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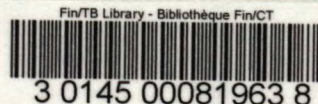
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**AN ECONOMIC ANALYSIS
OF
CANADIAN DEEP-SEA
SHIPPING OPTIONS
(MAIN REPORT)**

**Working Paper
Prepared for the
Shipping Advisory Board**

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Chapter 1

INTRODUCTION

1. BACKGROUND

Canada is a major consumer of deep-sea shipping services, ranking 10th in the world in terms of tonnage used according to the latest available UN statistics.¹ In 1974, however, less than two per cent of deep-sea tonnage used by Canadians was supplied by vessels registered under the Canadian flag.²

This contrast between deep-sea shipping services used by Canadians and supplied by Canadian flag shipping is the result of a government decision which has proved to be exceptionally durable. Canada emerged from the special circumstances of the Second World War with the fourth largest merchant marine in the world. By 1949 it was apparent that the fleet could not operate without government assistance. The government of the day declined to provide such assistance, and the fleet was disbanded. In effect, a decision had been taken to rely on the international shipping market to provide low-cost shipping services for Canada. Although other measures have since been taken to promote and protect Canadian shipping and shipbuilding, these have not led to the development of a Canadian deep-sea fleet.

While the decision not to foster a Canadian deep-sea fleet has proved to be durable, it has been subject to challenge. Those who support the development of a Canadian-flag deep-sea fleet have usually argued that it would have employment and balance of payments benefits, and that the lack of Canadian-flag deep-sea shipping may present certain risks to the security of Canada's overseas trade. As a result, the possibility of encouraging the development of a Canadian deep-sea fleet has been the subject of frequent re-examination.

In 1970, a major study of the economics of establishing a Canadian fleet was prepared for the Canadian Transport Commission by Hedlin Menzies and Associates.³ Neither the use of Canadian-built ships nor Canadian participation in the general cargo trades, however, were considered in this study. Principal findings of the study were that only a few bulk commodities offered prospects of full employment for Canadian-flag ships, and that a Canadian merchant marine would require continuing capital and operating subsidies to meet international competition. With respect to the possible employment benefits, the study

¹United Nations, Department of Economic and Social Affairs, Statistical Yearbook, 1975, Table 159, pp. 501-509.

²Alcan Shipping Services, Shipping Options for Canadian International Deep-Sea Trade, August 1977, Vol. III, p. 5-21. The term "deep-sea shipping" excludes Canadian coastal and Great Lakes shipping, in which there is, of course, very substantial Canadian flag participation.

³"Canadian Merchant Marine: Analysis of Economic Potential" (Ottawa, Government of Canada, 1970).

estimated that perhaps 200-450 officers and crew could be employed on potential Canadian-flag vessels, depending upon assumptions as to fleet size and composition.¹

An interdepartmental committee under the chairmanship of the Ministry of Transport supplemented these findings in March, 1973. The committee concluded, *inter alia*, that government assistance of \$30,000 to \$45,000 per crew member per year would probably be required if large bulk carriers were to be operated under the Canadian flag. If such ships were to be built in Canada, additional investment in Canadian yards would be required, and the costs of local building seemed likely to be 30 to 40 per cent higher than the costs of building in, for instance, the Far East.

The question of whether Canada should retain a "hands-off" policy with respect to the provision of deep-sea shipping services was also considered in a 1974 consultant's report to the Ministry of Transport by the late Howard Darling.² Mr. Darling pointed to certain developments that might inhibit freely competitive outcomes in international shipping markets and hence adversely affect Canadian interests. In particular, he was concerned by increasing interference in shipping by some countries, as indicated by cargo reservation for national flag fleets and the conclusion of bilateral cargo-sharing treaties. The proposed UN Convention on a Code of Conduct for Liner Conferences -- often referred to as the UNCTAD Code -- was also cited as evidence of international sanction of nationalistic interference in shipping markets and a potential threat to Canadian interests.³ Finally, Mr. Darling was concerned that Canadian bulk and container shipping services might be threatened by cartelization or increased cartelization.

The Darling Report has sometimes been viewed as endorsing the reintroduction of a Canadian-flag deep-sea fleet. Mr. Darling's terms of reference enjoined him to focus on possible roles for Canadian flag shipping, and he did indicate that conditions might arise which would lead to the natural development of Canadian participation in deep-sea trades. Mr. Darling emphasized, however, that Canadian-flag shipping was only one of the instruments available to protect Canadian interests in shipping, and observed that "alternative methods are likely to be less expensive and more effective".⁴ He explicitly cautioned against the hasty construction and operation of a Canadian-flag deep-sea merchant marine.

¹*Ibid.*, p. 280.

²"Elements of an International Shipping Policy for Canada" (Ottawa, Government of Canada, 1975).

³The proposed UNCTAD Code would allocate movement of general cargo by liner conferences according to a formula: 40 per cent of such cargo would be carried in vessels of the exporting country, 40 per cent in vessels of the importing country, and 20 per cent in third country vessels.

⁴"Elements of an International Shipping Policy for Canada", p. 55.

The essential message of the Darling Report in fact lies elsewhere. Mr. Darling called for a Canadian shipping policy with clearly defined objectives to be administered by a single authority within the government of Canada.

The concerns raised by Mr. Darling were subsequently noted by the Minister of Transport, and in June 1975 the Government announced that Canada would adopt a more positive international shipping policy to protect and promote national interests, and that an interdepartmental Shipping Advisory Board would be established to coordinate shipping policy activities and develop a framework for future shipping policies.

The Shipping Advisory Board has initiated a number of studies to review current and prospective problems in shipping. A principal study area consists of the analysis of the costs and benefits of shipping options for Canadian deep-sea trade.

The first phase of this analysis was undertaken by Alcan Shipping Services Ltd. (referred to below as the Alships Report), and examined private sector profits and losses associated with the operation of foreign and potential Canadian shipping services on major Canadian trade routes. The Alships study attempted to fill two gaps in previous research by obtaining information on the general cargo trades and on the costs of Canadian shipping using Canadian-built ships. In general, the study concluded that foreign costs of providing deep-sea shipping services would be less than the comparable costs of Canadian-flag operations.

The present study constitutes the second phase of the analysis, and examines shipping options on major Canadian trade routes from a national economic perspective. Whereas the Alships study focused on a financial analysis of the various shipping options from the perspective of a potential private investor, the present study explores the implications of the various shipping options for the efficient use of Canadian resources. It will be seen that this focus on real resources significantly alters the manner in which a potential investment is examined. In particular, consideration of total resource implications requires the incorporation of "external" effects not captured in a private assessment, but which are nonetheless important from the point of view of the national economy. These external effects include the potential of the various options to impact positively on the balance of payments and to provide employment in the Canadian shipping and shipbuilding industries. An important aspect of this study is an attempt to quantify the costs and benefits associated with these effects, and to see how such considerations affect the attractiveness of the various options.

2. THE DEEP-SEA SHIPPING MARKET

This is not the place for a detailed description of the international shipping industry or Canada's deep-sea trade. For purposes of the following analysis, however, it will be useful to begin with a short description of the environment, institutional setting, and market developments against which Canadian deep-sea shipping options must

necessarily be considered. The following section, therefore, reviews briefly the post-war development of deep-sea shipping, the changing cost structure and methods of providing shipping services, competition in the industry, the nature of Canada's deep-sea trade and of Canadian participation in deep-sea shipping, government intervention in the industry, and the current and prospective market outlook for shipping and shipbuilding.

Post-War Development of Deep-Sea Shipping

The post-war period, up to the mid 1970's, was one of unparalleled expansion in international sea-borne commerce. Rising national incomes and increasing integration of national economies led to rising international trade. Relative cost reductions also took place in the cost of deep-sea transport. The result of these factors was an explosive growth in deep-sea shipping. International seaborne trade rose more than sixfold between 1950 and 1974 -- from 525 to 3250 million metric tons.¹

A few commodities have accounted for a large proportion of the growth in seaborne commerce. Whereas total tonnage shipped in international sea-borne trade in the period 1950 to 1974 increased by 7.9 per cent per annum, the rate of growth of oil shipments was 9.1 per cent per annum and that of dry cargo 6.7 per cent. It should also be noted that growth in shipment of dry bulk commodities such as iron ore, bauxite and alumina, coal, grain and phosphate rock has been larger than growth in dry cargo shipments in general in the post-war period. In total, shipment of raw materials dominated tonnage shipped in international sea-borne trade by 1974, with oil accounting for 55 per cent of the total, and the principal dry bulk commodities for a further 21 per cent.

It is important to recognize, however, that while oil and dry bulk carriage dominate tonnage shipped in international sea-borne trade, the value of cargo shipped and total shipping revenues may well be greater for the remaining types of cargo movements. The latter are comprised of general cargo -- whether shipped in containers or in the break-bulk mode -- and "neo-bulk" shipments of goods in large lots such as automobiles and forest products.

Changes in Methods and Costs of Deep-Sea Shipping Services

The dynamic nature of the shipping industry captures the imagination. Writing in the early 1970's, S.A. Lawrence noted that:

During the last 10 years the average size of new oil tankers placed in service has grown from 28,000 to 130,000 deadweight tons (dwt.); that of dry bulk carriers, from 20,000 to 55,000 dwt....The number of crewmen required for modern, automated

¹ See U.N. Monthly Bulletin of Statistics.

² OECD, Maritime Transport Committee, Maritime Transport 1975 (Paris, OECD, 1976) pp. 22, 121 and 124.

bulk cargo carriers has been cut by roughly 40 per cent. In the package freight business, container ships have cut port-time by a factor of five and captured over half the prime North Atlantic traffic in less than five years. It sets matters in perspective to recall that the transition from sail to steam occurred over a period of 100 years and that the last sailing vessel was not retired from ocean-going commercial service until 1939.¹

Scale Economies and Specialization

The quotation points to the scale economies that have been achieved in shipping: that is, the lower costs made possible by a larger volume of output. Two types of economy of scale may be distinguished. Economies associated with vessel size have been vigorously exploited in the post-war period. The development of behemoth oil carriers has captured public attention, although other bulk trades have also seen increases in vessel size put into service.²

Possibly more important as a source of cost reduction is the specialization that has developed with larger scale shipping operations. Where cargoes move in large volumes, investments in specialized vessels and port facilities may expedite their handling. In this respect, one of the most striking phenomena in deep-sea shipping in the 1960's was the change in the methods of transporting dry bulk commodities. The world's dry bulk carrier fleet was virtually created in this decade, and construction of such vessels accounted for 80-85 per cent of all dry cargo vessel construction.³ Whereas at the beginning of the decade most dry bulk commodities were transported in general cargo vessels, at the end of the decade most were transported in specialized dry bulk carriers. Equally impressive specialization has occurred in general cargo shipments, with the development of the so-called unit-load fleets such as vehicle carriers and container vessels. The OECD Maritime Transport Committee asserts that the major transformation of general cargo movement by the introduction of such vessels took place in the late 1960's and early 1970's.⁴ Perhaps the best known example of the application of unit load principles in the general cargo field has been development of container shipments. Here large volumes of small consignments, packed in standard

¹International Sea Transport: The Years Ahead, (Lexington, Mass., Lexington Books, 1972), p. 5.

²As of 1976, two ULCCs (ultra large crude carriers) of over 500,000 dwt. were in service, and four more were on order. It might be noted, however, that orders for oil, bulk and combination carriers in the period 1974-77 reveal a tendency to smaller modal vessel size. See OECD, Maritime Transport 1976, pp. 74-76.

³See Lawrence, International Sea Transport, pp. 89-91. In 1976, only 30 per cent of "bulkable" commodities were shipped by general cargo vessels or by bulk carriers under 20,000 dwt. (OECD, Maritime Transport 1976, p. 34).

⁴Maritime Transport 1975, p. 56.

size containers, are handled with what are essentially bulk shipment techniques. The resulting faster port turn-around times, together with the higher speeds of container ships, have meant that a vessel carrying 1000 TEUs (twenty foot containers)¹ has a cargo capacity approximately equal to five conventional liners.

Factor Proportions

The economies of scale and specialization noted above have been made possible by substantial investments in ships and port facilities. In effect, capital has been substituted for labour in the production of deep-sea shipping services. Examples of the capital-intensive nature of modern deep-sea shipping may be given for several of the vessels to be considered in the present study. Thus, foreign prices for a newly built 350,000 dwt. VLCC (very large crude carrier) are in the neighbourhood of \$40-62 million, and for a 2000 TEU container vessel are \$40-52 million. On the labour side, 37 personnel would be required on board the VLCC, and the total ship's complement, including reserves, would be 59. Comparable manning figures for the container vessel would be 35 personnel on board, and a total ship's complement, including reserves, of 53.² The capital-labour ratio for these newly built ships, in other words, is of the order of \$750,000 to \$1,100,000 per crew member.

The contrast between these figures and comparable data for traditional general cargo vessels is substantial. A break-bulk vessel of the type considered in this study would have a delivered price from foreign sources of \$8-12 million, a total complement of 45 personnel, and an implied capital-labour ratio in the order of \$150,000 to \$250,000 per crew member.³

There are several important economic implications of the capital intensity of modern deep-sea shipping. In the first place, the terms and availability of credit for ship purchase are extremely important to the industry. Secondly, investments in capital appear to substitute

¹Lawrence, International Sea Transport, p. 295. It might be noted that the largest category of container ships currently carries 2900-3000 TEUs. See OECD, Maritime Transport 1975, p. 58.

²Alships Report, Part I, Table 4.2, and Summary Volume, Table 4.2. Estimates of the costs of building such vessels in Canada are higher than the foreign vessel prices noted in the text.

³Ibid.

for the use of less highly skilled labour and to enhance the employment of more highly skilled labour onboard ship.¹ Thirdly, the industry does not offer substantial employment opportunities.²

The increasing capital intensity of shipping should not, however, be overemphasized as a factor in the economics of the industry. Many shipowners have access to capital on similar terms, and differences in labour costs may make a substantial difference to profitability. Such differences in labour costs have obviously played an important part in the declining relative importance of much OECD shipping and growth in the relative importance of flag-of-convenience shipping in the world fleet over time.

¹Thus, the officer/rating rate onboard ships has risen in recent years. See OECD, Maritime Transport 1977, p. 95.

²Lawrence observes that "Worldwide deep-sea employment ... is dwarfed by employment in other facets of the maritime industry (i.e., ports and shipyards) and is wholly insignificant as compared to employment in such basic industries as fishing or farming." (International Sea Transport, p. 24).

³Thus, according to the OECD Maritime Transport Committee:

After its period of maximum expansion between 1970 and 1973 the growth of the Japanese fleet tapered off, as the costs of operation under Japanese flag became steadily more expensive. As a result the share of chartered foreign-flag shipping under Japanese control which in 1969 had been only 17% had risen by 1976 to 46% of the total of 112.4 million dwt. The development of the 'tie-in' or 'charter-back' fleet whereby ships are intentionally built or sold abroad for eventual time chartering by Japanese interests to perform virtually the same function as Japanese-flag vessels has become a permanent feature, involving particularly Hong Kong based shipowners operating their ships under flags of convenience. It has been estimated that for general cargo ships in the 30,000 dwt range a foreign-flag ship could operate and service its capital 18% cheaper than a Japanese ship, and for smaller short-sea ships of 8,000 dwt or so, the discrepancy is as great as 43%.

and: It seems probable that as the shipping crisis bites deeper, there will be increasing pressure on shipowners to give preference to nationals, which, as the Swedish and Japanese experience has shown, forms a vicious circle by reducing national flag competitiveness and hence increasing the needs for shipowners to seek ways to operating ships under the flags of countries with lower crew costs.

See OECD, Maritime Transport 1977, pp.79 and 95.

Market Organization

An important distinction has to be made between two types of market organization in deep-sea shipping -- the bulk carriers (both oil and dry bulk) on the one hand, and general cargo "liner" trade on the other.

As a general rule, most shipping capacity for the broad categories of bulk shipping is not directly owned by the large industrial concerns which constitute the customers for these services, but by independent owners. The latter often specialize in the needs of a particular trade. Even where industrial concerns are vertically integrated into shipping, their actual demands for shipping at any point in time usually exceed the capacity they own directly.¹ Industrial concerns which own shipping may also make available on the market capacity which is excess to their needs at any point in time. A wide variety of contractual instruments (known as "fixtures") are available for obtaining shipping capacity, and the bulk markets have shipping exchanges which function like stock markets. The usual contractual mode in oil carriage is by time charters of varying length, or by use of the spot voyage charter market. Substantial use is also made of the spot voyage charter market in dry bulk shipping markets, where cargo movements are irregular, as in the grain trades. Alcan Shipping Services estimates, however, that over 85 per cent of all dry bulk shipping movements are performed under longer-term contracts of affreightment, where shipowners undertake to provide a stipulated volume of transport service for a specified time period.² These contracts allow the shipowner flexibility with respect to the vessel type used, as well as the ability to pick up other cargoes. The security offered by the longer term contracts may provide sufficient incentive for independent shipowners to develop vessels which are specific to particular port/cargo combinations. On the other hand, the flexibility of the contracts provides shipowners manoeuvring room to deal with a principal problem of the bulk trades -- that of obtaining backhauls and minimizing ballast steaming. Intricate cross-trading patterns result from attempts to maximize vessel utilization.

The bulk shipping trades are generally considered to be competitive markets -- a fact attributable to the large number of shipowners supplying capacity to these markets. Freight rates vary with changes in demand for and supply of tonnage, and are subject to marked cyclical fluctuations.³

¹Thus, while the oil companies owned about one-third of oil carrier tonnage in the early 1970's, they also had about one-third of total capacity under charter. See the Alships Report, Part I, p. 5.5.

²Ibid., Part I, p. 5.9.

³For example, Alcan Shipping Services notes that "the monthly average index for tankers rose from 54.6 in May 1972 to 389.7 in October 1973, and fell back to 97.8 by August 1974. Clearly, fluctuations such as these bear no relationship to the commercial cost of providing shipping capacity." (Alships Report, Part I, p. 5.2).

The "liner" markets in general cargo shipping derive their name from the fact that shipowners offer a scheduled sailing pattern on a particular route encompassing several ports. The liner trades are predominantly non-competitive, being dominated by cartels or shipping "conferences". It has been argued that the cartels have arisen basically because it is easier to form a combine among the limited number of shipowners interested in servicing a particular general cargo route than it is, for example, among 500 independent tanker owners.

The cartels practise price discrimination in assigning freight rates to cargoes -- higher valued cargoes receiving higher tariffs. Freight rates are stable over time -- relative to freight rates in the bulk trades. The over-supply of shipping or excess capacity associated with these cartels is sufficient to cater to fluctuations in demand for cargo shipments. While most members of conferences compete on the basis of service, there are some "tight" cartels where cargo-pooling and profit-sharing are practised.

