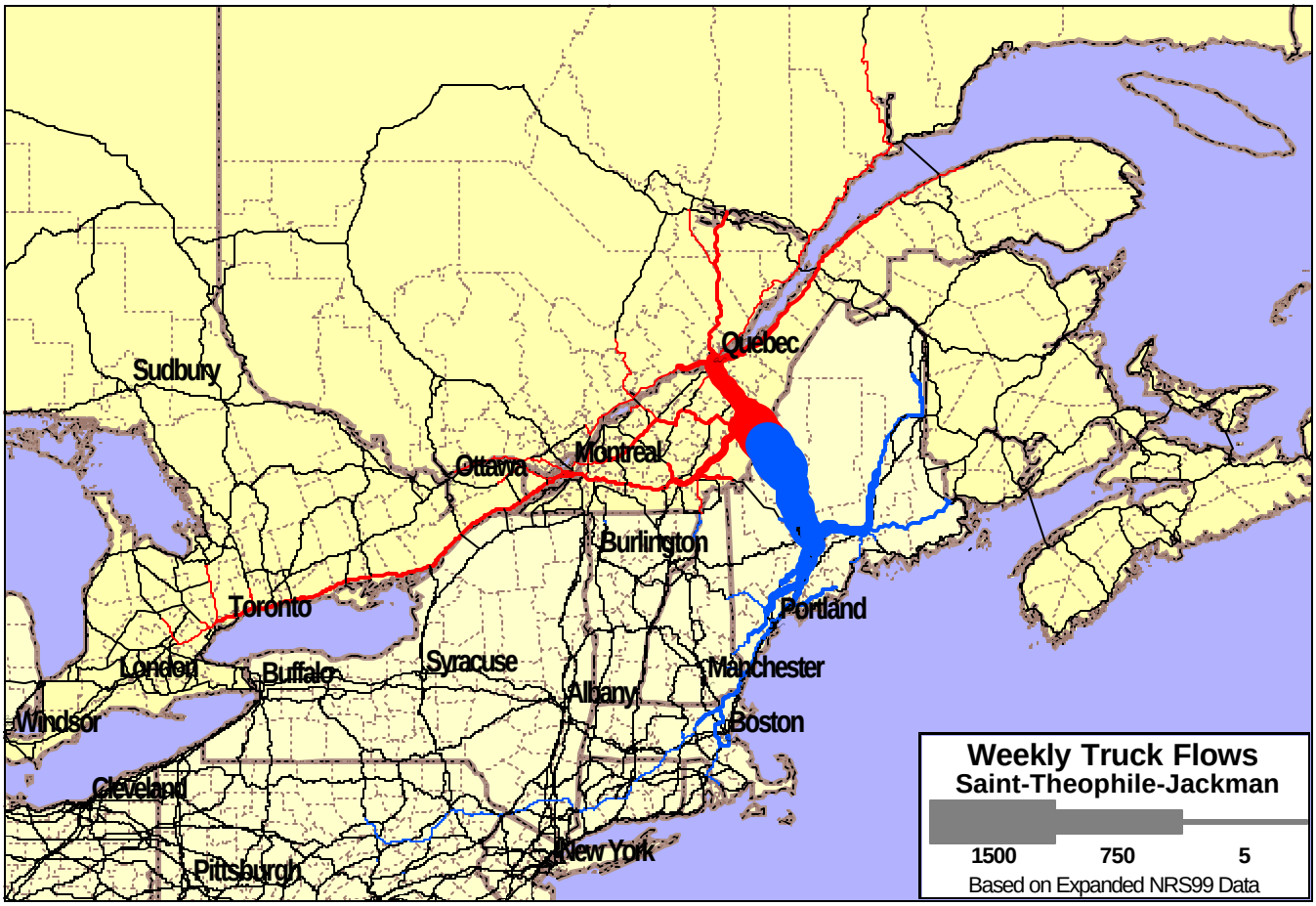

Figure 25: Weekly 1999 truck flows through Saint-Theophile-Jackman

Table 40: Weekly 1999 Saint-Theophile-Jackman crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	358	43.2	--	Empty	0	0	0.0	235	29.6
0	0	0.0	0	0.0	01-05	Agricultural products and fish	169	186	1.6	43	5.4
0	0	0.0	0	0.0	06-09	Grains, alcoholic beverages and tobacco	0	0	0.0	0	0.0
105	116	1.0	6	0.7	10-14	Stone, minerals and ores	126	139	1.2	4	0.5
0	0	0.0	0	0.0	15-20	Coal and petroleum products	1,848	2,037	17.6	78	9.8
33	36	0.3	49	5.9	21-24	Pharmaceutical and chemical products	34	37	0.3	7	0.9
10,129	11,165	96.3	399	48.2	25-30	Wood, textile, and leather products	5,907	6,511	56.2	270	34.0
0	0	0.0	0	0.0	31-34	Metal products and machinery	2,295	2,530	21.8	122	15.4
254	280	2.4	17	2.1	35-38	Electronics, vehicles, and precision goods	0	0	0.0	0	0.0
0	0	0.0	0	0.0	39-43	Furniture and miscellaneous products	93	103	0.9	17	2.1
0	0	0.0	0	0.0	--	Unclassified or unknown	40	44	0.4	17	2.1
10,521	11,597	100	829	100	Total[a]		10,512	11,587	100	793	100

a. Percentages may not total exactly 100 percent due to rounding.

attracting about 85 percent of the shipments. The majority of the remainder were bound for Massachusetts. The mix of commodities entering the U.S. was more varied than flows in the opposite direction. Wood, textile, and leather products still dominated the flows, but only accounted for about half of them. Metal products and machinery and coal and petroleum products accounted for another quarter (by truck trips) to third (by tonnage) of the flows entering the U.S. Approximately 30 percent of the trucks entering the U.S. were empty, the highest percentage of all crossings in the Atlantic region.

Rock Island, PQ-Derby Line, VT

The Rock Island-Derby Line crossing was also heavily dominated by flows of wood, textile, and leather products, as shown in Table 41. Of the flows entering Canada across Rock Island-Derby Line, three-quarters by weight fell into this category. Pharmaceuticals and chemicals were the next largest flow, accounting for six percent of the goods by weight entering Canada. The same picture was true for truck trips, although 40 percent of the trucks entering Canada were empty. Half of the trips entering Canada originated in Massachusetts and New Hampshire, as shown in Figure 26. Another third originated in Vermont, Maine, and Connecticut. The remainder came from New England states, New York, and New Jersey, although a small percentage originated in Wisconsin. Québec was the destination of about 85 percent of the flows entering Canada, with most of the remainder bound for Ontario.

Wood, textile, and leather products were also the major flow entering the U.S. at Rock Island-Derby Line. They accounted for half of the tonnage and almost 40 percent of the truck trips. Stone, minerals, and ores and metal product and machinery were also significant flows, amounting to another 20 percent of the goods entering the U.S. The remaining commodities were quite varied. Fifteen percent of the trucks entering the U.S. were empty.

Saint-Armand, PQ-Highgate Springs, VT

Based on the 1999 NRS survey data, the highest tonnage and number of trucks in the Atlantic region crossed at Saint-Armand-Highgate Springs. According to the trade statistics, it is also the largest crossing in the Atlantic region by value of goods.

Like the other crossings in the Atlantic region, wood, textile, and leather products dominated the flows. They accounted for over half of the tonnage of goods entering Canada, as shown in Table 42. Three other commodity groups (metal products and machinery, pharmaceuticals and chemicals, and furniture and miscellaneous products) accounted for about another quarter of the tonnage, although they represented a smaller proportion of the truck trips entering Canada. Wood, textile, and leather products were the largest truck flows, although 55 percent of the truck trips entering Canada were empty.

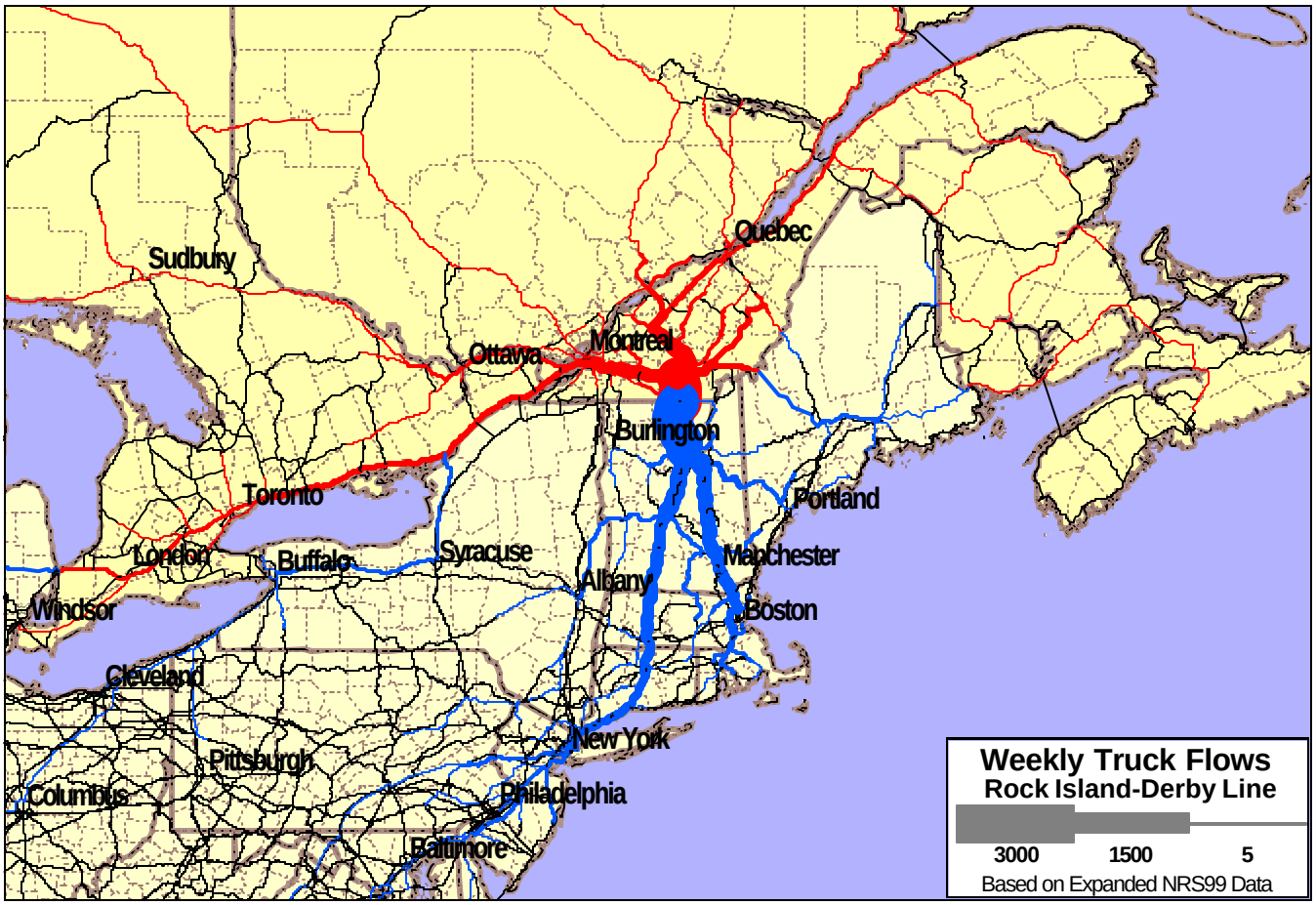

Figure 26: Weekly 1999 truck flows through Rock Island-Derby Line

Table 41: Weekly 1999 Rock Island-Derby Line crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	598	39.9	--	Empty	0	0	0.0	331	15.0
97	107	0.7	12	0.8	01-05	Agricultural products and fish	2,353	2,594	7.7	149	6.7
139	153	1.0	8	0.5	06-09	Grains, alcoholic beverages and tobacco	952	1,049	3.1	62	2.8
111	122	0.8	5	0.3	10-14	Stone, minerals and ores	3,584	3,951	11.7	183	8.3
100	110	0.7	8	0.5	15-20	Coal and petroleum products	1,050	1,157	3.4	90	4.1
862	950	5.9	51	3.4	21-24	Pharmaceutical and chemical products	799	881	2.6	80	3.6
11,286	12,441	77.8	614	40.9	25-30	Wood, textile, and leather products	15,492	17,077	50.7	869	39.3
649	715	4.5	71	4.7	31-34	Metal products and machinery	3,358	3,702	11.0	222	10.0
314	346	2.2	48	3.2	35-38	Electronics, vehicles, and precision goods	585	645	1.9	68	3.1
232	256	1.6	23	1.5	39-43	Furniture and miscellaneous products	1,255	1,383	4.1	101	4.6
717	790	4.9	63	4.2	--	Unclassified or unknown	1,111	1,225	3.6	60	2.7
14,507	15,990	100	1,501	100	Total[a]		30,539	33,664	100	2,215	100

a. Percentages may not total exactly 100 percent due to rounding.

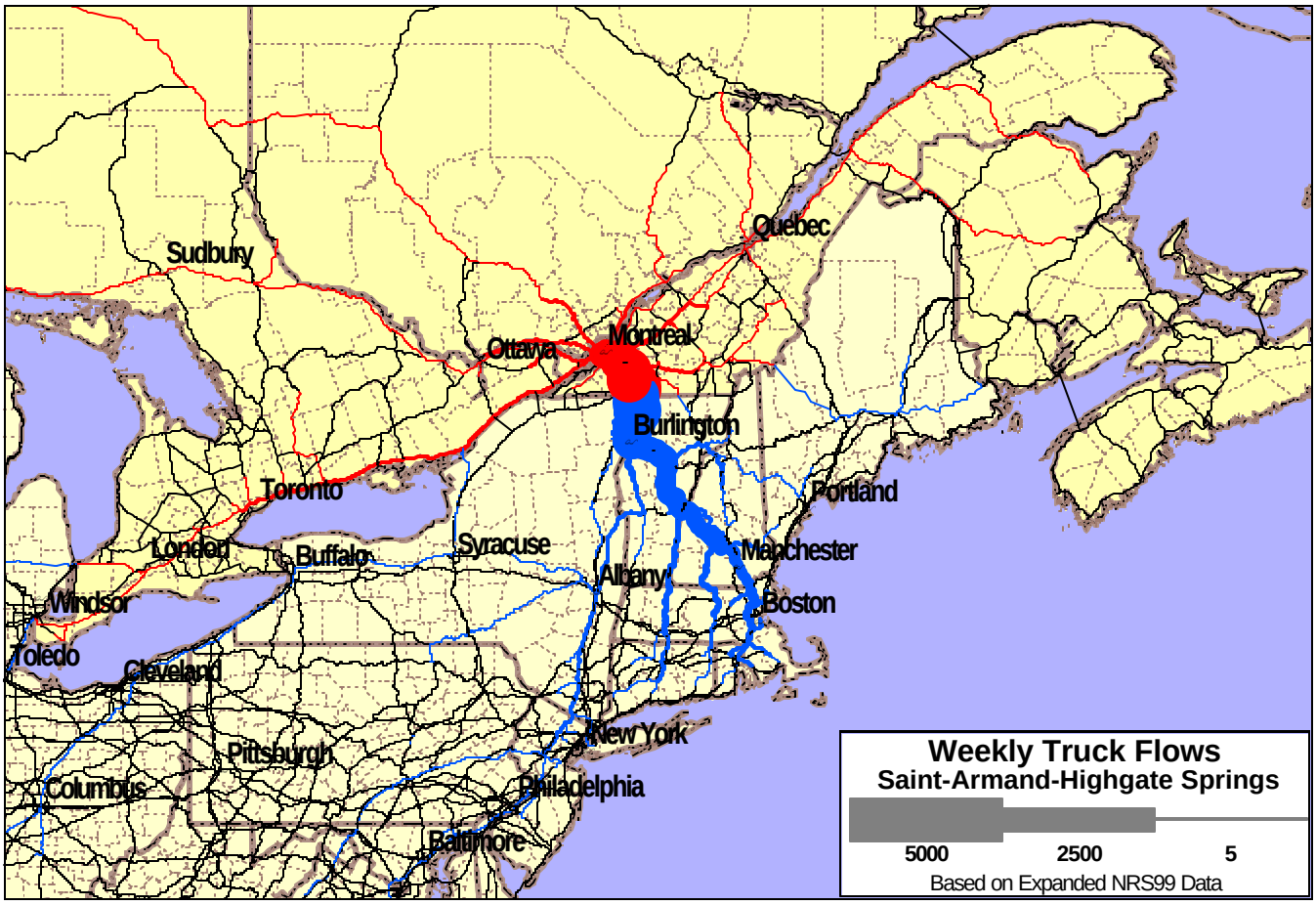

Figure 27: Weekly 1999 truck flows through Saint-Armand-Highgate Springs

Table 42: Weekly 1999 Saint-Armand-Highgate Springs crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	1,441	54.9	--	Empty	0	0	0.0	330	12.4
646	712	4.2	47	1.8	01-05	Agricultural products and fish	5,604	6,177	15.0	255	9.5
737	812	4.7	55	2.1	06-09	Grains, alcoholic beverages and tobacco	2,889	3,185	7.7	224	8.4
300	331	1.9	16	0.6	10-14	Stone, minerals and ores	1,937	2,135	5.2	106	4.0
246	271	1.6	12	0.5	15-20	Coal and petroleum products	6,390	7,044	17.1	277	10.4
1,353	1,491	8.7	85	3.2	21-24	Pharmaceutical and chemical products	2,336	2,575	6.2	153	5.7
8,319	9,170	53.5	555	21.1	25-30	Wood, textile, and leather products	8,537	9,410	22.8	596	22.3
1,362	1,501	8.8	149	5.7	31-34	Metal products and machinery	7,513	8,282	20.1	497	18.6
652	719	4.2	84	3.2	35-38	Electronics, vehicles, and precision goods	758	836	2.0	129	4.8
1,289	1,421	8.3	104	4.0	39-43	Furniture and miscellaneous products	276	304	0.7	38	1.4
657	724	4.2	77	2.9	--	Unclassified or unknown	1,185	1,306	3.2	66	2.5
15,561	17,152	100	2,625	100	Total[a]		37,425	41,254	100	2,671	100

a. Percentages may not total exactly 100 percent due to rounding.

Vermont was the leading origin of flows entering Canada, accounting for 41 percent of the tons and 48 percent of the truck trips. The truck flows are shown in Figure 27. Massachusetts accounted for another 28 percent (by both measures), while New Hampshire contributed about 10 percent. Over 90 percent of the goods were destined for Québec, with most of the remainder going to Ontario. A small amount (less than one percent) were destined for New Brunswick. The flows were almost perfectly symmetrical at this crossing, with flows entering the U.S. coming from and to the same states in the same proportions.

The commodity mix entering the U.S. was more varied than at most of the crossings in the region. Wood, textile, and leather products were the dominant flows, but they only accounted for a little less than a quarter of the tonnage and truck trips. Metal products and machinery were almost as significant, along with coal and petroleum products and agricultural products and fish. These four commodity groups accounted for three-quarters of the tonnage and 60 percent of the truck trips entering the U.S. at Saint-Armand-Highgate Springs. Twelve percent of the trucks entering the U.S. were empty.

St. Lawrence Region

There are four crossings in the St. Lawrence region that carried significant truck volumes. These include major crossings at Lacolle-Champlain and the Thousand Islands Bridge. They carried 55 and 34 percent of the trucks crossing in this region, respectively. The two other crossings in this region — Prescott-Ogdensburg and the Seaway International Bridge — together carried about 10 percent of the flows.

Lacolle, Québec-Champlain, New York

About 776,000 trucks crossed at the Lacolle-Champlain crossing in 1999. Wood, textile, and leather products (SCTG 25-30) were the dominant commodity group, accounting for almost 40 percent of the tonnage into Canada, and over a third of the tonnage into the U.S. The remaining commodities by weight covered the entire spectrum of commodity groups, as shown in Table 43. Grains, alcoholic beverages, and tobacco were the next largest commodity group for goods entering Canada. The picture was different for southbound shipments into the U.S. Agricultural products and fish (SCTG 01-05) and metal products and machinery (SCTG 31-34) were important commodities. A similar pattern was seen when measuring these flows in terms of truck trips.

Over 95 percent of the trips traveling south through Lacolle-Champlain originated in Québec, with the remainder coming from Ontario. As seen in Figure 28, the destinations were spread across several states. Slightly more than half of the trucks were destined for New York state, while another 19 percent were bound for New Jersey. Pennsylvania accounted for another 10 percent, with the balance spread across the eastern seaboard.

Figure 28: Weekly 1999 truck flows through Lacolle-Champlain

Table 43: Weekly 1999 Lacolle-Champlain crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	2,051	29.5	--	Empty	0	0	0.0	993	12.3
4,314	4,755	6.1	317	4.6	01-05	Agricultural products and fish	15,495	17,080	14.6	890	11.0
7,527	8,297	10.7	441	6.3	06-09	Grains, alcoholic beverages and tobacco	7,376	8,131	6.9	494	6.1
4,272	4,709	6.1	203	2.9	10-14	Stone, minerals and ores	2,995	3,301	2.8	140	1.7
3,177	3,502	4.5	170	2.4	15-20	Coal and petroleum products	6,547	7,217	6.2	288	3.6
3,357	3,700	4.8	357	5.1	21-24	Pharmaceutical and chemical products	9,621	10,605	9.1	736	9.1
27,355	30,153	38.8	1,651	23.7	25-30	Wood, textile, and leather products	36,209	39,913	34.1	2,168	26.8
6,756	7,447	9.6	603	8.7	31-34	Metal products and machinery	12,532	13,814	11.8	721	8.9
2,871	3,165	4.1	339	4.9	35-38	Electronics, vehicles, and precision goods	4,101	4,521	3.9	651	8.0
6,508	7,174	9.2	395	5.7	39-43	Furniture and miscellaneous products	4,333	4,776	4.1	441	5.4
4,347	4,792	6.2	434	6.2	--	Unclassified or unknown	7,002	7,718	6.6	576	7.1
70,484	77,694	100	6,961	100		Total[a]	106,211	117,076	100	8,098	100

a. Percentages may not total exactly 100 percent due to rounding.

The same geographic pattern was found in reverse for trips northbound through Lacolle-Champlain. New York, New Jersey, and Pennsylvania accounted for three-quarters of the origins of truck trips and tons moving north. The remainder of the origins were concentrated in states along the Atlantic seaboard. About 98 percent of the flows, measured in either truck trip or tonnage terms, were destined for Québec.

Cornwall, Ontario-Seaway International Bridge, New York

Slightly more than 125,000 trucks crossed the Seaway International Bridge in 1999. Like most of the crossings to the east, the dominant commodity group was wood, textile, and leather products. They accounted for over half of the tonnage and about 20 percent of the trucks entering Canada, as shown in Table 44. A remarkably large number (62 percent) of the trucks entering Canada were empty. Metal products and machinery were the next largest commodity group, accounting for 10 percent of the tonnage and five percent of the truck trips entering Canada. About 80 percent of the tonnage was evenly split between New York and Vermont, with most of the remainder coming from Maine. The patterns are shown in Figure 29. Approximately 85 percent of the tonnage and truck trips were destined for Ontario, with almost all of the remainder bound for Québec.

The character of trips entering the U.S. on the Seaway International Bridge was somewhat different. Metal products and machinery were dominant in tonnage terms, amounting to one third of the flows. Wood, textile, and leather products and agricultural products and fish accounted for 27 and 20 percent of the remaining flows, respectively. These three commodity groups accounted for 80 percent of the tonnage and almost one-half of the truck trips. The majority of the remaining trucks entering the U.S. (43 percent) were empty. Two-thirds of the tonnage originated in Ontario, with the balance in Québec. Almost 85 percent of the goods entering the U.S. were bound for New York, with much of the remainder destined for Vermont.

Prescott, ON-Ogdensburg, NY

The Prescott-Ogdensburg crossing diverged from the pattern of the other St. Lawrence region crossings. It handled less truck traffic than the other crossings in the region, and the character of what moved across there was different. Metal products and machinery accounted for over half of the tonnage crossing into Canada, making it the first crossing west of Maine and New Brunswick not dominated by wood products. The breakdown of flows by commodity group is shown in Table 45. Agricultural products and fish; wood, textile, and leather products; and stone, minerals, and ores accounted for over another third of the flows by tonnage. Like the Seaway International Bridge, a surprisingly large number of trucks (67 percent) entering Canada were empty. Most of the remainder carried metal products and machinery, the dominant flow by tonnage.

