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NORTH AMERICAN TRADE DIVERSION:
A NEW PERSPECTIVE

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The purpose of this paper is to discuss the routing of North American maritime trade, from the perspective of recently completed and ongoing transportation research on the hinterland of Canadian ports, cargo "diversion" in North America, and the supply of intermodal transport services for international trade. The topics covered in this paper are:

- (1) an overview of developments which have affected Eastern Canadian ports since the introduction of containerization, including a discussion of the factors behind the shifts in activity among major North American ports;
- (2) an assessment of the economic factors behind the growth of intermodalism in the movement of unitized cargo by liner shipping companies;
- (3) an analysis of cargo movements in the context of the total distribution system.

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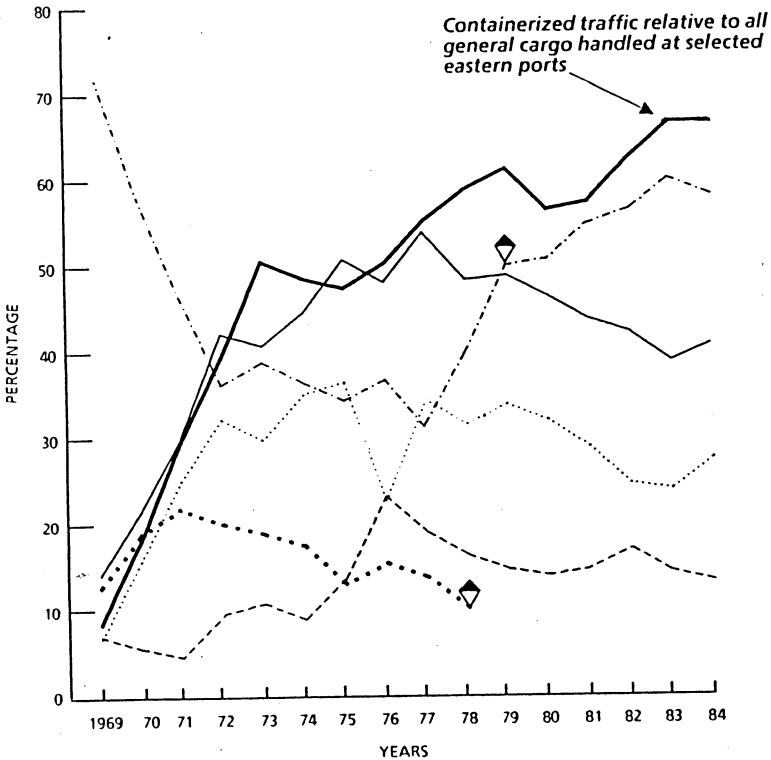
The main thrust of this paper is that in the intermodal era of transportation, the shifts in role among major North American ports and so-called "Cargo diversion", goes far beyond the issue of economic "losses" incurred by specific ports.

1. Trends in the Supply of Deep Sea Container Shipping Services in Canada

Containerization, which was first introduced into the Canadian deep sea trades during 1968 in the Port of Montréal, captured much of the general cargo trade by 1978. By 1984, nearly fifty per cent of all general cargo handled by the six major Canadian ports was containerized; this trend was even more pronounced for Eastern ports where almost 70 per cent of general cargo was containerized. The growth of containerization in the movement of general cargo in Eastern ports is illustrated in Figure 1. This figure also indicates the share of containerized traffic handled by the Atlantic ports relative to the St. Lawrence ports.

A close examination of Figure 1 shows the past and ongoing impacts of the containerization on the cargo handled by Eastern Canadian ports. First, during the 1969-1976 period, port activity in Halifax and Saint John significantly increased because containers allowed the quick and efficient intermodal transfer of

Figure 1
DISTRIBUTION OF CONTAINERIZED TRAFFIC
BY SELECTED EASTERN PORTS
1969 - 1984
(tonnage figures)



Legend

- Port of Québec
- Port of Saint John
- Port of Halifax
- Port of Montréal
- Ports of Halifax and Saint John
- ◆ CP Navigations operations transferred from the port of Québec to the port of Montréal in 1978

Source: Research Branch, Canadian Transport Commission.

cargo from ships to trucks or rail lines. These characteristics of the changing transport system significantly reduced the disadvantages of distance in the ports' hinterland which was common during the pre-container era. Despite the relatively small volume of container traffic in Canada, the use of many ports by liner companies was quite pervasive until about 1978. The strategy of liner companies to use many ports has been referred to as the "multi-port approach".

