

Highway Transportation Mode and Ontario's Trade with the United States, 1977-1987

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The value of trade between the Province of Ontario, Canada, and the United States is currently approximately \$130 billion. The purpose of this paper is to identify how the value of trade between the United States and Ontario changed from 1977 to 1987, focusing on the shift in modal share and in the type of major commodities traded. In particular, the reasons for the shift in modal share and subsequent actions by the provincial government will be documented.

The Ontario Ministry of Transportation has been keenly interested in information related to the movement of goods across its highway system in order to fulfill its highway protection and planning mandate.

The movement of goods has been the subject of increasing public attention caused by several factors; among them

1. Federal government initiatives on the signing of a free trade agreement with the United States and the implementation of regulatory reform of the transportation system;
2. Congestion and increasing volumes of larger and longer trucks on the highway system;
3. Economic considerations, which have meant that funds and support for new highway projects are based on an economic as well as a traffic rationale; and
4. Advanced deterioration of the highway network resulting from overloaded commercial vehicles.

The Municipal Transportation Policy Planning Branch is actively involved in goods movement data collection and analysis for its own purposes and in support of other policy offices in the Ontario Ministry of Transportation. For example, the branch

1. Undertakes major on-highway surveys of commercial vehicles at 5-year intervals;
2. Coordinates, funds, and directs municipal goods movement studies conducted periodically; and
3. Reviews data collection efforts by others. For example, much of the material in this paper is derived from Statistics Canada, a federal government agency.

The subject of this paper is the modal transport and trade relationship between the Province of Ontario and the United

States during the period 1977 to 1987. The data represent Province of Clearance information (i.e., where the commodity clears customs).

BACKGROUND

A review of 1987 data (Statistics Canada, International Trade Division, computer tapes, 1977 to 1989; unpublished import and export data) finds that Ontario is the principal importing and exporting province within Canada, accounting for 64 percent of Canada's import value, and 47 percent of Canada's export value (Figure 1).

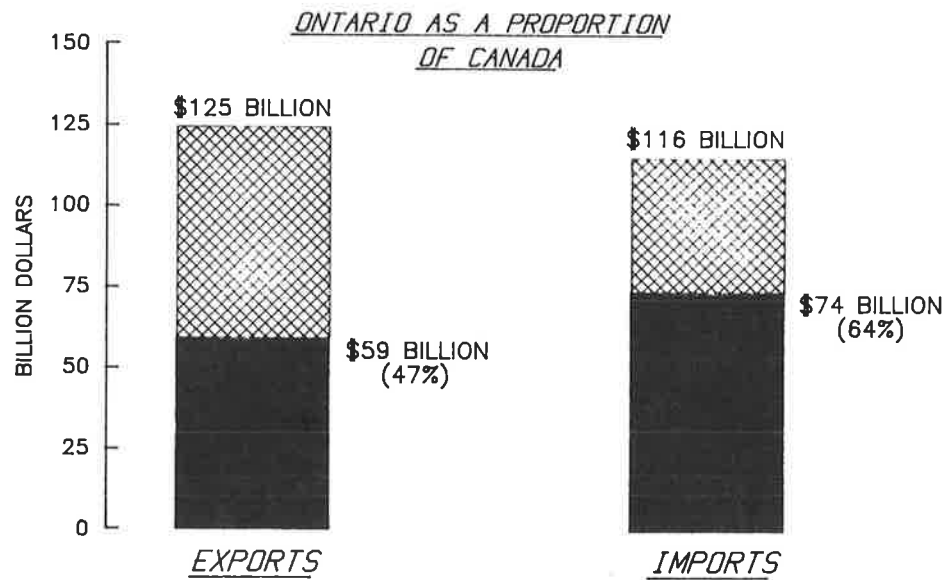
The United States is Canada's most valued trading partner; the U.S. provides 68 percent of its imports, and is the consumer of 76 percent of its exports (Figure 2). Conversely, Canada is the most valued trading partner of the United States, with a trade value in 1986 of some \$111.7 billion, 6 percent higher than that of Japan (1). Approximately 18 percent of U.S. imports come from Canada, whereas 21 percent of U.S. exports go to Canada. Although the United States imports more from Japan, it exports more to Canada (Figures 3 and 4). U.S. trade with Canada consistently exceeds its trade with the Federal Republic of Germany, Italy, the United Kingdom, and France combined.

Ontario's trading relationship is more closely linked to that of the United States than it is to that of the rest of Canada. About 89 percent of Ontario's exports go to the United States, whereas the United States supplies 80 percent of Ontario's imports (Figure 5). In contrast, 64 percent of exports from the rest of Canada are sent to the United States, and 48 percent of imports to the rest of Canada come from the United States.

The bulk of Ontario's trade with the United States is, not surprisingly, with those American states in closest proximity to it. The East North Central region, containing the states of Michigan, Wisconsin, Ohio, Illinois, and Indiana, accounted for \$22.4 billion, or 46 percent of Ontario's U.S. import total in 1987. This region also accounted for \$28.1 billion, or 53 percent of Ontario's U.S. export total in 1987 (Figure 6).