The Department of Industry, Trade and Commerce has estimated that, of cargo tonnage to and from Canada suitable for liner shipment in 1975, 41 per cent was carried by liner conferences, 19 per cent by non-conference liner services, and 40 per cent by unscheduled services. Conference control of general cargo shipping is larger than these figures indicate, however, since a large proportion of the unscheduled services consists of items such as forest products, steel or automobiles, which are often transported in shipload volumes aboard specialized unit-load carriers. Shipment of the latter "neo-bulk" commodities has many characteristics more similar to those of bulk commodities (i.e., relatively large volume and lower value) than to general cargo.

Role of Government Assistance

Any consideration of Canadian deep-sea shipping options, including possible Canadian-flag participation in the industry, must recognize the importance of promotion and protection of national flag shipping and shipbuilding by other governments.

Government assistance to shipping needs to be differentiated from aid to shipbuilding. In many nations, the shipbuilding industry has been the recipient of substantial government assistance -- clearly because of the industry's perceived importance in terms of employment. The benefits of this assistance are often available to all ship purchasers, irrespective of nationality. This shipbuilding assistance -- and particularly the provision of long-term loans for ship purchase at below-market rates of interest -- has ensured a steady flow of cheap capital to the shipping industry, and has contributed to its present capital-intensive structure.

¹See J.W. Devanney, M. Livanos and R.J. Stewart, "Conference Ratemaking and the West Coast of South America", Journal of Transport Economics and Policy, May 1975, p. 158.

Canada's general non-intervention in deep-sea shipping is the exception rather than the rule among nation states -- the rule being that merchant marine activities are accorded favoured status and special privileges relative to other industries. Many forms of assistance are employed in promoting merchant marine activities. Conventional fiscal measures include both taxation relief (such as rapid ship depreciation allowances and tax exemption for earnings reinvested in vessels) and expenditure measures (such as subsidies for vessel construction, operation, and training programs for marine personnel). In addition, government purchases of shipping services may be used to promote national flag shipping -- as, for instance, in reservation of foreign aid cargoes to national flag shipping. Governments may also intervene in the shipment of commercial cargoes by flag preference or flag discrimination measures. Thus, cabotage laws reserve coastal trade to national flag vessels and restrict cross-trading opportunities for vessels registered in other countries. Commercial cargoes moving in international trade may also be reserved wholly or in part to national flag vessels, and bilateral treaties exist to divide cargo shipments between the national flag carriers of states involved in deep-sea trade. Finally, governments may participate directly in deep-sea shipping by ownership of shipping lines -- as in the case of Communist bloc countries and many less developed nations. The commercial results of many of these enterprises justify regarding them as an attempt to promote deep-sea shipping.

It is worth noting that actual subsidies -- or direct monetary outlays by governments -- may constitute only the visible tip of the iceberg of government assistance to national flag shipping. Flag preference or flag discrimination measures can be of far greater quantitative significance.¹

The magnitude of this assistance to shipping and shipbuilding defies comprehensive assessment, even by dedicated analysts.² Attempts have been made by international agreement to restrict competition between governments in such assistance. Thus, OECD nations have agreed to place limits on credit accorded to ship purchasers, and the OECD Code of Liberalization on Current Invisibles asserts the principle that competition in international shipping should not be hampered by legislative provisions in favour of national flag shipping. Adherence to these agreements has, however, been more evident in times of prosperity for shipping and shipbuilding.

¹For instance, Gerald R. Jantscher, in his aptly titled study, Bread Upon the Waters (Washington, D.C., the Brookings Institution, 1975), concludes that ship operating subsidies, ship construction subsidies and taxation concessions to shipping cost the U.S. federal government \$3.6 billion, \$1.8 billion and \$350 million respectively in the years from 1936 to the early 1970's. In the 1950's and 1960's, however, cabotage and cargo preference laws alone are estimated to have added \$3 billion and \$5 billion respectively in costs to U.S. citizens (see, for example, pp. 138-140).

²Ibid., p. 2.

While much shipbuilding assistance has not affected the flag registration of shipping, direct assistance or preferential measures for shipping have had some effect.¹ The net result of much of this effort to promote national merchant marines may, nevertheless, be questioned. It is worth noting that the United States, with one of the most comprehensive programs of shipping assistance of any state, has until very recent years² witnessed a dramatic decline in its privately owned merchant marine. It is also worth noting that the growth of shipping in the post-war period has been much faster in countries where taxation and regulation are least -- that is, the flag-of-convenience countries -- than in the world fleet as a whole. Flag-of-convenience shipping accounted for 27 per cent of the total world fleet by 1976.³

Current World Market in Shipping and Shipbuilding

As already noted, the post-war period has seen substantial growth in deep-sea shipping and in allied maritime industries. A series of events in the mid-1970's, however, has led to a serious crisis in world shipping and shipbuilding. The causes of this crisis were the OPEC oil price increases of 1973-74 and the world economic downturn that followed. Substantial over-ordering of new vessels (particularly oil carriers) during the 1973 boom market in shipping also contributed to the crisis.

The magnitude of the crisis that has developed since the mid 1970's is indicated by data for cargo shipments; for ship utilisation, deliveries and prices; and for rates of return in shipping.⁴ Total world tonnage shipped decreased by 8 per cent in 1975 -- the first serious set-back in shipping markets since the Second World War. The problem was exacerbated by a 10 per cent addition to world tonnage in 1975 -- a record for the post-war years. In the shipping market that is most seriously affected -- the market for oil carriers -- estimated oversupply of tonnage at the end of 1975 was about 115 million deadweight tons, or 57 per cent of the world tanker fleet. According to the OECD Maritime Transport Committee, 1976 charter rates for most classes of shipping "were below total operating costs, with virtually no chance of servicing capital or making a profit."⁵ The decline in the output of

¹In the early 1970's Lawrence estimated that 10-15 per cent of the world's fleet was registered in countries other than the domicile of the parent company for purposes of obtaining commercial or operating advantages (rather than easy registry terms) (See International Sea Transport: The Years Ahead, p. 257).

²In the period 1966 to 1976, U.S. merchant fleet tonnage declined from 20.8 million gross registered tons to 14.9 million g.r.t., and personnel employed during the same period declined from 52,960 to 20,732. (See U.N. Statistical Yearbook, 1975, p. 497, and OECD, Maritime Transport, 1976, p. 138, and OECD, Maritime Transport, 1966, p. 95.)

³See OECD, Maritime Transport 1976, pp. 67-69.

⁴Unless otherwise indicated, all data are taken from OECD, Maritime Transport 1976.

⁵Ibid., p. 9.

world shipyards in 1976 marked the first such downturn since 1961. In markets where new tonnage has been required, fierce competition among shipbuilders for the few available orders has resulted in exceptionally low vessel prices.¹ The value of oil carrier tonnage has, of course, shown the most dramatic decline of all asset prices in shipping.²

It is evident that the world shipping and shipbuilding industries presently face the need for major structural adjustments, as a result of the fact that oil has been converted from a cheap to a dear commodity. OECD forecasts indicate that a balance between supply and demand in the market for oil carriers will only be achieved between 1983 and 1985, given continued implementation of present energy policies. More effective conservation and supply potential policies -- advocated by many governments as the answer to long-term energy problems -- would significantly reduce oil imports and prolong the oil carrier surplus beyond the middle of the 1980's.³

Other shipping markets are not insulated from this structural change in the oil carrier market. In some cases, the link between markets is direct. Thus, ore-bulk-oil (OBO) carriers serve both the oil and dry bulk markets, and hence overtonnaging in either market is reflected in the other. Shipbuilding provides an indirect link between shipping markets. Thus, switching of orders from tanker construction to other types of shipping has contributed to excess capacity in other shipping markets. In addition, a lack of orders for oil carriers leads to greater competition for new orders for other vessels. The latter effect is most noticeable in the size range of ships that can be built in the same yards as oil carriers -- namely, large dry bulk carriers. The outcome is that it now appears that growth in supply of dry bulk shipping is substantially in excess of expected demand: OECD forecasts indicate expected oversupply of 16-23 million deadweight tons in dry bulk markets by 1980. Nor may oversupply of shipping be confined to large dry bulk and oil carriers; it appears that the general cargo trades are also being affected.⁴ World container shipping capacity, for instance, is

¹Alcan Shipping Services notes that:

"By late 1976 a standard Panamax ship of 65,000 dwt, which could only have been ordered in 1974 for \$25 million, including a calculated allowance for escalation on labour and materials, was being offered at very little more than half that, namely, \$14 million fixed price delivery in 1977." (Alships Report, Part I, p. 4.1.)

²This fall in asset values is reflected mainly in the prices of existing tonnage, since there have been few orders placed for large oil carriers in some time according to the Alships Report (Part I, p 4.4). H.P. Drewry, Ltd. have reported that the second-hand vessel price for an 8 to 9 year old 100,000 d.w.t. tanker declined from over \$20 million in 1973 to under \$4 million in 1976. See Investment Opportunities in Second-Hand Tonnage (London, July 1976), p. 18. The U.K. Financial Times (February 20, 1978) reported that the gross value of oil carriers fell by a further 25 to 50 per cent in 1977.

³OECD, Maritime Transport 1976, p. 32.

⁴Ibid., pp. 35, 81.

predicted to increase by 24 per cent in 1978 after a similar increase in 1977.¹

The outcome is that the tonnage surplus in international shipping has grown progressively worse in recent years: at the end of 1977, for instance, the total of tonnage in lay-up was 13 per cent higher than a year previously. In its latest annual report, the OECD Maritime Transport Committee concludes that

there seems no prospect that a balance between world seaborne trade and the world fleet can be reached in the near future. On the contrary, a further deterioration in the overall balance is to be expected.²

The crisis in world shipping and shipbuilding has had several results. There are considerable tensions between shipbuilding and shipping interests: the former wanting to keep yards busy, the latter to reduce capacity in shipping. Government involvement in both shipping and shipbuilding has inevitably increased as a result of the crisis. Several governments have taken over bankrupt shipyards; others have had to support carrier debts to prevent bankruptcies of shipowners. Various proposals to reduce capacity in shipping and shipbuilding by cartel or governmental action are being advanced. Irrespective of the outcome of these proposals, however, it is evident that there will have to be a substantial reduction in world shipbuilding capacity. The OECD Maritime Transport Committee estimates world shipbuilding capacity as being about 39 million gross registered tons (grt.) in 1975, and cites an estimate of 13 million grt. for new shipbuilding orders in 1980. To balance supply and demand, the implied reduction in shipbuilding manpower would be somewhat less than the reduction in shipbuilding capacity, but would still be of the order of 35 to 40 per cent.³

Implications for the Present Study

The current market situation in shipping and shipbuilding has several important implications for an economic benefit-cost analysis of Canadian shipping options. In the first place, "bargain" deep-sea ship prices and resulting low freight rates will affect movement of many goods and services to and from Canada for some time to come. On the other hand, the Canadian shipbuilding industry seems likely to face a substantial reduction in capacity, in line with the prospects for the world shipbuilding industry. Seventy per cent of Canadian shipbuilding output in the period 1974-76 was exported, and this export market has been largely closed off as a result of the current difficulties in the industry. Reduction in Canadian shipbuilding capacity will entail adjustment costs to labour and other resources involved in the industry, and possible measures which might lessen these costs -- such as the construction of a deep-sea fleet -- are of obvious interest to society.

¹ See Containerization International, February, 1978, p. 23.

² See OECD, Maritime Transport 1977, p. 28.

³ OECD, Maritime Transport 1976, p. 80.

3. CANADA'S DEEP-SEA TRADE AND SHIPPING INDUSTRY

Most of Canada's international trade, of course, takes place with the United States. Deep-sea commerce, nevertheless, accounts for roughly 30 per cent of Canada's international trade by value. Table 1.1 indicates the break-down of Canadian deep-sea trade by principal types of cargo.

Table 1.1

Relative Importance of Types of Cargo in Canadian
Deep-Sea Trade by Volume and Value, 1974

Cargo Type	Exports		Imports	
	Per cent of total tonnage	Per cent of total value	Per cent of total tonnage	Per cent of total value
Bulk	82	52	91	34
Neo-bulk	14	30	4	20
General Cargo	4	18	6	46
Total	100	100	100	100

Source: Alships Report, Part III, pp. 5.5-5.9.

Table 1.1 indicates that, as far as deep-sea trade is concerned, it is still relevant to categorize Canada as being an exporter of raw materials and an importer of finished products. Dry-bulk cargo dominates our deep-sea exports in terms of both volume and value, and it might be noted that Canada is the third largest exporter in the world of dry-bulk tonnage.¹ Carriage of a few commodities makes up a large proportion of import and export tonnage for bulk and neo-bulk commodities. Iron ore, wheat, coal and gypsum account for around three-quarters of bulk export tonnage, and crude oil for about the same proportion of bulk import tonnage. The principal neo-bulk export is forest products; the principal neo-bulk imports are automobiles, iron and steel.

Further to Table 1.1, it might be noted that most general cargo trade with developed countries is shipped in containers, the volume of container traffic on the North Atlantic routes to Eastern Canada being ten times as great as that on the next largest container route. General cargo shipped in break-bulk vessels has declined in relative significance over time, and is of principal importance in trade with less-developed countries.

¹ See the Alships Report, Part III, p. 5.4. Unless otherwise indicated, all data in the description of Canada's deep-sea trade are from the Alships Report, Part III.

² Ibid., Part I, p. 5.5.

Vessels registered in flag-of-convenience countries carry a significant proportion of Canadian deep-sea tonnage, as might be expected, given the large volume of our trade which consists of bulk commodities. Thus, vessels registered under the Liberian flag carried 25 per cent of Canadian export tonnage and 31 per cent of Canadian import tonnage in 1974 -- proportions of tonnage which were roughly double those carried in vessels of the next largest country of registry. The flag-of-convenience fleet, however, is less involved in Canadian trade in higher value commodities (i.e., those shipped by the neo-bulk and general cargo modes). Alcan Shipping Services also makes the important point that carriage of trade in bulk and non-bulk commodities with an established maritime nation (such as the U.K. or Japan) tends to be dominated by national flag shipping of that country.

As indicated above, less than 2 per cent of Canadian deep-sea tonnage is carried in vessels registered under the Canadian flag. A careful distinction needs to be made, however, between the participation of Canadian flag shipping in deep-sea trade and Canadian control of and participation in deep-sea shipping. The large Canadian companies which are some of the primary users of bulk and neo-bulk tonnage (such as the aluminum and forest product companies) effectively "control" their shipping requirements through contracts of affreightment or chartered tonnage. Several of these companies have shipping subsidiaries which engage in deep-sea cross-trading as well as meeting company shipping requirements. Such subsidiaries make use primarily of chartered tonnage registered under foreign flags. It might also be noted that Canada has some large independent shipping companies which engage in both Canadian and other deep-sea trade and which own or charter substantial volumes of tonnage registered under foreign flags.¹

Assistance to the Maritime Industries in Canada

Federal government assistance to the maritime industries has been substantial. The coastal and Great Lakes shipping industry benefits from a cabotage law which, with a few minor exceptions, restricts trade between Canadian ports to Canadian vessels.² The federal government is

¹Thus, according to the Globe and Mail, (April 20, 1978),

"Fedcom (Federal Commerce and Navigation Ltd.) operates a British, Belgian and Liberian registered fleet of 20 vessels, eight of which are engaged in Great Lakes service ... Fedcom is also a major charterer of dry cargo vessels of up to 60,000 tons deadweight ... (having) a time-chartered fleet of up to 50 vessels."

²From 1970 to 1976 the share of Canadian coastal tonnage carried by foreign flag vessels has varied from 0.8 per cent to 12.2 per cent, with an average of 5.3 per cent. Source: Shipping Report, Pt. III, Coastwise Shipping, Statistics Canada, 54-204 Annual.

also principally responsible for the provision of marine infrastructure (wharves, port facilities, navigation aids, etc.), and the cost recovery ratio for such publically provided facilities was 17 per cent in 1975.

Of principal relevance to any contemplated Canadian-flag participation in deep-sea shipping, however, is government assistance to shipbuilding: Although the Canadian shipbuilding industry provides 1 per cent of manufacturing employment, shipbuilding subsidies account for 46 per cent of the Department of Industry, Trade and Commerce budget for industrial development. Currently, the level of the principal subsidy is set at 20 per cent of shipbuilding costs incurred in Canada, and an additional subsidy of 3 per cent of vessel construction costs is available to shipbuilders for purposes of productivity improvements in shipyards. Although shipbuilding receives assistance in many other forms, an aid which is particularly pertinent to the present study is the incentive given through the taxation system for Canadian shipowners to purchase locally built vessels. The first-time purchaser of a Canadian built vessel is eligible for a 33 1/3 per cent straight line depreciation allowance for purposes of company taxation. The purchaser of a foreign built vessel, on the other hand, is only permitted to depreciate such a vessel on a declining balance schedule of 15 per cent per annum -- a corporate cost allowance that more closely approximates the true economic depreciation of vessels. Although these forms of assistance are designed primarily to benefit Canadian shipbuilders, they constitute an existing incentive for Canadian deep-sea shipping operations which are conducted in locally built ships, and will assume some importance in the present study.

4. OUTLINE OF THE STUDY

An outline of the remainder of the study can be briefly given. Since the economic analysis of Canada's deep-sea shipping options builds on the prior commercial analysis of such options undertaken by Alcan Shipping Services Ltd., the second chapter will review the results of the latter study. The third chapter lays out the methodological framework for the economic assessment of the options, indicating how it is proposed to modify the commercial analysis to incorporate broader criteria. The fourth chapter contains an analysis of the labour markets in the Canadian shipbuilding and shipping industries, and presents the results of the basic research used in quantifying one of the more important social benefits of Canadian-flag deep-sea shipping options. Chapter 5 then presents the results of applying the methodology outlined in the preceding two chapters to the analysis of Canada's deep-sea shipping options. Some further considerations related to possible future changes in the world shipping environment are discussed in Chapter 6.

¹The cost-recovery ratio cited assumes that government seeks a return of only 6 per cent per annum on capital invested in maritime facilities. Use of a (higher) discount rate which reflected current estimates of the social cost of capital would further reduce the maritime cost-recovery ratio. See Appendix B on the Social Discount Rate.