From the beginning of 1979 to the middle of 1981, container port traffic in Canada, became more concentrated, indicating many liner companies started to abandon the "multi-port approach". Very high volumes of cargo were required to attain the economies of scale associated with the large container ships and container transport facilities either at ports or at inland interchange points between modes. Therefore, ports which are connected to more extensive rail and road networks were in a much better position to capture container traffic. For example, the fact that Montréal was linked to very extensive inland transportation networks has meant that, since 1979, the port of Québec has not handled any containerized traffic. The main economic reason for this was that the inland costs of hauling container freight directly to Montréal was lower than the combined costs of the maritime and port sector costs of handling the cargo at the port of

Québec. In other words, a call at the Port of Québec involves the whole ship as an indivisible unit while the incremental cost of the overland hauling may relate to only a small percentage of the entire cargo.

The economics of port choice not only takes into account the concentration of cargo at certain ports, but also the relative advantage of port locations. A secondary (i.e. less important) port could, from an ocean carrier's perspective, be economically included in an existing itinerary which is already sustained by large volumes of cargo. The economic incentive which would convince a carrier to include a secondary port in its itinerary would occur when the additional revenues generated by calling on the secondary port exceed the incremental costs of serving that port. Cases in point are the ports of Halifax and Saint John which are generally included in North Atlantic and Trans-Pacific-North American container routes. The large volumes of American trade loaded and unloaded at ports from New York to Norfolk, combined with the well developed inland networks connecting the ports of Halifax and Saint John to major Canadian industrial markets, provide the economic justification for their inclusion in the itineraries of many American shipping routes.

From the late 1970's to 1981, which can be considered as the first phase in the rationalization of

Canadian port, liner companies were choosing to serve fewer ports, thereby increasing the concentration of traffic in certain ports.

The second phase, which covered the 1981-1984 period, was marked by major decisions of two liner companies. In mid-1981, Dart Container Line moved its operations from Halifax to Montréal and, late in 1982, ACL consolidated all of its operations in Halifax. These recent changes have highlighted the comparative roles of the two ports. Montréal is the Canadian port served by ocean liners offering containerized services that usually do not include American ports in their itineraries while Halifax has emerged as the port used by maritime carriers offering container services to both American and Canadian ports; the latter are generally referred to as "continental routes".

2. Intermodalism and Competition between North American Ports

Although during the past ten years, the impact of containerization has mainly been viewed in terms of standardization of equipment, rationalization of port operations and shifts in activity among ports, the developing inland transport networks connected to ports have been the decisive factor in changing the traditional concept of a port's hinterland. Increasingly, liner shipping companies are playing a

greater role in the total distribution of cargo by implementing international intermodal through transport services. The above approach, where the shippers are offered a comprehensive door-to-door transport service, has enabled ocean carriers to reach farther into inland markets both in Canada and the United States. The two main consequences of this trend are:

(1) a port can no longer consider its traditional hinterland (any area within a reasonably close proximity) as a captive market;

(2) Canadian and United States' overseas trade are increasingly subject to routing through non-national ports.

The latter cargo movements are usually referred to as "diversion phenomena". Diversion is the process whereby carriers serving country A solicit cargo from shippers in country B, then transport it overland from country B to A for final shipment overseas to country C. Main statistics on cargo diversion in North America are presented in Tables 1 and 2.