About 85 percent of the flows originated in New York, with most of the rest coming from Virginia. About one-third of the tonnage, but almost three-quarters of the

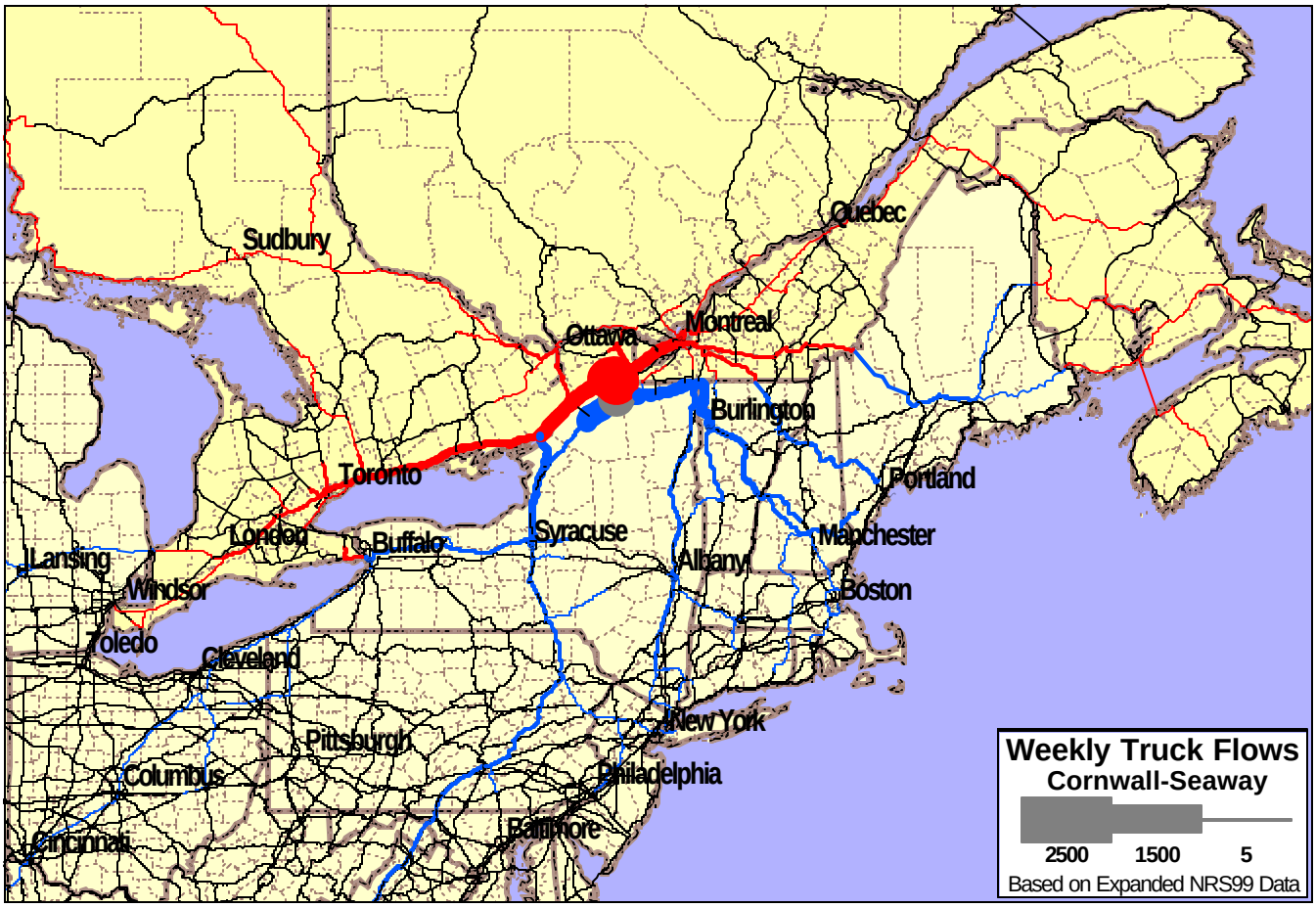

Figure 29: Weekly 1999 truck flows crossing the Seaway International Bridge

Table 44: Weekly 1999 Cornwall-Seaway International Bridge crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	680	62.4	--	Empty	0	0	0.0	605	42.6
0	0	0.0	0	0.0	01-05	Agricultural products and fish	1,052	1,160	7.0	66	4.6
163	180	2.0	7	0.6	06-09	Grains, alcoholic beverages and tobacco	111	122	0.7	6	0.4
632	697	7.7	34	3.1	10-14	Stone, minerals and ores	378	417	2.5	41	2.9
0	0	0.0	0	0.0	15-20	Coal and petroleum products	3,048	3,360	20.2	153	10.8
54	60	0.7	4	0.4	21-24	Pharmaceutical and chemical products	45	50	0.3	12	0.8
4,347	4,792	53.2	229	21.0	25-30	Wood, textile, and leather products	4,082	4,500	27.1	233	16.4
808	891	9.9	58	5.3	31-34	Metal products and machinery	4,986	5,496	33.1	249	17.5
694	765	8.5	36	3.3	35-38	Electronics, vehicles, and precision goods	22	24	0.1	17	1.2
380	419	4.7	32	2.9	39-43	Furniture and miscellaneous products	32	35	0.2	31	2.2
1,085	1,196	13.3	11	1.0	--	Unclassified or unknown	1,315	1,450	8.7	7	0.5
8,163	9,000	100	1,091	100	Total[a]		15,071	16,614	100	1,420	100

a. Percentages may not total exactly 100 percent due to rounding.

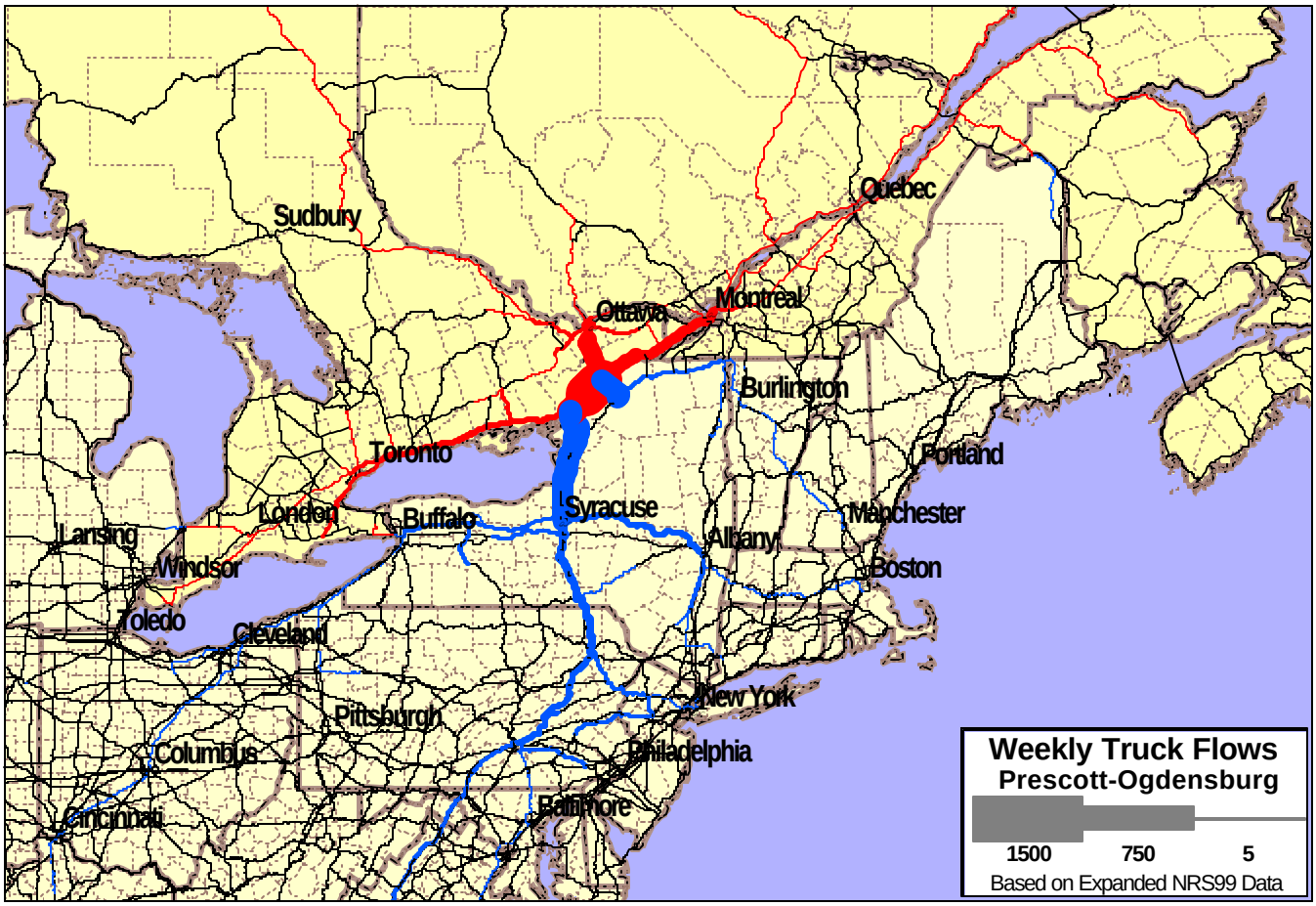

Figure 30: Weekly 1999 truck flows through Prescott-Ogdensburg

Table 45: Weekly 1999 Prescott-Ogdensburg crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	465	67.4	--	Empty	0	0	0.0	135	16.4
437	482	13.3	24	3.5	01-05	Agricultural products and fish	2,624	2,892	26.5	157	19.1
0	0	0.0	0	0.0	06-09	Grains, alcoholic beverages and tobacco	1,375	1,516	13.9	74	9.0
354	390	10.8	19	2.8	10-14	Stone, minerals and ores	64	71	0.6	4	0.5
150	165	4.6	7	1.0	15-20	Coal and petroleum products	1,510	1,664	15.2	72	8.7
107	118	3.3	7	1.0	21-24	Pharmaceutical and chemical products	333	367	3.4	42	5.1
373	411	11.3	22	3.2	25-30	Wood, textile, and leather products	2,669	2,942	26.9	136	16.5
1,683	1,855	51.2	94	13.6	31-34	Metal products and machinery	920	1,014	9.3	84	10.2
4	4	0.1	44	6.4	35-38	Electronics, vehicles, and precision goods	56	62	0.6	30	3.6
0	0	0.0	0	0.0	39-43	Furniture and miscellaneous products	37	41	0.4	10	1.2
177	195	5.4	9	1.3	--	Unclassified or unknown	322	355	3.2	80	9.7
3,285	3,620	100	691	100	Total[a]		9,910	10,924	100	824	100

a. Percentages may not total exactly 100 percent due to rounding.

truck trips, were destined for Ontario. An inverse amount (two-thirds of the tonnage but less than 30 percent of the truck trips) went to Québec. These flows are shown in Figure 30.

Wood products and machinery and agricultural products and fish equally dominate the goods flowing into the U.S. through Prescott-Ogdensburg. Each accounted for about one-quarter of the tonnage and a little less than 20 percent of the truck trips. Coal and petroleum products and grains, beverages, and tobacco together constituted another quarter of the flows by weight, and about 18 percent of the truck trips. Sixteen percent of the trucks entering the U.S. were empty. Three-quarters of the goods originated in Ontario, with the balance coming from Québec. Three-quarters of the flows were destined for New York, with most of the remainder going to Pennsylvania and Massachusetts. About 1½ percent of the flows were destined for Florida.

Lansdowne, ON-Thousand Islands Bridge, NY

The Thousand Islands Bridge was the second busiest crossing in the St. Lawrence region, closely behind Lacolle-Champlain. Like most of the other crossings in the Atlantic and St. Lawrence regions, wood, textile, and leather products were the major commodities handled. It accounted for over one-third of the tonnage entering Canada, and 27 percent of the truck trips. Metal products and machinery accounted for 18 and 15 percent of the tonnage and truck trips, respectively. About 21 percent of the trucks entering Canada were empty.

The origin-destination patterns of trips entering Canada were more varied than other crossings in this region. Only about one-third of the tons and truck trips originated in New York. Another quarter came from Pennsylvania. Ohio was a significant origin, accounting for almost 10 percent of the flows. The remainder came from a wide assortment of states in New England and the Atlantic seaboard. Half of the flows (in both weight and truck terms) were destined for Ontario and Québec. The flows are depicted in Figure 31.

The mix of commodities entering the U.S. was more varied, as shown in Table 46. Wood, textile, and leather products represented almost a third of the tonnage and one-quarter of the truck trips. Metal products and machinery accounted for more than 20 percent of the flows (measured in either terms). Pharmaceuticals and chemicals and coal and petroleum products each accounted for another 10 percent of the flows. Only eight percent of the trucks entering the U.S. were empty, the second lowest proportion (after Sault Ste. Marie) along the Canada-U.S. border. The origin-destination patterns were almost a perfect mirror image of the flows entering Canada. Kentucky was the only destination outside of New England and the mid-Atlantic states, with about 1½ percent of the flows.

Niagara Region

The two crossings in the Niagara region — the Queenston-Lewiston and Peace Bridges — are located in the greater Buffalo-Niagara area. The crossings are stra-

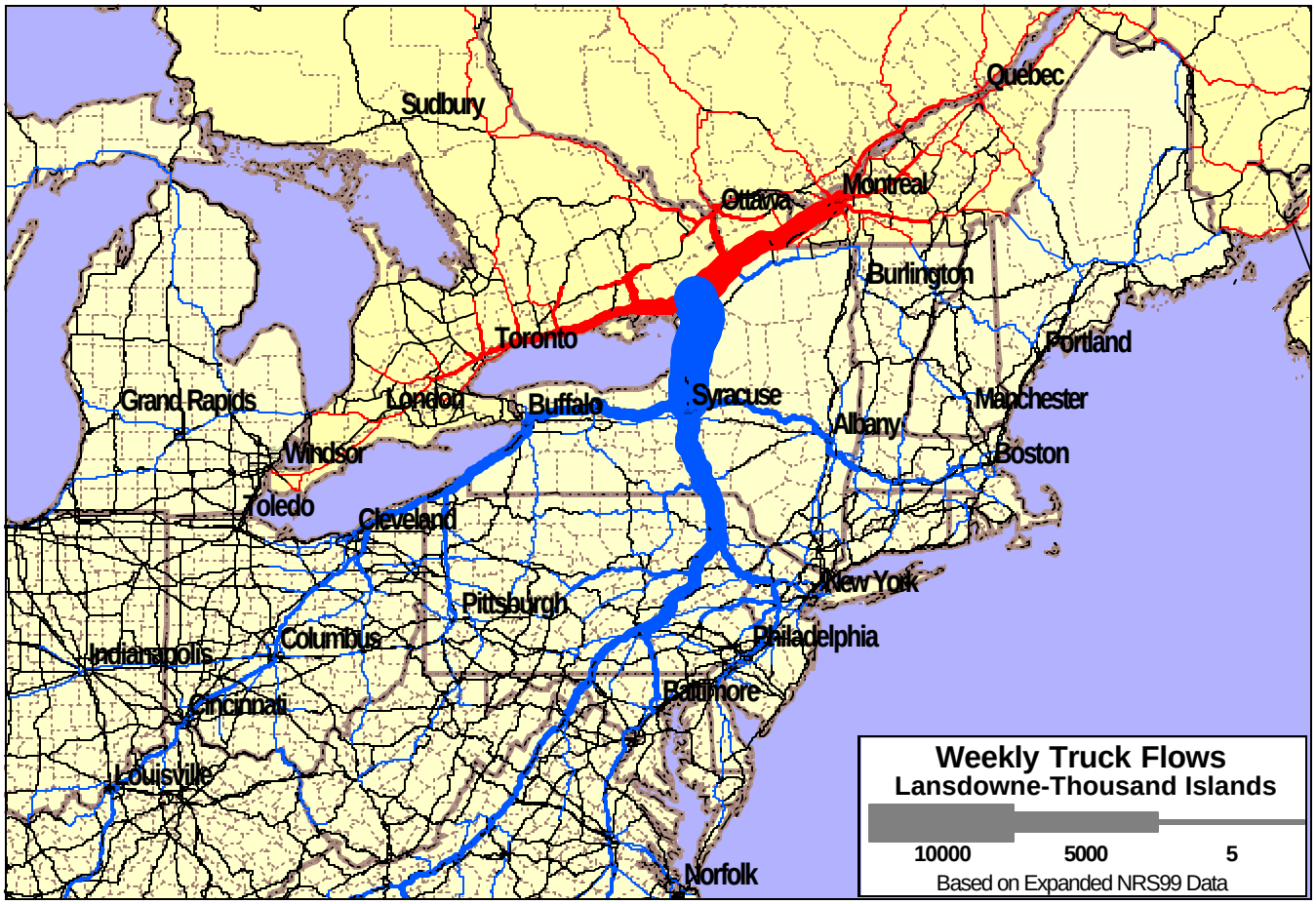

Figure 31: Weekly 1999 truck flows crossing the Thousand Islands Bridge

Table 46: Weekly 1999 Lansdowne-Thousand Islands crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	1,301	21.3	--	Empty	0	0	0.0	477	8.4
2,610	2,877	3.4	151	2.5	01-05	Agricultural products and fish	2,183	2,406	2.6	136	2.4
6,726	7,414	8.7	379	6.2	06-09	Grains, alcoholic beverages and tobacco	6,349	6,999	7.6	408	7.2
3,532	3,893	4.5	211	3.5	10-14	Stone, minerals and ores	2,235	2,464	2.7	114	2.0
5,186	5,717	6.7	251	4.1	15-20	Coal and petroleum products	9,361	10,319	11.2	495	8.7
6,835	7,534	8.8	525	8.6	21-24	Pharmaceutical and chemical products	9,200	10,141	11.0	579	10.2
28,997	31,963	37.3	1,661	27.2	25-30	Wood, textile, and leather products	25,050	27,613	30.1	1,449	25.6
14,279	15,740	18.4	910	14.9	31-34	Metal products and machinery	19,176	21,138	23.0	1,210	21.4
3,820	4,211	4.9	308	5.0	35-38	Electronics, vehicles, and precision goods	3,138	3,459	3.8	290	5.1
2,643	2,913	3.4	214	3.5	39-43	Furniture and miscellaneous products	5,253	5,790	6.3	381	6.7
3,038	3,349	3.9	190	3.1	--	Unclassified or unknown	1,378	1,519	1.7	130	2.3
77,666	85,611	100	6,101	100	Total[a]		83,323	91,848	100	5,669	100

a. Percentages may not total exactly 100 percent due to rounding.

tegically placed on the major routes to the Toronto metropolitan area. The Niagara crossings also represent the eastern end of a land bridge through Ontario, linking New York and New England to Michigan and the West and Southwestern United States. It is at the Niagara crossings that the character of goods flowing between Canada and the U.S. change from those carried across the Atlantic and St. Lawrence regions. The origins and destinations were more varied, as were the commodities carried.

The Niagara crossings handled almost one-quarter of the value of goods carried by truck across the 22 major crossings, and about 20 percent of the tonnage and truck trips. The Peace Bridge carried the majority of the flows, handling two-thirds of the value, tonnage, and truck trips attributed to the Niagara region.

The Queenston-Lewiston Bridge

A total of 953,000 trucks crossed the Queenston-Lewiston Bridge in 1999, making it the fourth busiest truck crossing along the Canada-U.S. border. Almost one-half of the commodities by weight moving into Canada belonged to three commodity groups: metal products and machinery; wood, textile, and leather products; and grains, beverages, and tobacco. However, all of the commodity groups except stone, minerals, and ores were well represented, as shown in Table 47. Over one-third of the trucks entering Canada were empty, with electronics, vehicles, and precision goods constituting the next largest category of truck trips. The remainder were spread across the spectrum of commodities, again with the exception of stone, minerals, and ores.

The origins and destinations of flows across the Queenston-Lewiston Bridge are shown in Figure 32. Over half of the origins by tonnage were in New York, as were two-thirds of the truck trip origins. Pennsylvania and New Jersey accounted for approximately 13 percent of the flows (in both tonnage and truck terms). Trips from the latter were concentrated in counties with marine ports and terminals. About four percent of the trips originated in Michigan, traveling through the U.S. to enter Canada at Queenston, Ontario. The remaining origins were in the mid-Atlantic states and New England, with the exception of Ohio (flows amounting to three percent). Ninety percent of the flows were destined for Ontario, with the majority for the Toronto region. Flows to Michigan across the Ontario land bridge accounted for another four percent of the flows, with the remainder destined for Québec.

The mix of commodities entering the U.S. was similar to those entering Canada, with a few notable exceptions. Metal products and machinery was the largest commodity by weight, accounting for 21 percent of the flows. Wood, textile, and leather products was the next largest, constituting 14 percent of the flows. Unlike the crossings to the east of the Niagara region, however, the flows in this commodity group were not exclusively wood products. A significant number were textiles, which were likely both apparel and related products as well as industrial fabrics used in the manufacturing of semi-durable and durable consumer goods. Agricultural products and fish and electronics, vehicles, and precision goods each

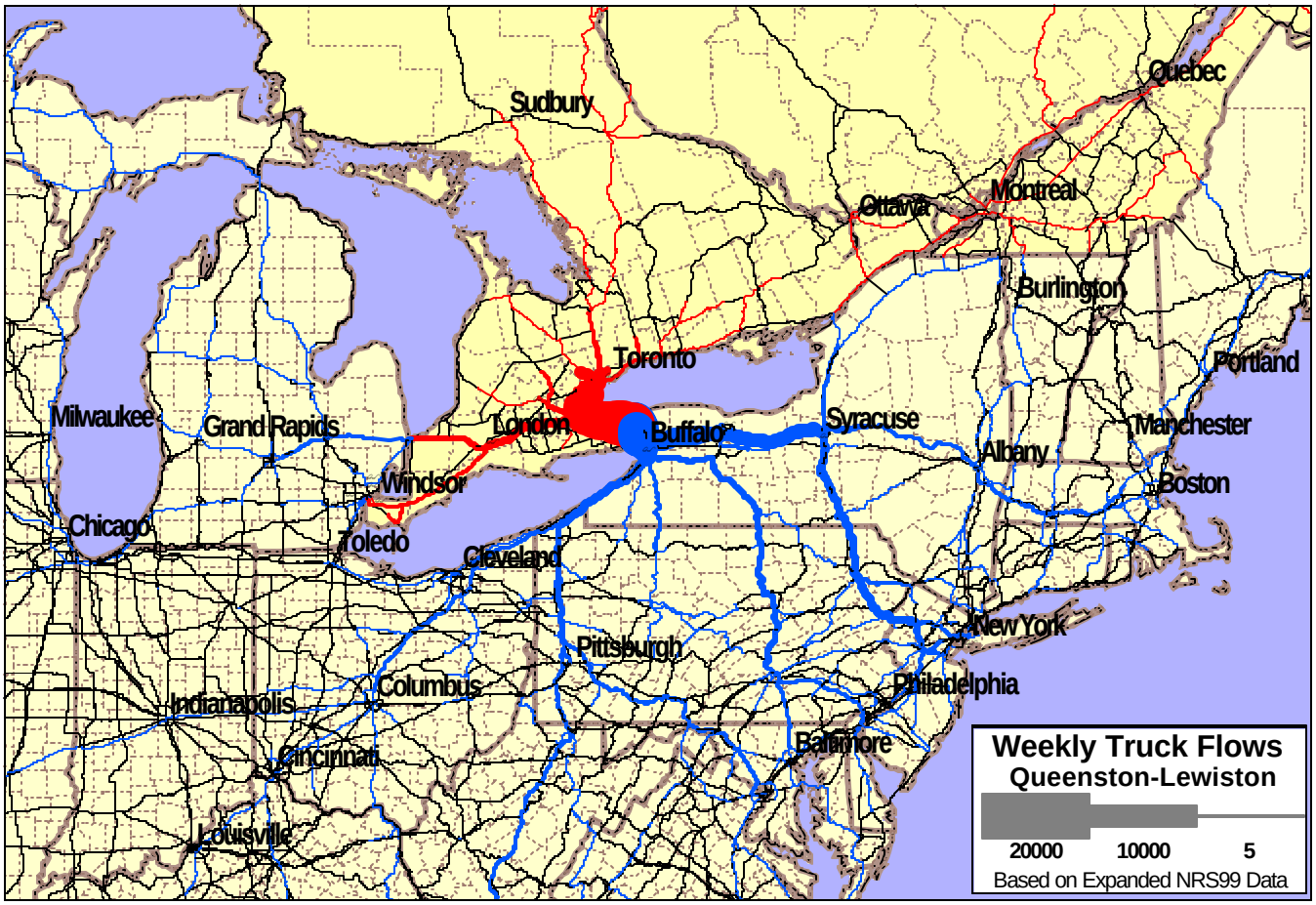

Figure 32: Weekly 1999 truck flows crossing the Queenston-Lewiston Bridge

Table 47: Weekly 1999 Queenston-Lewiston Bridge crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	3,832	36.0	--	Empty	0	0	0.0	1,469	17.2
8,317	9,168	9.7	617	5.8	01-05	Agricultural products and fish	10,415	11,480	11.7	648	7.6
12,371	13,637	14.5	690	6.5	06-09	Grains, alcoholic beverages and tobacco	8,218	9,059	9.2	484	5.7
1,369	1,509	1.6	83	0.8	10-14	Stone, minerals and ores	2,996	3,302	3.4	144	1.7
7,911	8,720	9.3	409	3.8	15-20	Coal and petroleum products	4,797	5,288	5.4	245	2.9
7,379	8,134	8.6	590	5.5	21-24	Pharmaceutical and chemical products	8,244	9,087	9.3	704	8.3
11,547	12,728	13.5	869	8.2	25-30	Wood, textile, and leather products	12,067	13,301	13.6	924	10.8
12,503	13,782	14.6	1,034	9.7	31-34	Metal products and machinery	18,674	20,584	21.0	1,427	16.8
7,840	8,642	9.2	1,075	10.1	35-38	Electronics, vehicles, and precision goods	9,517	10,491	10.7	964	11.3
5,490	6,052	6.4	551	5.2	39-43	Furniture and miscellaneous products	6,172	6,803	6.9	508	6.0
10,738	11,836	12.6	905	8.5	--	Unclassified or unknown	7,784	8,580	8.8	1,001	11.8
85,465	94,208	100	10,655	100	Total[a]		88,884	97,976	100	8,518	100

a. Percentages may not total exactly 100 percent due to rounding.

accounted for another 11 percent of the flows by weight. Almost 60 percent of the tons entering Canada belonged to these four commodity groups. Almost half of the truck trips carried the same commodities, with another 17 percent of the trucks being empty.