Chapter 2

COMMERCIAL ASSESSMENT OF DEEP-SEA SHIPPING OPTIONS

1. INTRODUCTION

The social benefit-cost analysis of Canadian deep-sea shipping options developed in subsequent chapters uses as a primary data source a study of Canadian deep-sea shipping options from a commercial viewpoint. Alcan Shipping Services Ltd. was commissioned to do the latter study, and the final report of the consultants was submitted in September 1977.¹ The basic objective of the consultants' study was to simulate commercial outcomes for Canadian and foreign-controlled shipping services carrying cargo over routes representative of Canadian deep-sea commerce. The study was intended to be a long-run examination of comparative shipping investments. Commercial outcomes for the various shipping options were simulated over the 20-year period 1976-1995.

The present chapter examines the methodology and findings of the Alships Report insofar as these relate to commercial prospects for Canadian shipping options. A brief description of the methodology and findings of the study will be followed by a more detailed examination of some of the study's critical assumptions and parameters. Limitations of the Alships Report will be described, and procedures for overcoming these limitations will then be introduced and used in the subsequent analysis.

2. METHODOLOGY OF THE ALSHIPS REPORT

Options Considered

The consultants examined the private costs and revenues associated with providing shipping services under four options. These options were:

¹Alcan Shipping Services Ltd., Shipping Options for Canadian International Trade, 4 Volumes (Montreal; 1977). The Transport Canada Research and Development Centre commissioned Alcan Shipping Services Ltd. to do the study. The latter contracted out various elements of the study to the Economist Intelligence Unit Ltd. and to Roymarine Leasing Ltd.

1. Foreign Shipping Services. Shipping services provided by firms operating vessels registered in foreign countries were examined in this option. It was assumed that vessels were purchased from the lowest cost source of supply.
2. Canadian Chartering of Foreign Flag Ships. In this case Canadians were assumed to charter vessels from owners (Canadian or foreign) of vessels registered in foreign countries. No equity investment on the part of the Canadian charterer was involved in this option.
3. Canadian Owned and Operated Vessels With Ships Purchased from the Lowest Cost Sources. In this option, Canadians were assumed to purchase vessels from abroad but register them in Canada. The crews were assumed to be Canadian.
4. Canadian Owned, Operated and Built Ships. Under this option, it was assumed that the vessels would be built and registered in Canada and manned by Canadian crews.

None of these options totally reflect the current situation in Canadian shipping. For example, a substantial amount of Canadian trade is carried in ships registered in flag-of-convenience countries -- a circumstance not precisely captured in the model. The options, however, do represent clearly defined alternatives available for the provision of shipping services to Canadians. Options 3 and 4 essentially represent 'Canadian flag' options, while Options 1 and 2 are 'foreign flag' options. Option 1, however, may include vessels registered in foreign countries but owned by Canadians.

It should be noted that Option 1 is in part a hybrid representation of services offered by traditional European maritime nations and by flag-of-convenience countries. The former was represented by the assumption that the crew would be paid wages similar to northern European crews. The flag-of-convenience aspect was represented by the assumption that the operator would not be subject to corporate taxation. The costs associated with Option 1 are, therefore, likely to be higher than should be associated with flag-of-convenience shipping, but somewhat lower than costs associated with shipping services of traditional European maritime nations.

Commodities and Trade Routes

Canada's trade can be divided into four major cargo types. Bulk commodities are those amenable to being pumped or discharged by fast-handling methods. Examples of such commodities are oil, coal, iron ore, grain, bauxite, sulphur, alumina, and copper ore. Neo-bulk commodities move in large parcel lots and include goods such as forest products, steel and autos. Container cargo is containerized, and break-bulk cargo is palletized or put together in slings.

Analysis of Canadian commodity trade flows in 1974 by the consultants permitted the selection of twenty-three trade routes for detailed examination in their study. Twelve of these routes were bulk

routes on which about 50 per cent of Canada's deep-sea bulk tonnage was carried. The five selected neo-bulk routes accounted for 48 per cent of Canada's deep-sea neo-bulk tonnage. Seventy-eight per cent of Canada's container tonnage was shipped on the four container routes. Break-bulk trade tends to be dispersed over a greater number of routes than other cargo types. The consultants selected two break-bulk routes for further examination: the St. Lawrence-Caribbean route, which accounts for about 8 per cent of total Canadian break-bulk tonnage; and the Pacific-South American route, which has been the subject of some governmental concern from time to time. Table 2.1 lists the 23 trade routes, commodities carried, and size of vessel chosen for analysis.

Vessel Types

The consultants' aim in selecting vessel sizes and types for each of the 23 trade routes was to predict the "representative" vessels expected to provide transportation services in the future. The procedure used to select these representative vessels involved examining the types and sizes of ships currently used in the trades and assessing the intentions of the shipping industry with regard to future purchases of vessels. These pieces of information were analyzed to determine the most appropriate vessel types and sizes for each trade route, subject to the constraints imposed by port and canal facilities. In general, the ships selected corresponded to the larger vessels currently employed on the various trade routes. The same vessel type was assumed to be used under each option on any given trade route.

Framework for Analysis

For each of the 92 trade route options (four separate shipping options on 23 trade routes), a data series was constructed reflecting costs and revenues in each year of the study period (1976-1995). The costs consisted of equity, principal and interest payments on ship purchase loans, operating costs, voyage costs, and taxes where applicable.¹ Revenues were calculated from estimates of market freight rates, vessel load factors and frequency of voyages. Using these cost and revenue estimates, a net after-tax cash flow was calculated for each year of the analysis. This calculation included provisions for deducting interest, capital cost allowances and operating and voyage costs from gross income before the appropriate corporate tax rate was applied. The annual cash flow was next discounted to obtain a net present value for the shipping operation. The discount rate used in this calculation was intended to represent the after-tax rate of return sought by investors in shipping: that is, what they could expect to earn on their equity capital if the latter were invested elsewhere.

¹Operating costs are those costs incurred whether or not the shipowner is carrying freight (as long as the ship is not laid up). These costs include such items as portage (the wage bill), stores, victuals and administration fees. Voyage costs are those incurred due to the actual performance of the vessel and would include fuel, port charges, handling costs, etc.

Table 2.1
Trade Routes, Commodities and Vessels
Considered in the Alships Report

Route Code	Route	Commodities (Export/Import)	Vessel Size in d.w.t.*
<u>Bulk</u>			
B-1	Maritimes - Middle East	Ballast/Crude Oil	350,000
B-2	St. Lawrence - Japan - Middle East - Maritimes	Iron Ore/Crude Oil	175,000
B-3	Pacific - Japan	Coal/Ballast	150,000
B-4	St. Lawrence - Atlantic Europe North	Iron Ore/Ballast	125,000
B-5	Maritimes - Caribbean	Ballast/Crude Oil	80,000
B-6	St. Lawrence - Atlantic Europe North	Grain/Ballast	65,000
B-7	St. Lawrence - Atlantic Europe North	Iron Ore/Ballast	65,000
B-8	St. Lawrence - U.S. Atlantic	Iron Ore/Ballast	65,000
B-9	St. Lawrence - South America East	Grain/Bauxite	65,000
B-10	Pacific - Australia/New Zealand	Sulphur/Alumina	40,000
B-11	Pacific - China	Grain/Ballast	40,000
B-12	Pacific - Japan	Copper Ore/Ballast	20,000
<u>Neo-Bulk</u>			
N-1	Pacific - Atlantic Europe North	Forest Products/ Ballast-Phosphate	42,000
N-2	Pacific - U.S. Atlantic	Forest Products/ Ballast-Phosphate	42,000
N-3	St. Lawrence - Atlantic Europe North	Forest Products/ Steel	25,000
N-4	Maritimes - Atlantic Europe North	Forest Products/ Autos	25,000
N-5	Pacific - Japan	Forest Products/ Ballast	25,000
<u>Break-Bulk</u>			
G-1	Eastern Canada - Caribbean	Break-bulk	12,500
G-2	Western Canada - South America East	Break-bulk	12,500
<u>Container</u>			
			(TEU** capacity)
C-1	Maritimes - Japan	Containers	2,000
C-2	Maritimes - Western Europe	Containers & Ro-Ro***	1,750
C-3	Pacific - Japan	Containers	1,250
C-4	St. Lawrence - Western Europe	Containers & Ro-Ro	800

*d.w.t. = dead weight tons

**TEU = twenty foot equivalent unit, a standard measure
of container size.

*** Roll-on, Roll-off type of vessel.

The net present values were used by the consultants as measures of the commercial viability of shipping options on particular trade routes. If the net present value of a particular shipping option on a particular route is greater than zero, the operator would receive an after-tax rate of return to the equity investment greater than that assumed necessary to yield 'normal' profits. With a net present value less than zero, the after-tax rate of return would be lower than the rate of return to equity assumed to be required for investment in shipping.

An alternative method of presentation of the results was also adopted in the consultants' report. This method employed the concept of a required freight rate which is defined as that freight rate which would ensure a specified after-tax return to equity after all costs have been incurred. Alternatively, the required freight rate can be viewed as the freight rate which would generate a net present value equal to zero for any assumed after-tax return to equity. A comparison of required freight rates across options was used by the consultants to indicate which of the options could provide shipping services at the lowest commercial cost.

The Base Case Scenario in the Alships Report

In developing the "base case" scenario for their study, the consultants made a decision which fundamentally affects the outcome of their report. The base case of the consultants is not intended to represent the commercial prospects for particular shipping options in current market conditions, but attempts to gauge the commercial prospects for these options when shipping and shipbuilding markets are in equilibrium. The consultants justified this approach on the basis that current market conditions may not persist, and that policy with respect to Canada's deep-sea shipping arrangements should take into account long-run trends in these markets.

In line with this objective, the consultants made several critical decisions on prices which were to be entered into the analysis. In the first place, the very low market freight rates currently observed on some trade routes were largely ignored and "long-run" market freight rates were developed by extrapolating past trends in freight rates.

In a parallel decision, the consultants decided to construct their cost estimates on the basis of prices for new vessels. These new vessel prices are hypothetical in several respects. In the first place, prices adopted by the consultants for new vessels of foreign origin reflect 1976 cost levels in European shipyards. It was the consultants' opinion that these ship prices are likely to prevail when the shipbuilding market returns to equilibrium. The consultants noted, however, that prices offered by Japanese shipyards in 1976 were well below European levels. For instance, prices offered by Japanese yards were a third or more below European levels for tankers and dry-bulk carriers, but as little as 15 per cent below European prices in sectors of the market where demand for vessels was stronger. Between 1976 and 1978, of course, the Japanese yen has appreciated by more than 50 per cent relative to the Canadian dollar, and it is unclear whether Japanese shipyards are still price leaders in many sectors of the shipbuilding market. In the

same interval, however, subsidy elements embedded in European quotations have increased, resulting in some well-known bargains for ship buyers. As well, low ship prices continue to be quoted by yards in some Asian countries whose currencies have not appreciated substantially relative to the Canadian dollar. Some information on movement in international ship prices in the period 1970-1978 is given in Appendix F. One can conclude from this information that prices for new foreign vessels in the buyers' market of 1978 are likely to be well below the 1976 price levels chosen by the consultants for use in their "base case" scenario.

There is also a hypothetical element in the estimated prices of newly built Canadian vessels. One can have reasonable confidence in the prices estimated by the consultants where similar vessels in the same size-range have been built in Canada. The problem is that Canadian shipyards have not had experience in building some of the vessels selected as being the most appropriate for many trade routes in the study. This observation applies particularly to vessels in the larger size ranges. The largest vessel built in Canada has been 80,000 d.w.t., but this undertaking was not a commercial success.¹ The "comfort zone" of the largest Canadian shipyard has been described as being in the vessel size-range up to 40,000 d.w.t.² It is evident that there would have to be substantial enlargement of Canadian shipyards to build some of the vessels considered in the Alships Report and associated investment costs would be incurred. The consultants assumed that 1976 price differentials between Canadian and foreign vessels in size-ranges where comparisons could be made would also apply to ships in the larger size ranges which have not been built in Canada. It is evident, however, that prices for Canadian-built ships in these larger size-ranges are subject to a considerable margin of uncertainty.

Uncertainty about future market freight rates and new vessel prices can be reflected in sensitivity analyses for alternative estimates of the value of these parameters, and the consultants undertook such sensitivity analyses. Such analyses can only reflect current conditions facing prospective investors in some shipping markets to a limited extent, however. For instance, new vessels are being ordered and delivered in many shipping markets, and it may be presumed that the prices at which these vessels are being sold render them competitive with existing vessels. In the market for large oil carriers, however, very few orders have been placed for new vessels in recent years, and, as indicated in Appendix F, the prices of existing vessels have fallen substantially. In this market at least, costs of shipping from foreign sources at the present time might be more appropriately estimated on the basis of used rather than new vessel prices.

It is clear that the assumptions underlying the base case scenario in the Alships Report, and the extent to which other scenarios should be considered, are key issues which require further critical examination.

¹See "Canadian Shipyards Face a Battle for Big LNG Carriers", The Globe & Mail, June 4, 1977.

²Ibid.

3. RESULTS OF THE COMMERCIAL ANALYSIS

As noted above, the results of the commercial analysis were presented in several forms. First of all, comparisons were made between trade routes in order to identify those routes which appeared commercially viable under all the options. This was accomplished by examining net present values for each shipping option on each trade route. A second form of presentation compared the costs of the options with each other by using required freight rates. Finally, sensitivity analysis was used to identify the impact of changing input values on the commercial viability of individual trade routes and options.

Figure 2-1 indicates the net present values estimated for each of the 23 trade routes under each of the four shipping options in the base case scenario. Some of the assumed values of the base case input parameters have been referred to previously, and include European vessel prices, estimates of long run market freight rates, and a 10 per cent after-tax return to equity. Six of the trade routes were estimated to be commercially viable under all four options, as indicated by positive net present values. A further trade route (B6) was commercially viable under three of the four options. These results led the consultants to the conclusion that only these "seven trade routes offer sufficient possibility of commercial success... to suggest a more detailed investigation".¹

The consultants drew a number of other conclusions from the commercial analysis by comparing the required freight rates under different shipping options. The results of this area of the inquiry are indicated in Figure 2-2. It was observed that "in virtually all cases, the four shipping options rank as follows in order of increasing cost of providing transportation services: Option 2, Option 1, Option 4 and Option 3". It was felt, however, that the costs of providing deep-sea transportation services under Options 1 and 2 "were sufficiently close to indicate a non-significant difference". The consultants were also of the opinion that the "costs of providing deep-sea transportation services under Options 3 and 4 are sufficiently close to indicate a non-significant difference". It was observed that the assumptions concerning vessel financing exerted an important influence on the ranking of Options 3 and 4 and that changes in these assumptions could affect the rankings. It was also noted that the purchase of vessels at the low prices quoted in 1976 by Asian shipyards, rather than the base case assumption of 1976 European vessel prices, would result in lower costs for Option 3 as compared to Option 4.

¹See the Alships Report, Part 1, Section 9, from which this and subsequent quotations in this section are taken.