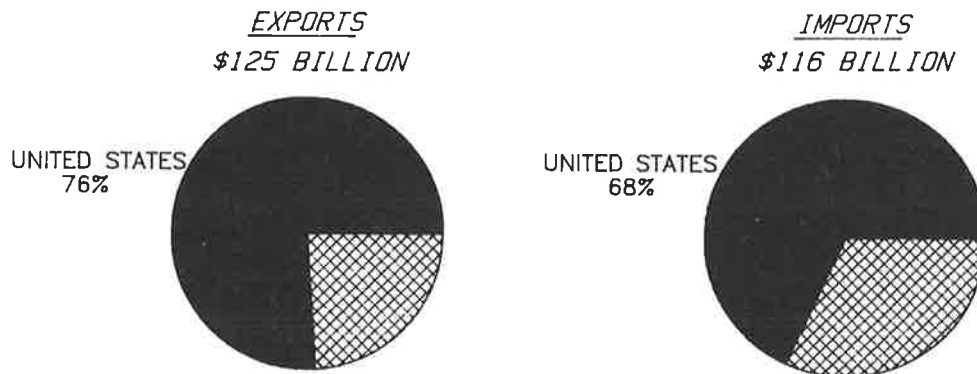
The Mid-Atlantic states of New York, New Jersey, and Pennsylvania are also prominent traders with Ontario, and their importance has increased over the past decade. In 1987, these states generated \$8.5 billion, or 18 percent of Ontario's U.S. imports, and \$12.2 billion, or 23 percent of Ontario's U.S. exports. Generally, between 1977 and 1987, the trade relationship between Ontario and the various U.S. census

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SOURCE: Statistics Canada International Trade Division

FIGURE 1 Distribution of Canadian trade, 1987.



SOURCE: Statistics Canada International Trade Division

FIGURE 2 Canada's trade relationship, 1987.

subdivisions became more diverse with proportionally less trade with the East North Central region.

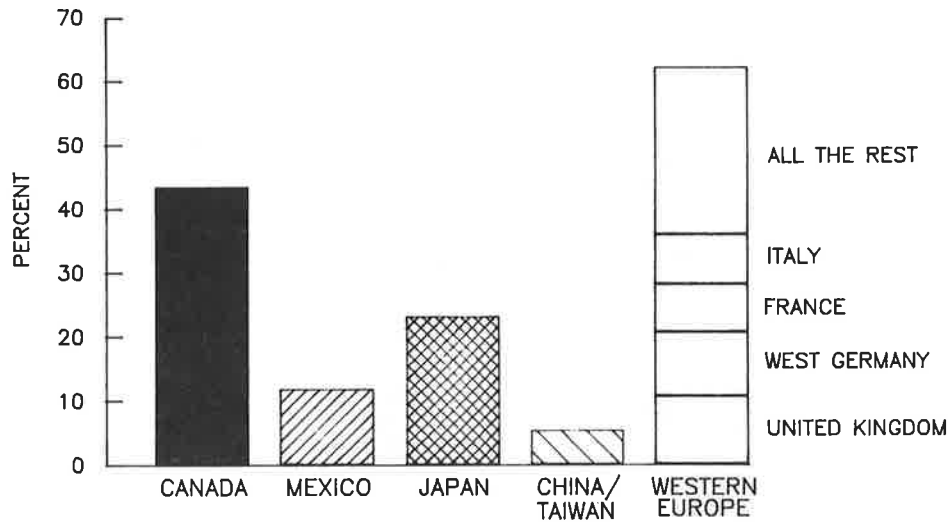
COMMODITY ANALYSIS

Import and export data collected by Statistics Canada also includes commodity information that is broken down into several large groups. Food and beverage-related items and special transactions are largely self-explanatory categories. Crude materials are broadly defined as unfinished goods: logs or nickel, for example. Fabricated materials are semi-finished goods such as lumber or steel, and end products are finished goods such as wood cabinets, furniture, or automobiles.

Increasingly, more of Ontario's exports are being processed to a finished product state. The proportion of Ontario's imports that were "end product"-related was already at a high level and exhibited little percentage change between 1977 and 1987 (Figure 7).