Ontario was the origin of 99 percent of the Canadian export tons and truck trips crossing the Queenston-Lewiston Bridge into the U.S. The remainder were bound from Québec. New York destinations accounted for 60 percent of the export tonnage and truck trips, with another 10 to 14 percent (trucks and tons, respectively) bound for Pennsylvania. About 10 percent of the flows were destined for New Jersey, with the remaining 18 percent headed for Ohio and the Atlantic seaboard states.

The Peace Bridge

The Peace Bridge was the third busiest truck crossing on the Canada-U.S. border in 1999, carrying almost 1.5 million trucks. It fell only slightly behind the second busiest truck crossing, the Blue Water Bridge. The mix of commodities was somewhat narrower than at Queenston-Lewiston, as shown in Table 48. Only three commodity groups represented almost two-thirds of the tonnage and about one-half of the truck trips entering Canada. Metal products and machinery accounted for 31 percent of the flows by weight, and almost 20 percent of the truck trips. Wood, textile, and leather products accounted for another 20 percent of the tonnage and 13 percent of the truck trips. Electronics, vehicles, and precision goods were the third largest commodity, representing 12 and 14 percent of the tons and truck trips, respectively. Another 29 percent of the truck trips were comprised of empty trucks entering Canada.

The origin-destination patterns of trips across the Peace Bridge are depicted in Figure 33. Two-thirds of the truck trips entering Canada originated in New York, Pennsylvania, and Ohio. New York accounted for a quarter of the total tonnage and a third of the truck trips. About 20 percent of the total flows originated in Pennsylvania, with another 15 to 17 percent (trucks and tons, respectively) from Ohio. Most of the remainder came from mid-Atlantic states and Massachusetts. Almost three percent of the tons originated in Illinois, although less than one percent of the truck trips did so.

Roughly half of the commodities entering the U.S. across the Peace Bridge belonged to the same three groups that dominated flows into Canada. Metal products and machinery held the largest share, one-quarter of the tons and almost 20 percent of the trucks entering the U.S. Wood, textile, and leather products accounted for another 17 and 13 percent of the tonnage and truck trips, respectively. An additional 18 percent of the trucks were empty. At the Queenston-Lewiston Bridge a significant proportion of these flows was in textiles and apparel rather than wood products. A detailed review of the trade statistics reveals that most of these were industrial textiles rather than consumer apparel. Electronics, vehicles, and precision goods represented another 13 percent of the flows into the U.S.

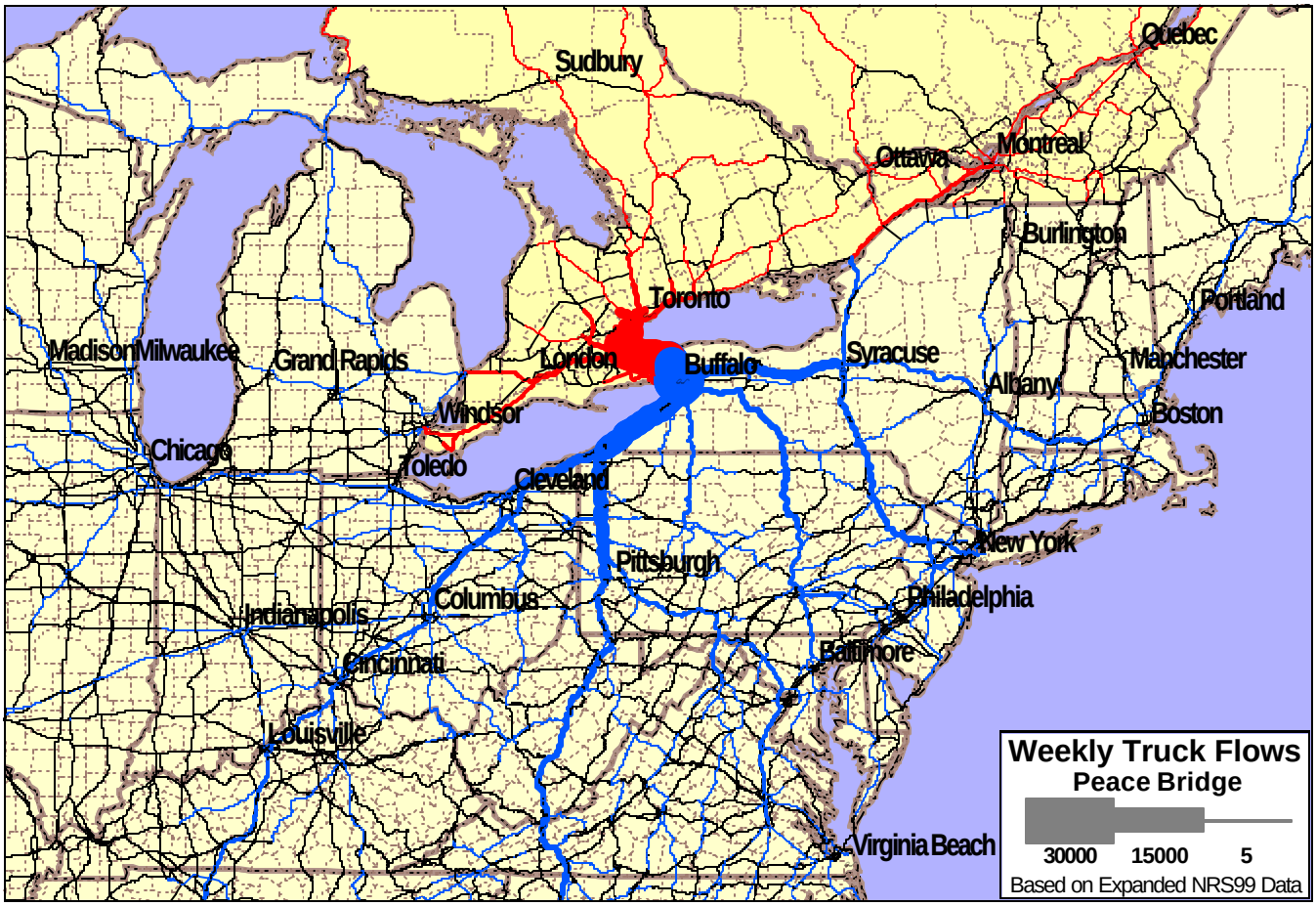

Figure 33: Weekly 1999 truck flows crossing the Peace Bridge

Table 48: Weekly 1999 Peace Bridge crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	4,243	29.2	--	Empty	0	0	0.0	2,778	17.9
3,390	3,737	2.4	284	2.0	01-05	Agricultural products and fish	11,381	12,545	6.1	753	4.9
8,255	9,099	5.8	522	3.6	06-09	Grains, alcoholic beverages and tobacco	24,297	26,783	13.0	1,439	9.3
3,231	3,562	2.3	183	1.3	10-14	Stone, minerals and ores	7,628	8,408	4.1	346	2.2
12,934	14,257	9.1	647	4.4	15-20	Coal and petroleum products	9,723	10,718	5.2	528	3.4
10,828	11,936	7.6	980	6.7	21-24	Pharmaceutical and chemical products	14,649	16,148	7.8	1,165	7.5
28,330	31,228	19.9	1,895	13.0	25-30	Wood, textile, and leather products	32,283	35,586	17.2	1,941	12.5
43,715	48,187	30.7	2,796	19.2	31-34	Metal products and machinery	46,405	51,152	24.8	3,002	19.4
17,244	19,008	12.1	1,960	13.5	35-38	Electronics, vehicles, and precision goods	24,490	26,995	13.1	2,147	13.9
7,196	7,932	5.1	583	4.0	39-43	Furniture and miscellaneous products	7,661	8,445	4.1	864	5.6
7,212	7,950	5.1	461	3.2	--	Unclassified or unknown	8,635	9,518	4.6	532	3.4
142,335	156,896	100	14,554	100	Total[a]		187,152	206,298	100	15,495	100

a. Percentages may not total exactly 100 percent due to rounding.

Almost 98 percent of the flows entering the U.S. originated in Ontario. While most came from the Toronto region, a significant number came from London, St. Catharines, Hamilton, and Windsor. The remaining two percent came from origins in Québec. New York was the principal destination, accounting for over a third of the movements. Pennsylvania represented 18 percent and Ohio roughly 14 percent of the destinations. The remainder were along the Atlantic seaboard, with about two percent bound for Tennessee and Kentucky. Many of the east coast destinations were in cities with large marine ports and terminals, such as Elizabeth, NJ, Norfolk, VA, and Charleston, SC.

Detroit-St. Clair Region

The Detroit-St. Clair region consists of the three truck crossings: the Ambassador Bridge and Detroit-Windsor Tunnel, which cross the Detroit River, and the Blue Water Bridge, which crosses the St. Clair River. A fourth truck crossing in this region is the Detroit-Windsor Truck Ferry, which handles oversized and hazardous material movements. It is not summarized in this chapter, due to its specialized function, low volume, and small number of samples in the survey.

The Detroit-St. Clair crossings have long been associated with close ties to the auto industries in Michigan and Ontario. The strength of this relationship has been clearly evident in the trade statistics as far back as 1968. Though there are no official statistics to establish the relationship prior to that, the ties are thought to extend back to the middle of the 1950s. The relationship remains strong today, as seen in both recent trade statistics and the NRS data.

Despite the continued influence of the auto industry and its suppliers, the mix of commodities using these crossings has diversified over time. Part of this has to do with supply chain logistics, where various auto components are manufactured in one place and vehicles assembled in another. The “Big Three” automakers, long the dominant economic force in the region, have largely outsourced most of their components, with attendant increases in the need for efficient and reliable truck transportation. A larger number of less-than-truckload (LTL) deliveries are now taking place with greater frequency, placing even further strain on the system.

The Ambassador Bridge

The Ambassador Bridge carried the largest number of trucks between Canada and U.S. in 1999, recording over 3.4 million movements. It carried over twice the volume of the second busiest crossing, the Blue Water Bridge. The auto industry clearly dominated the flows on the Ambassador Bridge. A summary of the commodities carried is found in Table 49. Metal products and machinery accounted for 40 percent of the tonnage moving across it, while electronics, vehicles, and precision goods made up another 24 percent. Together they made up two-thirds of the tonnage and almost half of the trucks crossing the bridge. It is difficult to assess the makeup of the metal products and machinery from the NRS data, but they mostly came from the same origins and destinations as electronics, vehicles, and

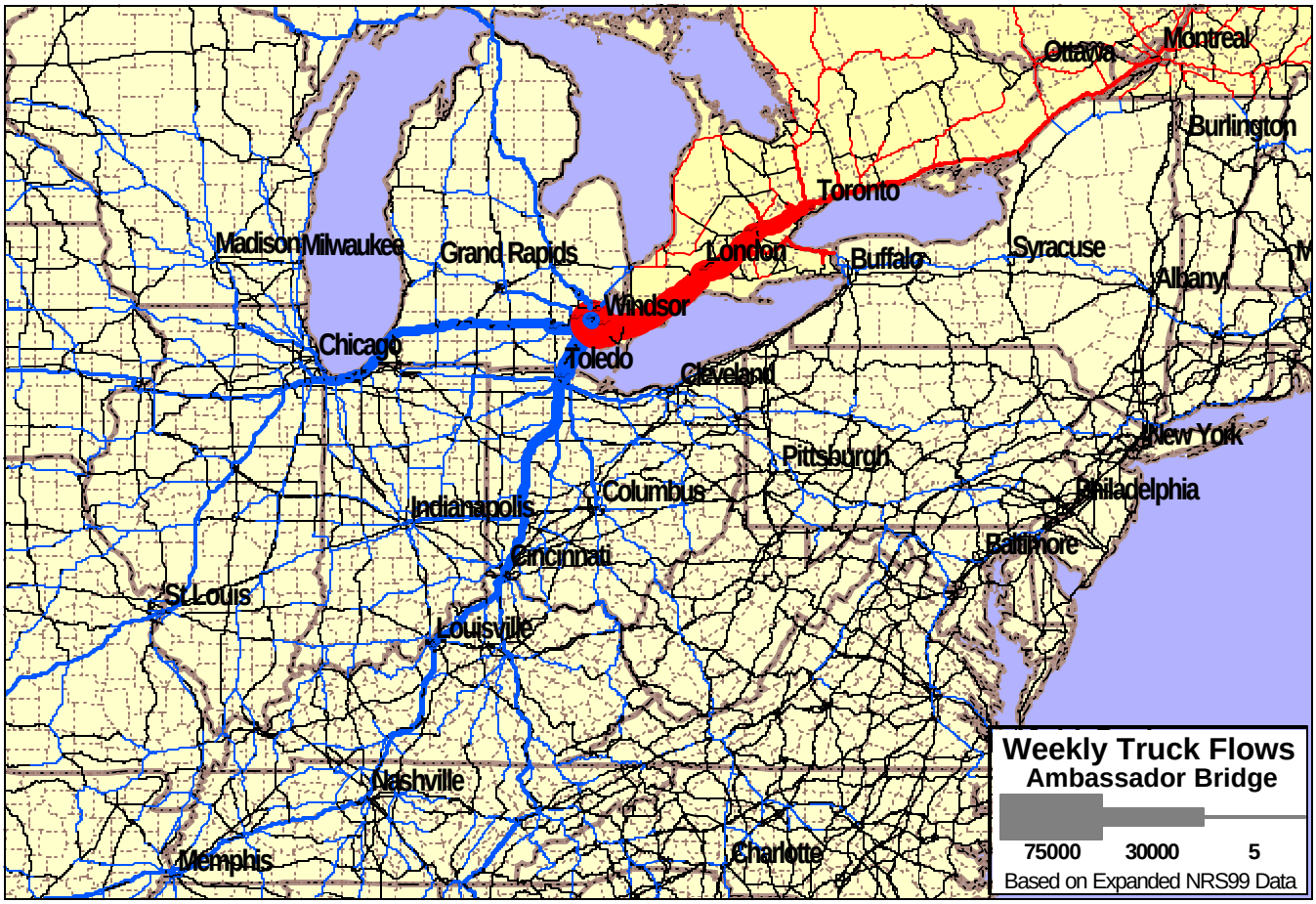

Figure 34: Weekly 1999 truck flows crossing the Ambassador Bridge

Table 49: Weekly 1999 Ambassador Bridge crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	10,028	29.5	--	Empty	0	0	0.0	12,743	33.0
25,498	28,106	7.7	1,435	4.2	01-05	Agricultural products and fish	21,283	23,460	6.1	1,108	2.9
12,744	14,048	3.8	797	2.3	06-09	Grains, alcoholic beverages and tobacco	17,694	19,504	5.1	915	2.4
5,230	5,765	1.6	267	0.8	10-14	Stone, minerals and ores	2,549	2,809	0.7	136	0.4
8,615	9,496	2.6	594	1.7	15-20	Coal and petroleum products	6,023	6,639	1.7	313	0.8
19,219	21,185	5.8	1,671	4.9	21-24	Pharmaceutical and chemical products	16,721	18,432	4.8	1,528	4.0
19,573	21,575	5.9	1,659	4.9	25-30	Wood, textile, and leather products	56,411	62,182	16.2	3,224	8.4
132,525	146,082	40.0	6,647	19.5	31-34	Metal products and machinery	104,076	113,723	29.9	7,498	19.4
77,802	85,761	23.5	8,292	24.4	35-38	Electronics, vehicles, and precision goods	95,940	105,755	27.6	8,948	23.2
8,339	9,192	2.5	808	2.4	39-43	Furniture and miscellaneous products	9,829	10,835	2.8	957	2.5
22,065	24,365	6.7	1,842	5.4	--	Unclassified or unknown	17,482	19,270	5.0	1,208	3.1
331,610	365,532	100	34,040	100	Total[a]		348,008	383,609	100	38,578	100

a. Percentages may not total exactly 100 percent due to rounding.

precision goods. Given other sources of information about the auto industry, there can be little doubt that the majority of these flows were attributable to it. Empty trucks comprised 30 percent of the total truck trips into Canada.

Four states — Michigan, Ohio, Illinois, and Indiana — accounted for two-thirds of the tonnage crossing the Ambassador Bridge into Canada, and almost three-quarters of the truck trips. Michigan only supplied 21 percent of the total tons moving across the bridge, although it made up 42 percent of the truck trip origins. This again reflects of the extent of the just-in-time delivery system, where large numbers of trips were made with relatively small payloads. The other three states are adjacent to Michigan, and home to a large number of auto manufacturing and component plants. The remaining origins were spread across the country. In contrast to all other crossings except Douglas-Blaine in Washington, a significant number of tons and trucks (about eight percent) originated in Texas and California. An equal number came from Tennessee and Kentucky.

Ontario was the destination of approximately 90 percent of the flows entering Canada. Another eight percent of the tons and five percent of the trucks were destined for Québec. Three percent of the tons and one percent of the trucks moved to New York across the Ontario land bridge. The origin-destination patterns are illustrated in Figure 34.

The same commodities that moved into Canada were carried across the bridge into the U.S. during the same time period, as shown in Table 49. Metal products and machinery were again the primary commodity, accounting for 30 percent of the tons and 20 percent of the truck trips entering the U.S. They were closely followed by electronics, vehicles, and precision goods, which amounted to 28 percent of the tons and 23 percent of the trucks. Another 8 to 16 percent (trucks and tons, respectively) were wood, textile, and leather products. Empty trucks accounted for another third of the total truck trips. These four groups (including empty) represented three-quarters of the flows entering the U.S.

Almost all of the flows entering the U.S. came from Ontario. It contributed 91 percent of the tons and 95 percent of the truck trips. The remainder originated in Québec. Michigan's share of trip destinations was larger than it was for trips entering the U.S. across the Ambassador Bridge. Forty percent of the tons and 50 percent of the truck trips were destined for Michigan, principally in Southeast Michigan. Ohio and Illinois both received about 13 percent of the tons entering the U.S., and they received almost the same share of the truck trips. No other state received a large portion of the flows entering the U.S., with several midwestern states, Texas, and California receiving some of the flows crossing the Ambassador Bridge.

Detroit-Windsor Tunnel

The Detroit-Windsor Tunnel carried about 205,000 trucks in 1999. Located adjacent to the Ambassador Bridge, it serves local traffic between Detroit and Windsor. Origins in Michigan accounted for 98 percent of the flows into Canada

Figure 35: Weekly 1999 truck flows through the Detroit-Windsor Tunnel

Table 50: Weekly 1999 Detroit-Windsor Tunnel crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	674	34.7	--	Empty	0	0	0.0	908	52.6
3,744	4,127	17.3	174	8.9	01-05	Agricultural products and fish	3,892	4,290	25.0	122	7.1
0	0	0.0	0	0.0	06-09	Grains, alcoholic beverages and tobacco	13	14	0.1	8	0.5
642	708	3.0	19	1.0	10-14	Stone, minerals and ores	261	288	1.7	12	0.7
290	320	1.3	29	1.5	15-20	Coal and petroleum products	0	0	0.0	0	0.0
0	0	0.0	0	0.0	21-24	Pharmaceutical and chemical products	19	21	0.1	10	0.6
398	439	1.8	69	3.5	25-30	Wood, textile, and leather products	317	349	2.0	9	0.5
14,355	15,824	66.2	657	33.8	31-34	Metal products and machinery	6,352	7,002	40.8	363	21.0
1,192	1,314	5.5	187	9.6	35-38	Electronics, vehicles, and precision goods	733	808	4.7	82	4.7
910	1,003	4.2	50	2.6	39-43	Furniture and miscellaneous products	3,572	3,937	23.0	175	10.1
152	168	0.7	86	4.4	--	Unclassified or unknown	392	432	2.5	38	2.2
21,683	23,903	100	1,945	100	Total[a]		15,551	17,141	100	1,727	100

a. Percentages may not total exactly 100 percent due to rounding.

through the tunnel, with the balance coming from Ohio. The vast majority of the origins were in the Detroit and Toledo areas, respectively. Almost all of the destinations (98 percent) were in Ontario, and the majority of them were in the Windsor area. A small number of destinations (less than one percent) were in New York. Metal products and machinery accounted for two-thirds of the tons entering Canada through the tunnel, and a third of the truck trips. Empty trucks accounted for another third of the truck trips entering Canada. Agricultural products and fish accounted for the majority of the remaining goods, as shown in Table 50.

Ontario accounted for all of the flows entering the U.S. through the tunnel. Most of the origins were in the Windsor region. Michigan destinations accounted for 85 percent of the tons moving through the tunnel, and 93 percent of the truck trips. A surprisingly large share of the tons (15 percent) were destined to Ohio. They were not as concentrated in the Toledo area as expected. Metal products and machinery again dominated the commodities shipped into the U.S. through the tunnel, amounting to 41 percent of the flows and 21 percent of the truck trips. Over half of the trucks entering the U.S. were empty. Furniture and miscellaneous products and agricultural products and fish each accounted for another quarter of the total tons entering the U.S. through the tunnel.

The Blue Water Bridge

The Blue Water Bridge was the second busiest truck crossing between Canada and the U.S. in 1999, carrying almost 1.5 million trucks. The bridge was an interesting contrast to the Ambassador Bridge, its competitor to the south. The same three commodities as for the Ambassador Bridge dominated movements into Canada, but in a somewhat different order. Electronics, vehicles, and precision goods comprised 24 percent of both tons and trucks entering Canada across the bridge. Metal products and machinery were almost as dominant, accounting for 18 and 20 percent of the trucks and tons, respectively. Wood, textile, and leather products accounted for only half again as many flows (10 and 8 percent, respectively, for tons and trucks). Slightly more than 19 percent of the trucks entering Canada were empty.

Michigan was the largest origin for trucks entering Canada, accounting for 42 percent of the tonnage and 53 percent of the trucks. Another 15 percent of the flows originated in Illinois. Most of the remaining third of the trips came from the midwest states and Texas. Almost 90 percent of the flows entering Canada were destined for Ontario. Most of the remainder were bound for Québec, although a small number (almost two percent) were bound for New York through Ontario.