Figure 2-1

CONSULTANTS' ESTIMATES OF COMMERCIAL VIABILITY: BASE CASE RESULTS
USING MARKET FREIGHT RATES

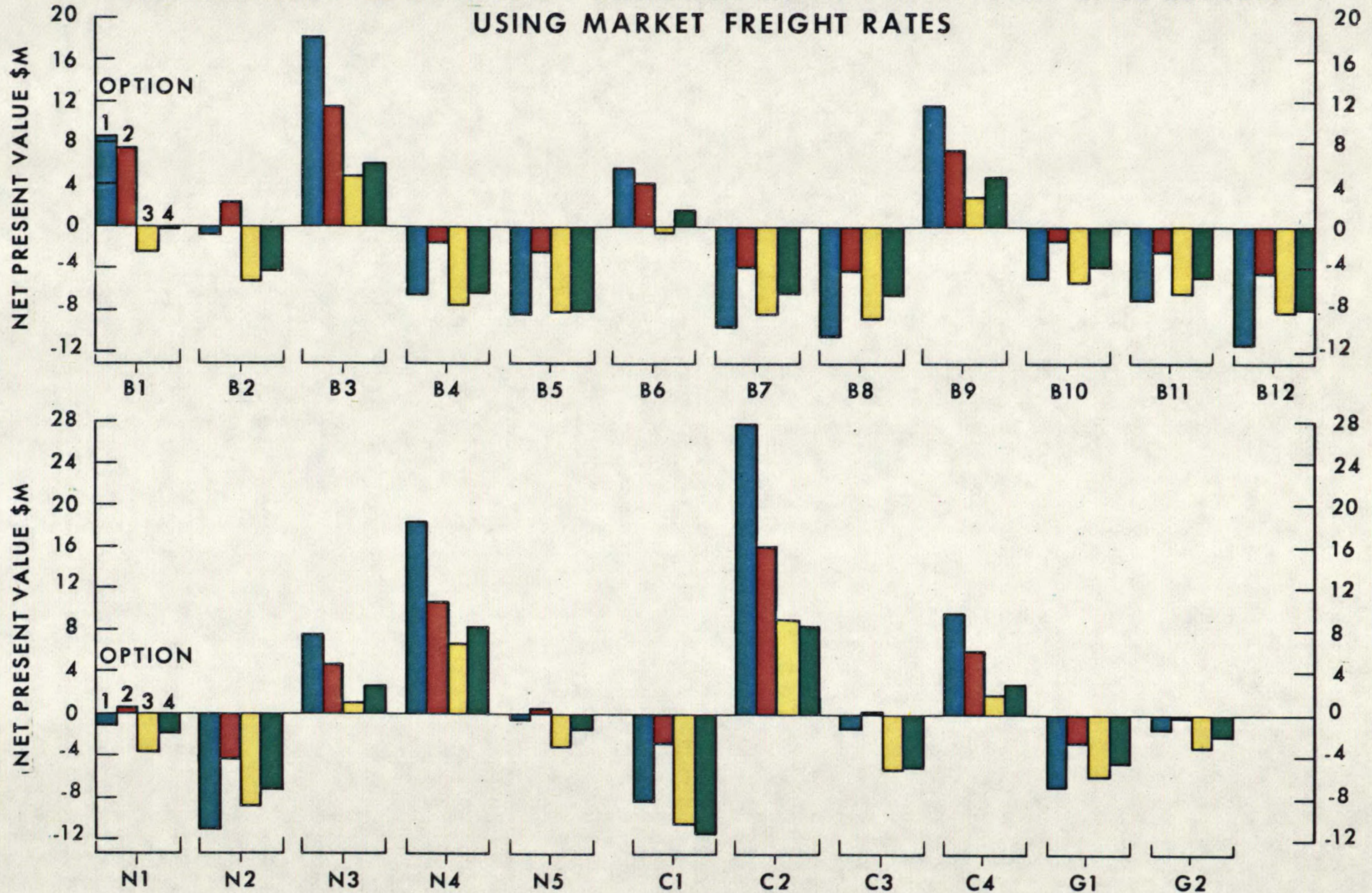
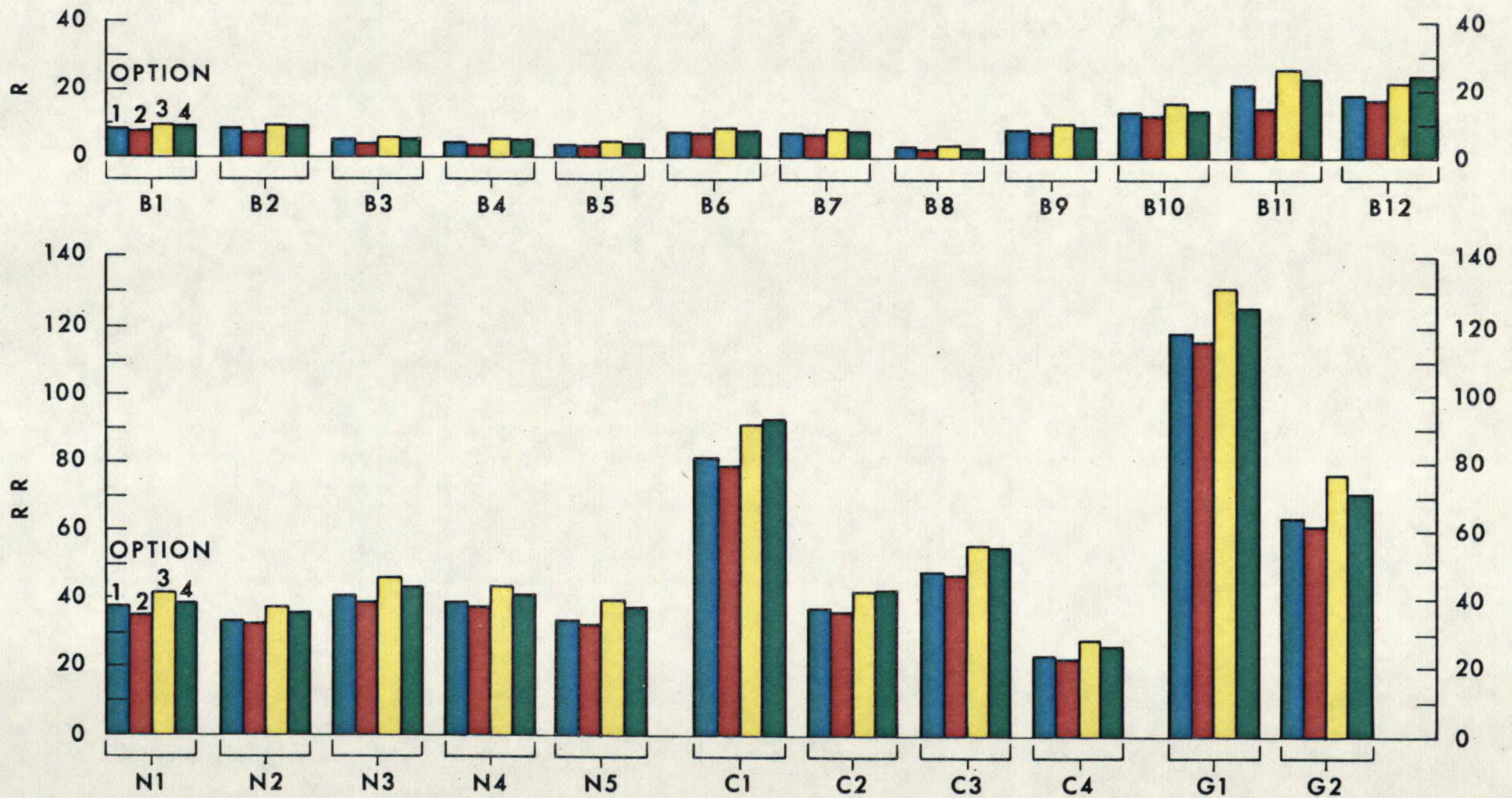


Figure 2-2
CONSULTANTS' ESTIMATES OF REQUIRED FREIGHT RATES



The finding that seven routes appeared to generate positive net present values under all options, while the required freight rate analysis indicated considerably lower shipping costs for Options 1 and 2, led the consultants to question whether Options 3 and 4 were in fact "commercially viable" in any absolute sense. Indeed, the consultants indicated that financial assistance of between 5 and 17 per cent of present transportation costs might be required if the Canadian flag options were to compete with Option 1 on these seven routes.

4. CRITIQUE OF THE COMMERCIAL ANALYSIS

An examination of figures 2-1 and 2-2 leads to questions regarding the consultants' results. For example, it is somewhat surprising that Option 2 has the lowest required freight rate of the four options on all trade routes. The consistency of this result across trade routes would seem to imply a systematic difference between Option 2 and the other options. Furthermore, this systematic difference would have to relate to cost differences between the options as these are the basis for the calculation of required freight rates.

A second surprising result is that the commercial net present values are negative for all four options on 11 of the trade routes analyzed. The implication of this finding is that shipping services would not be made available to Canadians. This result is somewhat unusual, as these trade routes were chosen precisely because large volumes of Canadian trade currently move on these routes.

Reasons for these particular results, and some of the difficulties they involve, are suggested below. Adjustments in the methodology which can help to avoid some of these difficulties are then suggested. These alternative methodological procedures are used in the subsequent analysis of the present study.

The Nature of Option 2

Before outlining the reasons for the results indicated for Option 2 in Figure 2-2, it is useful to explore the role of time chartering in world shipping markets. Essentially, time chartering is a market transaction whereby a firm takes on charter a fully manned and equipped vessel owned by another company. The period of the time charter may be for only one or two years or for a considerably longer period of time.

Shippers may decide to enter into time chartering arrangements as opposed to relying on spot market rates or short-term contracts of affreightment for reasons relating to security of supply, and/or because of a belief that the market freight rates available through the alternative

¹The precise length of the charters envisaged in the analysis of Option 2 are not specified in the consultants' report. The approach taken, however, was to estimate a charter cost representing the average rates expected to prevail on charter markets over the 20-year time horizon of the study. This charter rate can be thought of either as that associated with one long-term charter or as an average of the rates associated with a succession of short term charters.

of more short-term contractual arrangements will, on average, be above the rates available by securing time charters. Conversely, shippers may decide not to time charter when security of supply considerations are felt to be unimportant, when the volume of goods shipped is not sufficient to justify full utilization of a vessel throughout the charter period, or when it is believed that future spot market freight rates or short-term contracts of affreightment will on average be lower than currently prevailing time charter rates.

These considerations will also enter into the decision taken by the person on the opposite side of the transaction - the owner of the vessel. That is, it can be expected that owners of vessels would enter into time chartering arrangements when they believe these to be more advantageous than other forms of utilizing their vessels. Conversely, owners would not be expected to time charter their vessels for medium or long periods when they believe it to be more profitable to rely on single voyage fixtures or short-term contracts of affreightment.

In many cases, shippers will elect to diversify their portfolios by having some vessels leased on charters of varying time periods and by covering some of their requirements with spot market fixtures. Similarly, many shipowners will put some of their vessels into the time charter market, while employing others in the more short-term markets.

The time charter rates prevailing over the long term will then be determined by the supply and demand generated by the actors described above. We may expect that some shippers (owners) will guess correctly in making their decisions, while others will be mistaken in their estimates of future trends in the market. Over the long term, however, one would not expect to find any systematic divergence between the average rates negotiated in the various markets. If there were, the shipowner would shift from one market to the other until returns were equalized.

¹Under some circumstances, a firm may be able to organize production more efficiently by having greater control over the fleet used to transport its raw materials. The possibilities of achieving these operational economies through time chartering depend upon the type of product being shipped and on the market organization of the industry -- they are most important in vertically integrated industries such as steel, and least important in the shipment of agricultural commodities where the demand is erratic and where customers do not have a strong commitment to particular supply sources. The equalization of rates negotiated on various markets abstracts from these operational economies, and applies principally to a situation in which the utilization of a vessel would be identical under both Options 1 and 2 (i.e., to the situation measured in the Alships report). To the extent that the actual operation or type of vessel depends on market arrangements, the conclusion noted above may not be strictly valid. Under such circumstances, however, any savings available under Option 2 would be based on an operational advantage rather than on any particular structural characteristic of the time chartering option. It is the latter set of characteristics that is the focus of this and the consultants' report.

In modelling the operation of this market in the commercial analysis, the consultants assumed that the owner of the vessel would be operating out of a tax haven, and would be responsible for paying operating costs and for meeting the interest and principal payments on the cost of the vessel. In return, he would receive an annual payment from the charterer sufficient to meet these costs and earn a "normal" return on his equity investment. The Canadian charterer was assumed to be responsible for absorbing the voyage costs and for the annual payment (the charter cost) referred to above. The Canadian charterer would earn the freight revenue from the movement of goods in order to pay for these costs.

The perspective from which the commercial analysis was viewed was that of the Canadian charterer, rather than that of the owner. From this perspective, negative cash flows were generated by the payment of the charter cost, and positive cash flows resulted from the difference between freight revenues and voyage costs. These cash flows were constant in each year when expressed in deflated dollars. The discounted value of the difference between these cash flows was then termed the net present value of the chartering "investment".

As noted previously, all of the Option 2 required freight rates were lower than those associated with Option 1 -- implying that Option 2 has lower overall costs than Option 1. The reason for this finding related to an assumption used in deriving the charter cost estimate. As noted above, it was assumed that this charter cost would be sufficient to enable the owner of the vessel to cover all the costs for which he was responsible, and earn a 10 per cent return on his equity investment. In deriving this estimate, however, it was assumed that the vessel cost on which this return was calculated was a "blend" of new vessel prices offered in 1976 by Japanese and European shipyards. Since European vessel prices were used in the base case for Option 1, and since all other costs except taxes are identical between the two options, this assumption resulted in lower annual costs being attributed to the Canadian chartering option.¹ When identical vessel prices were assumed for each option, however, the divergence between the Option 1 and Option 2 costs in each year was eliminated. The required freight rates for Option 2 then equalled those of Option 1.²

For reasons given at the commencement of this section, it is felt that the latter result is the most likely. There is no particularly good reason for assuming that the vessel costs under Options 1 and 2 should be different, nor for the existence of a long-run divergence between the costs of time chartering vessels and the costs of acquiring foreign shipping services through other market transactions.

¹The taxes paid by Option 2 operators are never large enough to result in overall costs greater than the costs of Option 1.

²Where identical vessel prices are used in the analysis of Options 1 and 2, the revenues of Option 2 are just sufficient to cover the charter and operating costs. Under these circumstances, no income taxes are paid.

Many of the difficulties encountered in analysing Option 2, in fact, resulted from the attempt to "fit" this option into the same framework as was used in assessing the profitability of Options 1, 3 and 4. In many respects, however, Option 2 can be considered as simply another form of Option 1. That is, both options involve reliance on foreign shipping services, and both can be expected to generate similar estimates of transportation costs. This view is essentially confirmed in the consultants' report.

In the analysis presented in later chapters, Options 1 and 2 will be considered to be indistinguishable. The differences between the two options are more qualitative than quantitative.

Commercial Viability

It is difficult to determine precisely which of the cost and revenue factors result in some routes being "commercially viable" in the consultants' analysis while other routes are not. There would appear to be three principal problems associated with the consultants' findings concerning the commercial viability of the various routes. These problems are sufficiently serious to require a rethinking of the consultants' main conclusions.

Wage Rates. The first of these difficulties relates to the fact that the consultants chose to estimate crew costs for the "foreign flag" Option 1 on the basis of Northern European wage rates. These wage rates, of course, are greater than prevailing wage rates for flag-of-convenience crews. If the labour costs associated with the latter crews had been used in the analysis of Option 1 more trade routes may have been commercially viable than in the consultants' base case.

Movement of Vessels and Commodity Flows. The second difficulty is that market freight rates as estimated in the consultants' report reflect the ability of shipowners to optimize vessel utilization by engaging in trade on a number of different routes. The study, however, assumes that a vessel is dedicated solely to one trade route and does not have the ability to enter into cross-trades. The vessels under study are, therefore, implicitly competing with optimized patterns of vessel movement.

This is, perhaps, a major explanation of why so many trade routes do not appear to be commercially viable under all the shipping options. The study results imply that shipping services will not be provided on the trade routes with negative net present values. These same trade routes, however, were chosen precisely because large volumes of Canadian trade currently move over them. This discrepancy could be

¹"It is concluded that the costs of providing deep-sea transportation services associated with Options 1 or 2 are sufficiently close to indicate a non-significant difference. Variations in "real world" situations could very easily place either one of these options in front of the other." The Alships Report, Summary Volume, p. 3.18.

due to the inappropriateness of dedicating a vessel to a particular commodity route as the study does, rather than optimizing the movement of a vessel.

Market Freight Rates. The third major criticism of this part of the consultants' report is with respect to the estimated market freight rates. The consultants tried to estimate long-run trends in market rates to correspond to the long-run orientation of the base case in their study. There has been much disagreement with some of the forecasts on the grounds that they are too high. Such disagreement would not be too important if the results were sufficiently robust that variations in the market freight rates did not have a major effect on the estimates of net present values. The sensitivity analysis, however, indicates that when freight rates are reduced 10 to 35 per cent below the level in the base case (to accommodate alternative views as to long-run levels of freight rates), the number of commercially viable trade routes drops from seven to three. This indicates that the consultants' results are quite sensitive to the market freight rate assumptions.

It is extraordinarily difficult to forecast long-run trends in freight rates, and arguments can be made both for and against the level the consultants have chosen. An analysis of the methodology used in estimating these rates, however, raises a number of questions concerning their reliability.

The basic information on the freight rates for the oil trades was the AFRA (average freight rate assessment) index. A quarterly average of the index was used to suppress peaks and troughs in freight rates. These average rates were then expressed in terms of 1976 dollars by the application of various price indices¹ based on the increase in Worldscale Base Rates for each trade route. The resulting figures were then averaged over the 1969-76 period to give the estimated long-run freight rate. The consultants did not feel this level would be reached until 1985, however, because of the massive current disequilibrium in the oil trades. They assumed that current rates would rise at an average rate of 3 per cent per year to reach the long-run level in 1985.

The major difficulty with this procedure is that the analysis of the oil routes ceases to be a long-term study independent of current market fluctuations. Coincident with the very low market freight rates currently observed for oil carriage has been a sharp decline in the prices of both new and used oil tankers.² It is assumed in the consultants' base case, however, that Options 1 and 3 will have to purchase relatively expensive new vessels at prices which reflect cost-recovery in European shipyards. This conflict in assumptions casts doubt on the reliability of the net present values estimated for the oil trade routes.

¹See the Alships Report, Part 1, p. 5.7.

²This phenomenon simply reflects the fact that the price investors are willing to pay for capital goods is roughly equal to the discounted value of the future revenue stream expected to be earned from such goods.

The first step in the estimation procedure for the bulk and neo-bulk freight rates was to deflate the published quarterly data on spot market rates. These rates, which covered the period 1970-74, were then "decyclized", i.e., stripped of purely cyclical fluctuations, by using a worldwide voyage charter index. Each of the resulting figures can then be considered as an independent estimate of the appropriate long-term freight rate. The averages of these independent estimates were then adjusted to reflect the consultants' opinion that most bulk commodities are shipped under multi-voyage contracts of affreightment rather than under spot market contracts. The consultants felt that, on average, contract of affreightment rates are 20 per cent lower than spot market rates, and that 50 per cent of grain movements are shipped under contracts of affreightment as compared to 85 per cent of the other dry bulks. The market freight rates for the dry bulk trades were ultimately estimated using the weights indicated by these percentages.

While this procedure has a certain logical consistency to it, little confidence can be placed in the resulting estimated freight rates. The consultants indicate that about 40 per cent of the "decyclized" and deflated values of the freight rates were within 10 per cent of the average value for the dry bulk trades. On one of the two routes in which a detailed breakdown of the estimation procedure was given (B-4, iron-ore, St. Lawrence - Western Europe), only one of the 19 "decyclized" estimates was within 10 per cent of the average value. While the average of the estimates on this route was \$4.85, the range extended from \$3.10 to \$7.30.¹ This indicates that the procedure used to estimate the market freight rates for the dry bulk trades gave results with an extremely high variance, and thus the accuracy of the estimates is likely to be low.

In the case of container trades, freight rates are subject to much less violent fluctuations than the bulk and neo-bulk trades, because the container trades are, to a large degree, cartelized. This feature of these trades eliminated the need to use a complicated averaging procedure in an effort to predict long-term freight rates. The difficulty faced by the consultants, however, was to determine the likely contents of the containers on different trade routes, as there are different freight rates for each type of commodity. Knowledge of the contents of containers could be used with published information on freight tariffs to estimate the freight revenue generated per ton carried, which is the measure used in the study. Unfortunately, the consultants only gathered information on the content of Canadian containers. U.S. containers, which accounted for about 75 per cent of the containers on three of the four container routes studied, were assumed to have freight rates about equal to their Canadian counterparts. In addition, it appears that the sampling technique used to determine the contents of the Canadian containers was biased, leading to biased estimates of the revenues generated by

¹While the dispersion of the individual estimates of long-term freight rates was somewhat narrower on the other route for which detailed data are given in the Alships report (B-11, grain, Western Canada-Asia), 9 of the 20 estimates for this route deviated more than 10 per cent from the average value. See the Alships Report, Part 1, p. 5.18.

the Canadian part of the trade. These problems lead one to doubt the accuracy of the estimated container freight rates in the consultants' report.

The above discussion leads to the conclusion that little confidence can be placed in the consultants' estimates of long-run freight rates on the various trade routes. This conclusion implies, of course, that the consultants' findings concerning the commercial viability of various trade routes are likely to be unreliable. A lack of confidence in the market freight rates and measures of commercial viability does not mean that the whole of the consultants' study should be rejected, however, as comparisons can still be made between options on the basis of shipping costs.

Adjustment of Market Freight Rates

It will be recalled that the consultants estimated a series of "required freight rates", that is, those freight rates that would yield a 10 per cent after-tax rate of return to equity (and, correspondingly, a net present value equal to zero). These required freight rates are essentially a distillation of the private cost structure of each trade route and each shipping option. Consequently, the lowest required freight rate on any trade route will indicate the option with the lowest cost structure.

It would be possible to compare the required freight rates between the options to determine which is the most competitive -- a procedure followed by the consultants. A different approach, however, will be followed in the present study. This involves substituting the required freight rate for Option 1 (RFR1) for the market freight rates in the analysis of Options 3 and 4. If the resulting net present values are greater than zero, then the option will be able to cover all of its costs and earn an after-tax return to equity greater than 10 per cent per annum. In such a situation, the option will have lower costs than Option 1, which, in order to generate the RFR1, has been assumed to earn exactly a 10 per cent return to equity. Similarly, a net present value less than zero for any option will imply an after-tax return to equity of less than 10 per cent, and will indicate that the option is not competitive with Option 1.