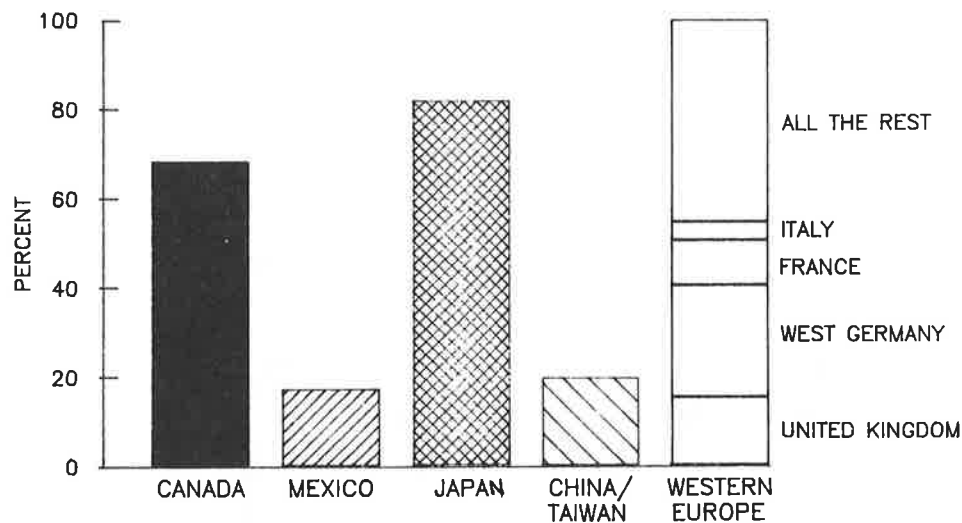
Not surprisingly, the automotive industry plays a pivotal role in the trade between Ontario and the United States. In 1977, 45 percent of Ontario imports from, and 50 percent of Ontario exports to, the United States were from this sector of the economy. In 1987, 42 percent of Ontario imports from, and 56 percent of Ontario's exports to, the United States were automotive industry products.

The automotive industry was particularly important in Ontario's trade to and from the states in the U.S. Midwest.



SOURCE: U.S. Bureau of the Census, Highlights of U.S. Export and Import Trade, Report FT990

FIGURE 3 Destination of U.S. exports, 1986.



SOURCE: U.S. Bureau of the Census, Highlights of U.S. Export and Import Trade, Report FT990

FIGURE 4 Origin of U.S. imports, 1986.

In contrast, trade with the mid-Atlantic and New England states was more diverse and proportionally contained more trade in fabricated materials.

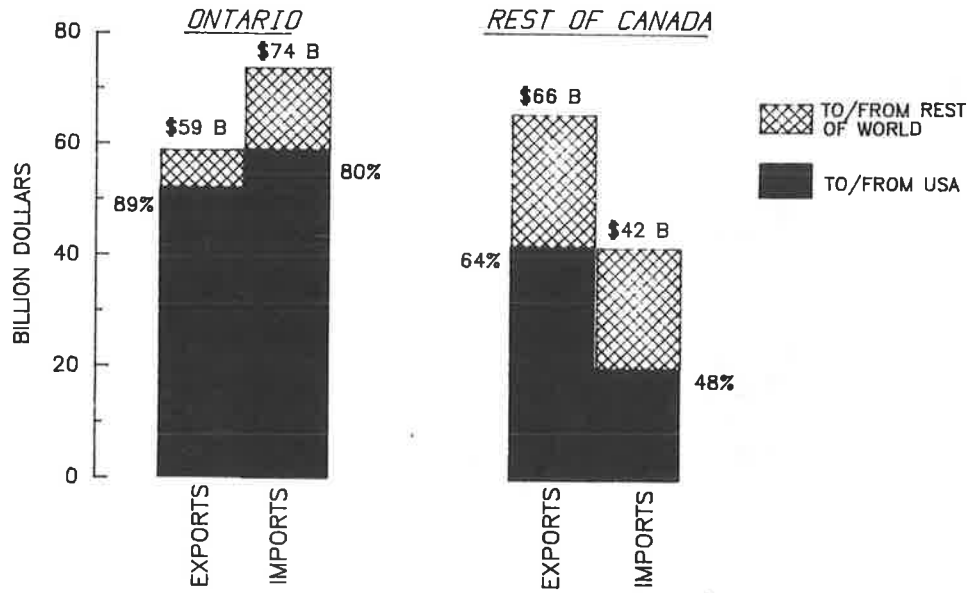
MODAL SHARE ANALYSIS

The majority of the value of Ontario's trade with the United States is transported by truck/highway mode. In 1977, 59 percent of Ontario's exports to the United States were transported by the truck/highway mode; by 1987, its proportion had increased to 70 percent at the expense of the rail mode (Figure 8). For Ontario's imports, the truck/highway mode

has an even greater share of transborder traffic. In 1977, 70 percent of the value of Ontario's imports from the United States were transported by the truck/highway mode; by 1987, this had risen to 85 percent of the total.