The commodities entering the U.S. across the bridge were more diverse than at most crossings. Three-quarters of the tons and two-thirds of the trucks entering the U.S. belonged to four commodity groups, as shown in Table 51:

- SCTG 31-34: Metal products and machinery
- SCTG 25-30: Wood, textile, and leather products
- SCTG 35-38: Electronics, vehicles, and precision goods
- SCTG 21-24: Pharmaceutical and chemical products

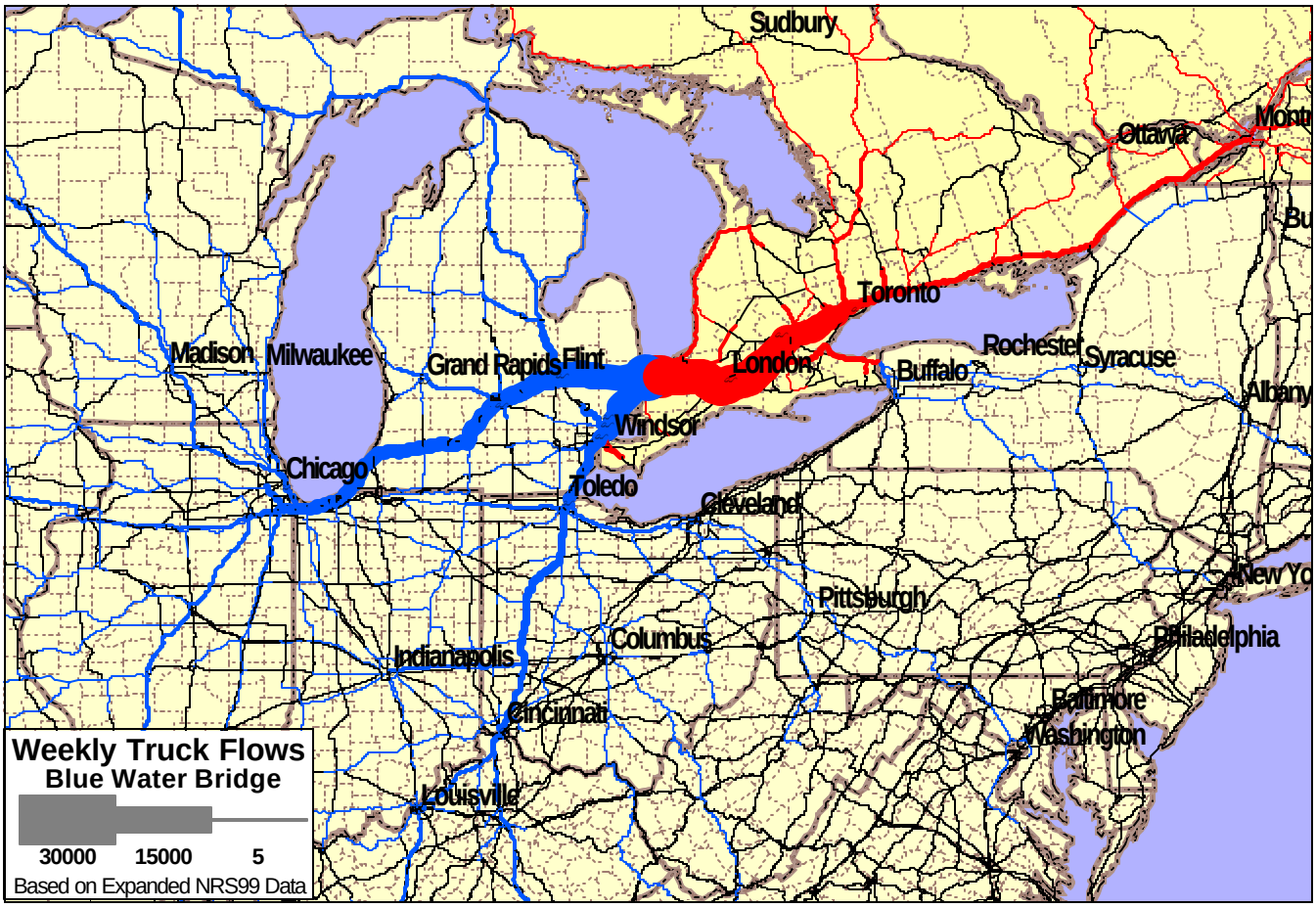

Figure 36: Weekly 1999 truck flows crossing the Blue Water Bridge

Table 51: Weekly 1999 Blue Water Bridge crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	2,513	19.2	--	Empty	0	0	0.0	2,509	16.9
12,325	13,586	9.2	540	4.1	01-05	Agricultural products and fish	4,772	5,260	2.7	321	2.2
5,684	6,265	4.2	341	2.6	06-09	Grains, alcoholic beverages and tobacco	9,047	9,973	5.2	542	3.7
3,821	4,212	2.8	205	1.6	10-14	Stone, minerals and ores	4,661	5,138	2.7	216	1.5
8,891	9,801	6.6	496	3.8	15-20	Coal and petroleum products	14,780	16,292	8.5	635	4.3
11,967	13,191	8.9	946	7.2	21-24	Pharmaceutical and chemical products	19,328	21,305	11.1	1,401	9.5
12,867	14,183	9.6	991	7.6	25-30	Wood, textile, and leather products	34,201	37,700	19.7	1,786	12.1
27,060	29,828	20.1	2,304	17.6	31-34	Metal products and machinery	42,332	46,663	24.4	3,084	20.8
31,848	35,106	23.7	3,191	24.4	35-38	Electronics, vehicles, and precision goods	27,382	30,183	15.8	3,120	21.1
9,811	10,815	7.3	748	5.7	39-43	Furniture and miscellaneous products	8,965	9,882	5.2	610	4.1
10,151	11,189	7.6	804	6.1	--	Unclassified or unknown	8,313	9,163	4.8	588	4.0
134,425	148,176	100	13,079	100	Total[a]		173,781	191,559	100	14,812	100

a. Percentages may not total exactly 100 percent due to rounding.

Another 17 percent of the trucks entering the U.S. were empty.

Ninety percent of the trucks entering the U.S. originated in Ontario, with the remainder from Québec. About half of the trips were destined for Michigan, most of which were in the Detroit area, as well as Flint, Lansing, and the Saginaw-Bay City area. Another 12 percent were bound to Illinois. The remaining third were destined for Indiana, Ohio, Wisconsin, and other midwest states. Texas and California were the destination of approximately seven percent of the tons and five percent of the truck trips entering the U.S. across the Blue Water Bridge. The flows are mapped in Figure 36.

Superior Region

The Superior Region includes crossings at both ends of Lake Superior, as well as those further west in Minnesota. Care should be exercised in interpreting and using the statistics presented in this section. Several of the adjacent provinces (Manitoba, Saskatchewan, and Alberta) did not share survey information for use in this study, and thus the number of observations with trips going to and from them is very small. While significant flows from Manitoba were present only in the westernmost crossings in this region there is likely some amount of non-inclusion bias present in these findings.

Sault Ste. Marie

The International Bridge at Sault Ste. Marie carried almost 150,000 trucks in 1999. Wood, textile, and leather products accounted for 44 percent of the tons entering Canada, and 27 percent of the truck trips. Agricultural products and fish accounted for another 15 percent of the tonnage, but only seven percent of the truck trips. Metal products and machinery were also a significant commodity, amounting to 16 percent of the tons and 12 percent of the trucks crossing into Canada. About 37 percent of the northbound trucks were empty when they crossed the bridge. Almost 70 percent of the flows originated in Michigan, with another 18 percent (almost all wood products) from Wisconsin. Indiana contributed less than one percent of the tonnage entering Canada, but accounted for 11 percent of the truck trips. Minnesota (also almost all wood products) accounted for another seven percent of the northbound flows.

Wood, textile, and leather products dominated the flows into the U.S. from Canada, as shown in Table 52. They accounted for two-thirds of the tonnage and over one-half of the truck trips. Metal products and machinery accounted for another 20 percent of the flows, in both tonnage and truck terms. Only one percent of the trucks entering the U.S. at Sault Ste. Marie were empty, the lowest such percentage anywhere on the Canada-U.S. border. Three-quarters of the origins were in Ontario, with the remainder from Québec. The flows are illustrated in Figure 37. Michigan was the destination of about 40 percent of the tonnage, and 34 percent of the truck trips. Wisconsin and Ohio each received about 18 percent of the tonnage. About 20 percent of the truck trips were bound to Wisconsin, and 12 percent to

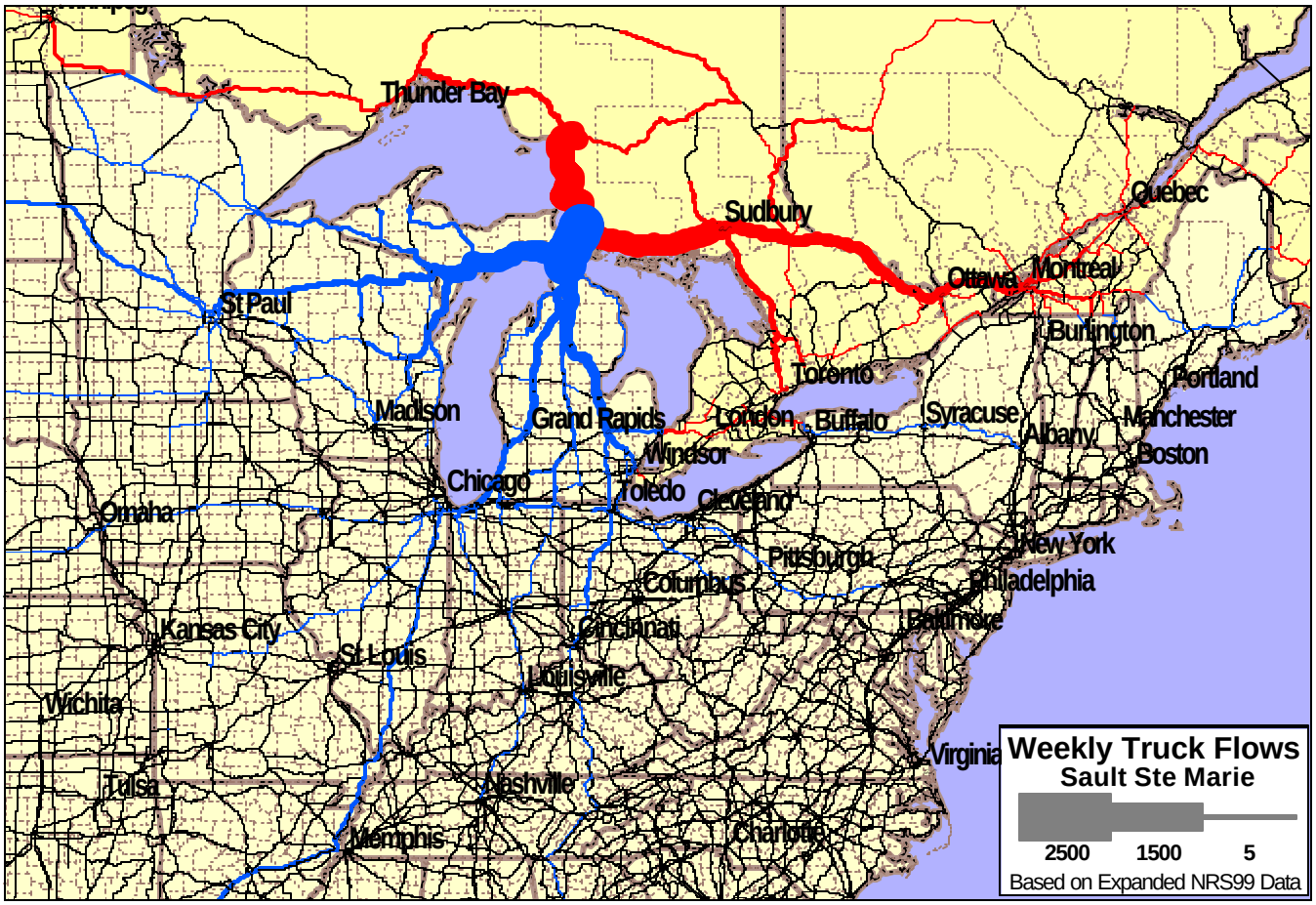

Figure 37: Weekly 1999 truck flows through Sault Ste. Marie

Table 52: Weekly 1999 Sault Ste. Marie crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	467	36.7	--	Empty	0	0	0.0	12	1.1
2,960	3,263	15.2	88	6.9	01-05	Agricultural products and fish	377	416	1.6	20	1.9
0	0	0.0	0	0.0	06-09	Grains, alcoholic beverages and tobacco	551	607	2.4	39	3.7
607	669	3.1	16	1.3	10-14	Stone, minerals and ores	609	671	2.7	36	3.4
926	1,021	4.7	33	2.6	15-20	Coal and petroleum products	404	445	1.8	19	1.8
1,006	1,109	5.2	52	4.1	21-24	Pharmaceutical and chemical products	597	658	2.6	41	3.9
8,516	9,387	43.7	342	26.9	25-30	Wood, textile, and leather products	14,317	15,782	62.3	577	54.6
3,131	3,451	16.0	156	12.3	31-34	Metal products and machinery	4,987	5,497	21.7	210	19.9
367	405	1.9	31	2.4	35-38	Electronics, vehicles, and precision goods	339	374	1.5	35	3.3
560	617	2.9	51	4.0	39-43	Furniture and miscellaneous products	309	341	1.3	32	3.0
1,436	1,583	7.4	35	2.8	--	Unclassified or unknown	500	551	2.2	36	3.4
19,509	21,505	100	1,271	100	Total[a]		22,990	25,342	100	1,057	100

a. Percentages may not total exactly 100 percent due to rounding.

Ohio. Minnesota was the only other state to receive significant flows, with about six percent of the tonnage and 11 percent of the truck trips.

Thunder Bay, ON-Grand Portage, MN

The data for Thunder Bay-Grand Portage illuminate another anomaly in the trade statistics. The tonnage and truck volumes were comparable to crossings on either side of it (Sault Ste. Marie to the east, and Fort Frances-International Falls to the west). However, the value of trade attributed to Thunder Bay-Grand Portage was only a fraction of either neighbor. Based on the data presented in Tables 36 and 37, it appears that much of the value of goods crossing there was attributed to Fort Frances-International Falls.

The majority of goods flowing into Canada at Thunder Bay-Grand Portage were wood, textile, and leather products. These accounted for 61 percent of the northbound tonnage and 42 percent of the truck trips. However, almost 30 percent of the northbound trucks were empty; those carrying wood, textile, and leather products constituted an equal majority of the laden trucks. Metal products and machinery accounted for an additional 16 percent of the northbound tons and 10 percent of the trucks. Almost 60 percent of the flows originated in Minnesota, as suggested in Figure 38. Another third originated in Wisconsin, with the remaining seven percent coming principally from Illinois and Montana. All of the flows were destined to Ontario, primarily in the western part of the province.

Almost all of the commodities entering the U.S. at Thunder Bay-Grand Portage were wood, textile, and leather products, as shown in Table 53. They accounted for 93 percent of the tonnage, and 38 percent of the truck trips. However, 57 percent of the trucks entering the U.S. were empty; the wood, textile, and leather products accounted for almost all of the non-empty truck trips. Virtually all of the trips entering the U.S. originated in Ontario, with a small number (about one percent of the flows each) traveling from Québec and Manitoba. Half of the tonnage, and 70 percent of the truck trips, were bound for Minnesota. Wisconsin destinations accounted for another 30 percent of the tonnage, and 21 percent of the truck trips. Flows to North Carolina amounted to about 10 percent of the tons imported into the U.S., but only four percent of the truck trips.

Fort Frances, ON-International Falls, MN

During the survey period the flows across the border at Fort Frances-International Falls were almost equal to those at Sault Ste. Marie. On an annual basis the latter carried close to 150,000 trucks, while Fort Frances-International Falls handled almost 88,500 truck trips.

The mix of commodities entering Canada was very similar to that at Thunder Bay-Grand Portage: almost all of the flows were wood, textile, and leather products. The majority of these flows (86 percent of the tonnage) were raw timber and unfinished lumber. The breakdown by commodity groups is shown in Table 54. Wood products accounted for 30 percent of the truck trips entering Canada, but

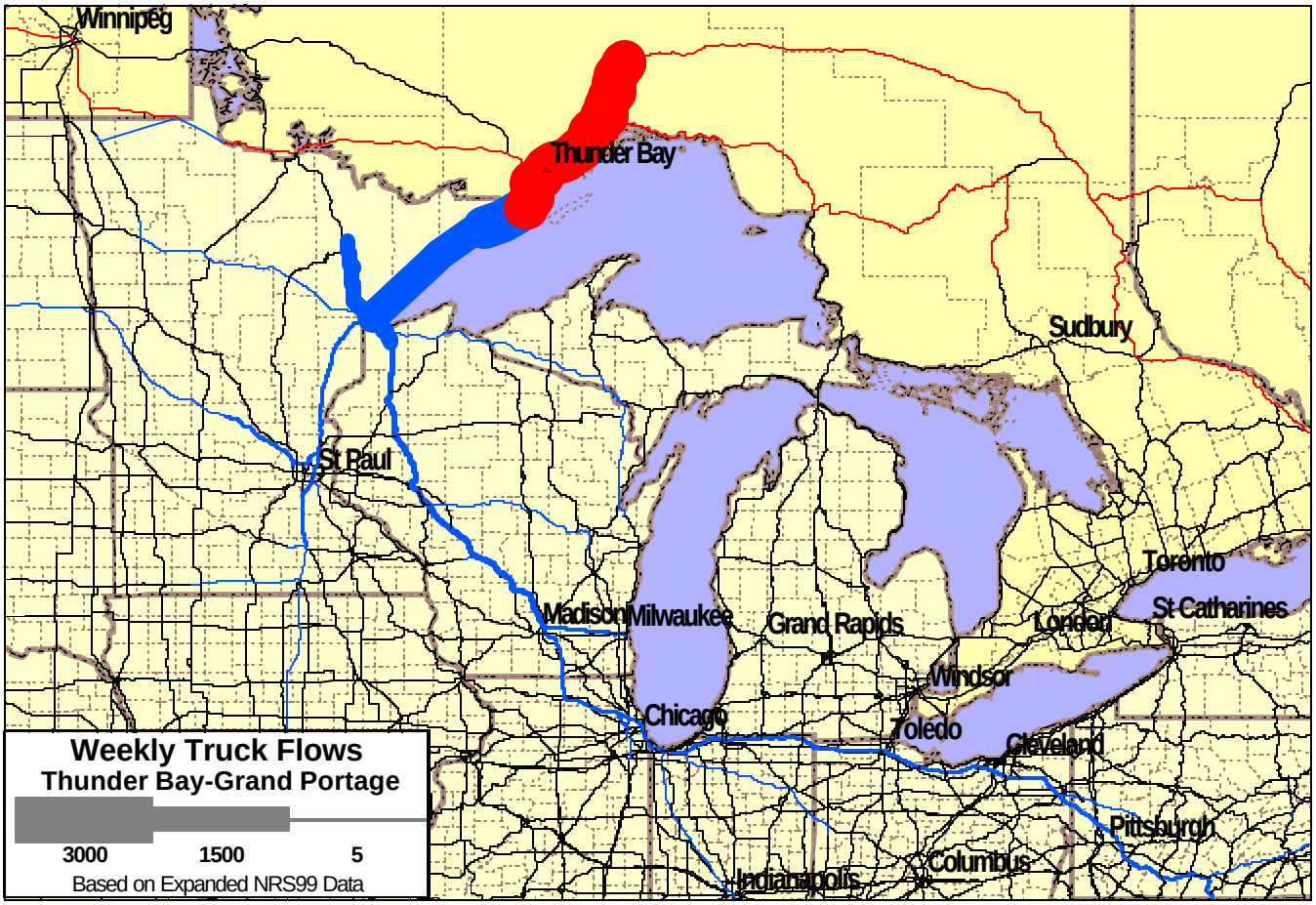

Figure 38: Weekly 1999 truck flows through Thunder Bay-Grand Portage

Table 53: Weekly 1999 Thunder Bay-Grand Portage crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	410	29.4	--	Empty	0	0	0.0	875	56.7
1,261	1,390	5.9	70	5.0	01-05	Agricultural products and fish	0	0	0.0	0	0.0
0	0	0.0	0	0.0	06-09	Grains, alcoholic beverages and tobacco	3	3	0.0	1	0.1
266	293	1.2	11	0.8	10-14	Stone, minerals and ores	0	0	0.0	0	0.0
2,271	2,503	10.7	102	7.3	15-20	Coal and petroleum products	88	97	0.7	4	0.3
0	0	0.0	0	0.0	21-24	Pharmaceutical and chemical products	0	0	0.0	0	0.0
12,883	14,201	60.4	581	41.6	25-30	Wood, textile, and leather products	11,770	12,974	93.2	587	38.0
3,303	3,641	15.5	143	10.3	31-34	Metal products and machinery	559	616	4.4	69	4.5
740	816	3.5	61	4.4	35-38	Electronics, vehicles, and precision goods	0	0	0.0	0	0.0
292	322	1.4	11	0.8	39-43	Furniture and miscellaneous products	85	94	0.7	7	0.5
299	330	1.4	7	0.5	--	Unclassified or unknown	120	132	0.9	0	0.0
21,315	23,496	100	1,396	100	Total[a]		12,625	13,916	100	1,543	100

a. Percentages may not total exactly 100 percent due to rounding.

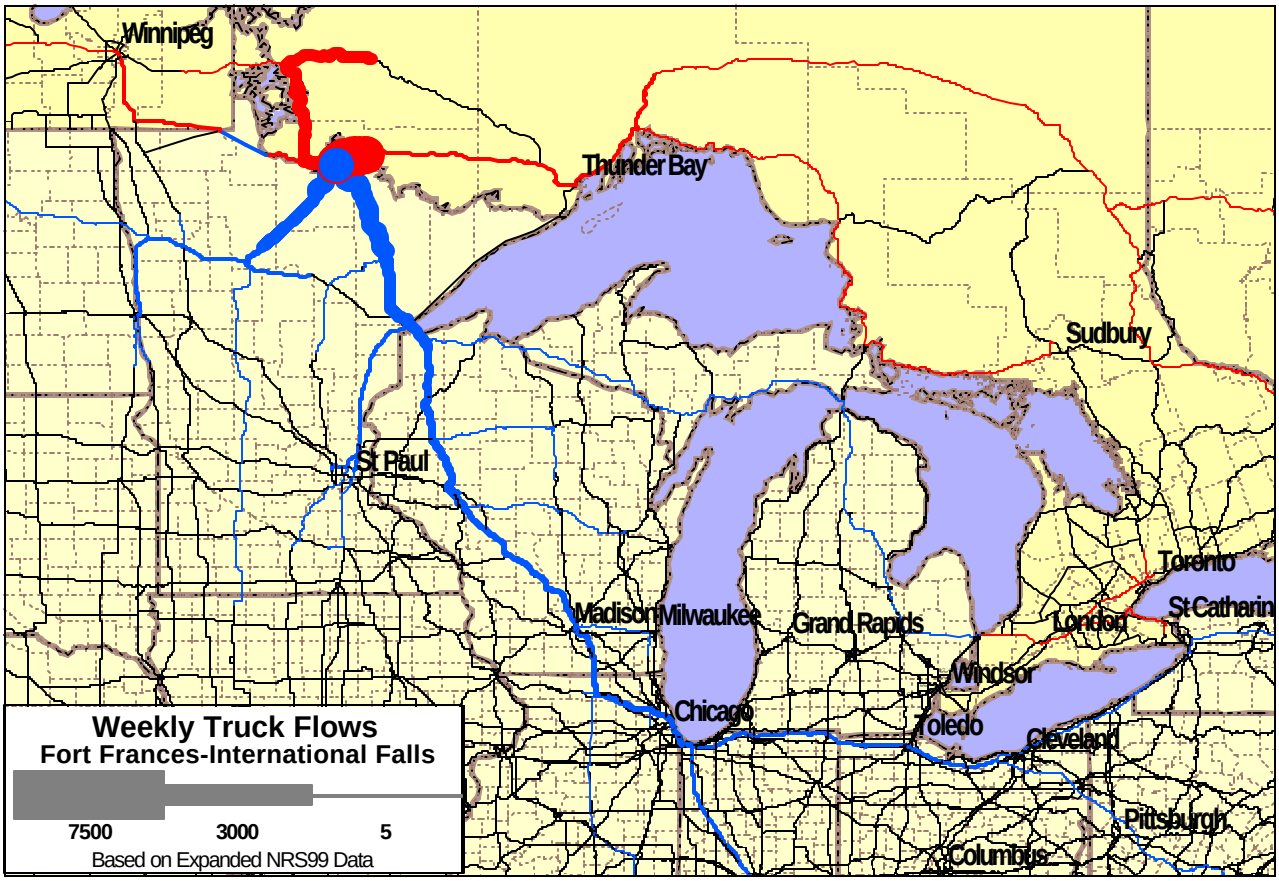

Figure 39: Weekly 1999 truck flows through Fort Frances-International Falls

Table 54: Weekly 1999 Fort Frances-International Falls crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	2,052	63.5	--	Empty[a]	0	0	0.0	2,271	65.8
0	0	0.0	0	0.0	01-05	Agricultural products and fish	653	720	2.9	34	1.0
0	0	0.0	0	0.0	06-09	Grains, alcoholic beverages and tobacco	197	217	0.9	10	0.3
0	0	0.0	0	0.0	10-14	Stone, minerals and ores	0	0	0.0	0	0.0
2,106	2,321	9.4	190	5.9	15-20	Coal and petroleum products	110	121	0.5	16	0.5
0	0	0.0	0	0.0	21-24	Pharmaceutical and chemical products	1,659	1,829	7.4	72	2.1
19,368	21,349	86.0	976	30.2	25-30	Wood, textile, and leather products	18,534	20,430	82.9	1,036	30.0
0	0	0.0	0	0.0	31-34	Metal products and machinery	84	83	0.4	8	0.2
100	110	0.4	12	0.4	35-38	Electronics, vehicles, and precision goods	0	0	0.0	0	0.0
0	0	0.0	0	0.0	39-43	Furniture and miscellaneous products	0	0	0.0	0	0.0
939	1,035	4.2	0	0.0	--	Unclassified or unknown	1,125	1,240	5.0	2	0.1
22,513	24,815	100	3,230	100		Total[b]	22,362	24,557	100	3,449	100

a. The unusually high proportion of empty trucks in both directions is probably due to the survey station location, which handles local as well as border crossing traffic. Some local traffic may have been included in the cross-border survey data.

b. Percentages may not total exactly 100 percent due to rounding.

this percentage increased to 83 percent when excluding empty trucks. The latter accounted for two-thirds of the trucks entering Canada, the second largest such percentage on the Canada-U.S. border. The only other noteworthy commodity was coal and petroleum products, which represented almost 10 percent of the flows by weight, but only six percent of the truck trips entering Canada.