Since the RFR1 essentially represents the cost structure of Option 1, using it as a substitute for market freight rates is identical to comparing the cost structure of Option 1 with the corresponding cost structures of Options 3 and 4. The reasons for preferring this procedure are three-fold. As discussed in the previous section, one cannot attach much confidence to the estimates of market freight rates derived by the consultants. Moreover, it is not even clear that the use of market based freight rate estimates is appropriate where the routes developed are artificial and are not representative of actual voyage movements. This difficulty with cross-trading does not arise when one is using RFR1, however, since the size of the resulting net present values depend only on the differential cost characteristics between Options 3 and 4 on the one hand and Option 1 on the other. These differentials would persist if cross-trading were introduced into the model. As long as one

is willing to assume that all options are able to take advantage of the same cross-trading opportunities (and there is no reason to expect that this would not be the case), the net present value associated with any particular vessel under Options 3 and 4 will not be affected by the introduction of additional voyage legs.

The second reason for preferring the use of RFR1 to estimates of market freight rates relates to the desire for clarity in exposition. While it would have been possible to accommodate differences in forecasts of freight rates in the sensitivity analysis (as was done by the consultants), the consequence of such an approach is to lose the thrust of the analysis in a sea of figures. Difficulties in interpretation of the results inevitably follow from the consultants' use of estimated market freight rates, since one is forced to try to explain how a route can be "commercially viable" and "non-competitive" simultaneously. One also has to explain why investments identified as earning a real return on equity in excess of 10 per cent per annum would need financial assistance, and why shipping services are being supplied on routes where foreign shipping services earn less than the "required" rate of return.

Use of a cost-based estimate of future freight rates involves making the assumption that competition in these markets will be such that, in the long run, shipowners will only receive "normal" profits. Under these assumptions, the prices charged for shipping services would be just high enough to allow costs to be covered (including a normal profit). That is, prices higher than this level could be expected to encourage more entry into the markets in question, thus exerting downward pressure on freight rates. Exit from the industry would have the opposite effect in cases where long term freight rates fell below the cost-recovery level.

It is recognized that this assumption may not accurately reflect future conditions in all shipping markets. In the case of the general cargo trades (container and break-bulk), the assumption is particularly suspect, in view of their cartelized market structure. It could also be argued that movements towards bilateralism could potentially alter the competitive nature of other shipping markets. The degree to which international shipping will be non-competitive in the future is a subject of intense dispute. Many analysts feel that the present oversupply of shipping services in many markets will help to keep rates competitive for a number of years to come. Furthermore, it can be argued that the existence or threat of entry of non-conference operators in the general cargo trades will restrain freight rates in these markets. Observers inclined to take a different view, however, argue that increasing government intervention to protect shipping industries will result in decreased competition in deep-sea shipping in the future.

In the face of these unresolved issues, use of the required freight rate for Option 1 as the market freight rate allows one to determine the commercial viability of the various shipping options if it is assumed that markets will be competitive in the future. Furthermore, it can be determined by how much these competitive freight rates would have to vary in order to ensure the commercial viability of the Canadian-flag options. Finally, the question of which Canadian-flag option would

have the lowest commercial costs can be addressed by examining which of the options "come on stream" as rates are varied above the competitive level.

In the remainder of this chapter, and in the presentation of the main findings of the economic analysis in Chapter 5, the routes and options were analysed using the required freight rate for Option 1 as the market freight rate.

5. RESULTS USING COST-BASED FREIGHT RATES

Figure 2-3 presents the net present values for Options 3 and 4 when the required freight rate for Option 1 is used to represent the market freight rate and costs are as calculated in the base case of the consultants. Two conclusions emerge from the figure. In the first place, both Options 3 and 4 have negative net present values -- indicating that they have higher cost structures than Option 1. Secondly, Option 3 has higher costs than Option 4 on all but two of the trade routes.

Comparison of Options 3 and 4

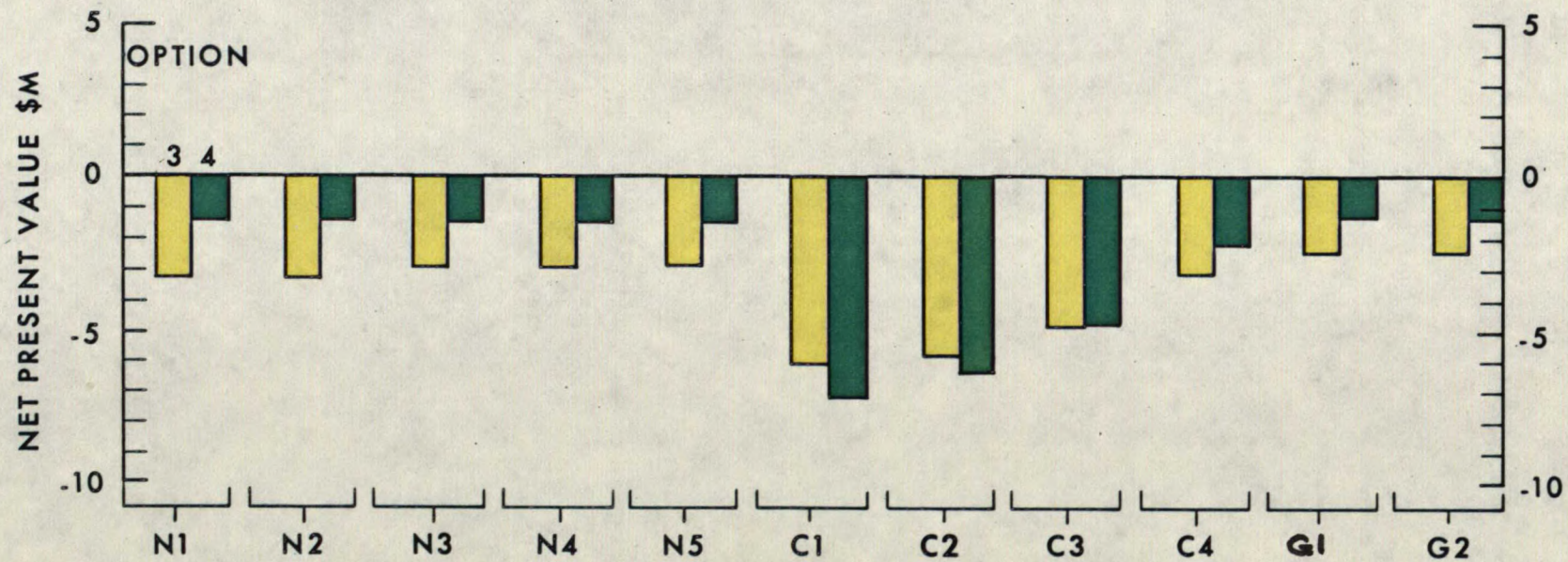
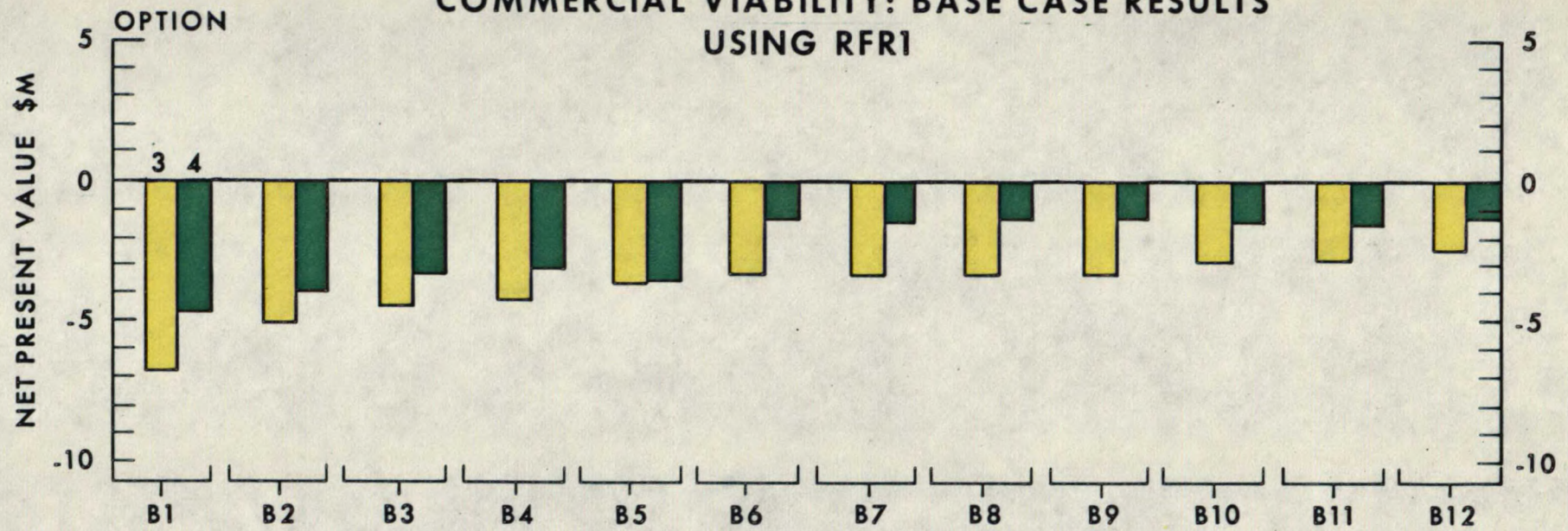
There are three major cost differences between Options 3 and 4 which explain the difference in their respective net present values. These are vessel prices, depreciation rates, and financial arrangements.

- (i) Vessel Prices: It is assumed that the Option 3 vessels are built in Europe, while Option 4 vessels are produced in Canada. The prices for European vessels are lower than Canadian prices, even when account is taken of the 12 per cent Canadian ship-building subsidy assumed in the analysis.
- (ii) Capital Cost Allowance (CCA): Option 3 operators are permitted to depreciate their vessels for tax purposes at a declining balance rate of 15 per cent per year, beginning in the first year of operation. Canadian tax laws allow operators of Canadian-built vessels (i.e., Option 4) to claim depreciation at a rate of up to 33 1/3 per cent per year on a straight line basis.² The consultants assumed, however, that operators would probably not be in a financial position to take full advantage of the latter "incentive" depreciation rate. It was assumed that Option 4 shipowners would claim depreciation for their ships at a straight line rate of 12 per cent per annum

¹These option rankings are, of course, the same as the rankings determined by the consultants on the basis of their own comparisons of required freight rates.

²The declining balance method of depreciation allows the operator to deduct 15 per cent of the undepreciated value of the vessel in each year of vessel operation. Straight line depreciation allows a percentage of the vessel purchase price to be deducted in each year.

Figure 2-3
COMMERCIAL VIABILITY: BASE CASE RESULTS
USING RFR1



for vessels costing more than \$30 million, and at a 20 per cent rate per annum for smaller vessels. It might be noted that Option 4 operators have an additional advantage over Canadian purchasers of foreign-built vessels. The former can begin to claim depreciation for taxation purposes when the keel is laid in vessel construction; the latter can only claim depreciation when actual shipping services commence. The laying of the keel was assumed to take place a full year before the beginning of vessel operation.

- (iii) Financial Arrangements: Table 2.2 identifies the differing financial arrangements assumed to apply in the two options in the base case of the consultants. The financial arrangements for Option 3 are the most lenient permitted by the OECD protocol on ship export financing.

Table 2.2

Differences in Financial Arrangements
Between Options 3 and 4

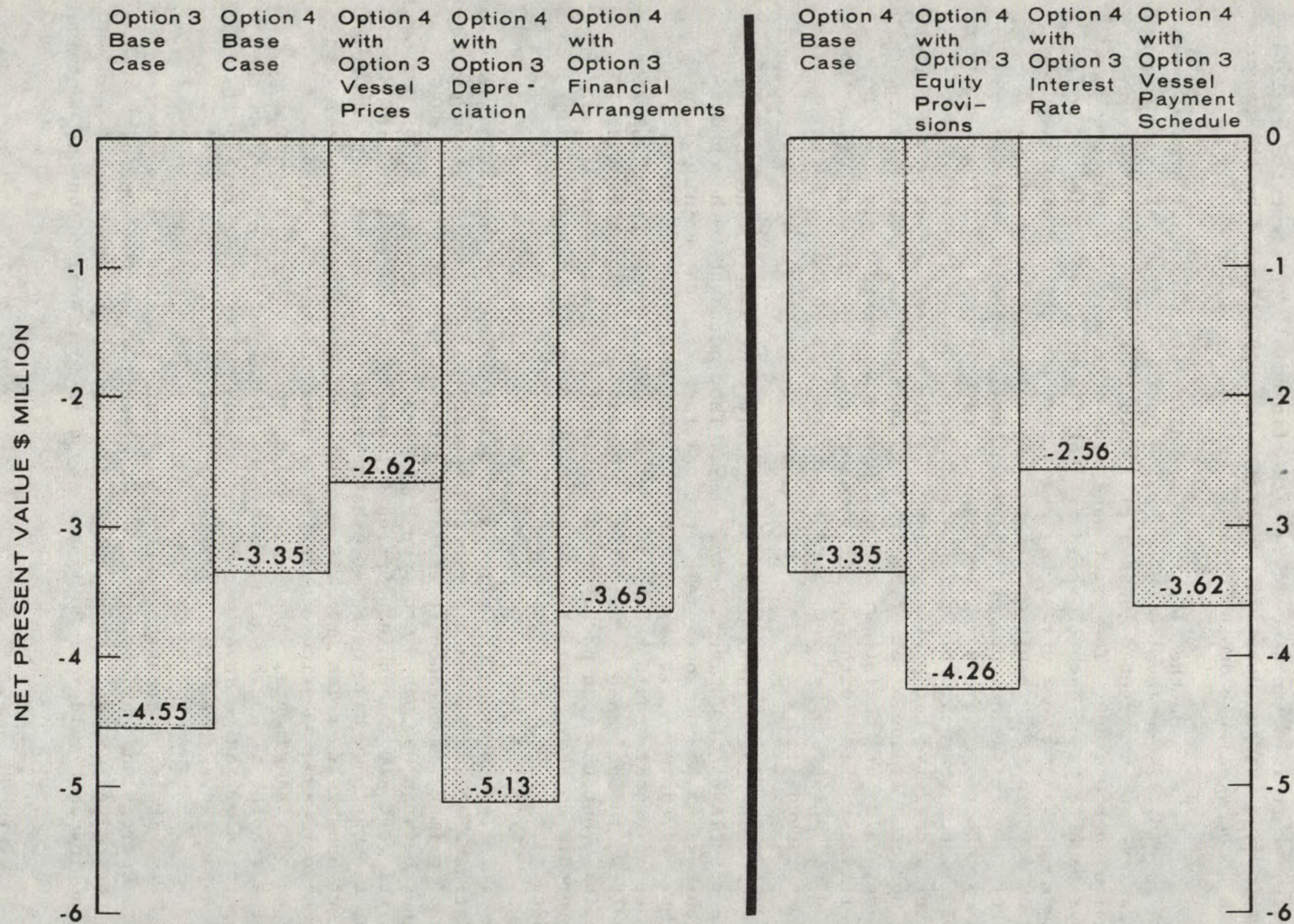
	<u>Option 3</u>	<u>Option 4</u>
(a) proportion of vessel cost financed by loans	70%	80%
(b) interest rate	8.5%	11.5%
(c) length of loan	8 years	8 years
(d) withholding tax on interest paid abroad	15%	nil
(e) vessel payment schedule	30% in first year of construction 70% in second year of construction	20% in first year of construction 80% in second year of construction

The relative importance of these differences in costs can be examined by substituting (separately) the levels of the Option 3 variables into simulation of Option 4 net present values. That is, as one variable was changed, other Option 4 costs were assumed to remain at their base case levels. The effects of utilizing such a procedure on trade route B-3 are presented on the left hand side of Figure 2-4.

The first two bars of Figure 2-4 represent the base case net present values for Option 3 (-\$4.55M) and Option 4 (-\$3.35M) respectively. As shown in the third bar, when Option 3 vessel prices are substituted in simulation of Option 4, the net present value of Option 4 becomes less negative. This is the result of Option 3 vessel costs being 7 per cent lower than the net-of-subsidy price of Canadian vessels. On the other hand, if the depreciation provisions for tax purposes under Option 4 were the same as under Option 3, the Option 4 net present value becomes more negative, as shown in the fourth bar (-\$5.13M compared to -\$3.35M). Both the reduced depreciation allowance and the requirement of taking it later in the life of the operation serve to make the Option 3 depreciation schedule less attractive than the Option 4 depreciation schedule.

Figure 2-4

SIMULATION OF OPTION 4 COMMERCIAL NET PRESENT VALUES USING OPTION 3 INPUT VALUES



Finally, introduction of the cluster of Option 3 financial arrangements into Option 4 reduces the net present value of the latter slightly (i.e., produces a more negative net present value) as indicated in the fifth bar (-\$3.65M compared to -\$3.35M). This is a rather startling result, as it is often assumed that the financial arrangements available from foreign shipbuilders are preferable to those assumed by the consultants to be available domestically.

To examine the effects of the differing financial arrangements more carefully, the level of each of the Option 3 financial arrangements variables was substituted (separately) into the simulation of Option 4 results on Route B-3. The right hand side of Figure 2-4 indicates the separate effects of each of the different financial variables. The higher equity and more stringent vessel payment schedule associated with Option 3 would each result in greater costs for Option 4, and would therefore make the net present value of the latter more negative (-\$4.26M and -\$3.62M respectively). The interest rate for Option 3 loans however, would reduce the costs of Option 4 and, consequently, the size of the latter's negative net present value. As the overall impact of substituting Option 3 financial arrangements into Option 4 is to make the net present value of the latter more negative, this would imply that the benefits associated with a lower interest rate are more than offset by the disadvantages of an increased equity requirement and a faster vessel payment schedule.

The consultants were not entirely confident of the assumed base case level of Option 4 loan terms. They noted that the creditworthiness of the borrower is a critical factor in determining loan terms. Furthermore, it was pointed out that the construction of a number of vessels could result in a strain on Canadian capital markets, resulting in increased vessel financing costs.¹ It is, therefore, possible that the loan packages available from foreign sources could be preferable to those available domestically under the circumstances indicated.