Table 1 shows that East coast ports in Canada handled most of the American overseas trade moving through Canadian ports. In fact, between 1976 and 1984, U.S. cargo accounted for about 23 per cent of the containers traffic growth in these ports. However, table 2 (based on 1978 constant dollar) reveals that a substantial amount of Canadian overseas trade was also diverted through U.S. ports. In addition, what is much more relevant to observe is that the diversion of

Table 1
CONTAINERIZED INTERNATIONAL TRAFFIC GROWTH
IN CANADA
1976 - 1984

| | <u>East Coast</u> | | <u>West Coast</u> | | <u>Canada</u> | |
|---|-------------------|-------|-------------------|-------|---------------|-------|
| | 1976 | 1984 | 1976 | 1984 | 1976 | 1984 |
| Canadian traffic at Canadian ports: | | | | | | |
| (1) (000, TEU) average annual growth | 305.1 5.5% | 468.6 | 71.2 6.1% | 114.1 | 376.3 5.6% | 582.7 |
| American traffic through Canadian ports: | | | | | | |
| (2) (000, TEU) average annual growth | 49.9 14.4% | 146.6 | 1.4 11.3% | 3.3 | 51.4 14.3% | 149.9 |
| Total containers handled at Canadian ports | | | | | | |
| (3) (000, TEU) average annual growth | 355.0 7.1% | 615.2 | 72.6 6.2% | 117.4 | 427.7 7.0% | 732.6 |

* Twenty Foot Equivalent Unit

Source: Canadian Transport Commission, Research Branch.

Table 2
 CANADIAN AND AMERICAN DIVERTED TRADE
 1978-1982
 (000 000, \$)
 (in constant 1978 Canadian dollar)

| | 1978 | 1979 | 1980 | 1981 | 1982 |
|---|----------------|----------------|----------------|----------------|----------------|
| Canadian Trade Through USA | | | | | |
| (1) Via US East Coast | 922.2 | 959.3 | 973.6 | 1 132.3 | 1 055.7 |
| (2) Via US West Coast | <u>1 577.6</u> | <u>2 667.3</u> | <u>3 121.7</u> | <u>3 856.2</u> | <u>2 959.1</u> |
| (3) Total | 2 499.8 | 3 626.6 | 4 095.3 | 4 988.5 | 4 014.8 |
| American Trade Through Canada | | | | | |
| (4) Via Canadian East Coast | N/A | 2 686.2 | 2 823.2 | 3 123.2 | 2 520.4 |
| (5) Via Canadian West Coast | <u>N/A</u> | <u>189.4</u> | <u>229.9</u> | <u>208.4</u> | <u>224.8</u> |
| (6) Total | 2 675.0 | 2 875.6 | 3 053.1 | 3 331.6 | 2 745.2 |
| <u>Selected Breakdown</u> | | | | | |
| Canadian Trade Through US West Coast | | | | | |
| (7) Export | 192.9 | 165.1 | 240.8 | 312.1 | 407.0 |
| (8) Import | 1 384.7 | 2 502.2 | 2 880.9 | 3 544.1 | 2 552.1 |
| American Trade Through Canada's East Coast | | | | | |
| (9) Export | N/A | 1 018.9 | 1 451.4 | 1 574.3 | 1 233.5 |
| (10) Import | N/A | 1 667.3 | 1 371.8 | 1 548.9 | 1 286.9 |

Note: N/A not available

Source: Canadian Transport Commission, Research Branch

American and Canadian cargo takes on distinctive patterns. Liner shipping companies operating through U.S. west coast ports had a significant impact on the routing of Canadian trade, mainly with regard to our import trade. By contrast, liner companies serving Canadian east coast ports carried a substantial amount of trade originating from and destined for the United States.

The origins and destinations of this diverted overseas trade, as shown in Tables 3 and 4, emphasize this distinctive pattern. American trade diverted through Canada is essentially destined for or originating from Western European countries, while the bulk of Canadian trade diverted through U.S.' ports is destined for or originating from Asian countries. In addition, there is a certain amount of Canadian exports via American Atlantic ports, which are destined for South America, Central America and Middle East.

Various reasons have been proposed as explanation for the diversion phenomena:

- (1) "thin" Canadian trade on some maritime routes, resulting in less frequent calls at Canadian ports in comparison with American ports (such as for South and Central America);
- (2) differences between Canadian and American labour costs, port charges, and union regulations (such as container destuffing and stuffing rules); and
- (3) more efficient and better co-ordinated intermodal services in Canada due to the development of extensive inland transport networks.