Ninety percent of the flows entering Canada originated in Minnesota, with the remainder evenly split between North Dakota and Wisconsin. All of the flows were bound to Ontario, principally to destinations in the western part of the province. The flows are shown in Figure 39.

The same picture emerged when looking at flows entering the U.S. at Fort Frances-International Falls. Almost all of the flows were wood, textile, and leather products, as shown in Table 54. This commodity group accounted for almost all of the non-empty truck trips as well. Two-thirds of the trucks entering the U.S. at this crossing were empty. About 93 percent of the flows (in both tonnage and truck terms) originated in western Ontario, with the remaining coming from Manitoba. The majority of the flows were destined to Minnesota (about 29 percent of both tons and trucks) and Wisconsin (26 percent of tons, but only nine percent of trucks). A surprisingly large amount of the tonnage (19 percent) was destined for Florida, coupled with six percent of the truck trips.

Emerson, MB-Noyes, MN

The Emerson-Noyes crossing was the busiest in the Superior Region in 1999, handling over 196,000 trucks. During the survey period the volume through this crossing was slightly less than at Fort Frances-International Falls, and higher than the other crossings. In 2000 new truck facilities opened in nearby Pembina, North Dakota. Almost no truck traffic is currently handled at the Emerson-Noyes facility.

During the survey period agricultural products and fish were the primary commodities moved northbound across the border. They accounted for over two-thirds of the tons, and almost half of the truck trips crossing the border. This was the only truck crossing on the northern border with as high a percentage of agricultural products. The only other significant commodity was metal products and machinery, which accounted for six percent of the tonnage and 10 percent of the truck trips. South Dakota was the dominant origin of the northbound truck flows, accounting for almost two-thirds of the tonnage and 40 percent of the truck trips. Minnesota contributed another 13 percent of the tons, and 18 percent of the trucks. The remaining origins were spread among the midwestern states, with some as far away as Florida and Texas (about 1½ percent of the tons and trucks each). Manitoba was the destination of almost all of the flows, with roughly five percent of the remainder bound for Alberta, Saskatchewan, and British Columbia.

The commodity mix for southbound movements was quite varied, as shown in Table 55. Wood, textile, and leather products held the largest share, with only 25 percent of the tonnage and 17 percent of trucks. Indeed, only a few commodity groups were not well represented. Ninety-five percent of the flows entering the

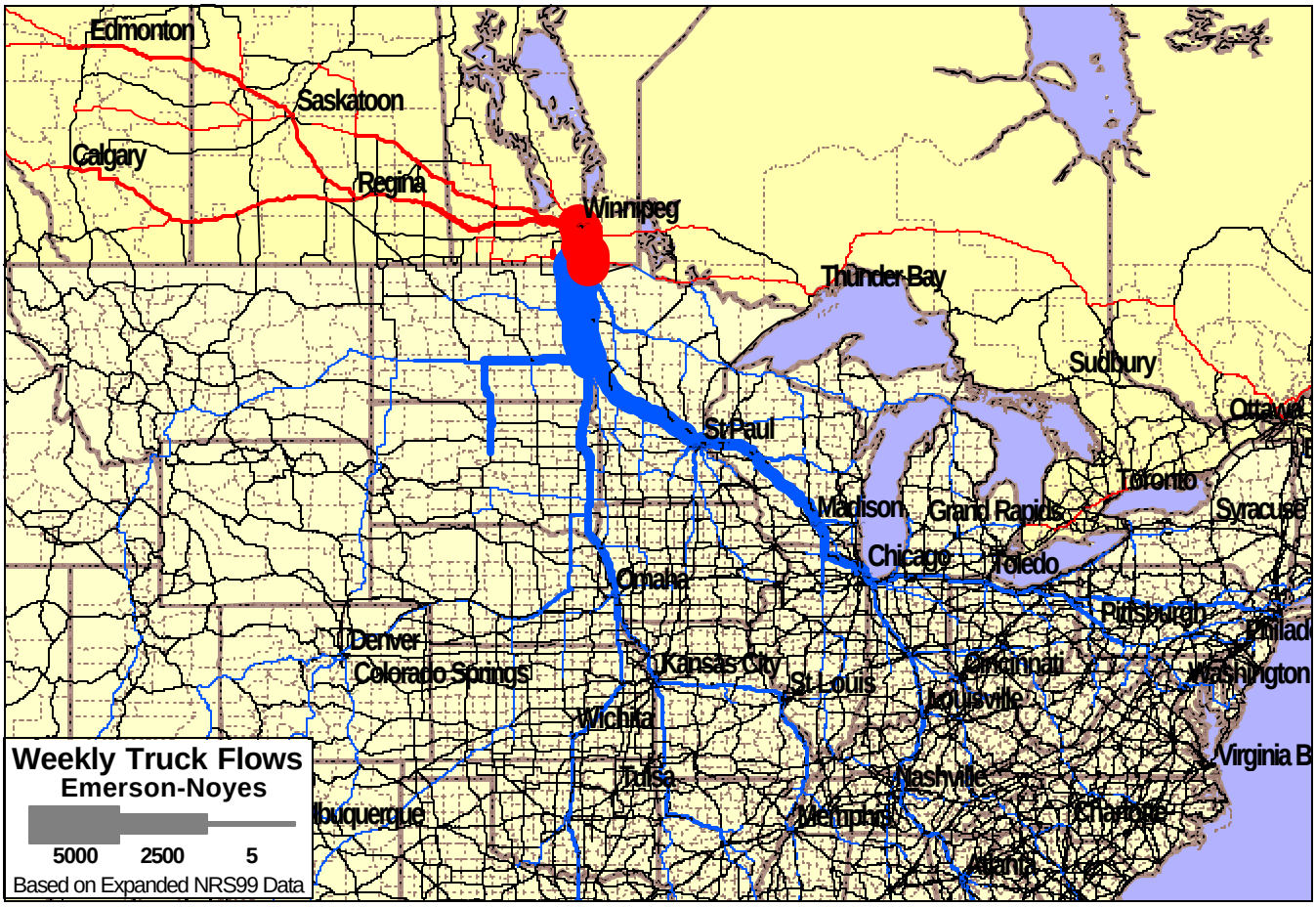

Figure 40: Weekly 1999 truck flows through Emerson-Noyes

Table 55: Weekly 1999 Emerson-Noyes crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	255	9.4	--	Empty	0	0	0.0	645	19.0
33,318	36,726	67.8	1,311	48.1	01-05	Agricultural products and fish	8,475	9,342	17.7	520	15.3
2,975	3,279	6.1	151	5.5	06-09	Grains, alcoholic beverages and tobacco	3,878	4,275	8.1	203	6.0
678	747	1.4	31	1.1	10-14	Stone, minerals and ores	974	1,074	2.0	52	1.5
1,364	1,504	2.8	82	3.0	15-20	Coal and petroleum products	6,820	7,518	14.3	265	7.8
1,610	1,775	3.3	120	4.4	21-24	Pharmaceutical and chemical products	1,989	2,192	4.2	126	3.7
2,810	3,097	5.7	173	6.4	25-30	Wood, textile, and leather products	12,076	13,311	25.3	582	17.1
3,027	3,337	6.2	273	10.0	31-34	Metal products and machinery	5,227	5,762	10.9	338	9.9
1,793	1,976	3.7	188	6.9	35-38	Electronics, vehicles, and precision goods	1,755	1,935	3.7	233	6.8
805	887	1.6	70	2.6	39-43	Furniture and miscellaneous products	687	757	1.4	83	2.4
736	811	1.5	70	2.6	--	Unclassified or unknown	5,896	6,499	12.3	355	10.4
49,116	54,139	100	2,724	100	Total[a]		47,777	52,665	100	3,402	100

a. Percentages may not total exactly 100 percent due to rounding.

U.S. originated in Manitoba, with the remainder evenly split between Saskatchewan and Alberta. North Dakota and Minnesota each accounted for about one-half of the destinations by weight and truckloads. Texas was the next largest destination, consuming nine percent of the tonnage and six percent of the truck trips. None of the remaining states obtained more than a few percent of the flows, which were evenly spread over most of the continental U.S.

Pacific Region

Four crossings between British Columbia and the State of Washington handled trucks. Of these, the crossing at Douglas-Blaine carried the largest truck flows. From a regional perspective the flows in the Pacific region are growing the fastest along the Canada-U.S. border. In 1990 the Pacific region represented only about six percent of the total truck traffic between the two countries. By 1999 it had risen to 10 percent overall for the year, and 12 percent during the NRS survey period.

Osoyoos, BC-Oroville, WA

Slightly more than 61,350 trucks crossed between Canada and the U.S. at Osoyoos-Oroville in 1999. The crossing was the smallest volume truck crossing in the region. For a small crossing the commodities handled and the origin-destination patterns observed were remarkably diverse.

The leading import into Canada was electronics, vehicles, and precision goods, as shown in Table 56. They accounted for over one-third of the northbound tons, and over one-quarter of the truck trips. Metal products and machinery were the next more frequent commodity, representing 19 and nine percent of the tonnage and trucks, respectively. Grains, beverages, and tobacco accounted for an additional 15 percent of tonnage and six percent of trucks.

Washington was the source of only 20 percent of the northbound tons, but almost half of the truckloads. California, Oregon, Indiana, and Ohio each shipped about 10 percent of the tonnage moving into Canada at Osoyoos-Oroville. Many of these movements were to Vancouver, and apparently cross at Osoyoos-Oroville to avoid the congestion at the Douglas-Blaine crossing. The remaining commodity origins were spread over the western U.S. Almost 90 percent of the goods entering Canada were bound for the Vancouver area, with the remainder destined for Alberta. A small amount of the residual (about one percent) were bound for Québec.

Wood, textile, and leather products were the dominant southbound flow, with most of those being finished wood products and paper. They represented half of the southbound tonnage and an equal number of trucks (when excluding empty trucks, which constitute one-quarter of the southbound truck trips). Agricultural products and fish accounted for another 20 percent of the tonnage, and 12 percent of the truck trips. Grains, beverages, and tobacco were also significant flows entering the U.S., with 18 percent of the tonnage and nine percent of the truckloads. These three commodity groups accounted for over 85 percent of the U.S. imports by weight and almost 60 percent of the truck trips.

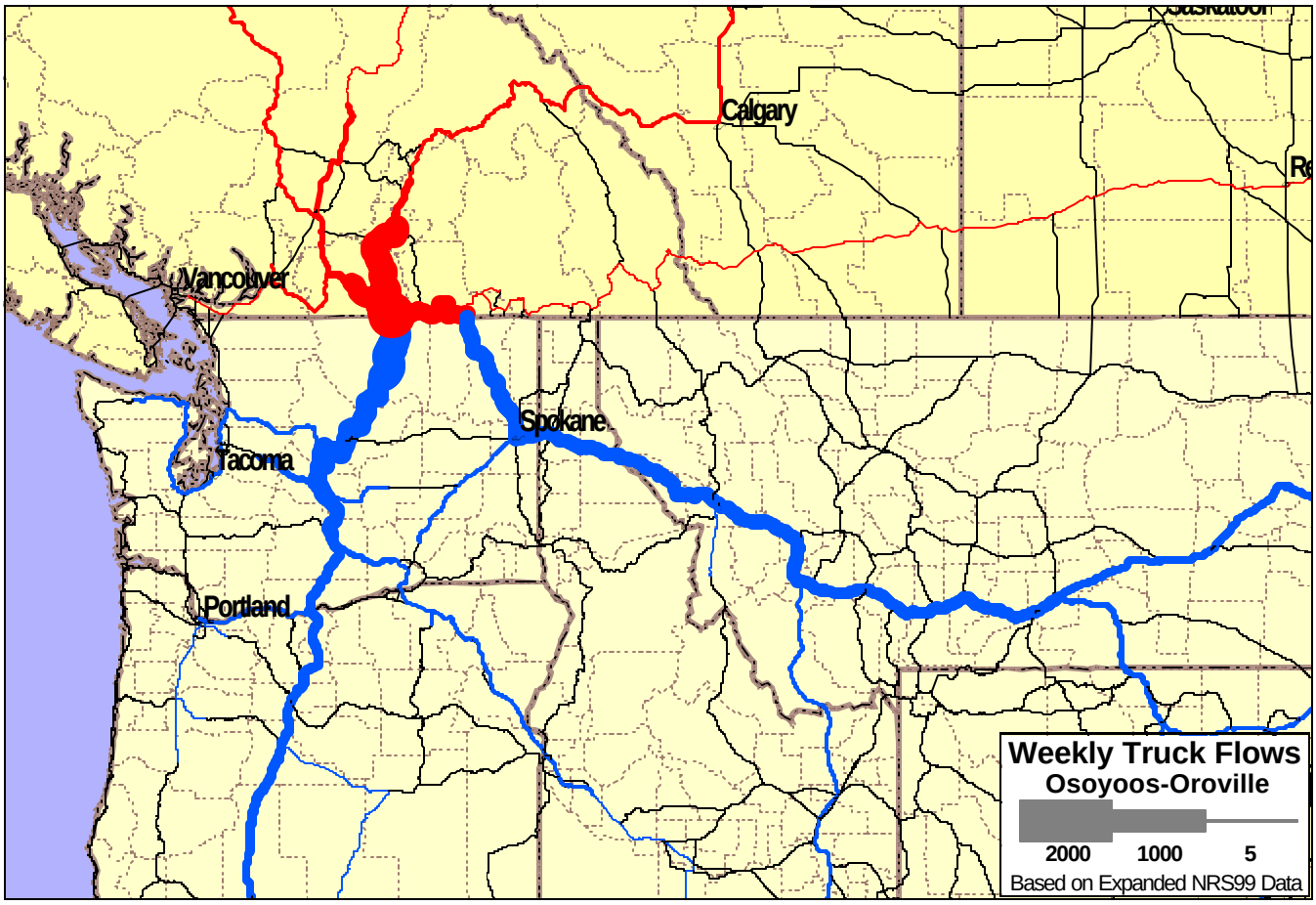

Figure 41: Weekly 1999 truck flows through Osoyoos-Oroville

Table 56: Weekly 1999 Osoyoos-Oroville crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	432	41.1	--	Empty	0	0	0.0	262	24.2
496	547	5.5	23	2.2	01-05	Agricultural products and fish	1,842	2,030	20.0	126	11.6
1,362	1,501	15.0	67	6.4	06-09	Grains, alcoholic beverages and tobacco	1,640	1,808	17.8	96	8.9
740	816	8.2	25	2.4	10-14	Stone, minerals and ores	0	0	0.0	0	0.0
0	0	0.0	0	0.0	15-20	Coal and petroleum products	241	266	2.6	12	1.1
68	75	0.8	11	1.0	21-24	Pharmaceutical and chemical products	94	104	1.0	44	4.1
178	196	2.0	17	1.6	25-30	Wood, textile, and leather products	4,568	5,035	49.6	236	21.8
1,715	1,890	18.9	90	8.6	31-34	Metal products and machinery	679	748	7.4	38	3.5
3,410	3,759	37.6	276	26.3	35-38	Electronics, vehicles, and precision goods	24	26	0.3	27	2.5
0	0	0.0	0	0.0	39-43	Furniture and miscellaneous products	128	141	1.4	243	22.4
1,106	1,219	12.2	110	10.5	--	Unclassified or unknown	0	0	0.0	0	0.0
9,075	10,003	100	1,051	100	Total[a]		9,216	10,158	100	1,083	100

a. Percentages may not total exactly 100 percent due to rounding.

Virtually all of the southbound flows originated in British Columbia, with a small percentage attributed to Alberta. Three-quarters of the tonnage and truck trips were bound for Washington, California, and Oregon, as depicted in Figure 41. Most of the remaining destinations were in the Rocky Mountain states.

Huntingdon, BC-Sumas, WA

The Huntingdon-Sumas crossing was the second most active truck crossing in the region in 1999. Over 150,000 trucks moved across the border there in 1999, and over 6,500 during the NRS survey week. Three commodity groups accounted for about 60 percent of the goods flowing into Canada at Huntingdon-Sumas, as shown in Table 57. Metal products and machinery were the largest group, representing about 20 percent of the tonnage. Coal and petroleum products accounted for another 20 percent of the tonnage. Wood, textile, and leather products (primarily raw timber and unfinished lumber) constituted another 18 percent. A very large number of northbound trucks were empty (almost three quarters of all truck movements). These vehicles were primarily timber haulers, which normally cannot accommodate backhauls.

Roughly 90 percent of the northbound tonnage and truckloads originated in Washington, with most of the remainder in western Oregon. Over 90 percent of the flows were destined to southwestern and south-central British Columbia. Almost nine percent of the tonnage and two percent of the truckloads were bound for Alberta.

Almost all of the flows into the U.S. at Huntingdon-Sumas were wood, textile, and leather products. Most of these were finished lumber, wood products, and paper products. They accounted for almost three-quarters of the southbound tonnage and over half of the truck trips. Another 20 percent of the southbound trucks were empty. These flows originated across south-central British Columbia, as shown in Figure 42. Roughly half by weight and truckloads were bound for Washington, with another 15 percent to California. Oregon was the only other major destination, accounting for nine percent of the tonnage and seven percent of the truck trips. The remaining destinations were primarily spread across the western U.S.

Aldergrove, BC-Lynden, WA

The Aldergrove-Lynden crossing is located just east of the Douglas-Blaine crossing. It primarily handles local truck traffic. Almost two-thirds of the trucks entering Canada were empty. They were principally timber haulers returning without a backhaul. The most important northbound commodity was stone, minerals, and ores, which accounted for half of the tonnage and almost 20 percent of the truck trips (half of the truck trips when excluding empty trucks). Most of the remaining goods were agricultural products and fish, which accounted for 13 percent of the tonnage and nine percent of the northbound trucks. Washington was the origin of 90 percent of these flows, while about seven percent was attributed to California. The remainder were all from Oregon. Southwestern British Columbia was the exclusive destination of the these flows.

Figure 42: Weekly 1999 truck flows through Huntingdon-Sumas

Table 57: Weekly 1999 Huntingdon-Sumas crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	2,107	73.2	--	Empty	0	0	0.0	726	19.7
1,765	1,946	11.2	79	2.7	01-05	Agricultural products and fish	2,240	2,469	4.3	138	3.7
799	881	5.1	45	1.6	06-09	Grains, alcoholic beverages and tobacco	3,075	3,390	6.0	154	4.2
213	235	1.4	28	1.0	10-14	Stone, minerals and ores	567	625	1.1	13	0.4
3,209	3,537	20.4	193	6.7	15-20	Coal and petroleum products	2,055	2,265	4.0	112	3.0
87	96	0.6	8	0.3	21-24	Pharmaceutical and chemical products	111	122	0.2	18	0.5
2,763	3,046	17.6	124	4.3	25-30	Wood, textile, and leather products	36,234	39,941	70.2	2,072	56.3
3,158	3,481	20.1	154	5.3	31-34	Metal products and machinery	2,348	2,588	4.5	139	3.8
15	17	0.1	8	0.3	35-38	Electronics, vehicles, and precision goods	35	39	0.1	4	0.1
221	244	1.4	8	0.3	39-43	Furniture and miscellaneous products	67	74	0.1	8	0.2
3,475	3,830	22.1	124	4.3	--	Unclassified or unknown	4,905	5,407	9.5	299	8.1
15,705	17,313	100	2,878	100	Total[a]		51,637	56,920	100	3,683	100

a. Percentages may not total exactly 100 percent due to rounding.

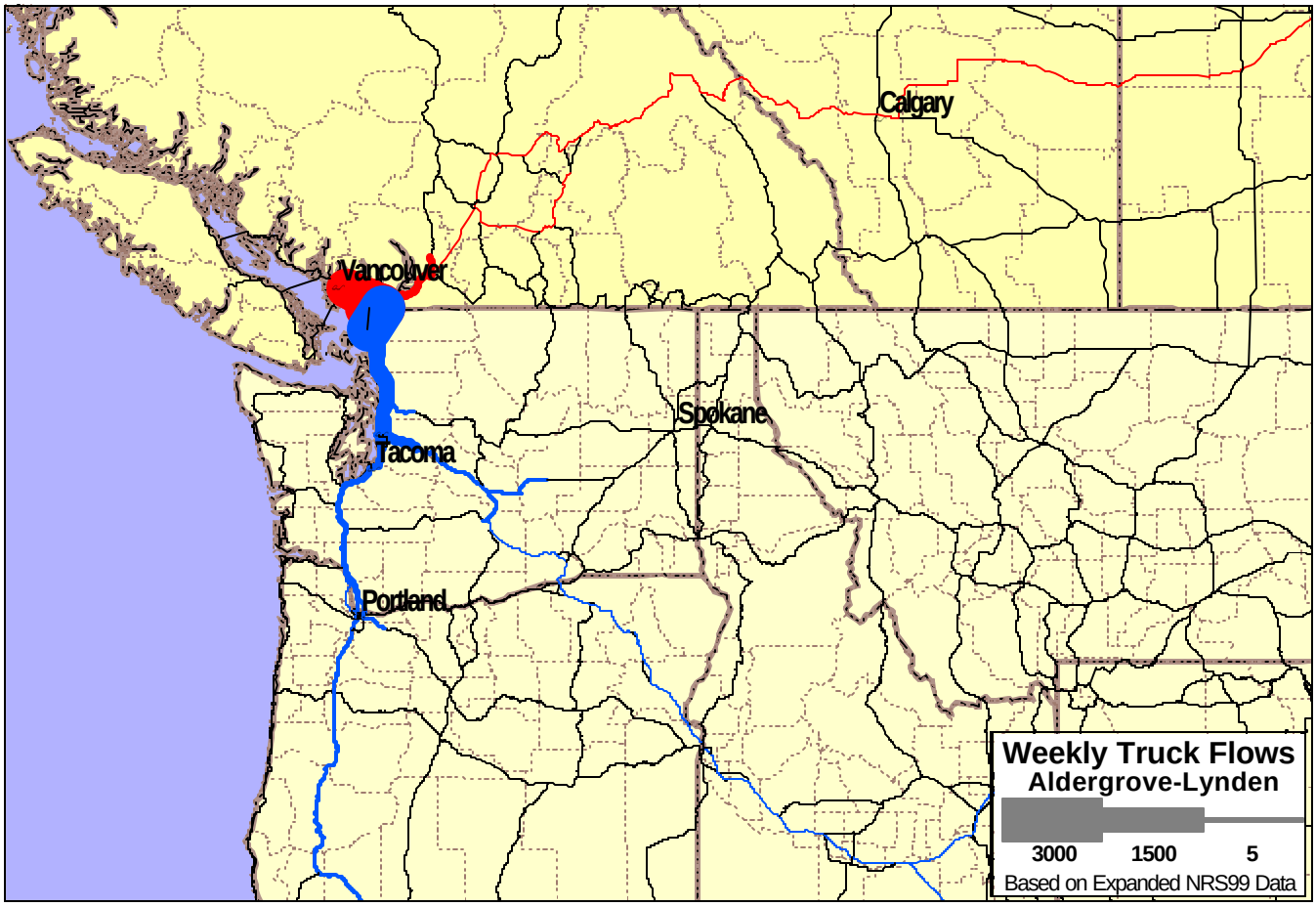

Figure 43: Weekly 1999 truck flows through Aldergrove-Lynden

Table 58: Weekly 1999 Aldergrove-Lynden crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	858	61.8	--	Empty	0	0	0.0	817	44.0
1,754	1,933	13.1	127	9.1	01-05	Agricultural products and fish	8,430	9,292	36.5	356	19.2
343	378	2.6	18	1.3	06-09	Grains, alcoholic beverages and tobacco	3,130	3,450	13.6	135	7.3
6,754	7,445	50.3	250	18.0	10-14	Stone, minerals and ores	2,597	2,863	11.2	97	5.2
0	0	0.0	0	0.0	15-20	Coal and petroleum products	0	0	0.0	0	0.0
84	93	0.6	17	1.2	21-24	Pharmaceutical and chemical products	0	0	0.0	0	0.0
1,274	1,404	9.5	64	4.6	25-30	Wood, textile, and leather products	8,611	9,492	37.3	333	17.9
285	314	2.1	24	1.7	31-34	Metal products and machinery	277	305	1.2	13	0.7
32	35	0.2	8	0.6	35-38	Electronics, vehicles, and precision goods	11	12	0.0	1	0.1
0	0	0.0	0	0.0	39-43	Furniture and miscellaneous products	0	0	0.0	0	0.0
2,890	3,186	21.5	23	1.7	--	Unclassified or unknown	33	36	0.1	106	5.7
13,416	14,788	100	1,389	100		Total[a]	23,089	25,450	100	1,858	100

a. Percentages may not total exactly 100 percent due to rounding.