In comparing the effects of vessel prices, depreciation provisions, and financial arrangements, it would appear that the depreciation provisions are of primary importance in explaining the difference in net present values between Options 3 and 4 on Route B-3. The substitution of Option 3 capital cost allowances into Option 4 leads to the largest deviation from the Option 4 base case net present value. The second most important effect appears to arise from assumptions concerning vessel prices, with the higher Canadian prices conferring a disadvantage on Option 4. Financial arrangements, taken as a whole, appear to be the least significant variable, although various elements of this variable, such as the proportion of equity investment required and the interest rate on loans, would have a greater effect if taken on their own.

It is interesting to note in Figure 2-3 that the two routes where Option 3 has a less negative net present value than Option 4 are both container routes. Furthermore, the percentage differential between the net present values of Options 3 and 4 is much smaller on the container

¹See the Alships Report, Part 1, Appendix B.

routes (an average of 15 per cent) than on all of the other routes (an average of 43 per cent). This is the result of two factors. A substantial proportion of the investment in a container operation consists of the containers themselves. (The latter represent 30 to 45 per cent of the total capital required.) Since it is assumed that the financial arrangements for acquisition of containers are identical for both Option 3 and Option 4 vessel owners, Option 4 does not have an advantage over Option 3 in this area. Furthermore, the depreciation rate allowed by Canadian taxation regulations for containers is a declining balance rate of 15 per cent per annum under both options. Thus, Option 4 does not have the advantage of accelerated depreciation for a substantial proportion of total investment in container ships. These two factors serve to put Option 3 on a more equal footing with Option 4 in the container trades, and result in base case net present values which are closer than on the other trade routes.

Sensitivity Analysis

It is important for several reasons to determine the sensitivity of the commercial results for shipping options to different levels of costs than those assumed in the base case of the consultants. In the first place, such sensitivity tests can reflect the uncertainty which is inherent in estimates of some future shipping costs. Secondly, sensitivity tests can determine which variables are critical in leading to the outcome of an analysis. The detailed results of such sensitivity analyses are reported in Appendix A and can be briefly summarized.

In none of the situations examined did the net present values for Options 3 and 4 become positive. This indicates, of course, that the Canadian-flag options are not competitive when compared to Option 1. Furthermore, there were only two situations where the base case ranking of the options (1, 4, 3) was altered. The first of these ranking changes occurred when Option 4 was subjected to more stringent loan terms. The increase in costs resulted in Option 3 appearing more competitive than Option 4 on 8 out of 23 routes. As noted above, the consultants felt that more stringent domestic loan terms could apply if many ships were being built in Canada or if the ship purchaser were not of sufficient financial strength.

The second situation that resulted in changed rankings was the assumption of low foreign vessel prices. With this assumption, a new (lower) RFR1 was used in the analysis of Options 3 and 4, as Option 1 would be operating with lower costs. The lower RFR1 resulted in the net present values for Option 4 declining by over 100 per cent. The Option 3 net present values, however declined only slightly. In this situation of low foreign vessel prices, Option 3 outperformed Option 4 on every trade route.

This latter result is important, as low vessel prices may continue to be offered by foreign shipbuilders for some time in the future. In this case Option 4 would appear substantially inferior, from a commercial viewpoint, to Option 3. Neither option, of course, can compete with Option 1, as the latter option always has the lowest costs of any option studied.

6. CONCLUSIONS

The consultants' report provides a basic framework for analyzing the commercial viability of various shipping options. There appear, however, to be several major difficulties with the report. First, there does not appear to be any compelling reason why the commercial results for Options 1 and 2 should differ. As such, Option 2 will be dealt with only in qualitative terms in the subsequent analysis of this report. A second difficulty relates to the conceptual and empirical problems associated with the market freight rates estimated by the consultants. In the present study, the use of estimated market freight rates has been rejected and the required freight rates for Option 1 have been substituted in their place. A third difficulty relates to the base case scenario of the consultants, which is intended to reflect long-run conditions in shipping and shipbuilding rather than current market conditions.

When the RFR1 was used in the analysis but other assumptions in the base case of the consultants were retained, the net present values of Options 3 and 4 were consistently negative, implying that shipping services would be provided at the lowest private cost by Option 1. Option 4 had the smaller negative net present value on 21 of the 23 trade routes, indicating that this is the Canadian-flag option that would generally provide shipping services at the lowest private cost. In comparison, the commercial costs associated with Option 3 vessels are greater than those of Option 4 -- a result attributable primarily to the more favourable depreciation provisions available to the latter option. Consequently, the ranking of options in terms of increasing commercial costs is 1, 4, 3.

This ranking of options and the consistently negative net present values for Options 3 and 4 were basically confirmed in the sensitivity analysis. In only two situations did the net present values of Option 3 become less negative than those of Option 4. One situation was where loan terms were more stringent for Option 4 operators. In this case, Option 4 outranked Option 3 only on 15 of the 23 trade routes.

A more striking change in the ranking of options occurred when vessel prices were varied. If vessel prices remain at their currently low level for some time in the future, as many analysts believe they will, then Option 3 would be more competitive than Option 4. This critical variable would need very close study before a private entrepreneur could seriously consider an investment in a Canadian-built vessel.

The overall and most important conclusion, however, does not change in the sensitivity analysis. That is, the consistently negative net present values associated with the Canadian-flag options imply that the commercial costs of carrying Canadian cargo would be lowest if reliance were placed on foreign flag carriers.

Chapter 3

METHODOLOGICAL FRAMEWORK FOR THE ECONOMIC ANALYSIS OF DEEP-SEA SHIPPING OPTIONS

1. INTRODUCTION

The analysis presented in the previous chapter focused on the private profitability of prospective shipping investments. Each of the net present values generated in this area of the inquiry can be considered as a measure of the commercial viability of undertaking an investment in the provision of shipping services. Positive net present values were interpreted as indicating that the shipowner would receive a return greater than could be expected from pursuing alternative investment opportunities. Conversely, negative net present values suggested that the return associated with supplying the shipping service would be less than that realized in alternative activities.

This analysis of private profitability provides the basic data necessary for consideration of the various deep-sea shipping routes and options from the point of view of the Canadian economy as a whole. As in the commercial analysis, the economic analysis will begin by considering each of the routes and options as independent investment decisions. General policy conclusions can only be derived after the results for individual routes and options have been assessed.

In examining each of the potential investments from an economic perspective, it is necessary to take into account much broader criteria than potential private profitability. Indeed, the whole concept of "costs" and "benefits" is considerably altered in approaching the analysis from an economic perspective, and an appreciation of this distinction is necessary to understanding what follows.

Essentially, analysis of investment projects from the viewpoint of society focuses on the total real resource implications of alternative actions, while a private financial analysis measures flows of money between various actors in the economy. Within the former framework, economic costs are defined in terms of the opportunities sacrificed by deploying labour and capital in particular investments, while economic benefits are measured by the value users place on the goods or services produced by the investment. Net economic benefits will result when the total present value of the production realized from the investment exceeds the value of the productive opportunities lost by diverting resources from alternative uses. Conversely, economic costs result when the value produced is less than could be expected if the resources were employed in alternative activities.

In many cases, the measurement of both economic benefits and economic costs can be achieved simply by use of market prices. On the

benefit side, this is accomplished by multiplying the total quantity of goods or services produced by the price consumers are willing to pay for the product in question. On the cost side, the value of output sacrificed can often be determined by measuring the prices commanded by the resources employed in undertaking the project. Thus, if a certain resource used as an input commands a price of \$X per unit, this often implies that \$X per unit of alternative production is sacrificed for each unit of the factor employed in the project being examined.¹

Under certain conditions, however, the existence of distortions in the economy will lead to a divergence between the market prices of real resources and the economic costs associated with employment of these resources. Such distortions occur most often where resources would not be fully employed in the absence of the project in question. In such cases, an "externality" exists to the extent that the price of the resource does not represent its opportunity cost (the output sacrificed), and it becomes necessary to apply a special "shadow price" to account for the effects of unemployment. This "shadow price", which has the effect of lowering the economic costs of an activity below its private costs, is most often applied to the labour employed in a project.

On the benefit side, there are certain conditions under which the price consumers are willing to pay for a good or service is less than the social or economic valuation of the product. The case for making such adjustments is often advanced when particular projects generate foreign exchange earnings, either by replacing imported goods or by augmenting the production of export goods. Under such circumstances, it can be argued that the foreign exchange generated commands a "shadow price" higher than its market price, and thus generates a net economic benefit.

In practice, the incorporation of the broader economic criteria in benefit-cost analysis of a project can be achieved by making a series of adjustments to the private cash flows generated in financial analysis of the same project. The effect of the transformation of financial flows into their underlying real resource effects may either increase or decrease the attractiveness of the investment from that measured in the financial analysis. The effects of the shadow price adjustments, however, are generally to lower the economic costs or to increase the economic benefits, and these adjustments therefore augment the net benefits associated with the investment being studied.

The methodologies employed in transforming financial flows into their underlying real resource effects and in applying a shadow price to foreign exchange effects are discussed in the remainder of this chapter. Chapter 4 will outline the methodology used in estimating the labour adjustments and presents the analysis undertaken to estimate the quantitative significance of the latter effects.

¹This method of valuation derives from the principle that in perfectly competitive input and output markets a factor of production will be paid the value of its marginal contribution to output.

2. ECONOMIC VS. FINANCIAL PERSPECTIVES

Selection of Appropriate Cash Flows

As mentioned previously, the commercial analysis of Canadian deep-sea shipping options involved the generation of a series of cash flows which indicated the net change in the financial position of the potential investor in Options 3 and 4 for each year of the project. These cash flows were then discounted at an interest rate which reflected the opportunity cost of the investor's equity capital. The resulting net present value of the commercial cash flow consequently measured the amount by which expected profits from the project exceeded or fell short of what would be considered an acceptable return on the equity investment.

While this procedure is relevant for private sector evaluation of investment alternatives, the accounting must be altered somewhat in order to examine the project from a social perspective. In the commercial analysis of Options 3 and 4, the debt initially supplied to purchase the vessel, together with government subsidies to Canadian shipbuilding, are not regarded as costs to the investor in shipping. Since these items are in effect transfers from institutions such as banks or government agencies to the shipbuilder, they do not appear as negative entries in determining the net cash flow position of the investor in shipping. In later years, however, the principal and interest payments on the debt do represent a negative entry in determining the net cash flow position of the investor, since these charges represent direct claims on revenue of the shipping firm. Similarly, any taxes paid are considered as costs from the investor's viewpoint and, correspondingly, taxation provisions which reduce these payments are considered to be benefits.

In examining these investments from the viewpoint of the economy as a whole, however, we are interested in the efficiency with which resources are allocated, and not simply with the results of an equity investment. Since the debt or government subsidy applied to the purchase price of a vessel is a measure of real resources allocated to the project, it is appropriate to include these items as costs in the

¹This is most clearly seen in the effect of the accelerated capital cost allowance available under Option 4. By reducing the taxable income of the shipowner in the early years of the investment, this capital cost allowance may considerably improve the internal rate of return on equity of such investments. Accordingly, the financial analysis indicates that significant "benefits" are associated with the ability of shipowners to take advantage of this tax provision. From an economic perspective, however, these "benefits" are simply transfers from the taxpayer to the shipowner, and do not affect the economic return on the investment.

economic analysis. The repayments of the debt do not represent costs from the viewpoint of the economy as a whole, however, since these flows are simply financial transfers within the private sector; that is, they do not represent changes in the allocation of real resources.¹

On the benefit side of the economic analysis, it is necessary to consider the value of the total product generated from the investment in question, and not simply that portion of the payment for the good or service which accrues to the private participant after the payment of taxes. In practice, the necessary adjustments involve including the debt servicing charges, debt repayments and taxes as positive cash flows in the economic analysis, since these payments -- together with the financial return to the equity investor -- measure the market value of the goods produced.

This distinction between the cash flows relevant for private sector evaluation and the movements of real resources applicable in the economic analysis is illustrated in Figure 3-1. Flows of money between the various participants are indicated by solid lines, while the associated real resource flows are depicted by broken lines on the right hand side of the figure. It can be seen that the economic evaluation of the prospective investment focuses on the gross (pre-tax) return for the total investment, and that this in turn is equal to the sum of the net cash flows accruing to equity holders, financial institutions and government.

The Social Discount Rate

The selection of appropriate cash flows is only the first step in the economic evaluation. It is necessary to aggregate these effects in order to take into account the lower values associated with future costs and benefits relative to those in the present. It is also necessary to measure these flows against the return expected had the resources not been diverted from alternative uses. Both of these effects can be incorporated in the analysis through the use of a social discount rate reflecting the productivity of capital in the Canadian economy.

The social discount rate recommended for use in the Canadian government is 10 per cent per annum, and this rate has been adopted in the analysis that follows. A discussion of the theoretical and empirical evidence supporting this figure is presented in Appendix B.

Adjustment for Subsidized Foreign Vessel Financing in Option 3

While the use of a 10 per cent discount rate in the economic analysis of investment projects undertaken with Canadian resources has rather firm theoretical and empirical foundations, there is some doubt as to whether such a discount rate is entirely applicable in assessing Option 3.

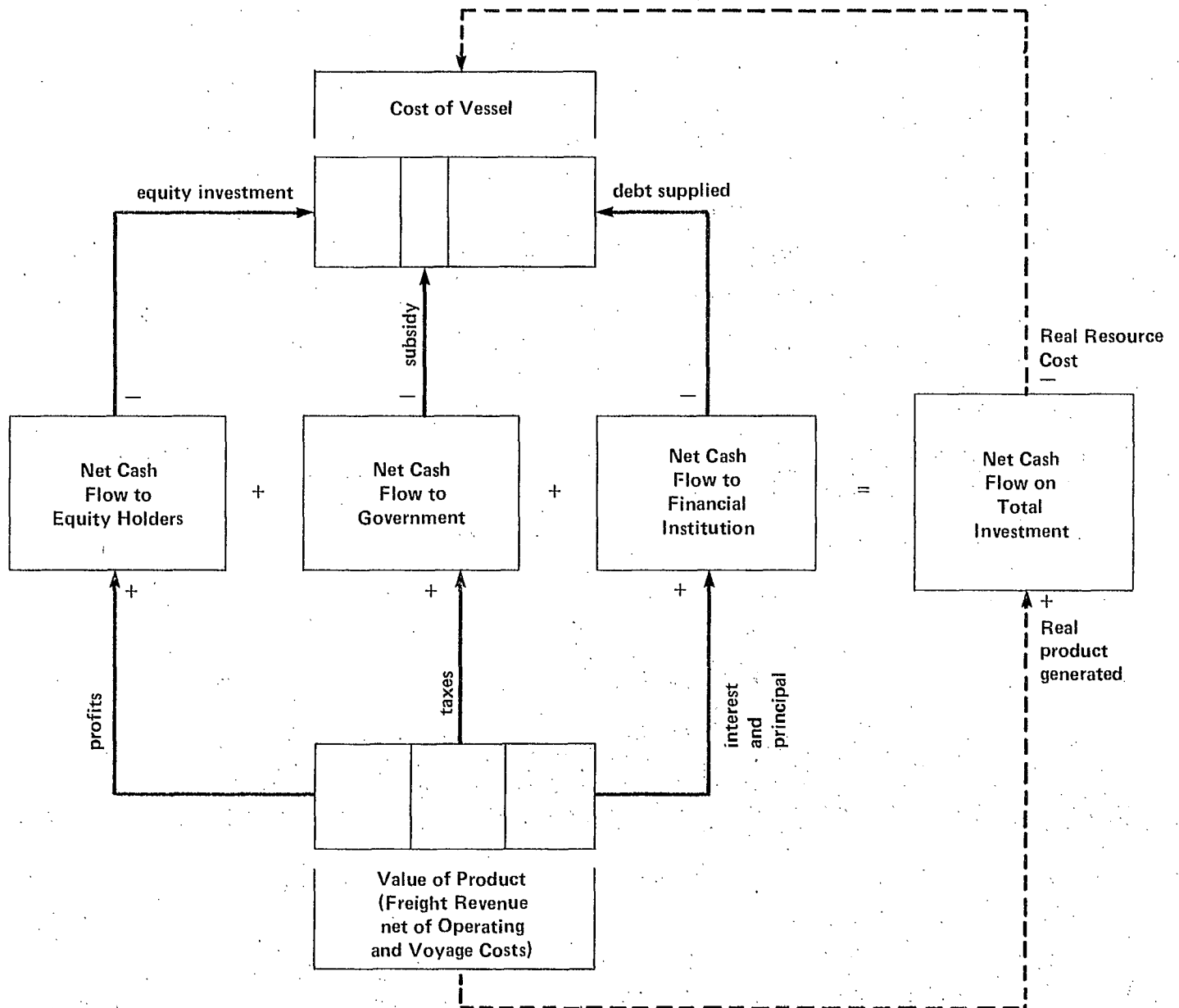
As noted in Appendix B, the theoretical foundation for the 10 per cent social discount rate rests in part on the notion that the

¹An exception to this rule occurs when the debt is supplied from foreign sources and when the capital can be considered incremental to the Canadian economy. This exception is discussed below.

Fig. 3-1
PUBLIC VERSUS PRIVATE INVESTMENT CRITERIA

FINANCIAL ANALYSIS

ECONOMIC ANALYSIS



supply of foreign capital to the Canadian economy is a relatively fixed proportion of total domestic investment. Accordingly projects should be evaluated under the assumption that capital inflows greater than this proportion will displace other foreign borrowing. In this "fixed proportion" case, therefore, the fact that certain investments may be financed at relatively low rates of interest does not imply that a social discount rate close to such borrowing rates is applicable in evaluation of projects.

There is some doubt, however, as to whether the assumption of "non-incrementality" of capital flows is appropriate when considering the effects of an Option 3 investment involving purchases of foreign ships. Virtually all countries in the world subsidize their shipbuilding industries, with the provision of subsidized loans to foreign buyers being the rule rather than the exception. In view of the rather acute overcapacity in this industry, and the apparent willingness of many countries to compete vigorously in offering highly attractive loan and subsidy schemes to their customers, a good argument can be made for considering the capital inflow associated with foreign vessel purchases under Option 3 as being "incremental" and not affecting other capital inflows. Under such conditions, the provision of substantial loan assistance at below-market interest rates for the purchase of ships can be considered to impart a "capital gift" to the recipient country.

The benefits accruing to the Canadian economy through subsidized financing were accordingly incorporated explicitly in the analysis. These benefits were measured by multiplying the difference between the estimated real productivity of capital in the Canadian economy (10 per cent per annum) and the real cost of the capital for purchases of foreign ships (approximately 1 1/2 per cent per annum) by the amount of the loan outstanding in each period.