Table 3
 AMERICAN TRADE DIVERSION
 COUNTRY GROUPS OF ORIGIN AND DESTINATION
 (by percentage of value)
 1982

| COUNTRY GROUPS | EXPORTATION | | | IMPORTATION | | |
|-----------------|-------------|------------|------------|-------------|------------|------------|
| | Total | East Coast | West Coast | Total | East Coast | West Coast |
| Western Europe | 79.4 | 93.5 | 6.5 | 81.0 | 96.6 | 3.4 |
| Eastern Europe | 13.2 | 81.0 | 19.0 | 2.4 | 98.6 | 1.4 |
| Middle East | 0.6 | 80.7 | 19.3 | 0.2 | 98.2 | 1.8 |
| Africa | 1.1 | 98.6 | 1.4 | 3.5 | 98.8 | 1.2 |
| Asia | 4.0 | 45.9 | 54.1 | 10.1 | 73.8 | 26.2 |
| Oceania | 1.1 | 54.7 | 45.3 | 1.2 | 90.8 | 9.2 |
| South America | 0.5 | 71.6 | 28.4 | 1.0 | 89.0 | 11.0 |
| Central America | 0.1 | 93.6 | 4.4 | 0.6 | 98.7 | 1.3 |
| Total | 100.0 | 89.3 | 10.7 | 100.0 | 94.3 | 5.7 |

Source: Canadian Transport Commission, Research Branch

Table 4

CANADIAN TRADE DIVERSION
COUNTRY GROUPS OF ORIGIN AND DESTINATION
 (by percentage of value)
 1982

| COUNTRY GROUPS | EXPORTATION | | | IMPORTATION | | |
|-----------------|-------------|------------|------------|-------------|------------|------------|
| | Total | East Coast | West Coast | Total | East Coast | West Coast |
| Western Europe | 12.8 | 83.4 | 16.6 | 9.8 | 52.8 | 47.2 |
| Eastern Europe | .. | | | .. | | |
| Middle East | 11.4 | 96.7 | 3.3 | 0.1 | 93.8 | 6.2 |
| Africa | 3.0 | 97.7 | 2.3 | 6.6 | 30.9 | 69.1 |
| Asia | 49.6 | 38.7 | 61.3 | 79.0 | 2.0 | 98.0 |
| Oceania | 4.8 | 82.7 | 17.3 | 0.7 | 17.5 | 82.5 |
| South America | 10.9 | 98.9 | 1.1 | 2.4 | 87.1 | 12.9 |
| Central America | <u>7.5</u> | 96.5 | 3.5 | <u>1.3</u> | 78.2 | 21.8 |
| Total | 100.0 | 65.7 | 34.3 | 100.0 | 9.7 | 90.3 |

(..): less of 0.1 percent

Source: Canadian Transport Commission, Research Branch

The rest of this paper will develop the thesis that the implementation of intermodal services has had a significant impacts on the evolution of the structure of the North American trade diversion and that these services are going to have an increasing influence on the total distribution system.

3. Intermodalism and International Liner Shipping Companies

As it is apparent from the first two sections of this paper, by and large, containerization has made the implementation of cost efficient intermodal transport services technologically feasible. This evolution in transportation has altered the conventional notion of a sea port's hinterland because ocean carriers now can have greater access to new inland markets across the North American continent.

Until recent regulatory changes in the United States, multimodal transport has been more common in Canada than in the United States. However, recent U.S. deregulatory legislation are resulting in the development of U.S.-based multimodal transport enterprises. For example, the U.S. Shipping Act of 1984 now allows individual liner companies to offer time-volume rates and complete intermodal services (referred to as "service contracts" in the U.S.). Such intermodal services could include pick-up and delivery,

inland as well as maritime transport and freight forwarding services.

The above discussion leads us to the question of the economic and commercial reasons behind the liner shipping companies decision to become involved in these new integrated transport services. This raises the issue of scale economies associated with the utilization of containers and, concurrently, issues related to ships' size and transportation geography.