The two dominant commodities entering the U.S. were agricultural products and fish and wood, textile, and leather products. They each accounted for over one-third of the tonnage entering the U.S., and close to 20 percent of the truck trips. Empty trucks constituted another 44 percent of the southbound truck trips. Grains, beverages, and tobacco represented 14 percent of the tonnage, and seven percent of the trucks. Stone, minerals, and ores were the only other significant commodity, amounting to 11 percent of the tonnage and five percent of the trucks. These four commodity groups accounted for virtually all of the tonnage and non-empty trucks entering the U.S. All of the flows originated in southwestern British Columbia, and about 95 percent of the destinations were in Washington. Oregon was the only other state that attracted significant flows.

Douglas, BC-Blaine, WA

In 1999 almost 952,000 trucks crossed at Douglas-Blaine, making it the fifth busiest on the northern border. In terms of rate of growth over the past 15 years it is second, only behind the Blue Water Bridge. The traffic flowing through this crossing was unique in that much of it flowed between the Seattle-Tacoma area and the Port of Vancouver, and between Vancouver and the Port of Seattle. The ports are highly competitive, and many shipping lines serve only one or the other. Thus, some of the trade crossing at Douglas-Blaine (perhaps as much as a third of it) might not actually be trade between Canada and the U.S. Instead, these flows moved through an intermediary in the other country before being traded with other parts of the world.

Agricultural products and fish held the largest share of the traffic entering Canada, as shown in Table 59. They accounted for a third of the tonnage and 21 percent of the truck trips. Metal products and machinery amounted to 23 percent of the tonnage and 14 percent of the truckloads, while wood, textile, and leather products (primarily timber and forest products) contributed another roughly 15 percent of the flows. These three commodities accounted for about 70 percent of the tonnage and half of the northbound truck trips. Empty trucks constituted another 21 percent of the northbound flows. Furniture and miscellaneous products were interesting, in that they accounted for only three percent of the tonnage but 10 percent of the truck trips entering Canada.

Most of the flows entering Canada originated in Washington. The flows are illustrated in Figure 44. Washington origins accounted for 60 percent of the tonnage and three-quarters of the truckloads entering Canada. Shipments from California amounted to another 20 percent of the tons and 12 percent of the truck trips. Flows from Oregon accounted for the remainder. Over 95 percent of the flows were destined for southwestern British Columbia, principally in Vancouver. The remainder were bound to Alberta.

Wood, textile, and leather products (principally finished wood products and lumber) accounted for almost 60 percent of the tonnage entering the U.S., and a third of the truckloads. Agricultural products and fish were a distant second, representing 11 percent of the tonnage and 12 percent of the trucks. All of the southbound

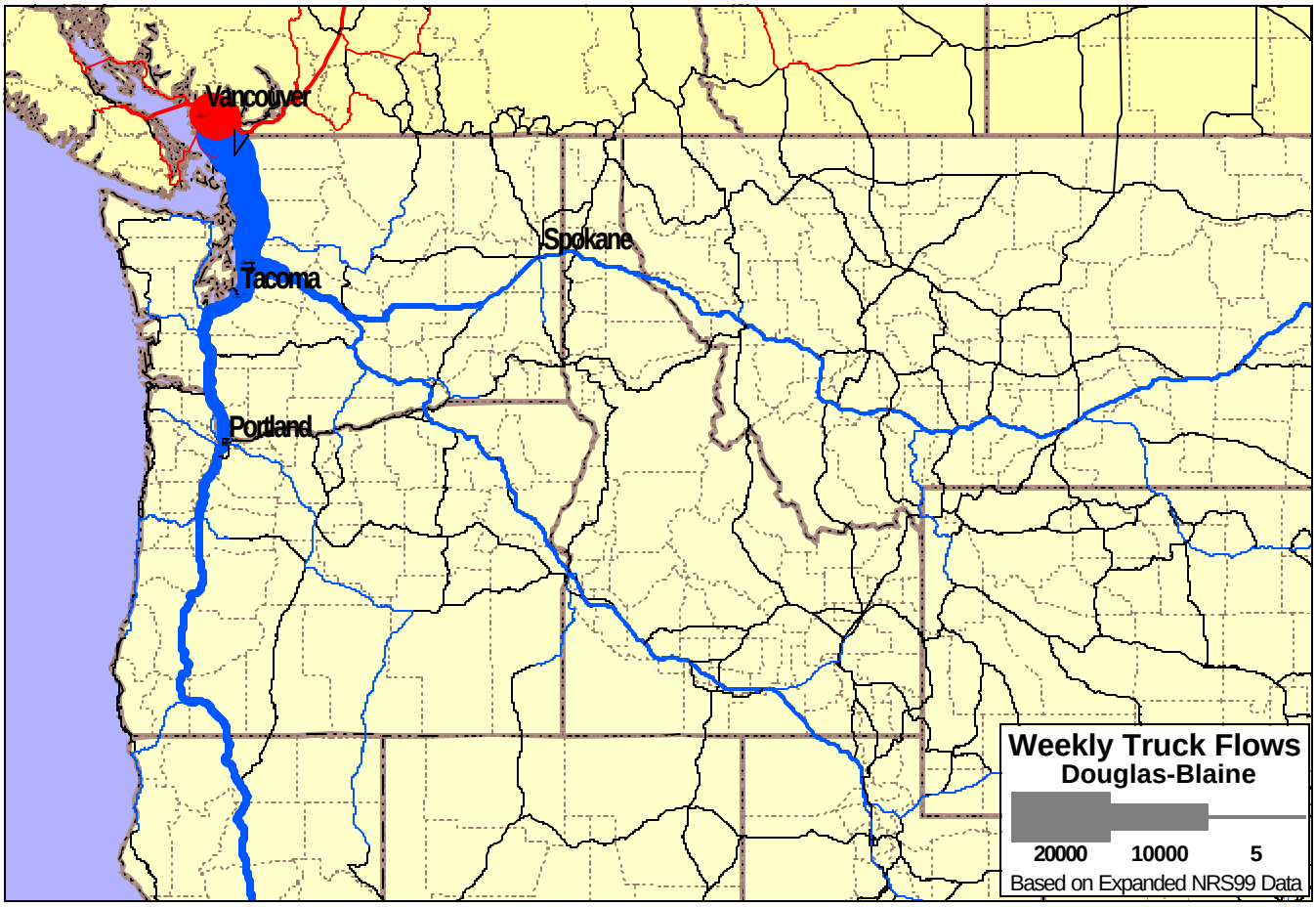

Figure 44: Weekly 1999 truck flows through Douglas-Blaine

Table 59: Weekly 1999 Douglas-Blaine crossings by commodity group

Flows entering Canada					SCTG	Description	Flows entering the U.S.				
Metric tons	Short tons	Per-cent	Trucks	Per-cent			Metric tons	Short tons	Per-cent	Trucks	Per-cent
0	0	0.0	1,897	21.1	--	Empty	0	0	0.0	2,383	26.1
28,428	31,336	33.0	1,928	21.4	01-05	Agricultural products and fish	10,893	12,007	11.1	1,048	11.5
2,107	2,323	2.4	175	1.9	06-09	Grains, alcoholic beverages and tobacco	2,702	2,978	2.8	272	3.0
880	970	1.0	45	0.5	10-14	Stone, minerals and ores	1,393	1,536	1.4	79	0.9
7,438	8,199	8.6	533	5.9	15-20	Coal and petroleum products	2,248	2,478	2.3	126	1.4
1,104	1,217	1.3	151	1.7	21-24	Pharmaceutical and chemical products	180	198	0.2	144	1.6
12,852	14,167	14.9	1,229	13.6	25-30	Wood, textile, and leather products	57,692	63,593	58.9	3,048	33.4
19,764	21,786	22.9	1,283	14.2	31-34	Metal products and machinery	7,363	8,116	7.5	592	6.5
1,400	1,543	1.6	201	2.2	35-38	Electronics, vehicles, and precision goods	1,100	1,213	1.1	293	3.2
2,750	3,031	3.2	914	10.1	39-43	Furniture and miscellaneous products	3,274	3,609	3.3	301	3.3
9,397	10,358	10.9	649	7.2	--	Unclassified or unknown	11,041	12,170	11.3	846	9.3
86,120	94,930	100	9,005	100		Total[a]	97,886	107,899	100	9,132	100

a. Percentages may not total exactly 100 percent due to rounding.

flows originated in British Columbia, the majority of which come from Vancouver. About half (by tonnage) to two-thirds (by truckload) of the flows were destined for Washington. Another one-quarter of the tonnage and 14 percent of the truck trips were bound for California. Oregon received 10 percent of the tonnage and seven percent of the trucks. These three states together accounted for 80 percent of the U.S. destinations, measured either way. The remaining destinations were states in the western U.S., with the exception of a small number of truck trips bound for Ohio and Illinois.

CHAPTER 6

Forecasts of Truck Flows by Major Crossings

The forecasting of future truck flows at major ports of entry was an important part of previous trade flow analyses for the EBTC. The requirement for forecasting information remains in the current work. As noted earlier, the NRS data provided a detailed look at cross-border truck movements not previously possible. However, the survey covered only a brief period in time, precluding the use of these data alone for forecasting purposes. The NRS data were fused with other data to achieve the goal of revising earlier forecasts of cross-border trade and trucking. The forecasting process developed to do so and the principal findings are summarized in this chapter.

As in previous efforts, our work in this area began with an earnest attempt to align our forecasting with the work of others. While several models of both national economies exist, there are no official forecasts of trade between Canada and the U.S. The U.S. International Trade Commission sponsored a review of existing trade models (USITC, 1992) that is now dated, but has never endorsed a particular methodology or forecast. Several organizations have developed forecasts based on trend extrapolation, although most tend to focus on a single commodity and cover only a small number of years. The most comprehensive forecast of trade between the U.S. and Canada remains the INFORUM model, a joint collaboration between the Universities of Guanajuato and Maryland (Meade, 2000). However, the INFORUM model typically produces forecasts in range of three to five years, far shorter than those required for long-term transportation infrastructure planning.

In the absence of suitable external forecasts of trade between the two countries, a long-term forecast was developed based upon available data. A key objective of the forecasting approach was to develop a straight-forward and efficient model that both replicated existing flows and provided defensible forecasts based on historical trends. An ideal forecasting tool would employ a behavioral model of trade between the two countries, as well as recognizing the factors that make trucking an advantageous mode of transportation for certain elements of that trade. Previous work by several parties have identified factors that influenced trade between Canada and the U.S., to include the growth in gross domestic product, differential tax

rates for gasoline and cigarettes, the North American Free Trade Agreement (NAFTA), and crude petroleum prices. The association between GDP and trade has been strong but reveals no long-term causal relationship (Parsons Brinckerhoff, 1998). Trade with the U.S. presently accounts for about 25 percent of the Canadian GDP, a percentage that has grown considerably over the past 35 years. There is an upper limit on how much of Canada's GDP can accommodate trade with the U.S., but no one knows quite what that upper limit is. The remaining causal factors are themselves not forecasted, precluding the construction of a truly behavioral model of Canada-U.S. trade.

Preliminary work in this area during this project revealed that trade is growing faster overall than are truck volumes. This suggests that the majority of trade growth in the past decade has been in modes other than trucking, particularly in rail and intermodal traffic. Higher U.S. imports of Canadian petroleum are also included in the total, which are also not transported by truck. Thus, a forecasting approach linked to growth in overall trade will overstate the likely increases in cross-border truck traffic.[1]

A review of the historical truck crossing data revealed surprisingly stable growth patterns that could be fitted with simple linear models. The long time series associated with most of the higher volume crossings lent evidence of stable increases in truck flows at more reasonable rates of growth than for overall Canada-U.S. trade. These forecasts eliminate the effect of the high growth in rail traffic described earlier, and are more in line with similar forecasts used by many of the member agencies. The process used included the following steps:

- A time series for each crossing was collected from the state and provincial transportation agencies, the Bridge and Tunnel Operators Association, and Customs agencies in both countries.[2]
- A three or five year moving average was applied to the time series to reduce the influence of outliers. A three year average was used for in cases where the time series was 10 years or less. The five year moving average was used for the remaining cases.
- A linear regression ($y = ax + b$) was fit to the three or five year moving average. The slope of the line represents the average annual growth in trucks. Note that this solution is very close to the autoregressive trend model used in time series analyses:

$$y_t = ay_{t-1} + b$$

1. The standard U.S. and Canadian trade statistics are available for origin, destination, and port of clearance. In addition, the data report mode of transport or commodity, but not both. Thus, it is not possible to construct a time series of data by commodity for only truck movements. Customized datasets with such breakdowns are available from Statistics Canada for recent years, historical data of sufficient length for modeling purposes are not. While Statistics Canada can produce these data back to 1978, the cost of doing so is prohibitive.
2. In general, U.S. Customs was unwilling to disclose the requested information, although comparable data were generally available from Canadian sources.

The observed models fit the data very well, in most instances with $r^2 > 0.90$. In only five cases out of 20 did the model fail to do so, with the lowest r^2 equal to 0.72. These outcomes were generally as good as, and in some cases better, than similar attempts using time series of trade by commodity. The forecasts by individual crossings, through the year 2020, are shown in Tables 60 and 61. The results shown in Table 60 are summarized by individual crossings[3], while the emphasis in Table 61 is on the totals by state and province. The exact form of the models, as well as a graphical presentation of the data for each crossing, are shown in Appendix B.

The summaries presented in the Tables reveal several interesting trends:

- The largest increase in truck volumes will be in the Pacific Northwest, where flows will double over current levels in 20 years. The Douglas-Blaine crossing had the third highest growth rate over the past decade, and the highest among the higher-volume crossings. If it grows at this forecast suggests it will have the highest growth rate over the next 20 years of all crossings on the Canada-U.S. border, growing from slightly under 1 million to almost 2.3 million annual trucks.
- The crossings between Maine and New Brunswick are growing almost as fast, with traffic projected to almost double over the forecast period. Most of this growth is expected to occur at the St. Stephen-Calais crossing, which is forecasted to grow to about one-half million trucks per year by 2020.[4]
- The crossings "in the middle" — between New York, Ontario, and Michigan — will increase the most in absolute terms, growing from roughly 8.5 million to 14 million trucks per year. This will represent an increase of about 60 percent over current flows, and will strain the capacity of the largest volume crossings on the Canada-U.S. border.
- The crossings that connect Québec, Vermont, and Northern New York had the slowest historical growth and are projected to continue at the same rate into the future. However, the expected growth will still result in flows 30 to 40 percent higher than current levels. In most instances this translates into over 100,000 more trucks per year at each crossing.

It should be emphasized that these forecasts are more accurate at the state or provincial level than for individual crossings, particularly those that are close in proximity to one another. The forecasting approach used here was chosen because of its ability to be applied consistently across all crossings. However, there are a number of economic and institutional factors unique to each crossing that are not taken into account in these forecasts. This is compounded by the fact that some of

3. The Detroit-Windsor Tunnel had a significantly poorer fit, having seen a rapid increase in truck traffic before the mid-1990s and an equally large decline thereafter. The operator is projecting a 0.5 percent increase over the next 20 years, a forecast we have included in lieu of the model.

4. With the opening of the Fredericton-Moncton Highway in November 2001, there is preliminary indication of a shift in truck traffic from St. Stephen/Calais to Woodstock/Houlton. This early indication may foretell increases at Woodstock/Houlton. This trend should be monitored, and forecasts adjusted as necessary.

the time series used in these forecasts were not very long, as reported in Table 60. Forecasts for crossings with fewer than 20 years of data are not as reliable as those meeting this threshold.

Table 60: Forecasted growth in annual truck volumes by crossing

Crossing	Years of data	AAGR [a]	AAGR-10 [b]	Linear fit (r^2)	2000 volume	2020 forecast [c]
St Stephen-Calais	9		5.5%	0.98	239,508	482,000
Woodstock-Houlton	9		6.6%	0.77	207,000	356,000
Saint-Theophile-Jackman	23	3.5%	4.3%	0.89	121,108	169,000
Rock Island-Derby Line	23	8.5%	10.2%	0.94	266,966	395,000
Saint-Armand-Highgate Springs	23	4.4%	8.3%	0.91	307,356	408,000
Lacolle-Champlain	23	4.7%	5.1%	0.72	769,232	939,000
Cornwall-Seaway	31	6.6%	4.3%	0.94	131,203	191,000
Prescott-Odgensburg	31	5.0%	3.0%	0.93	57,757	81,000
Thousand Islands Bridge	21	6.7%	6.0%	0.96	542,703	861,000
Queenston-Lewiston Bridge	32	6.3%	4.7%	0.97	1,019,492	1,417,000
Peace Bridge	24	4.4%	5.0%	0.96	1,439,824	2,227,000
Ambassador Bridge	22	6.6%	8.3%	0.87	3,486,110	5,051,000
Detroit-Windsor Tunnel	22	2.6%	-4.1%	0.48	170,054	187,000 [d]
Blue Water Bridge	22	10.2%	8.2%	0.99	1,576,839	2,944,000
Sault Ste Marie	22	4.2%	7.3%	0.84	137,804	240,000
Thunder Bay-Grand Portage	9		5.9%	1.00	64,193	123,000
Fort Frances-Int'l Falls	9		3.6%	0.97	92,263	147,000
Osoyoos-Oroville	9		5.6%	1.00	64,812	124,000
Huntingdon-Sumas	10		8.4%	0.91	186,513	378,000
Aldergrove-Lynden	10		6.8%	0.77	120,646	232,000
Douglas-Blaine	10		8.5%	0.98	951,995	2,258,000
Average		5.8%	6.3%			
Total					11,953,378	19,210,000

a. The annual average growth rate (AAGR) is the average of the annual growth rates for each of the years in the entire time series.
b. Annual average growth rate for the last ten years in the data. For cases with 9 years of data this corresponds to the annual average over those years.
c. The forecasted model for each crossing is shown in Appendix B.
d. Operator forecast used in lieu of modeled outcome.

Table 61: Forecasted growth in annual truck volumes by crossing, state, and province

2000 volume	2020 forecast[b]	Annual growth[a]	Prov	Crossing	2000 volume	2020 forecast[b]	Annual growth[a]	State	2000 volume	2020 forecast[b]	Annual growth[a]
446,508	838,000	4.4%	NB	St Stephen-Calais	239,508	482,000	5.1%	ME	567,616	1,007,000	3.9%
				Woodstock-Houlton	207,000	356,000	3.6%				
1,464,662	1,911,000	1.5%	PQ	Saint-Theophile-Jackman	121,108	169,000	2.0%				
				Rock Island-Derby Line	266,966	395,000	2.4%	VT	574,322	803,000	2.0%
				Saint-Armand-Highgate Springs	307,356	408,000	1.6%				
				Lacolle-Champlain	769,232	939,000	1.0%	NY	3,960,211	5,716,000	2.2%
8,718,242	13,469,000	2.7%	ON	Cornwall-Seaway	131,203	191,000	2.3%				
				Prescott-Odgensburg	57,757	81,000	2.0%				
				Thousand Islands Bridge	542,703	861,000	2.9%				
				Queenston-Lewiston Bridge	1,019,492	1,417,000	1.9%				
				Peace Bridge	1,439,824	2,227,000	2.7%				
				Ambassador Bridge	3,486,110	5,051,000	2.2%	MI	5,370,807	8,422,000	2.8%
				Detroit-Windsor Tunnel	170,054	187,000[c]	0.5%				
				Blue Water Bridge	1,576,839	2,944,000	4.3%				
				Sault Ste Marie	137,804	240,000	3.7%				
				Thunder Bay-Grand Portage	64,193	123,000	4.6%	MN	156,456	270,000	3.6%
				Fort Frances-Int'l Falls	92,263	147,000	3.0%				
1,323,966	2,992,000	6.3%	BC	Osoyoos-Oroville	64,812	124,000	4.6%	WA	1,323,966	2,992,000	6.3%
				Huntingdon-Sumas	186,513	378,000	5.1%				
				Aldergrove-Lynden	120,646	232,000	4.6%				
				Douglas-Blaine	951,995	2,258,000	6.9%				
11,953,378	19,210,000	3.0%		Total	11,953,378	19,210,000	3.0%		11,953,378	19,210,000	3.0%

a. Forecasted annual growth rate over the period 2001 to 2020.
b. The forecasted model for each crossing is shown in Appendix B.
c. Operator forecast used in lieu of modeled outcome.

CHAPTER 7

Major Findings, Conclusions, and Recommendations

The NRS survey provided a wealth of new information about truck traffic crossing the Canada-U.S. border, such as truck weights and facility type at the origin and destination, that had never been collected before. The data provided a much clearer and more complete picture of truck movements crossing the border, and filled several gaps in knowledge about trip chaining and truck characteristics. In this chapter important methodology considerations are reviewed, as well as principal findings, conclusions, and recommendations from this study.

Some of the most interesting findings came from contrasting the movements by different measures. Data have traditionally only been available for the value of trade between Canada and the U.S., and most of these data were aggregate in nature (state or province level). Excellent data on truck volumes were available from the Bridge and Tunnel Operators Association (BTOA), although they contain no information about the commodity or origin-destination patterns. By contrast, data from crossings not included in the BTOA summaries were difficult and time-consuming to obtain. Unlike the trade statistics, there are no regulations or government programs that provide such data to the public. Finally, no reliable data on cross-border truck or cargo weights have ever been available. The NRS fills a critical gap in this regard.

The NRS data were collected in the summer and fall of 1999. However, the evidence from the trade statistics shows that market interactions change slowly over time, rarely faster than five to seven years. While the volume of trade has changed since 1999, much of the character of it probably has not. About 65,000 observations were collected during the survey, about 25,000 of which crossed the Canada-U.S. border. It was found that 21,304 of these observations contained reliable and useful origin-destination, commodity classification, weight, and other information. These observations, expanded to represent a typical Fall 1999 week, formed the basis of our analyses. The success of the roadside interviews was due in part to the high level of cooperation and trust between border crossing operators, carriers, and provincial authorities.

The NRS was a Canada-wide study intended to serve a number of purposes. As such, it collected far more information than required or useful for our analyses. However, the richness and detail of the data support a large number of users with varying data requirements. These range from provincial, statewide, and metropolitan transportation planning to infrastructure monitoring to motor carrier surveillance and enforcement. The use of a single survey to support these varying needs resulted in a larger and more complex effort than any single-use survey would have been. The economies of scale and efficiency of implementation, however, undoubtedly outweigh the additional cost. The practical implication for the EBTC was that it took far longer than anticipated to fully clean, edit, expand, and analyze the data.

Data on the value of the payload was not collected during the survey. Experience in prior NRS surveys suggested that drivers often do not have this knowledge and lack the documentation to readily and reliably estimate it. An attempt was made to impute the shipment value based on value-weight relationships by commodity developed from the trade statistics.[1] However, these ratios resulted in value estimates by border crossing that exceeded those in the trade statistics.[2] After considerable effort it was decided to use the aggregate value of trade reported in the trade statistics as control totals in place of the imputed NRS estimates.

Major Findings

In many respects the main body of the report covers the major findings of our work. There is a wealth of information in these data, covering almost all of the cross-border truck traffic along the entire Canada-U.S. border. Summarizing the principal findings in a few pages misses the unique characteristics of the major crossings and regions along the border. Some of the more notable findings include:

- The six highest-volume truck crossings[3] on the Canada-U.S. border handled almost 90 percent of the value and three-quarters of the tonnage and truck trips. The four bridges crossing the Niagara, Detroit, and St. Clair rivers handled the majority of these flows, whose commodities typically had higher value-to-weight ratios, such as electronics and electrical machinery, automobile components, and metal products.