3. THE SOCIAL VALUE OF FOREIGN EXCHANGE

Arguments for assigning a special value to activities 'gaining' foreign exchange which are based solely on balance-of-payments considerations are discussed in Appendix C. They are not generally considered to justify, at least in the Canadian context, assigning a value to foreign exchange that is different from the exchange rate. There is, however, a respectable academic literature which, on rather different grounds, favours applying a premium or positive² shadow price to activities which augment supplies of foreign exchange. The theory was originally developed for application to less-developed countries, but has, nonetheless, some relevance for more advanced economies. In

¹The loan for an Option 3 vessel was assumed to be available at a nominal interest rate of 8 1/2 per cent and the assumed expected inflation rate equalled 7 per cent. The real cost of this capital under these assumptions is given by the following formula.

$$r = \frac{1+i}{1+p} - 1 = \frac{1.085}{1.07} - 1 = .014 \cong 1.5 \text{ per cent}$$

Where r = real cost of capital
 i = nominal interest rate
 p = expected rate of inflation

²See, for example the 'Symposium on Shadow Exchange Rates', Oxford Economic Papers (New Series), Vol. 26, No. 2, July 1974.

particular, Jenkins has constructed and estimated a general equilibrium model of the Canadian economy to determine what an appropriate shadow price of foreign exchange might be for this country.¹ Since the model is quite complicated, only the general theoretical approach will be discussed here. The interested reader is advised to consult the original source for a more complete elaboration of the basic concepts.

The theory that the social value of foreign exchange is higher than its market price derives from consideration of the extent to which tariffs and subsidies "distort" the supply of and demand for foreign exchange. It is argued that tariffs on imported goods drive a wedge between the social value of imports (measured by the gross-of-tariff price) on the one hand and the foreign exchange cost of the goods (measured by the net-of-tariff price) on the other. Consequently, measures that serve to increase the consumption of imports are thought to confer an indirect benefit on Canada. The value of this benefit is equal to the increase in imports times the difference between the gross- and net-of-tariff prices of goods.

The existence of subsidies to exports similarly drives a wedge between the social value of exports (the gross-of-subsidy value) and the foreign exchange earned from these exports (the net-of-subsidy value). Consequently, measures which serve to reduce the amount of resources devoted to such activities will confer benefits equal to the reduction in production of subsidised exports multiplied by the average subsidy per unit of production.

These concepts can be used to derive a shadow-price for foreign exchange earnings. The latter can be estimated by determining the extent to which incremental foreign exchange earnings tend to increase the exchange rate. A rise in the value of the Canadian dollar would tend to increase imports and reduce exports, resulting in the benefits described previously.

Jenkins' calculation of the distorting effects of tariffs and subsidies indicate that the value of foreign exchange is some 15 per cent greater than its market price. The implication for the present analysis is that if particular Canadian shipping options generate net foreign exchange receipts, then these options should be credited with 15 per cent of the value of such net foreign exchange earnings.

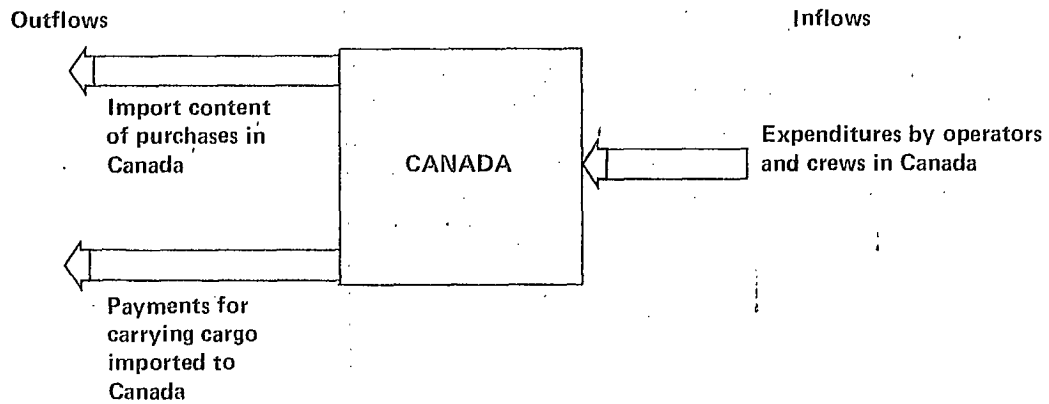
The Calculation of Net Foreign Flows in the Analysis of Deep-Sea Shipping Options

It is important to note that the 15 per cent premium should be applied only to the net foreign exchange generated by a shipping option. The Alships Report provides the data necessary for the calculation of these net foreign exchange effects. The various foreign exchange flows associated with the different shipping options are indicated in Figure 3.2.

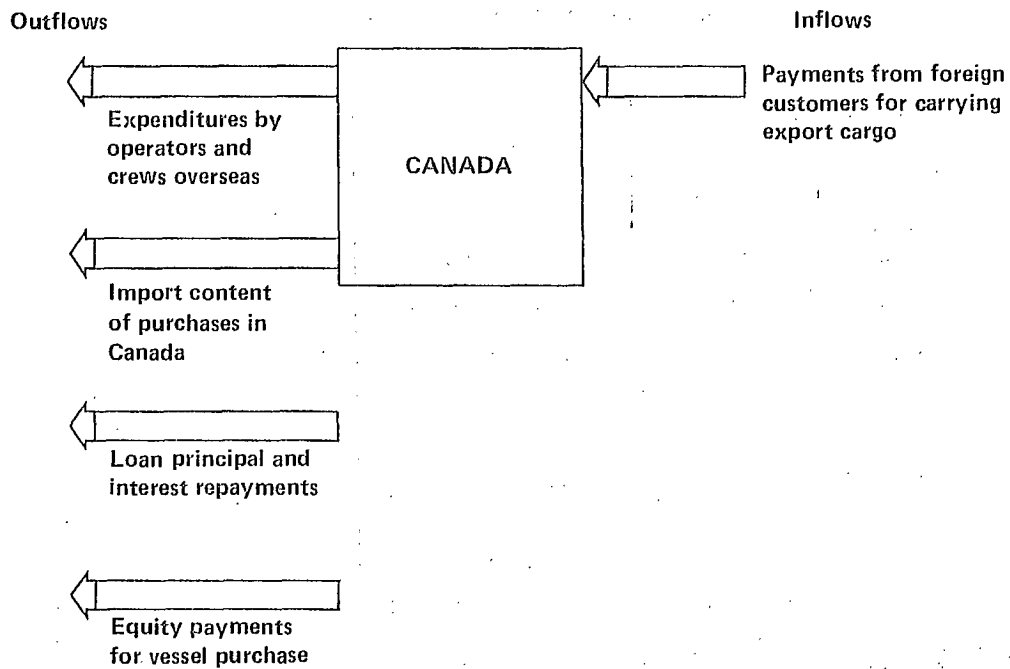
¹Glenn P. Jenkins, "Theory and Estimation of the Social Cost of Foreign Exchange Using a General Equilibrium Model with Distortions in All Markets", Harvard Institute of International Development, December 1976.

Fig. 3-2
DIRECT FOREIGN EXCHANGE FLOWS

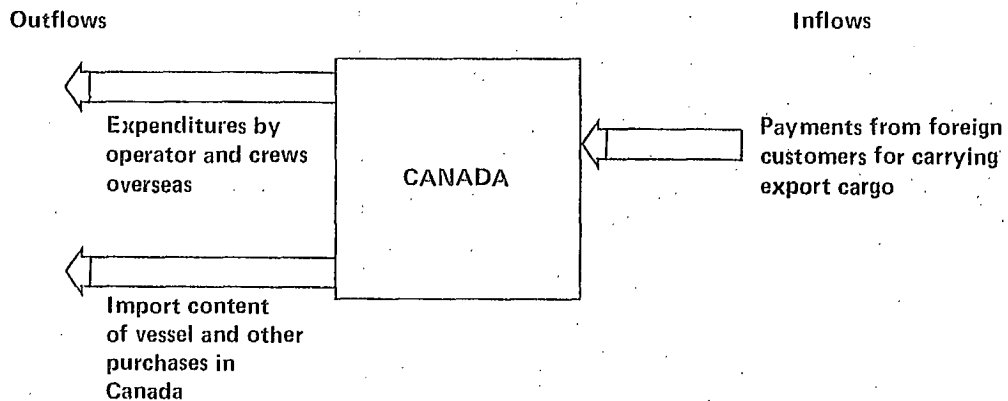
Option 1



Option 3



Option 4



On the revenue side of shipping operations, Option 1 results in an outflow of foreign exchange from Canada in the form of freight charges paid to foreign shipping firms for transporting Canadian import cargo. The charges for Canadian export cargo are considered to be ultimately paid by foreigners, and so do not enter into the calculus. When imports are carried under Options 3 or 4, payments by Canadians for shipping services accrue to other Canadians and result in no foreign exchange effects. Freight charges for Canadian exports carried under Options 3 or 4 are paid by foreigners to Canadians and result in a foreign exchange inflow.

These primary effects of foreign exchange flows resulting from the accrual of revenues have to be adjusted to reflect the foreign exchange flows resulting from shipping costs. For example, Option 3 utilizes vessels purchased and financed from abroad, and the payments for these vessels constitute an outflow of foreign exchange. In addition, the Option 4 vessels built in Canada have some imported content which must be registered as an outflow of foreign exchange. Moreover, all shipping options purchase some fuel in Canada, but a portion of this fuel is imported. This ultimately leads to a foreign exchange outflow in spite of the fact that initial payments for the fuel were made to Canadians. These and other foreign exchange flows associated with costs of the various shipping options are detailed in Part II of the Alships Report.

Once the net direct foreign exchange impact for the various options is calculated for each year of the analysis, the flows are discounted so that they can be presented in net present value terms. The next step of the analysis is to subtract the foreign exchange flows associated with each trade route under Option 1 from the flows associated with the other shipping options on the same trade routes. This gives the net direct foreign exchange effects of moving from the 'foreign option' to one of the 'Canadian options'.

The shadow price for foreign exchange can now be applied to the calculated net flow of foreign exchange associated with Option 3. For Option 4, however, further indirect foreign exchange effects have to be taken into account. These indirect foreign exchange effects arise because Canadian labour, capital equipment and intermediate goods are used in the production of Option 4 vessels. If these factors of production were not used in shipbuilding they might be employed elsewhere in the economy producing exports or import-replacing goods. Thus, foreign exchange is foregone by using these factors in shipbuilding, and such foregone foreign exchange must be subtracted from the previous calculation of the net foreign exchange effects of the option.² The 15 per cent foreign exchange premium can now be applied to this final calculation of the net foreign exchange effects of Option 4.

¹The Alships Report, Part II, page 3.1.

²A detailed explanation of the calculation of such indirect foreign exchange effects can be found in Appendix C.

The Shadow Price of Foreign Exchange: An Alternative View

Many analysts are not convinced by the arguments put forward in favour of shadow pricing the foreign exchange effects of investment projects. These analysts argue that it is invalid to regard all tariffs and subsidies as being "distortions" in the economy, and that these policy instruments may actually be designed to increase social and economic welfare. Thus, import duties on liquor may be intended to reduce consumption of alcohol; textile and footwear tariffs may be designed to protect jobs in slow growth areas of the country where workers would otherwise be unemployed. If tariffs and subsidies for exports increase economic efficiency and social welfare, then there is no divergence between the social and market value of foreign exchange, and no reason to apply a premium to any net foreign exchange generated by a project.

Even if there is acceptance of the basic theory underlying the shadow price of foreign exchange, there is not complete agreement that 15 per cent is the appropriate shadow factor. There are a large number of variables to be estimated, and some feel that unreasonable assumptions have been made regarding the level of some of these parameters. The view has been expressed that these assumptions impart an upward bias to the estimate. If more 'reasonable' assumptions were made in the analysis, the shadow factor would presumably be less than 15 per cent.

A further difficulty with the use of a foreign exchange premium is that its use may provoke a reaction from other countries. That is, in response to Canada's preferential treatment of projects that generate or save foreign exchange, foreign governments may subsidize exports or increase the tariff rate on imports. In such a situation, the attempt to correct distortions in the Canadian economy by shadow pricing foreign exchange results in new distortions resulting from the actions of foreign governments. These new distortions involve a changed environment for Canadian trade and hence the foreign exchange market. This, of course, affects the foreign exchange premium, leading to doubts about the completeness and validity of the model.

There is obviously merit in the arguments of both the proponents and opponents of applying a shadow price to the foreign exchange generated by investment projects, and the present study will take an agnostic position on the debate. The economic effects of the various shipping options will, therefore, be presented with and without a premium for the net foreign exchange they generate. While this procedure does not resolve the methodological problem, it does provide the reader with information concerning the possible importance of foreign exchange "benefits" relative to other benefits and costs of the various shipping options.

¹This is currently a major problem in international trade, with countervailing duties being levelled on imports whose production is subsidized by foreign governments.

Chapter 4

LABOUR MARKET EFFECTS

1. INTRODUCTION

As indicated in Chapter 3, the social or economic cost of using an underemployed resource can be less than the nominal price charged for the use of that resource. In such a case, it is appropriate in an overall economic analysis to use a "shadow price" that is lower than the market price for the resource in question. Or, to put it another way, in the present case -- to the extent that otherwise unemployed labour would be employed as a result of one of the Canadian deep-sea shipping options -- it is possible to estimate a labour "benefit" or "externality" associated with that option. Such a benefit or externality should be used to reduce the nominal or market cost of the labour so employed.

The present chapter outlines the methodology and procedures used to estimate the labour externalities associated with Canadian deep-sea shipping options. A more complete explanation of the principal parts of the analysis is given in Appendix D.

Sections 2 to 8 review the analysis used to estimate a labour externality for Canadian shipbuilding. The resulting estimates are incorporated into the economic analysis of Option 4 as presented in chapter 5.

The concluding section of the present chapter deals with employment aboard ship and the estimation of a corresponding externality for on-ship labour. The resulting estimates were incorporated, as reported in chapter 5, into the economic analysis for both of the Canadian-flag shipping options, i.e., Options 3 and 4.

2. LABOUR EXTERNALITY IN CANADIAN SHIPBUILDING

In Chapter 1, mention was made of the substantial excess capacity in the world shipbuilding industry, and the expectation that this condition will persist over the medium term. The Canadian industry, like others, has been hard hit by the collapse in the world market and, with its relatively high cost structure, has found it very difficult to obtain new international orders. It can be expected that some reduction in the size of the industry is likely to be inevitable, and that this will involve the layoff of at least a portion of the present labour force.

Under these circumstances, one of the potential benefits of developing a Canadian-flag fleet using Canadian-built vessels, i.e., Option 4 in the present study, is that the incremental demand for Canadian vessels could postpone or avert layoffs that would otherwise be expected in the Canadian shipbuilding industry.

The unemployment-reducing potential of an Option 4 investment was assessed by developing and estimating a model of employment and unemployment in the Canadian shipbuilding industry. Using a data base developed from information collected by the Unemployment Insurance Commission, it was possible to estimate two scenarios of the labour market affected by the construction of a vessel in Canada. The effect of incremental demand for Canadian vessels was modelled by developing a retention scenario, in which it was assumed that the number of individuals affected, their earnings, and their weeks of unemployment could be predicted on the basis of the average experience of shipbuilding employees in the past. The effect of not constructing a vessel was modelled by developing an immediate termination scenario, in which it was assumed that the individuals otherwise employed in vessel construction would be laid off from the industry. This scenario was developed by examining the data available for individuals who had been separated from the shipbuilding industry in the last few years.

The essential distinction between these two scenarios is that the latter envisages an immediate layoff of the persons otherwise employed, while the former involves a postponement of the layoff for a two year period.¹ Accordingly, while a reduction in unemployment is observed during the construction period of the retention scenario, this is somewhat offset by an increase in unemployment when the workers are released in the third year.²

Construction of vessels could, of course, proceed sequentially, and some of the impending layoffs could perhaps be postponed for many years.

The approach taken in the present study is to estimate the unemployment-reducing potential associated with the construction of a single vessel, and to take the resulting benefits into account along with the other economic costs and benefits of such an investment. The labour benefits of sequential vessel construction would be simply a series of two year "postponements". If the demand were sustained

¹The two year period was chosen on the basis of the two year vessel construction period envisaged in the Alships Report.

²The only circumstances under which it would be appropriate to neglect increases in unemployment in the third year would be if the difficulties facing the industry reflected only a temporary cyclical downturn in a market that was expected to recover in the near future. The evidence presented in Chapter 1, however, indicates that the present downturn in world shipbuilding is more a structural than a cyclical phenomenon. Under these circumstances, an analysis which neglected the post-construction effects would be distorted either by failing to take account of the extra costs required to sustain the demand or by neglecting the limited period over which the employment would be provided.

for a ten year period by the construction of five deep sea vessels, for example, this can be thought of as a series of five decision points at two year intervals. At each decision point, the labour benefits can be measured as those coincident with postponing a layoff for another two years. The net economic costs or benefits associated with a ten-year investment scenario would simply be a multiple of the net costs or benefits measured under the single vessel approach.

A complete exposition of the model used to generate the retention and immediate termination scenarios, and of the estimation procedure employed, is given in Appendix D. An outline of the main results of the analysis is provided in Section 8 below. It is first necessary, however, to outline the methodology used in linking these scenarios of employment and unemployment to the economic analysis of the Option 4 investments. This requires an elaboration of the concepts of a labour externality and of opportunity costs of labour.

3. GENERAL CONCEPTS

The basic costs of Option 4 vessels represent all of the payments accruing to the factors of production -- labour, capital, and materials -- involved in building a ship. In most cases, these costs are indicative of the value of output sacrificed when the resources concerned are employed in the Canadian shipbuilding industry. That is, the market prices commanded by factor inputs generally reflect the value of the goods and services produced by these resources. In the usual case, we might expect that the resources would be employed in other activities in the absence of the shipbuilding investment. Under such circumstances, the payments to these factors represent the opportunity cost associated with their deployment in shipbuilding.

The assumption that material inputs are likely to be fully employed in the absence of any particular investment can generally be accepted without too much difficulty, particularly when the time frame of the analysis is intended to reflect more long term conditions. Thus, there are many uses for steel in the Canadian economy, and it is reasonable to expect that other uses would be found for any locally produced steel not used in the manufacture of Canadian vessels. Valuation of the capital used in producing vessels -- the equipment, machinery, etc. -- raises a more difficult problem, since the payments accruing to the owners of these assets generally represent compensation for costs that have been incurred in the past. The opportunity cost of this capital, however, consists of the return it could earn in alternative uses. This return will be related to the liquidation value of the fixed assets in a situation where a firm is expected to decline, and may not be equal to the return commanded by the owners when capital is used in shipbuilding. The measurement of the divergence between the opportunity cost and the factor payments to capital is quite complex, however, and is not attempted in this inquiry.