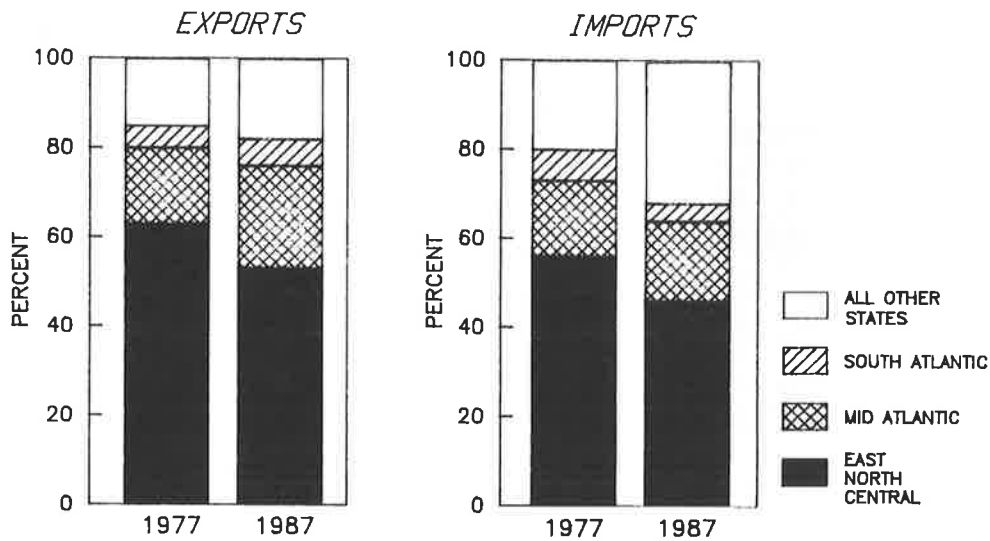
These changes were not merely a function of changes in value or currency fluctuations. There were significant declines in the amount of transborder rail traffic expressed in tonnage terms during this time period. The only components of rail traffic to increase appreciably between 1977 and 1987 were container on flatcar (COFC) and trailer on flatcar (TOFC) movements, which involved interfacing with the truck mode.

The transport modal share relationship varied considerably among the U.S. states. It was generally assumed that, all



SOURCE: Statistics Canada International Trade Division

FIGURE 5 United States trade emphasis, 1987.



SOURCE: Statistics Canada International Trade Division

FIGURE 6 Ontario/United States trade relationship, 1977 and 1987.

things being equal, the truck/highway mode would be less important in the transportation of Ontario's exports and imports to and from more distant states. This assumption did not always prove correct. For example, for Ontario's exports to points in the United States east of the Mississippi, the highway mode has become more dominant. This is true for the transportation of Canadian goods to the more southerly states, and less so for those transported to the mid-Atlantic and New England states, which are closer (Figures 9 and 10).

The modal share attained by rail to the East North Central states was found to be lower than anticipated, in light of the extensive trackage owned in that region by U.S. subsidiaries

of both of Canada's national railways. Factors influencing the aforementioned trends will be discussed later in this paper.

OTHER EVIDENCE OF TRUCK/HIGHWAY DOMINANCE

There was additional evidence of a general shift in favor of the truck/highway mode from other data sources. Between 1977 and 1987, the number of inbound trucks crossing into Ontario from the United States rose from 1.3 million to 2.2 million, an average annual increase of 5.4 percent (Statistics

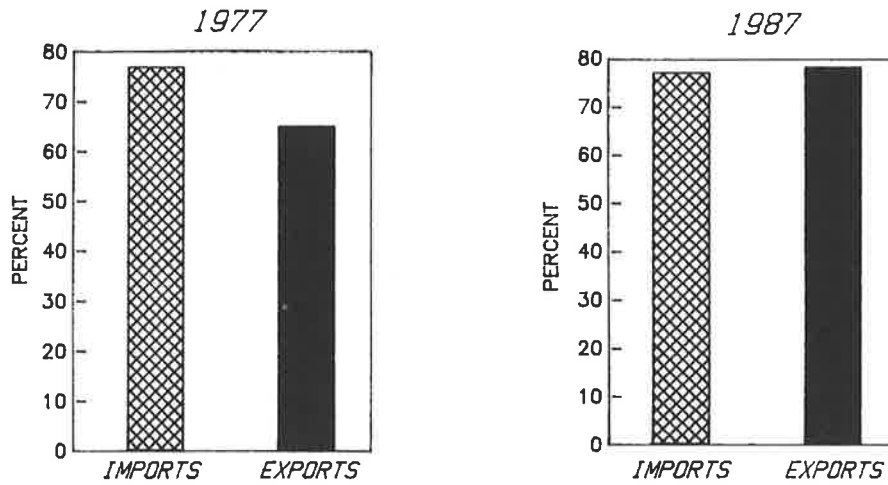


FIGURE 7 Proportion of trade value "end products," Ontario/United States, 1977 and 1987.