1. These trade statistics include the data distributed by the U.S. Bureau of the Census and Statistics Canada, which form the official trade statistics for each country. The USDOT Transborder Surface Freight Data are a customized compilation of the these data for Canada-U.S. flows. These trade data have traditionally been used by transportation planners, and are probably the most familiar to them.
2. A number of explanations are possible, including an inadequate sampling rate, that the seasonality of the NRS surveys was not truly representative of the entire year, inconsistent or incorrect accounting of intermodal trips in the trade statistics, the absence of in-bond and otherwise tariff-exempt flows from the trade statistics, and the deliberate under-reporting of value to Customs.
3. The six highest volume truck crossings were, in descending order, the Ambassador Bridge, Blue Water Bridge, Peace Bridge, Queenston-Lewiston Bridge, Douglas-Blaine, and Lacolle-Champlain.

- Most of the remaining crossings were much lower in volume, and typically handled lower value, higher weight shipments. This was particularly true along the western half of the border and in the New England states, as shown in Figure 2 on page 10. Moreover, many of the lower volume crossings are of great regional importance. The Woodstock-Houlton and St. Stephen-Calais crossings, for example, handle almost all of the traffic to and from the Atlantic provinces.
- The states along the border were responsible for a smaller share of total trip origins and destinations than previously thought. The border states contributed a third of the total value of goods flowing into Canada, 40 percent of the tonnage, and slightly more than half of the truck trips. About half of the shipments entering the U.S. from Canada — by all three measures — were bound to the border states.
- The majority of the cross-border trips were made using tractor-single trailer combinations. The Buffalo-Niagara and Detroit-Windsor crossings were the only ones where single-unit (straight) trucks carried any significant portion of the trips. Virtually all of the single-unit trucks served trip interchanges of less than 100 miles.
- Almost 70 percent of the truck trips carried only a single load between one origin and one destination. Most of the remainder carried only two shipments.
- The average payload weight on trucks crossing at the higher volume crossings was lower than at the lower volume crossings. This reflects a higher composition of shorter distance trips, as well as the influence of just-in-time deliveries. The average at the six highest crossings was around 14 metric tons for tractor-trailer combinations and 3.5 metric tons for single-unit trucks, versus about 17.2 and 4.8 tons, respectively, for the remaining crossings.
- Empty trucks comprised a significant share of the flows at each crossing. In some instances empty trucks were the largest single category of movements, accounting for 40 to 50 percent of the trucks entering Canada. In general the higher percentages of empty trucks occurred at the lower-volume crossings, and at those whose commodity mix was dominated by wood and lumber products. However, several exceptions to these rules existed. The data gave no clues as to the commodities carried by the same truck in the other direction (previous or next trip) across the border. However, it is known that arranging backhauls across the border is far more difficult than for domestic moves. Moreover, many of the vehicles (particularly timber haulers) have specialized trailers that are not conducive to moving different loads in the opposite direction.
- Over 40 percent of the truck trips crossing the border originated or ended at transportation terminals (including air, rail, intermodal, and marine facilities), warehouses, or distribution centers. Many of these goods were in turn shipped to other destinations. Almost as many trips were bound from and to manufacturing facilities. Only a small portion of the goods were destined directly for retail or consumer use, although some portion of the goods shipped to distribution centers were likely to be staged there for delivery to retail and commercial outlets.

Conclusions

The 1999 NRS provided valuable insights into truck flows between the U.S. and Canada. Many aspects of these flows have never been illuminated before. The NRS data provide information at a more precise level of geography than available through other sources[4], as well as useful and detailed driver, vehicle, commodity, and trip information. These data portray distinct market transactions and their related transportation elements that simply could not be discerned from other sources.

Most of the recent economic and security-related turmoil in North America has and will continue to have a relatively smaller impact on cross-border flows. Several factors contribute to this:

- Structural market forces affecting auto production in the U.S. and Canada were apparent as far back as the mid-1990s. While the 2001-2002 recession has exacerbated these trends, they have not prompted them.
- The contribution of information technology to the overall mix of commodities flowing across the eastern border has been small. The collapse of the New Economy businesses appears to have had little effect on the truck flows across the border. The Pacific Northwest, long a conduit for computer hardware from the Pacific Rim, has ironically seen the largest increase in truck flows since the Internet bubble began shrinking in the summer of 2000.
- Historical trends in trade between the U.S. and Canada suggest that recessions have had only a mild effect on trade. While recessions in the 1970s and 1980s depressed the economies in both countries, their effect on trade was not as strong.

Truck counts collected for the six months following the September 11th terrorist attacks have shown a quick return to their previous levels. In the months following the attack the flows were about five percent below year-earlier monthly flows. But more recent data indicate they have returned to the same levels, although weight and value information are not available. The resilience of the trade flows to economic shocks testifies to the importance of the integrated economies of both countries, and the trade flows that sustains them. The NRS data, by providing detailed and comprehensive information about the transportation impacts of trade, will help decision-makers at the local, state or province, and regional levels make more informed choices.

The NRS data tell a somewhat different story than do the trade statistics. The trade data depict a financial transaction between a shipper on one side of the border, and recipient on the other side. Only a few attributes of the shipment are reported, with little information about the transportation aspects of the transaction. In many cases the trade data are likely to show the dollar flows between one large multinational firm and another, or between divisions or factories within a single firm. The actual

4. The NRS data were coded to the Canadian Census Division or U.S. county, which is far more detailed than the state-level information available through trade statistics and other sources.

flow of goods may take place between subsidiary locations far from those handling the import or export transaction. While useful for studying the balance of trade, the trade data can be misleading when used for transportation infrastructure planning and investment.

The NRS data provide objective evidence that the flows measured by the trade statistics often do not adequately describe the true movement of the goods. This finding is an important outcome of the EBTC work, for it establishes the importance of primary data collection to support transportation planning at all levels of government, at a finer level of geographic detail.

Most of the flows across the border link major metropolitan areas in Canada with those in the U.S., particularly in the Upper Ohio Valley and along the Atlantic seaboard. About half of the flows into the U.S. from Canada were destined for border states, while about a third of the Canadian imports from the U.S. originated in border states. Thus, the U.S. border states were net importers from Canada, while the remaining states were net exporters. While documenting the importance of trade to the border states, this finding suggests that the economic linkages between the two countries run deeper and further into the U.S. than previously thought.

The NRS data clearly show that only a portion of the flows through the 22 major truck crossings considered in this report were produced or consumed near where they crossed the border. While most of the impacts of cross-border truck traffic are concentrated in the vicinity of the border crossings and along the roadways serving them, the economic benefits are more broadly distributed. The notable exception to this is the Detroit-Windsor area, home to the “Big Three” auto manufacturers. Most of the flows between Michigan and Ontario move between the Detroit and Toronto metropolitan areas. The Buffalo-Niagara metropolitan area, at the other end of the Southern Ontario axis, retains a smaller share of the trade flowing through it.

The crossings in the Pacific Northwest have a completely different character. Like many of the lower volume New England crossings, the Pacific crossings handle a large amount of raw timber, unfinished wood, and finished wood products. Most of these flows serve the regional marketplace. The Douglas-Blaine crossing, however, is somewhat of an anomaly. A surprisingly large number of trips from shippers and receivers on one side of the border traveled across the border to reach a marine port on the other side. Flows from the Seattle-Tacoma area to the Port of Vancouver, and from Vancouver to the Port of Seattle, were apparent in the data. The competition between these ports, and their accessibility to metropolitan areas on both sides of the border, have created a microcosm of trade in the Pacific Northwest.

These broad trends, which include high rates of growth in truck traffic over the past two decades, are forecasted to continue into the foreseeable future. Truck volumes will increase at all of the crossings surveyed. In most instances these increases through 2020 are quite substantial, ranging from increases of 60 to 120 percent over current levels. Even the slowest growing crossings will handle vol-

umes a third higher than at present. As noted earlier, these trend forecasts are more accurate at the state or provincial level than for individual crossings. A number of local and regional economic and institutional factors relating to each crossing must be taken into consideration in developing forecasts for specific infrastructure, corridor, technology, staffing and other changes.

Few, if any, of these crossings can accommodate such increases without substantial investments in infrastructure, technology, and staffing. While the use of intelligent transportation systems and streamlined clearance procedures will tend to make border crossings more efficient, they alone will not be able to handle the increased flows at the higher-volume crossings. In fact, their application becomes even more critical because the effect of an increased emphasis on security may run counter to or offset many of these gains in efficiency. Few domestic transportation facilities or corridors are expected to grow as quickly as border crossings over the next 20 years, underscoring the importance of timely attention to these growing infrastructure and institutional deficits. Of equal importance will be investment and maintenance of the corridors leading to the major crossings.

Recommendations

Collaboration with the NRS has paid off well for the EBTC members. The data now available for transportation planning and investment are singular in their scope, level of detail, and clarity. Used and interpreted wisely, these data have the potential to revolutionize our understanding of cross-border truck traffic. Perhaps of equal importance, they can help identify economic development opportunities. A number of steps can be taken to improve both the data and their use in transportation planning on both sides of the border:

- A pressing need is to get the NRS data into the hands of metropolitan, statewide, and provincial transportation planners. These data can be used to fulfill a number of requests from policy-makers about the volume and nature of cross-border flows and their impact on the transportation system in both countries. The dissemination of these data were anticipated from the outset of this study. This report will be available from the EBTC web site at http://www.ebtc.info.
- The EBTC made a large investment in the 1999 NRS, both in terms of funding the additional data collection as well as their subsequent analysis, reporting, and dissemination. Several actions should be taken to build upon this investment. The most important of these are changes to the overall survey approach and expansion of future efforts to include other modes of transportation.
- The EBTC should continue to collaborate with CCMTA in the conduct of future NRS surveys, including the upcoming 2004 survey.
- The EBTC participation in the 1999 NRS was prompted in part by recommendations from an earlier conference that addressed data requirements for policy and investment planning. The EBTC should work together with Canadian and U.S. transportation, Census, and Customs agencies to organize a meeting to discuss the lessons learned in the EBTC portion of the NRS, and to recommend improvements in the survey program.

- The NRS is conducted about every five years. While adequate for its originally intended purposes, such an interval is not ideal for many uses of the EBTC members. The EBTC should consider a more frequent border crossing survey program during the years that the NRS is not conducted. Such surveys would complement the information collected during the NRS. They could collect a much smaller subset of data, focusing only on ten to twenty key data items required by transportation planners. This would permit more interviews per unit of time and by reducing respondent burden, might reduce the refusal and early termination rate. Several other benefits would accrue from this approach, including the possibility of year-round collection of data, training and retention of experienced surveyors, and reduced time lag between data collection and dissemination.
- Further research on empty trucks should be undertaken in conjunction with future NRS survey work. In many instances empty trucks comprised a large proportion of observations in the survey week. Research into the causes and impacts of empty movements will help planners and policy-makers take actions to reduce the incidence of such movements, as well as minimizing their effect on the efficient movement of non-empty vehicles.
- The EBTC portion of the NRS should also be expanded to include rail and intermodal transportation terminals. Rail is the dominant carrier of several commodities across the border. Knowledge of trends in rail market shares will help transportation planners understand the opportunities and limitations of substituting rail options for additional truck capacity at the border crossings and the corridors serving them. Intermodal container service is an important carrier of cross-border traffic, whose share of the market has increased dramatically over the past decade. Understanding the dynamics of container service are essential for grasping the larger picture of transportation across the border. Since time series data are not readily available for intermodal services, a descriptive study of their markets, perhaps undertaken by the Intermodal Association of North America, would serve the EBTC data requirements better than surveys of intermodal facilities.
- It is recommended that the NRS change the commodity classification system used. The Standard Classification of Transportable Goods (SCTG) was adopted by the U.S. and Canada as a standard in 1996. The SCTG was designed to be compatible with the Harmonized System (HS) used for reporting imports and exports. In practice the desired compatibility has not been achieved. Globalization is becoming increasingly more significant in the North American economy. The distinction between domestic freight flows (SCTG) and international flows (HS) is not helpful when trying to understand a global phenomena such as freight. Future efforts should employ the HS as the commodity classification system.
- The EBTC should work with Transport Canada and the U.S. Department of Transportation and interested states and provinces to draft recommended changes in the definition of origins and destination in the trade data. These agencies can then work with their counterparts in the Canadian and U.S. Customs to explore changes in the way trade data are collected, coded, and

reported. The Canadian practice of coding the destination as the province of clearance, for example, renders the data seriously deficient in applications where the knowledge of the true destination is needed. There is ample evidence that U.S. exports to Québec and the Atlantic provinces were substantially understated in the trade data, owing to the fact that they entered Canada through and were attributed to Ontario despite being destined elsewhere.

- The analysis of the NRS data and forecasts informed by them suggest continued growth in truck traffic at all crossings on the Canada-U.S. border, which will result in additional congestion and delays at truck crossings and the corridors providing access to them. To ensure that there are adequate facilities in place to meet the continued growth in trade between the two countries, the U.S. and Canada should work together to develop a streamlined binational process for the planning, environmental review, approval, and construction of new border crossings and expansion of existing ones where they are needed.

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Appendix A

Standard Classification of Transportable Goods (SCTG) Codes

The Standard Classification of Transportable Goods (SCTG) was adopted in 1997 by both the U.S. and Canada. It is used to classify domestic freight traffic by both countries. It was employed in the U.S. Commodity Flow Surveys in 1997 and 2002, and used in this project to maintain compatibility with those efforts. A complete description of the SCTG can be found at http://www.bts.gov/cfs/sctg/ backgrnd.htm. The two-digit codes and several families they are aggregated into for reporting purposes include:

SCTG 01-05: Agricultural products and fish

1. Live animals and fish
2. Cereal grains
3. Agricultural products, except for live animals and fish, cereal grains, and forage products
4. Animal feed and feed ingredients, cereal straw, and eggs and other products of animal origin, N.E.C.[1]
5. Meat, fish, seafood, and preparations

SCTG 06-09: Grains, alcoholic beverages, and tobacco

6. Milled grain products and preparations, and bakery products
7. Prepared foodstuffs N.E.C. and fats and oils
8. Alcoholic beverages
9. Tobacco products

SCTG 10-14: Stone, minerals, and ores

10. Monumental or building stone
11. Natural sands
12. Gravel and crushed stone
13. Non-metallic minerals, N.E.C.
14. Metallic ores

1. Not elsewhere classified.

SCTG 15-20: Coal and petroleum products
15. Coal
16. Crude petroleum
17. Gasoline and aviation turbine fuel
18. Fuel oils
19. Products of petroleum refining N.E.C. and coal products
20. Basic chemicals

SCTG 21-24: Pharmaceutical and chemical products
21. Pharmaceutical products
22. Fertilizers and fertilizer materials
23. Chemical products and preparations N.E.C.
24. Plastics and rubbers

SCTG 25-30: Wood, textile, and leather products
25. Logs and other wood in the rough
26. Wood products
27. Pulp, newsprint, paper, and paperboard
28. Paper or paperboard articles
29. Printed products
30. Textiles, leather, and articles

SCTG 31-34: Metal products and machinery
31. Non-metallic mineral products
32. Base metal in primary or semi-finished forms and in finished basic shapes
33. Articles of base metal
34. Machinery

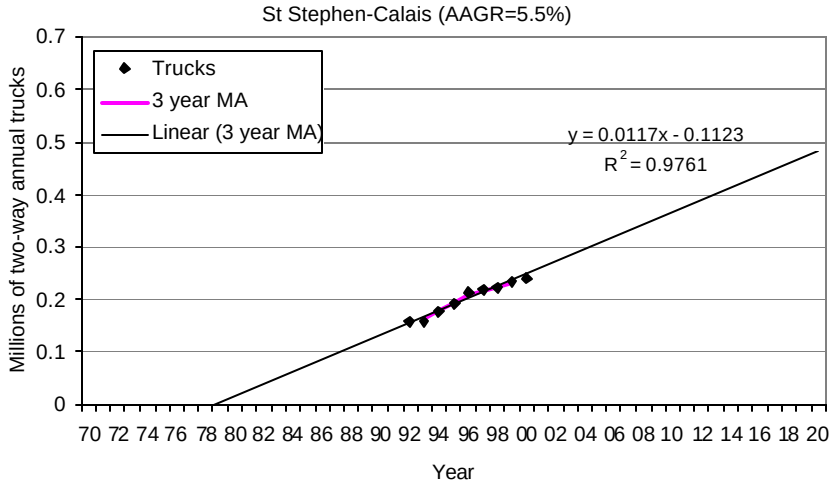
SCTG 35-38: Electronics, vehicles, and precision goods
35. Electronic and other electrical equipment and components, and office equipment
36. Vehicles
37. Transportation equipment N.E.C.
38. Precision instruments and apparatus

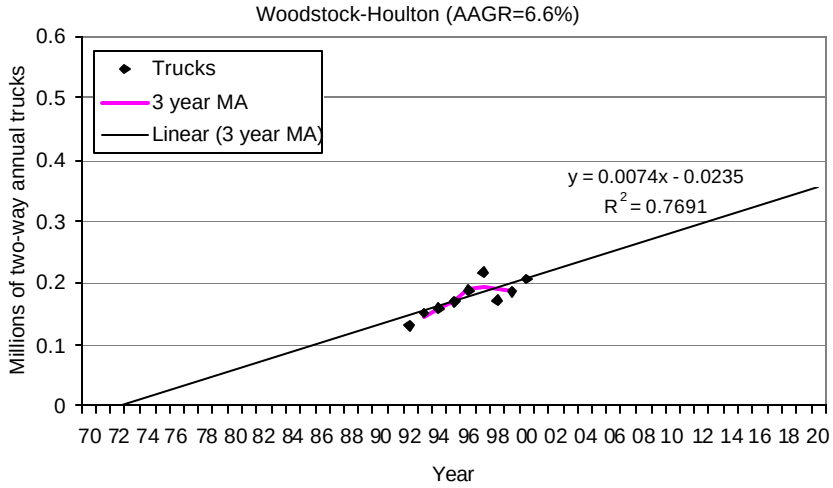
SCTG 39-43: Furniture and miscellaneous products
39. Furniture, mattresses and mattress supports, lamps, lighting fixtures, and illuminated signs
40. Miscellaneous manufactured products
41. Waste and scrap
42. Miscellaneous transported products

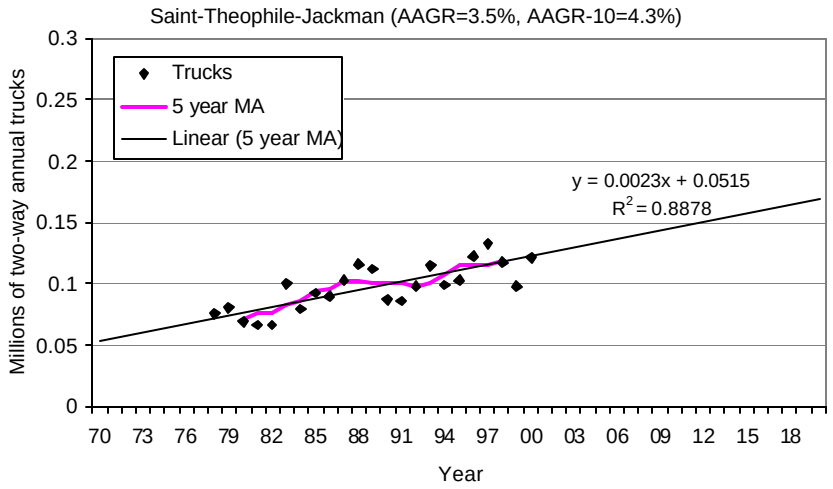
Appendix B

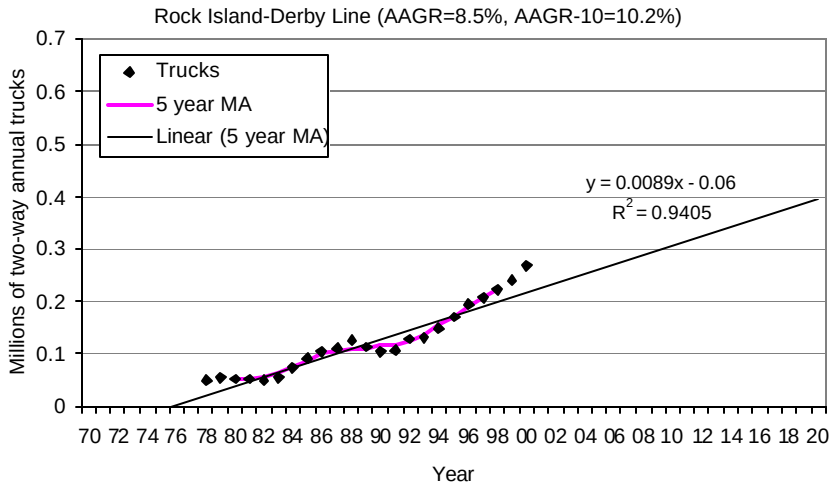
Forecasts of Truck Flows at Selected Border Crossings

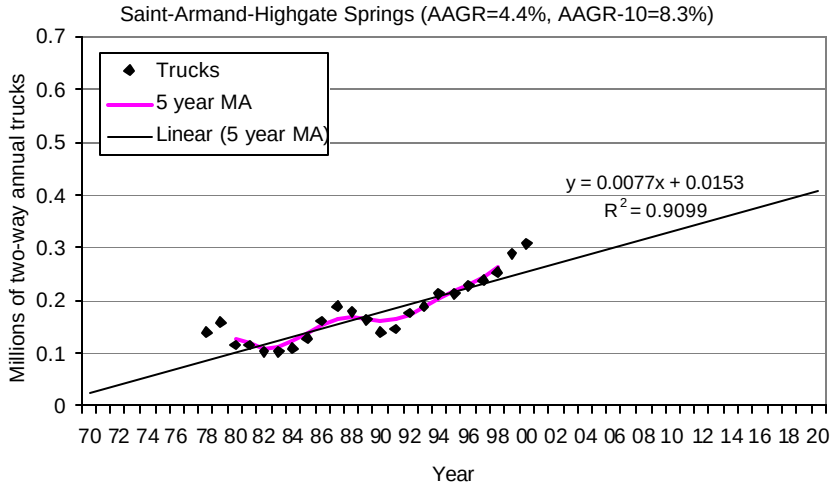
The models depicted on the following pages were used to develop the forecasts reported in Chapter 6. The purple trend shows the three or five year moving average (MA), the length of which is dependent upon the length of the time series. Note that the fit of the model for the Detroit-Windsor Tunnel was relatively poor compared to the other models. The owner's forecast of a one-half of one percent growth rate per year was used in lieu of the modeled results.