With the introduction of containers into deep-sea trade, ports have experienced a notable transformation in their operations due to improved cargo handling methods. Among other things, these improvements have meant higher productivity and faster turnaround time at the ports. In order to take advantage of the scale economies made possible by the use of containers, liner companies, during the mid-1970's, introduced a new generation of fully cellular containerships to replace conventional vessels converted to carry containers.

The introduction of specialized containerships, with their much larger carrying capacity, has resulted in two major organizational problems in the distribution of cargo. The first problem was the need for better integration with and coordination between land and maritime transport so as to achieve a rapid inland turnaround of containers and

to avoid port congestion. The second problem has been to establish a new equilibrium between route density (effective demand) and the expanded capacity provided by the new specialized fleet of large containerships (effective supply); the latter were made economically feasible by the greater handling speed of containerized cargo.

Liner companies have attempted to solve the first distributional problem by supplying coordinated services of more than one mode under their own control. This extension of ocean carriers' activities into surface transport sector has been achieved through cooperation and formal agreements with rail and truck carriers or, directly, through vertical integration by the acquisition of carriers in other transport modes. An example of a special arrangement by an ocean carrier is the American President Lines leasing its own railway equipment and having an agreement with a railway to operate this equipment. Typical examples of integrated firms are CP Enterprises Ltd. in Canada and Sea-Land Services in the U.S.

These recent initiatives by liner companies can be explained in large part by the fact that port container facilities and the new containerships are highly capital intensive and require high density traffic volumes to achieve the scale economies which would make the investment profitable. In order to have

control over the cost and quality (i.e. reliability) of service offered to shippers in inland markets, it is in the economic and business interest of the liner companies to offer intermodal transport services.

In regard to the second distributional problem, resulting from the faster turnaround time at ports and the larger, but fewer, containerships, there has been an integration of services and an expansion of geographical markets. Typical examples of integrated services are the consortium, Atlantic Container Lines (ACL) and, more recently, the new liner company, Canada Maritime, which was jointly created by CP Ships and Dart Container Line. The broader geographical markets are embodied in the new port itineraries and service patterns, which have resulted in greater traffic concentration in fewer ports.

In practice, market forces have concurrently imposed solutions to both distributional problems. Today, the available intermodal transport technology has been adapted and well integrated into the operations of inland carriers. Since its introduction into the transport system by liner shipping companies, the container has come to be considered as a unit of transport. After selecting the carrier, the shipper tends to let the carrier take complete responsibility for the transport of cargo, including routing and the choice of port. Within the context of oceanborne

containerized cargo, inland modes are playing an increasingly important role in the development of container transport networks, and, consequently, the maritime routes established by liner carriers. With the increasing use of larger specialized container ships, liner companies will be more and more selecting ports on the basis on the total cost of delivery to final destinations.

In summary, the strategies chosen by individual liner companies are, to a large extent, determined by the following five factors:

- actual and/or potential market size
- inland transport networks
- frequency of shippers' transport requirements
- length of maritime itineraries
- sizes of ships.

The economic impact of these factors have already been discussed, but the particular effects on Canadian transportation are worth noting and should be monitored; this monitoring should include such new developments as the inland container terminals.

4. New Cargo Routing and the Concept of Inland Terminals

"Round-the-world" services and inland terminal centers dominate the recent and ongoing developments in the supply of international liner shipping services. Both of these developments reflect the idea that intermodalism has reached a certain stage

of maturity and that liner shipping is entering the third phase of containerization. Round-the-world services has been already proposed or announced by American President Lines, Evergreen Container Lines, and the joint services of Neptune Orient Lines and Orient Overseas Container Lines. These new services can be viewed as an extension of continental services (joint American and Canadian port itineraries), which characterize many of the actual container routes calling on Halifax, Saint John and Vancouver.

The scale economies derived from the overall intermodal transport system always provides the economic rationale for the establishment of round-the-world services and continental routes. However, economies of traffic density have also encouraged liner companies to supply such services. These latter economies refer to the decrease in incremental costs associated with a particular segment or facility of the system. These economies of traffic density are a result of:

- (1) to some extent, larger and more specialized vessels;
- (2) savings resulting from the automation of port facilities;
- (3) technological improvements in the inland transport modes; and
- (4) savings achieved in the development of consolidation/marshalling inland centers.