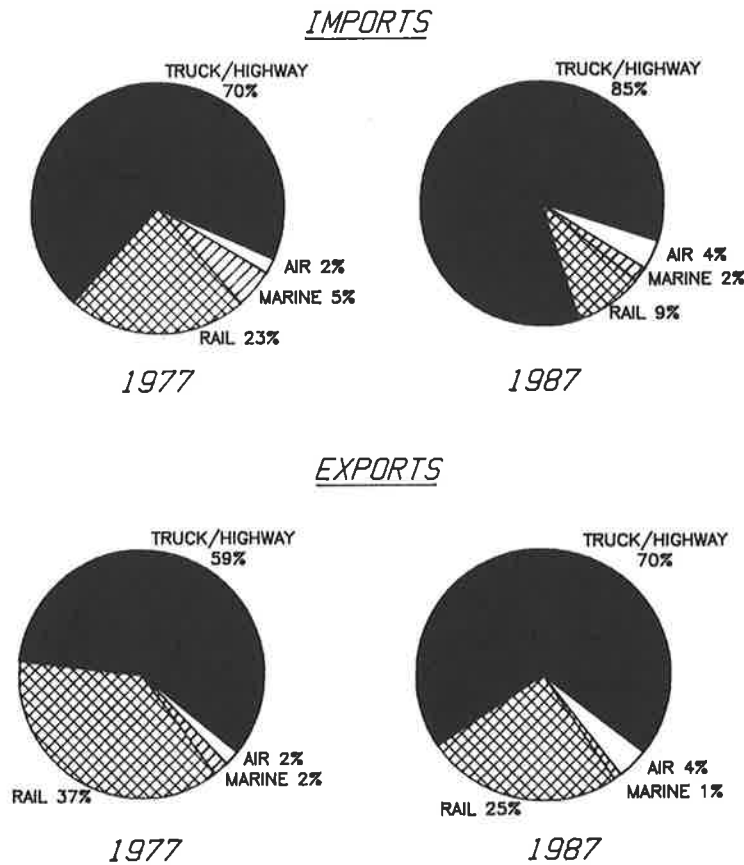


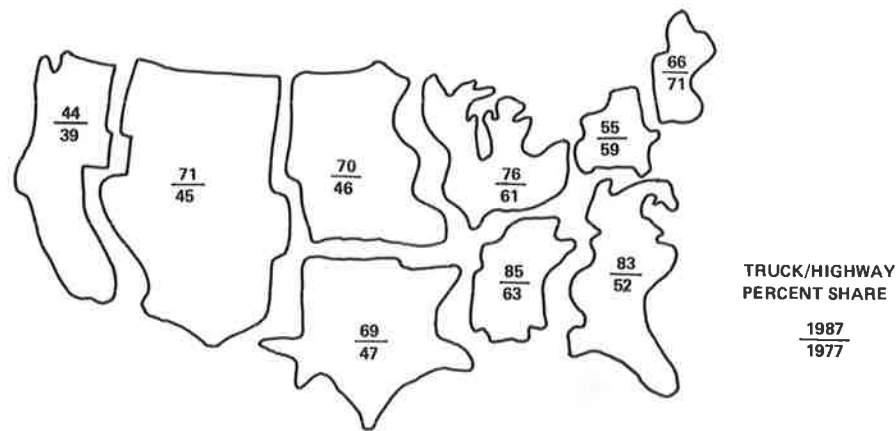
FIGURE 8 Ontario/United States trade relationship: mode used to cross customs, 1977 and 1987.

Canada, International Travel Division; unpublished data) (Figure 11). Truck movements via New York State gateways rose at a slightly higher rate: from 533,000 to 914,000, although the Ambassador Bridge at the Windsor-Detroit crossing continued to be by far the most heavily frequented border crossing, with 837,600 trucks traversing that crossing alone in 1987.

Preliminary information from the Ontario Ministry of Transportation's 1988 Commercial Vehicle Survey also sug-

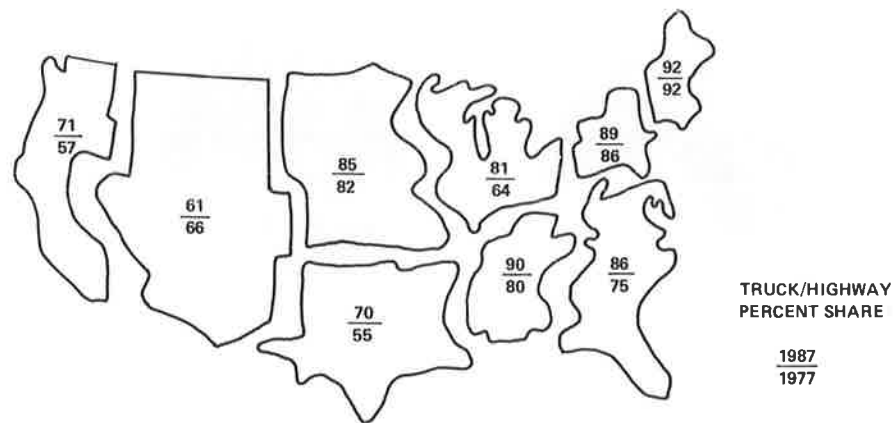
gests that the percentage of all international truck movements in Ontario is increasing at the expense of intraprovincial movements in particular.

Although truck volumes on the Ontario provincial highway system were also increasing in the 5 percent/year range, the degree of increase varied by highway; for example, they almost doubled between 1983 and 1987 on some segments of highways in the greater Toronto area. The highest truck volumes



SOURCE: Statistics Canada International Trade Division

FIGURE 9 Truck/highway modal share of Ontario/United States export trade value, 1977 and 1987.



SOURCE: Statistics Canada International Trade Division

FIGURE 10 Truck/highway modal share of Ontario/United States import trade value, 1977 and 1987.

were found among the 12-lane Highway 401 within Toronto, on which approximately 32,000 commercial vehicles passed per day.

REASONS FOR SHIFT IN MODAL SHARE

There are many reasons why the role of the truck/highway mode has been increasing in importance. First, the pattern of urban development is such that many new industrial areas are located along highways rather than rail lines.