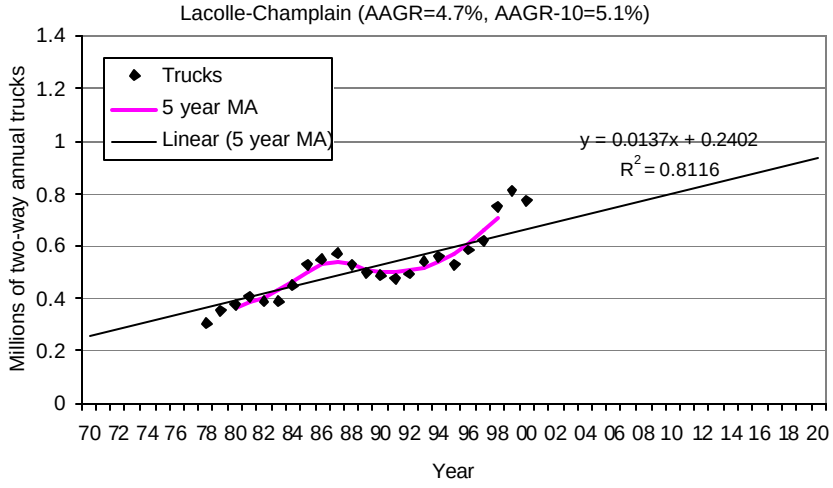

St Stephen-Calais (AAGR=5.5%)
Trucks
3 year MA
Linear (3 year MA)
y = 0.0117x - 0.1123
R2 = 0.9761
Millions of two-way annual trucks
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Year


Woodstock-Houlton (AAGR=6.6%)
Trucks
3 year MA
Linear (3 year MA)
y = 0.0074x - 0.0235
R2 = 0.7691
Millions of two-way annual trucks
0.6
0.5
0.4
0.3
0.2
0.1
0
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Year


Saint-Theophile-Jackman (AAGR=3.5%, AAGR-10=4.3%)
Trucks
5 year MA
Linear (5 year MA)
y = 0.0023x + 0.0515
R2 = 0.8878
Millions of two-way annual trucks
0.3
0.25
0.2
0.15
0.1
0.05
0
70 73 76 79 82 85 88 91 94 97 00 03 06 09 12 15 18
Year


Rock Island-Derby Line (AAGR=8.5%, AAGR-10=10.2%)
Trucks
5 year MA
Linear (5 year MA)
y = 0.0089x - 0.06
R2 = 0.9405
Millions of two-way annual trucks
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Year


Saint-Armand-Highgate Springs (AAGR=4.4%, AAGR-10=8.3%)
Trucks
5 year MA
Linear (5 year MA)
y = 0.0077x + 0.0153
R2 = 0.9099
Millions of two-way annual trucks
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Year


Lacolle-Champlain (AAGR=4.7%, AAGR-10=5.1%)
Trucks
5 year MA
Linear (5 year MA)
y = 0.0137x + 0.2402
R2 = 0.8116
Millions of two-way annual trucks
0 0.2 0.4 0.6 0.8 1 1.2 1.4
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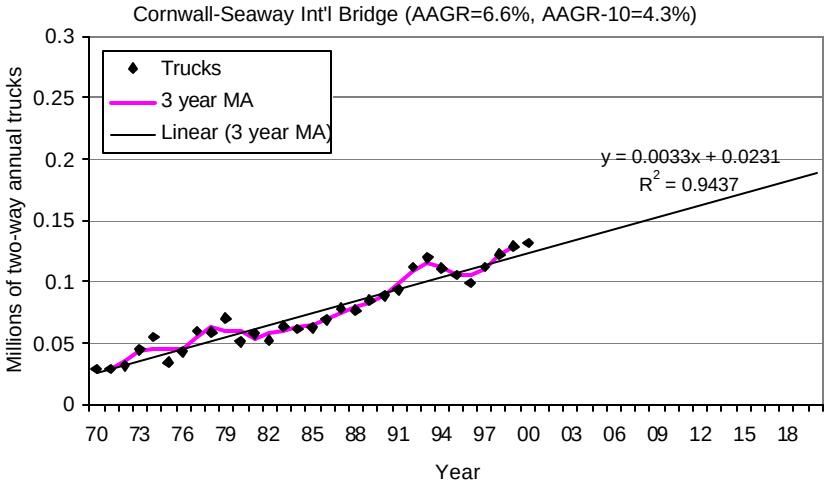
Year


Cornwall-Seaway Int'l Bridge (AAGR=6.6%, AAGR-10=4.3%)
Trucks
3 year MA
Linear (3 year MA)
y = 0.0033x + 0.0231
R2 = 0.9437
Millions of two-way annual trucks
0.3
0.25
0.2
0.15
0.1
0.05
0
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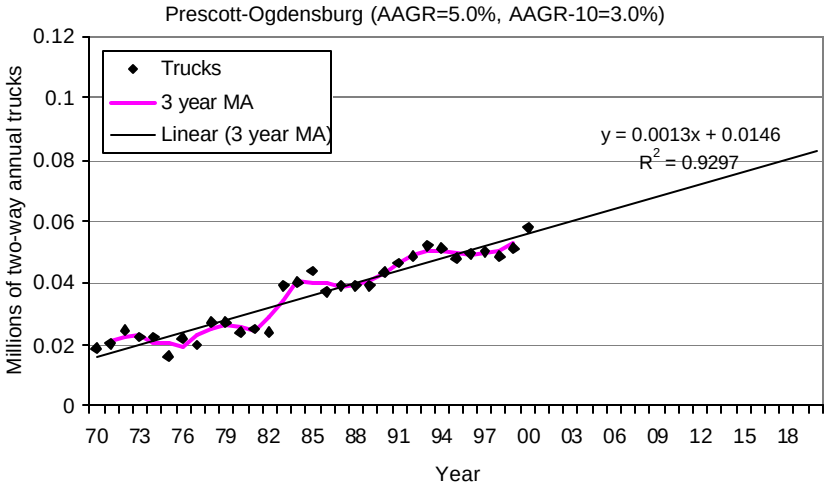
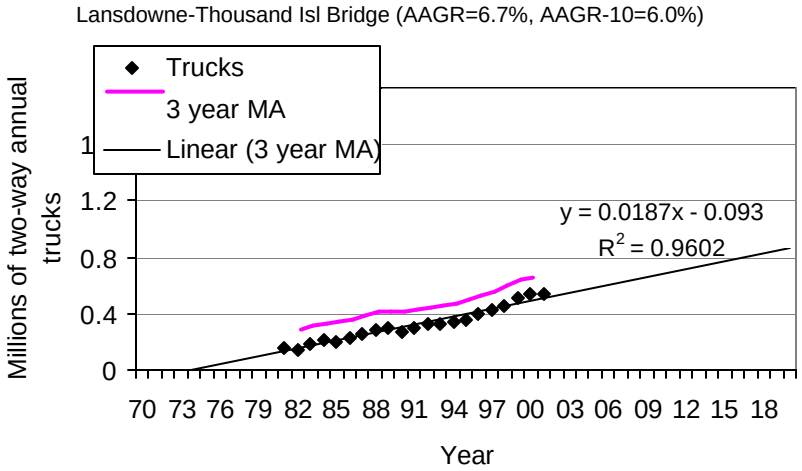
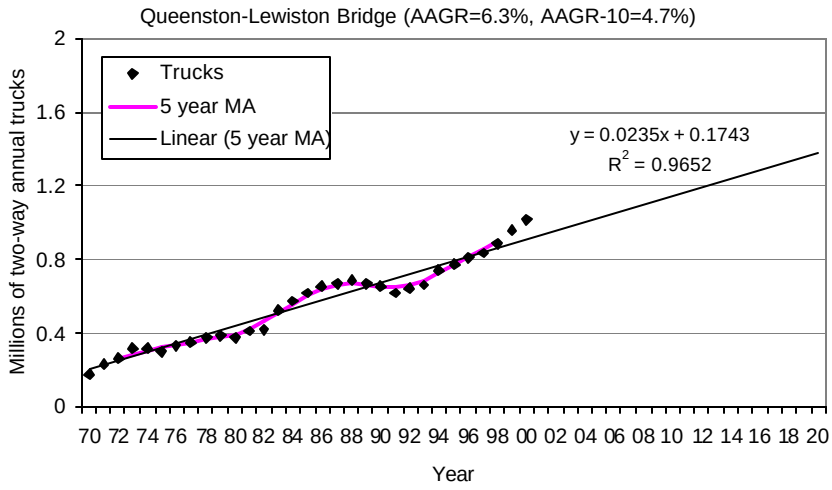
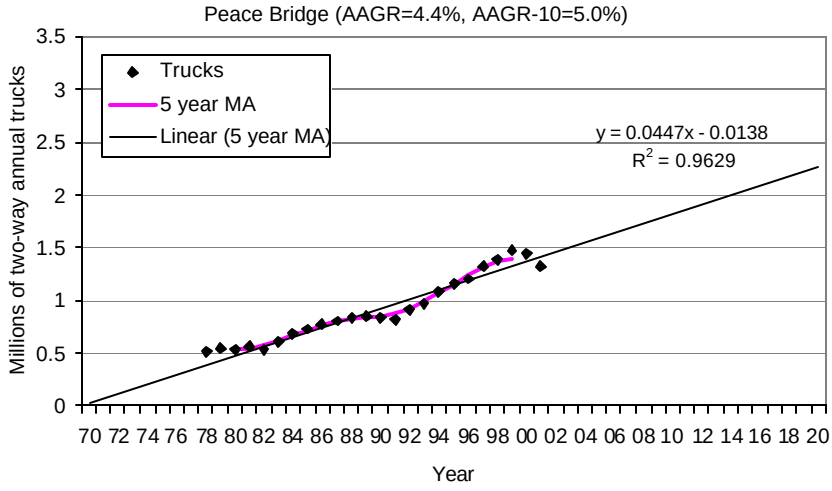
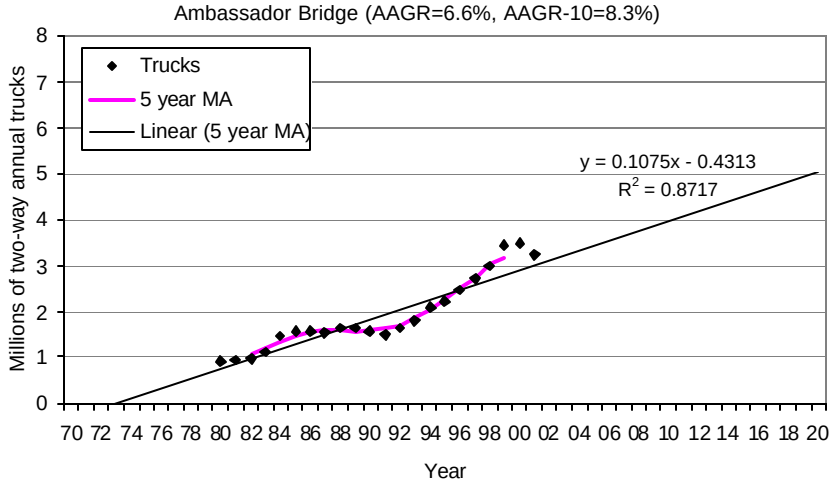
Year


Prescott-Ogdensburg (AAGR=5.0%, AAGR-10=3.0%)
Trucks
3 year MA
Linear (3 year MA)
y = 0.0013x + 0.0146
R2 = 0.9297
Millions of two-way annual trucks
0.12
0.1
0.08
0.06
0.04
0.02
0
70 73 76 79 82 85 88 91 94 97 00 03 06 09 12 15 18
Year


Lansdowne-Thousand Isl Bridge (AAGR=6.7%, AAGR-10=6.0%)
Trucks
3 year MA
Linear (3 year MA)
y = 0.0187x - 0.093
R2 = 0.9602
Millions of two-way annual trucks
1
1.2
0.8
0.4
0
70 73 76 79 82 85 88 91 94 97 00 03 06 09 12 15 18
Year


Queenston-Lewiston Bridge (AAGR=6.3%, AAGR-10=4.7%)
Millions of two-way annual trucks
Trucks
5 year MA
Linear (5 year MA)
y = 0.0235x + 0.1743
R2 = 0.9652
0
0.4
0.8
1.2
1.6
2
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Year


Peace Bridge (AAGR=4.4%, AAGR-10=5.0%)
Millions of two-way annual trucks
Trucks
5 year MA
Linear (5 year MA)
y = 0.0447x - 0.0138
R2 = 0.9629
0
0.5
1
1.5
2
2.5
3
3.5
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Year


Ambassador Bridge (AAGR=6.6%, AAGR-10=8.3%)
Millions of two-way annual trucks
Trucks
5 year MA
Linear (5 year MA)
y = 0.1075x - 0.4313
R2 = 0.8717
0
1
2
3
4
5
6
7
8
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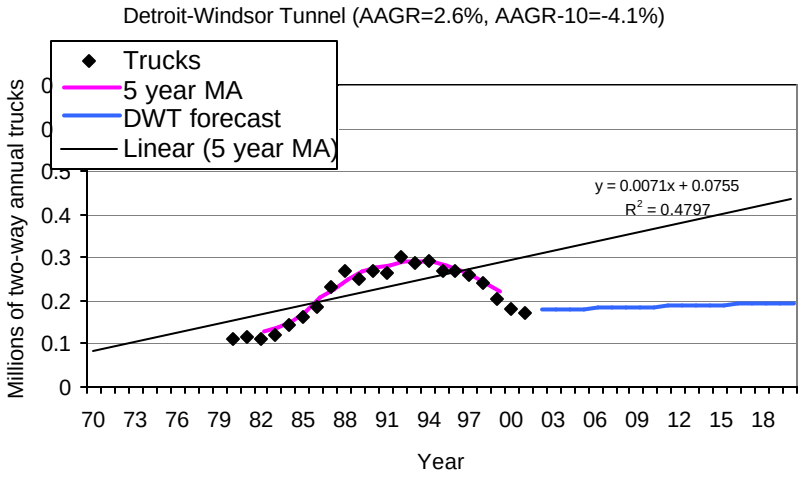
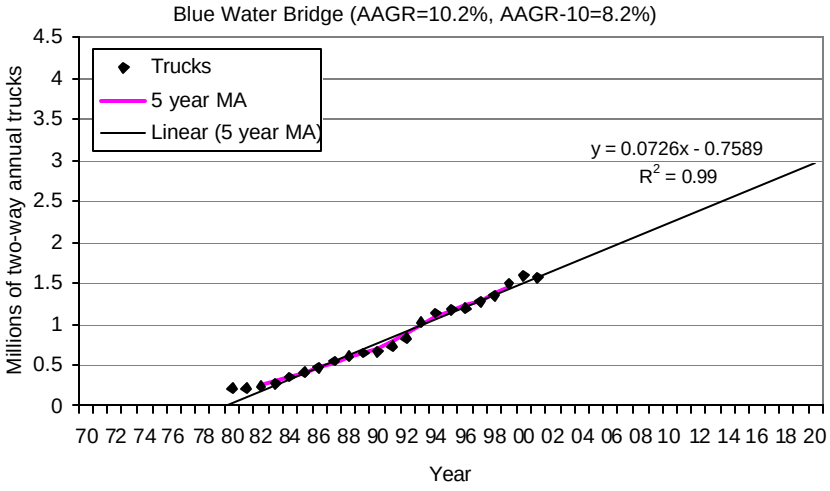
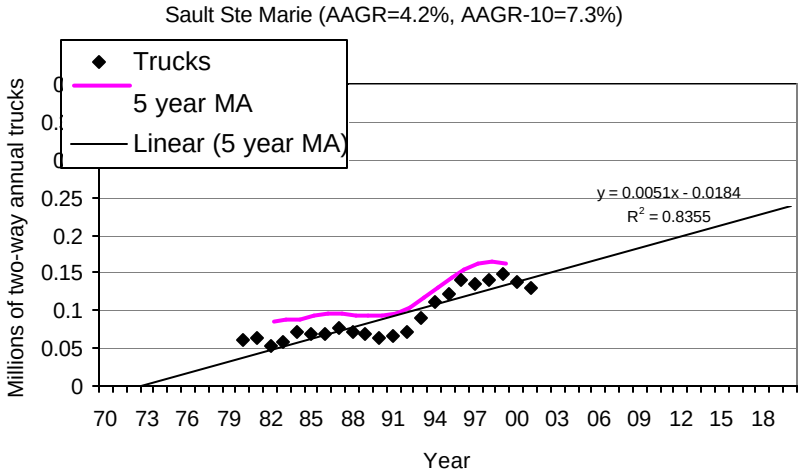
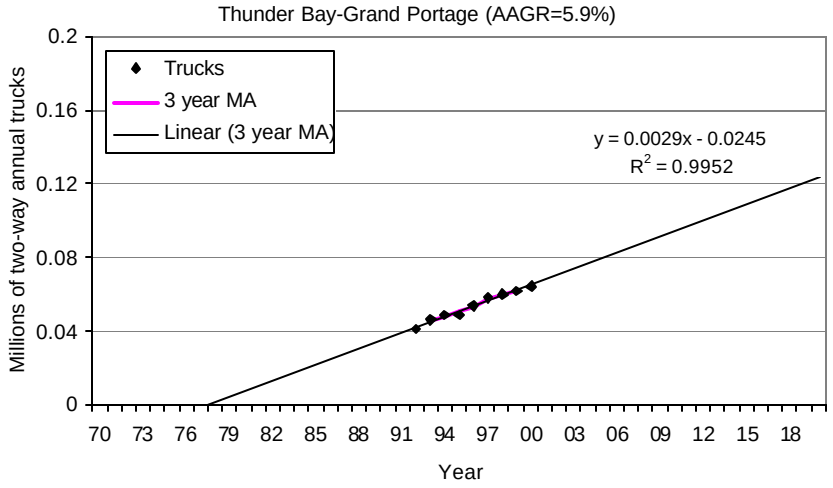
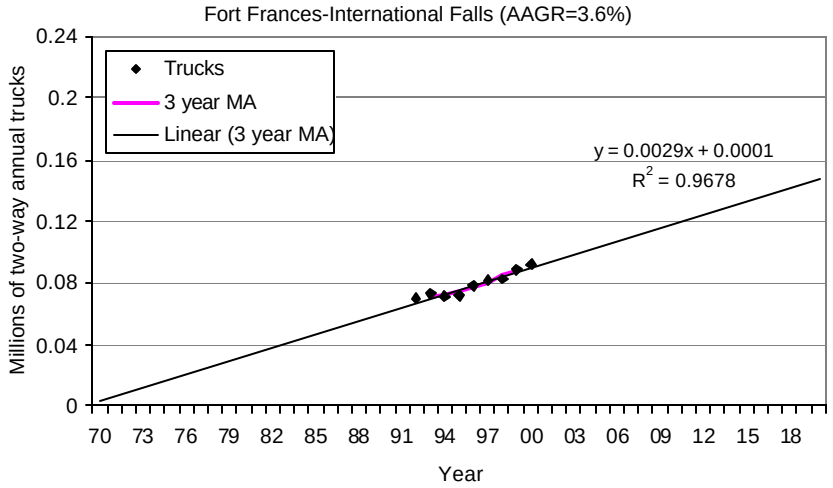
Year

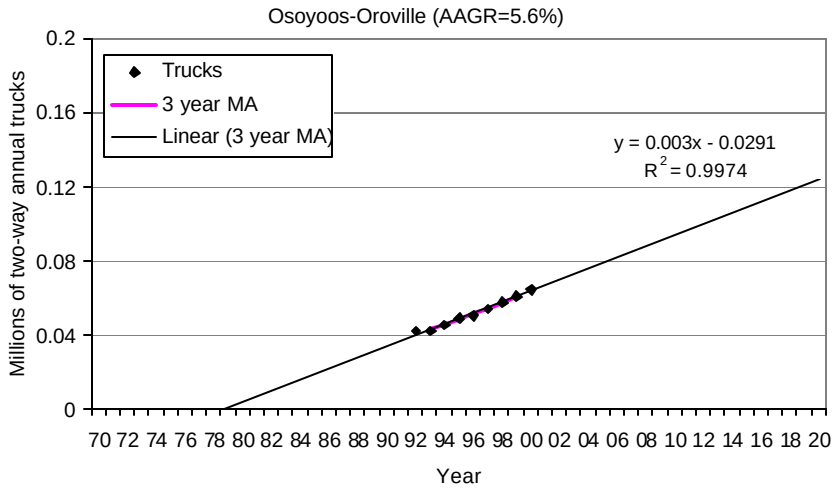

Detroit-Windsor Tunnel (AAGR=2.6%, AAGR-10=-4.1%)
Trucks
5 year MA
DWT forecast
Linear (5 year MA)
y = 0.0071x + 0.0755
R2 = 0.4797
Millions of two-way annual trucks
0
0.1
0.2
0.3
0.4
0.5
70 73 76 79 82 85 88 91 94 97 00 03 06 09 12 15 18
Year

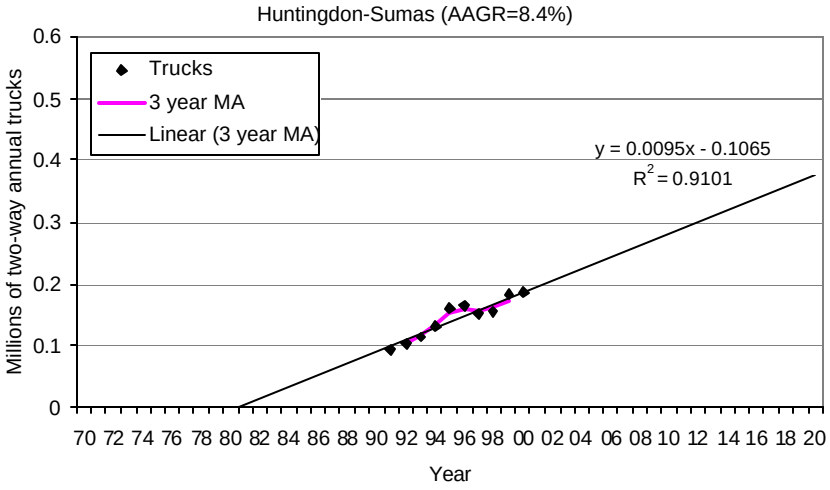

Blue Water Bridge (AAGR=10.2%, AAGR-10=8.2%)
Trucks
5 year MA
Linear (5 year MA)
y = 0.0726x - 0.7589
R2 = 0.99
Millions of two-way annual trucks
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Year

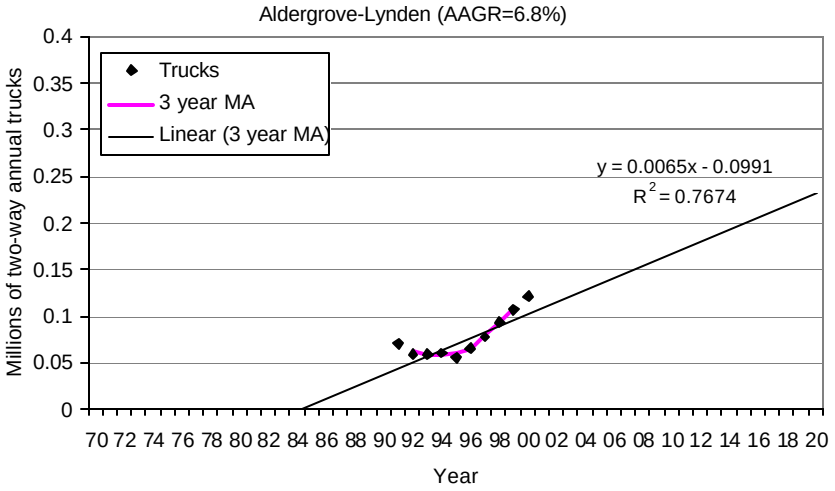

Sault Ste Marie (AAGR=4.2%, AAGR-10=7.3%)
Trucks
5 year MA
Linear (5 year MA)
y = 0.0051x - 0.0184
R2 = 0.8355
Millions of two-way annual trucks
0
0.05
0.1
0.15
0.2
0.25
70 73 76 79 82 85 88 91 94 97 00 03 06 09 12 15 18
Year

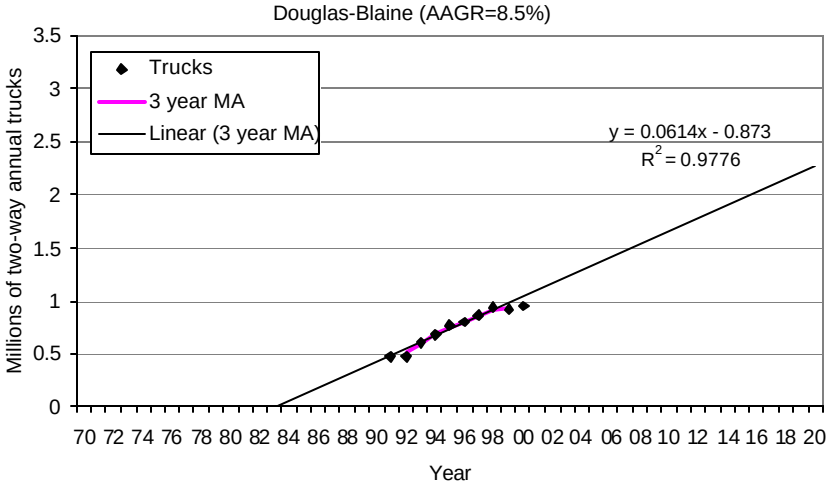

Thunder Bay-Grand Portage (AAGR=5.9%)
Millions of two-way annual trucks
0.2
0.16
0.12
0.08
0.04
0
Trucks
3 year MA
Linear (3 year MA)
y = 0.0029x - 0.0245
R2 = 0.9952
70 73 76 79 82 85 88 91 94 97 00 03 06 09 12 15 18
Year


Fort Frances-International Falls (AAGR=3.6%)
Millions of two-way annual trucks
0.24
0.2
0.16
0.12
0.08
0.04
0
Trucks
3 year MA
Linear (3 year MA)
y = 0.0029x + 0.0001
R2 = 0.9678
70 73 76 79 82 85 88 91 94 97 00 03 06 09 12 15 18
Year


Osoyoos-Oroville (AAGR=5.6%)
Millions of two-way annual trucks
0.2
0.16
0.12
0.08
0.04
0
Trucks
3 year MA
Linear (3 year MA)
y = 0.003x - 0.0291
R2 = 0.9974
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Year


Huntingdon-Sumas (AAGR=8.4%)
Trucks
3 year MA
Linear (3 year MA)
y = 0.0095x - 0.1065
R2 = 0.9101
Millions of two-way annual trucks
0
0.1
0.2
0.3
0.4
0.5
0.6
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Year


Aldergrove-Lynden (AAGR=6.8%)
Trucks
3 year MA
Linear (3 year MA)
y = 0.0065x - 0.0991
R2 = 0.7674
Millions of two-way annual trucks
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Year


Douglas-Blaine (AAGR=8.5%)
Trucks
3 year MA
Linear (3 year MA)
y = 0.0614x - 0.873
R2 = 0.9776
Millions of two-way annual trucks
0
0.5
1
1.5
2
2.5
3
3.5
70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 00 02 04 06 08 10 12 14 16 18 20
Year