It is likely that the co-existence of economies of scale and economies of traffic density in

the supply of international intermodal services are the major inducements for liner companies to operate round-the-world and continental services. The key requirements for the abovementioned economies is the concentration of cargo handling facilities. The actual growth of existing continental services are evidence that such concentration can be achieved.

On the other hand, geographic concentration (access to major cargo markets) is not always possible to achieve. This explains why both round-the-world services or continental routes include selected ports within well-defined and rational routes. The two remaining factors to consider are ship size and distances between major markets.

The North Atlantic route has two important features. First, it is by far the shortest of the deep-sea container routes. Second, after the North American-Far Eastern route, it is the second largest route for containerized cargo. Since this route is relatively short, fleets of relatively small ships can serve a small number of ports, provided the services are reasonably frequent.

Montréal's central location in North America and its relative proximity to Western European ports allow some liner companies to simultaneously serve the Canadian industrial heartland and the U.S. Mid-west markets (especially between Chicago and Detroit). The

ocean carriers decision to use the port of Montréal are based on a fast turnaround time at port, minimum transit time on the maritime portion through a simple route structure integrated with an inland transport network. Those three components allow competitive overall transit times and constitute an alternative to round-the-world and continental services to North American/Western European shippers.

The information contained in Tables 1 and 3 and the fact that Western Europe is the main market for Montréal support the contention of comparative economic advantages of liner companies operating out of Montréal on the North Atlantic route and the view that there is a great deal of American diverted trade handled by Montréal-based ocean carriers.

Nevertheless, continuing technological innovations and changes in the organization of cargo distribution systems, combined with recent regulatory reforms in the U.S. (i.e. the Shipping Act of 1984 and the Stagger's Act of 1980), indicate that the current situation is a dynamic rather than a static one.

Inland container terminals are a recent innovation which may in some markets become an integral part of the intermodal system. The inland terminal's philosophy is that "...large container vessels and speedy handling of containers at the port alone would not yield the ultimate advantage of large-scale

intermodal movements (linked with either round-the-world or continental services) if the cargo could not reach its inland destination at the same rapid pace."

(Hayut, Y. (1980)) A typical inland container terminal might provide some or all of the following services:

- (1) grouping and dispatching consignments to obtain dense traffic flows;
- (2) consolidating shipments in order to minimize costs by either ensuring full containerloads or reducing pick-up and delivery charges;
- (3) offering auxilliary services such as forwarding and packaging; and finally,
- (4) providing temporary warehousing and storage facilities.

Although this list is not exhaustive, it indicates the numerous functions, traditionally provided by sea ports which can potentially be provided by these inland container terminals.

There are a number of reasons for constructing inland container terminals. First, from the shipping companies' point of view, there are the combined advantages of quicker movement of containers and the wider access to inland points. Second, from the inland carriers' viewpoint, there would be better co-ordination between trucking firms and railways. Third, from mainly the railways' perspective, there is the opportunity to achieve economies of traffic density. The distance of these terminals from ports may vary considerably and they do not necessarily have to be points of origin or destination. These terminals will, of necessity, require a high degree of

accessibility to major highways, rail lines and ports. This concept has already been introduced into North America with the co-operation of some railways and shipping lines.

In view of the above, there is a strong indication that a greater co-ordination and integration of the links in the intermodal transport chain are likely to emerge as inland container terminals become established. It is also likely that as market forces intensify this trend, international carriers will be thinking in terms of offering intermodal services as a complete package. The major question arising from these potential developments is: what will be the impact on the actual cargo distribution in North America, particularly with reference to Canadian ports?

The answer to this question is not obvious. The possible "continentalization" of container transport networks cannot be ignored. Trends in the development of international intermodal transport systems, including the emerging operational and organizational strategies of liner shipping carriers, will clearly have a major direct impact on the movements of Canadian and American trade as well as the viability of our ports.

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