Second, changes in regulations have permitted motor carriers to carry more weight, which has enabled them to be more competitive on longer distance trips. For example, in the early 1970s, a five-axle tractor trailer unit could carry a maximum weight of 80,000 lb; now the maximum weight permitted on Ontario highways is about 140,000 lb—greater than the amount that could be stored in the belly of a single 747 jumbo aircraft.

Third, the commodity mix has changed. More of both Ontario's imports and exports in particular are end products that are lighter and have a higher intrinsic value. Such goods are more favorably distributed by truck or air mode.

Fourth, the manner of production has changed with the introduction of the just-in-time inventory processing system by the automotive industry. There is less stockpiling of inventory; rather, both inputs and the final output must be delivered more promptly. The truck/highway mode is most suited to that type of scheduling. Somewhat surprisingly for the exporting of automotive products, however, the truck/highway proportion of modal traffic changed only marginally and was approximately 64 to 65 percent in both 1977 and 1987.

Fifth, the structure of the transportation industry, by definition, favors greater use of the truck/highway mode because there are far more carriers who offer greater flexibility in transporting goods with superior prices and service than can be found with the other modes. Even bulk commodities, such as lumber, that have been traditionally moved by the rail

mode are now increasingly being handled by the truck/highway mode. For example, in 1977, only 20 percent of the value of Ontario's lumber exports to the United States were transported by the truck/highway mode; by 1987, 92 percent were transported by that mode (Figure 12).

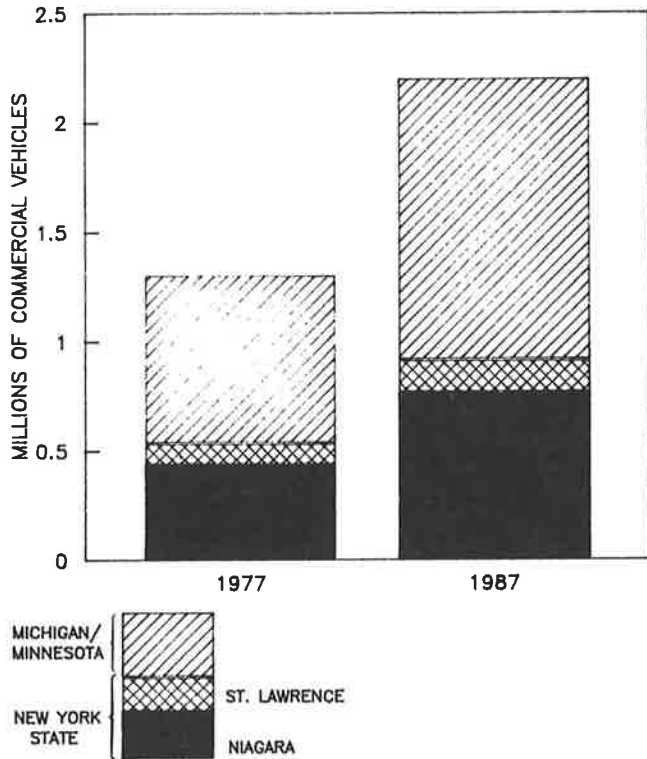
The reason why the truck/highway mode was not as prominent in the trade relationship between Ontario and the mid-

Atlantic and New England states is twofold: (a) there is a higher proportion of trade in fabricated materials rather than end products; in that particular class of commodity, rail transport can be (and obviously is) quite competitive, and (b) contrary to the national trend, the rail mode has been successful in maintaining or retaining a significant share of the exporting of automotive products from Ontario through aggressive marketing. Three-quarters of all rail export traffic to the mid-Atlantic/New England states is made up of one commodity: passenger automobiles and their chassis. The rail mode transports 86 percent of Ontario's exports of this commodity to those two U.S. census subdivisions, but only 27 percent of this commodity to the remainder of the United States.

The inability of the rail mode to attract or maintain transborder traffic during this decade, particularly in the East North Central region, is a function of many complex factors. Among them are the short distance of haul to and from destinations north of the border and the predominant commodity traffic mix, but also the perceived reluctance to adopt double-stack technology and more actively solicit intermodal traffic by Canadian rail carriers.

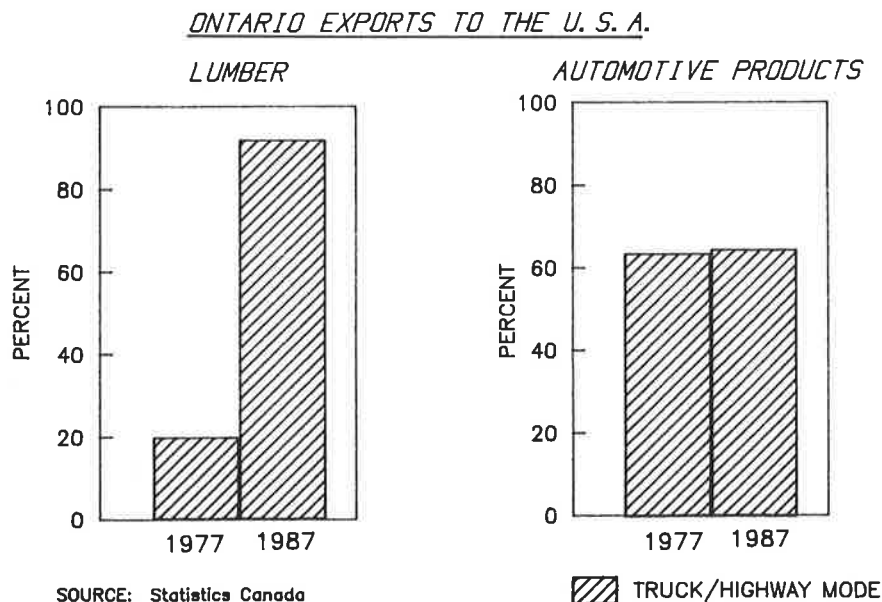
Sixth, there are continual additions and enhancements to the highway infrastructure system on both sides of the border. This is at a time when the rail network is shrinking through branch line abandonment, the St. Lawrence Seaway is still constrained by weather and the size of its locks, and the air mode is hampered by airports that do not have enough runways and terminals and whose ability to move goods is affected by the existence of curfews on night flights, insufficient numbers of customs clearance personnel (given the demand), and bilateral restrictions.

For example, a major U.S. air cargo carrier is permitted to fly into Toronto, Canada's principal air passenger and cargo hub, to unload goods but is not allowed to fly goods out. Instead, it is forced to have them sent by truck to Buffalo, where they are flown to its central U.S. sorting hub in Ohio for distribution (2).



SOURCE: Statistics Canada International Travel Division

FIGURE 11 Inbound border truck movements, Ontario/United States, 1977 and 1987.



SOURCE: Statistics Canada

FIGURE 12 Modal share changes, 1977 to 1987.

Yet another firm finds airport customs facilities in Toronto so busy that it is actually faster to fly instead to Buffalo and to truck goods to Toronto. Because of such constraints and flight infrequency to some destinations, it is estimated that almost 15 percent of air cargo traffic at Pearson International Airport in Toronto is trucked to its final destination.

Seventh, because of such physical or operational considerations, there is greater use of American gateways to move a considerable proportion of Ontario's trade to and from other continents. For example, Canada Post recently made a decision to forward mail to Europe using trucks to transport it first to New York and then to Europe by U.S. air carriers, rather than by Air Canada via Canadian gateways at Toronto and Montreal, as it had done previously (3). Flights were discovered to be more frequent and cheaper by using that route. This has led to further increases in truck traffic on Ontario's highways.

A review of trade data found that approximately 29 percent of Ontario's imports from other continents and 21 percent of Ontario's exports to other continents are transported by the truck/highway mode, using an American port or airport such as Port Elizabeth, Detroit, Miami, or New York (Figure 13).

IMPLICATIONS

Some problems have been associated with the shift in modal share in favor of the truck/highway mode. First, although increases in truck volumes on the provincial highway system and at the border have largely been commensurate with those of automobiles, expansion and enhancement of the network and border crossings have not kept pace with this degree of increase. As a result, there has been increased congestion at border areas and during the peak hour in major municipalities.

Trucks generally deliver during the off-peak hour in urban locations to minimize the effects of congestion; typically, they account for 10 to 15 percent or less of peak hour travel. During

the course of the conduct of the Ontario Ministry of Transportation's 1988 Commercial Vehicle Survey, classification counts indicated that truck activities were far less oriented to the peak hour than were those of automobiles (Ontario Commercial Vehicle Survey, to be published in 1990) (Figure 14).

The expansion of the peak hour has, however, affected truck scheduling so much that a recent goods movement study in Toronto estimated that close to 30 percent of the cost of moving goods—or almost \$2 billion per year—was directly attributable to congestion (4) and could be expected to increase to 50 percent of the cost of moving goods if no mitigating measures were undertaken. Because of the larger size and operational characteristics of trucks, they are increasing viewed by commuters as contributors to congestion and there have been calls in some circles for their movement to be restricted, for example, most recently in Charleston and Los Angeles (5,6).

Second, trucks have been increasing in size and length, whereas automobiles are becoming smaller and less powerful, raising concerns about safety, particularly given the perceived effects of deregulation in both Canada and the United States.

Third, because trucks are now carrying heavier and denser commodities such as lumber, greater pressure is being borne by pavement surfaces, requiring increased and more frequent rehabilitation.

Fourth, the increase in both truck movements and the proportion of those movements that are related to dangerous goods has resulted in the desire of some communities to have truck bypass routes constructed by the province in order to minimize the perceived risk of an incident. The economic cost of providing such routes, given general fiscal restraint measures, is, however, increasingly prohibitive.

PROVINCIAL AND OTHER ACTIONS

In recognition of the broader economic role of highways and the need to make a long-term commitment to transportation

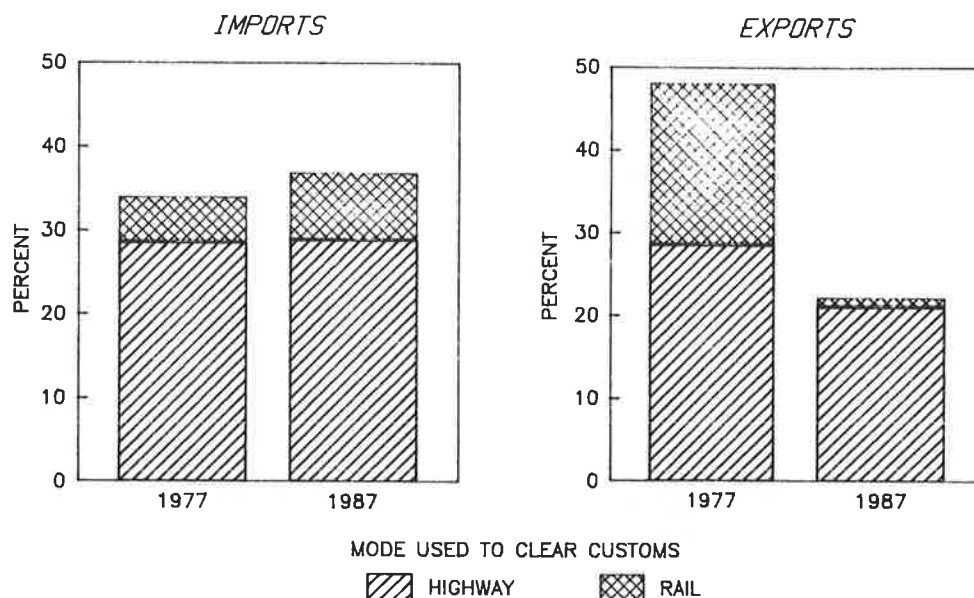


FIGURE 13 Role of United States gateways: Ontario's trade to all other countries, 1977 and 1987.

INBOUND MOVEMENTSA.M. PEAK REPRESENTS

17.9% of daily total



12.1% of daily total

OUTBOUND MOVEMENTSP.M. PEAK REPRESENTS

20.1% of daily total



10.0% of daily total

TRUCKS CONSTITUTE

- 15% of 7–9 a.m. – inbound movements
- 10% of 4–6 p.m. – outbound movements
- 22% of remainder of day inbound movements
- 20% of remainder of day outbound movements

SOURCE: 1988 Ontario Commercial Vehicle Survey
7 day/24 hour classification count
Trafalgar North & south inspection stations

FIGURE 14 Peak hour characteristics.

investment to support sustained economic growth, a number of measures and initiatives have been adopted to deal with the subjects of congestion, the increase in truck volume, and the shift in modal traffic to the truck/highway mode.

First, the cornerstone of provincial action in this regard was a recent announcement of a \$2 billion, 5-year transportation capital program by the provincial treasurer in his May 1989 budget (7). In the fastest-growing regions of the province, the following major improvements are planned:

- Expansion and accelerated construction of the provincial highway network,
- Considerable financial commitment for major municipal arterial roads and connecting links,
- Increases in capital spending for municipal transit projects, and
- Expansion of provincially operated commuter rail service.

These actions would have the effect of enhancing mobility on both the highway and transit networks, enabling goods to be moved more expeditiously by truck. To improve service levels and safety in other areas of the province, freeway capacity would be increased by widening some highways, constructing new highways, and adding more truck climbing lanes on selective facilities.

Second, measures are being implemented to improve the operational efficiency of highways with the expansion of the freeway traffic management network.

Third, because responsible decisions cannot be made in a vacuum, there is an increase in research to better quantify goods movement considerations for highway planning and protection purposes. As indicated previously, major commercial vehicle surveys are undertaken on the provincial network every 5 years, the province funds and provides direction for municipal studies on the subject, participates on task forces organized by other levels of government, and undertakes related research.

Fourth, to enhance safety and protect the pavement surface, enforcement of weight restrictions and safety standards on commercial vehicles has been added. This has been accomplished through periodic enforcement blitzes and altering the hours of operation of the province's truck inspection stations. Since 1985 in Ontario, the Ministry of Transportation highway enforcement personnel and the Ontario Provincial Police have laid over 2,000 charges for on-highway offenses.

Constructive efforts have been undertaken by both the private and public sectors as well. To minimize the effects of congestion, both manufacturers and motor carriers are resorting to evening and weekend deliveries. Measures have been adopted by Canada Customs to reduce inbound border truck

traffic by permitting goods to proceed without inspection in bond to inland "suffrage" customs warehouses and by placing additional truck booths at customs areas for through truck traffic.

As this paper illustrates, monitoring and accounting for the movement of goods is a complex undertaking, but it should provide worthwhile insights for transportation planners and engineers for use in capital planning, maintenance staging, and enforcement deployment. It is hoped that the results of this paper would be to encourage further work to be undertaken in this field of research.

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The opinions expressed in this paper are solely those of the author and in no way reflect the position of the Ontario Ministry of Transportation.

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