The assumption that labour would be fully employed in the absence of vessel construction is clearly untenable. In the previous section, it was argued that the alternative to construction of Option 4 vessels may well be layoffs of shipbuilding workers. To the extent that these individuals would be unemployed for some period of time, the "true" or "social opportunity" cost of employing them in shipbuilding will not be given by the wages that they receive (the private cost), but rather will be equal to a lower figure which reflects the value the individuals place on their productive time while unemployed. That is, when a project employs persons who would otherwise be unemployed, no alternative physical output is being sacrificed by the economy, and the wage bill will thus overstate the opportunity cost of employing the individuals concerned.

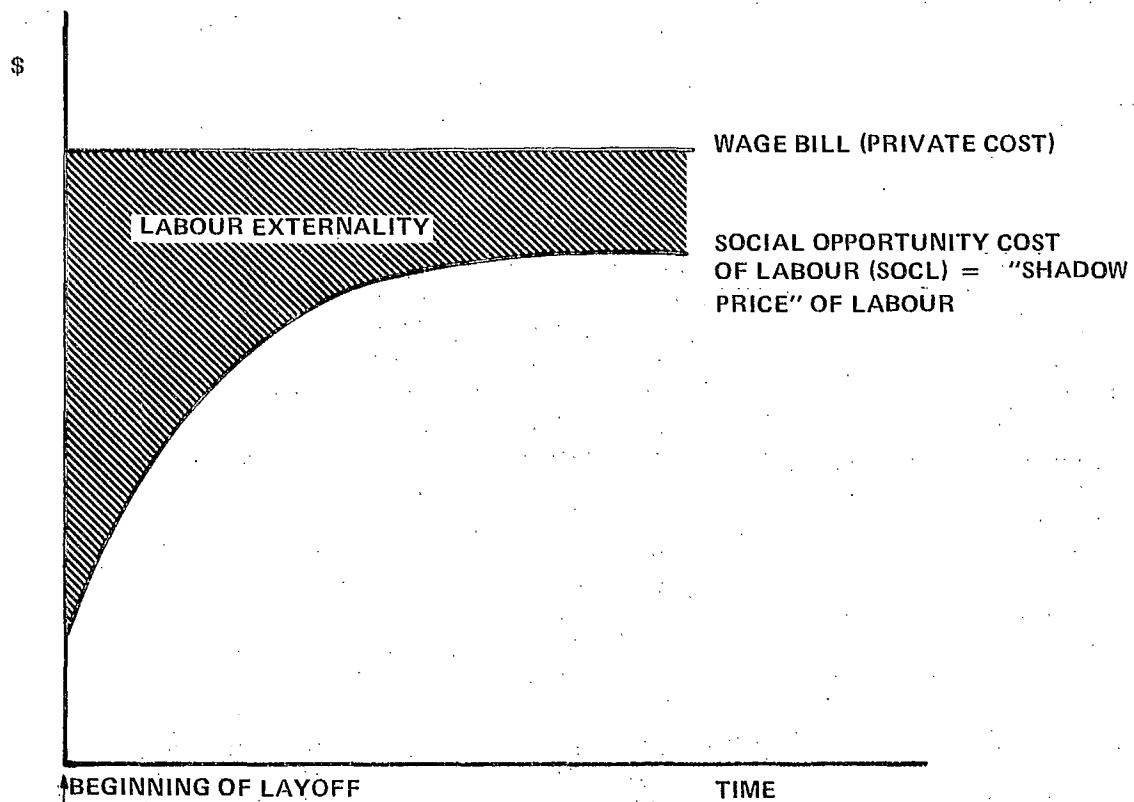
The extent to which the wage bill in shipbuilding overstates the true opportunity cost of labour will depend upon the length of time workers could expect to be unemployed and the alternative employment opportunities they might secure following layoffs in shipbuilding. The opportunity cost of such labour will generally increase over time, as most workers eventually obtain other jobs. A divergence between the wages received in shipbuilding and the true opportunity cost of labour will still remain, however, if the new employment opportunities are in areas of lower productivity, or if some of the individuals subject to layoff would fail to secure alternative employment. The relationship between the time following layoffs, the wage bill in shipbuilding, and the social opportunity cost of labour is illustrated in Figure 4-1.

A methodology for estimating the opportunity cost of labour will be outlined in the next section. For present purposes, it is sufficient to recognize that this is lower than the wages received by the individuals in shipbuilding, and that an adjustment consequently needs to be made to the costs of Option 4 vessels in the analysis of deep-sea shipping options.

Two other terms are often used in capturing the unemployment-reducing effects of an investment project. The social opportunity cost of labour is often referred to as the "shadow price" of labour. The difference between the wage bill and this shadow price is termed a labour externality. All of these terms essentially reflect the same concept, i.e., the extent to which the wage bill overstates the true opportunity cost of labour by failing to account for the extent to which a project has the potential to reduce unemployment. These concepts are also referred to in Figure 4-1.

Fig. 4-1

RELATIONSHIP BETWEEN WAGE BILL,
SOCIAL OPPORTUNITY COST OF LABOUR,
SHADOW PRICE OF LABOUR AND
LABOUR EXTERNALITY



4. MEASUREMENT OF LABOUR EXTERNALITIES

A methodological basis for estimating labour externalities has been developed in a number of benefit-cost analyses undertaken in the government of Canada.¹ The precise techniques used have varied with the project being analysed and the data available. In general, the procedures have become more sophisticated over time, as better data has become available and as a more rigorous theoretical foundation has been established.

As noted previously, the social cost of employing persons who are expected to be unemployed in the absence of the project in question is less than the wage received. Whereas the employment of a person who would otherwise be employed involves the sacrifice of alternative production possibilities, the only economic cost incurred in hiring from the unemployed consists of the value that individuals place on their time. For a number of reasons, we might expect this value to be positive. First of all, unemployed individuals engage in job search activity, and it would

¹The principal methodological contributions have been made by a team of analysts working at the Departments of Industry, Trade and Commerce and Regional Economic Expansion. The procedures used in this report are based in large measure on the concepts developed in this previous work. Two reports in particular formed the basis for the approach taken here. A paper entitled "The Social Opportunity Cost of Displaced Workers" by Glenn P. Jenkins and Claude Montmarquette (presented at the Annual Meeting of the Canadian Economics Association, Quebec City, 1976) provided the conceptual basis for the estimation procedures used for the present study. The Jenkins/Montmarquette report was concerned with estimating the externality associated with the postponement of layoffs in the Canadian aircraft industry. A second and more complex model was subsequently developed for use in the analysis of a steel complex in Cape Breton Island. A description of this model can be found in "On Measuring the Social Opportunity Cost of Permanent and Temporary Employment in Labour Markets with Migration", by Glenn P. Jenkins and Chun-Yan Kuo (mimeo, Department of Regional Economic Expansion, 1976).

While the above two reports formed the basis for the empirical procedures adopted in the present study, no attempt has been made to replicate exactly the models developed in those analyses. Instead, the approach taken has been to use the concepts developed in previous work and modify them in cases where the considerations relevant for the present analysis differed from the issues addressed in the earlier studies. In part, such modifications are inevitable if the tools developed are to be sufficiently flexible to accommodate the diverse requirements of different analyses. In part, the approach taken here was necessitated by the data available.

clearly be incorrect to suggest that this has zero value to the economy. Indeed, the importance of this activity is recognized in the design of many government programs created to facilitate the matching of workers with jobs.¹

A second argument in support of a non-zero value for the time of unemployed individuals is that we do not often observe people willing to take jobs at a wage equal to their unemployment insurance benefits. If people did not place any value on their time while unemployed, however, this is precisely what we would expect to observe.²

A maximum approximation to the value of time of the unemployed can be derived by considering that the least price at which such individuals are willing to supply their labour is equal to the value of their time plus the unemployment insurance compensation that they expect to receive while unemployed. If labour markets were perfectly competitive, we might expect that the wages prevailing in these markets would be bid down until the after-tax earnings of individuals per period equalled the supply price of labour. That is, firms would obviously have no incentive to pay after-tax wages higher than the minimum supply price of labour, while, if they paid any less, they would not be able to attract workers. Under these circumstances, the value of time can be determined from the following formula:

$$W(1-tw) = V + E(UIC)(1-tu)$$

where W = average weekly wages prevailing in competitive labour markets

tw = average tax rate on wage income

V = value of time

E(UIC) = expected unemployment insurance benefits per week

tu = average tax rate on unemployment insurance benefits

Reasonable estimates of these parameters might be as follows:

$$tw = .15$$

$$tu = .10$$

$$\text{and } E(UIC) = .5W$$

Inserting these estimates in the formula yields a value of time equal to 40 per cent of the wage rate gross of taxes.

¹The program of mobility grants offered by the Department of Employment and Immigration is one which immediately comes to mind. Unemployment insurance is another example of a program partially designed to facilitate job search activity, and hopefully to improve the matching of skills and individuals.

²It could be argued that people do not really derive any positive value from their time while unemployed, but will not work for nothing because of the "disutility" associated with working. In this case, the externality would simply be equal to the difference between the wage rate minus the disutility of working and a zero value of time. This would not be any different from the externality described above.

This rather idealized model of wage determination, however, neglects some very important factors at work in real labour markets. First of all, the model presumes that individuals are free to choose between work and non-work activities in a manner such that everyone is working just as long as they desire. All unemployment would be voluntary under these circumstances. Secondly, the model neglects the existence of institutional factors such as minimum wage laws and collective agreements, which act to keep prevailing wage rates above the price individuals are willing to accept in order to become employed. Consideration of both of these effects would tend to lower the value of time below that estimated above.

In recognition of the fact that a zero value of time implies that individuals would be willing to take jobs at a wage equal to their unemployment insurance benefits, while a value in the 40 per cent range is only consistent with purely voluntary unemployment, an estimate halfway between these two extremes was adopted in this study. This gave rise to an externality equal to 80 per cent of the wage rate for each extra week of unemployment experienced by individuals who were predicted to find jobs after layoffs from the shipbuilding industry.

Certain individuals involved in shipbuilding layoffs, however, were predicted to remain unemployed for longer than one year. For these long-term unemployed, the value of time could well fall considerably below the level adopted for individuals securing alternative employment more easily. After a long period of involuntary unemployment, we might expect that at least some of these individuals would in fact be willing to take a job at a wage paying little more than their social assistance payments. In order to avoid any possible underestimation of the externality associated with these individuals, the extreme assumption was made that there is a zero social cost associated with retaining such workers in shipbuilding. Thus, the externality for those predicted to experience long-term unemployment was set equal to their entire loss in income.²

¹A completely rigorous estimate of the value of time would require knowledge of the minimum supply price of labour, and its relationship to the wage rates actually prevailing in the local labour market. Since only the latter variable can be observed, some imprecision in the estimation of the value of time is inevitable.

²This undoubtedly serves to overestimate somewhat the appropriate externality, since we may expect that even the long-term unemployed will have a positive value of their time during at least the early part of the unemployment period.

The initial spell of unemployment experienced by individuals who are laid off but who subsequently find jobs may capture only part of the externality associated with their retention in shipbuilding. If the alternative employment that could be secured by these people is less productive than in shipbuilding (i.e., is at a lower wage), or if the probability of their subsequent unemployment is greater, a further positive externality will be associated with maintenance of shipbuilding employment. This externality will be equal to the difference between the "social products" of the individuals in the two scenarios -- i.e., the difference between the sum of the incomes and values of time of the individuals in the retention scenario, and the corresponding values for the immediate termination scenario. Expressed another way, this additional externality is equal to the difference in wage rates for each week in which the individual is predicted to be employed under both scenarios, plus 80 per cent of the wage rate for each extra week of unemployment (subsequent to the initial unemployment period) in the immediate termination scenario.

In summary, the externalities calculated in this study as being associated with averting shipbuilding layoffs are equal to:

- (1) 80 per cent of the wage rate for each extra week of unemployment experienced directly following the layoff (for individuals finding subsequent employment);
- plus (2) the entire loss in employment income for individuals predicted to be unemployed for over one year;
- plus (3) the difference between the "social product" of workers in the retention and immediate termination scenarios for the period following the initial spell of unemployment.

The focus of the methodology employed to capture labour externalities is on the real resource cost involved in retaining workers in Canadian shipyards, rather than on measures of the welfare of the individuals concerned. The reasons for taking such an approach are two-fold

- (1) the primary purpose of a cost-benefit analysis is to investigate the efficiency effects of alternative courses of action, i.e., to determine whether a proposed investment is of benefit to the national economy after taking into account the alternative production sacrificed by employing individuals in the project in question;
- (2) there is no method of assigning "prices" to the distributional consequences of different actions that is likely to command universal support, and it is not the function of the analyst to impart his own value judgments in this respect.

It nonetheless remains true that these distributional effects are an important concern, and should be presented clearly as an accompaniment to the efficiency analysis. Such a procedure is adopted in the present study.

The externalities calculated by the above procedure overstate the income loss to the individuals affected by a layoff from the shipbuilding industry. The estimated externality is equal to 80 per cent of the wage rate for each extra week of unemployment, and the entire loss in income for the long-term unemployed. The income loss, on the other hand, will be roughly equal to the difference between unemployment insurance benefits and previous wage income (both net of tax) for individuals securing alternative employment relatively quickly (i.e., prior to exhausting their unemployment insurance benefits). It was suggested earlier that this difference may be about 40 per cent of the previous wage, or half the estimated real resource labour externality. For the long term unemployed, the income loss will be equal to the difference between previous earnings and the combination of unemployment insurance and social assistance payments received by these individuals, which is again less than the externality estimated in this paper. Accordingly, the labour externality exceeds the amount of additional compensation required to maintain the income levels of individuals who would be laid off from the shipbuilding industry.

The focus on real resource effects provides a starting point for assessing appropriate government action. To the extent that the real resource externality may exceed the net economic costs of maintaining the industry (as identified elsewhere in this report), government actions designed to preserve capacity would be beneficial to the national economy; to the extent that the externality does not exceed these costs, the preservation of capacity cannot be said to be in the national economic interest, and alternative strategies to deal with the social costs of plant shutdowns would be preferable.

5. INDIRECT EXTERNALITY

While the previous section has outlined the method used for evaluating the direct externalities associated with the retention of individuals in a declining industry, two indirect effects were excluded from this approach. The first of these relates to multiplier effects, i.e., possible induced employment in the supplier and service industries. A second indirect effect of retaining individuals in a declining industry may be observed in the local labour market in cases where unemployment is high. If individuals laid off from shipbuilding would simply take jobs that would otherwise be filled by individuals who are unemployed, the prevention of such layoffs would tend to reduce the time spent unemployed by these "other" individuals. This latter phenomenon is termed a "trickle-down effect".

The use of multiplier effects is a very controversial area and has been explicitly discouraged, for example, in the Benefit-Cost Analysis Guide issued by the Treasury Board Secretariat. The grounds for excluding these effects are that forward and backward linkages are common to all forms of economic activity and, for example, will also arise from the alternative employment secured by individuals who might be laid off from shipbuilding. Insofar as avoiding unemployment in the service industries is concerned, it is, of course, the case that the increase in provincial and federal transfer payments to those directly affected by any layoff will tend to cushion the impact on aggregate demand in the community. It is also reasonable to expect that the subsidies necessary to encourage a particular activity may well have been used to provide stimulus in other areas of the economy, and that such alternative actions would also have multiplier effects.

A further difficulty with multipliers relates to the method of measurement. The most common practices used in estimating induced employment effects are to apply either estimated input-output coefficients or "primary-secondary" employment ratios to the number of jobs provided by the investment in question. Once this exercise has been undertaken, however, it is by no means clear how to use the resulting calculations of the secondary employment that is linked to the primary activity. Presumably, some of the individuals indirectly affected by a layoff would lose their jobs or suffer income losses as a result of the base sector decline, while other individuals would seek out new markets for their services. The extent to which each of these responses would occur is very difficult to measure, and it seems likely that a certain arbitrariness is inevitable in estimates of such effects.

¹The effect of creating an additional job in Canadian shipyards has been estimated by using the 1971 version of Statistics Canada's input-output model. An increase in the final demand for ships of \$30,000 produces an additional 1.4 jobs in related and service industries, for a total of 2.4 jobs. Using the same version of the model, an equivalent shock to final demand in the economy produces an additional 2.4 jobs across Canada. It would, therefore, appear that the employment multiplier effect in shipbuilding is about the same as that from any other increase in final demand brought about by increased government expenditure.

It should also be noted that the Statistics Canada input-output model fails to take account of inflationary or financial impacts of expenditures. The macroeconomic model used by the Department of Finance and the Bank of Canada (RDX2) incorporates such impacts, and produces an incremental 2.0 jobs in a simulation where a \$30,000 stimulus is applied to the national economy. A comparable stimulus to the national economy using the Statistics Canada model produces 2.8 jobs when the "closed" version of the latter model is used. This suggests that the neglect of financial and inflationary effects in the input-output model overstates the number of jobs resulting from increased expenditures by approximately 0.8.

A somewhat related issue concerns the significance of "trickle down" effects, which result when the individuals laid off compete with other unemployed persons for available jobs. We may expect that the duration of unemployment will lengthen somewhat in the region in which the layoffs occur, and that the direct externality will understate the total amount of unemployment generated by layoffs. We might also expect that such an increase in unemployment will take the form of a relatively small increase in duration among a large number of individuals in a major urban center, while the effect may be more severe among a smaller number of individuals in a more isolated community.

The "trickle down" hypothesis would appear to have more validity than the issue of multiplier effects, inasmuch as the former is not susceptible to the "linkages are common to alternatives" criticism. Extreme forms of this argument, in which it is hypothesized that there is a one-to-one relationship between any reduction in man-years (as a result of a layoff) and an increase in years of unemployment are, however, highly suspect. For one thing, the extreme argument implies that the workers laid off and other unemployed individuals in the region are perfectly substitutable, and this is difficult to reconcile with the known data on the structural characteristics of the unemployed (e.g., the concentration of unemployment among younger age groups and among women relative to the comparatively low incidence among prime age males). It might also be noted that a corollary of the extreme assumption would be that it does not matter how long an individual who is laid off takes to secure subsequent employment, since someone else is presumably deprived of a job in any event.

Notwithstanding these objections to the use of extreme assumptions regarding indirect effects, estimates which entirely ignore the effect of such economic linkages would appear to be unduly optimistic. This would be particularly the case in slow growth regions where the base sector activity (such as shipbuilding) may be large in relation to the total economic activity in the particular area.

A rigorous calculation of these secondary effects is beyond the scope of this paper. Work is presently underway in the government on integrating these secondary effects into a general equilibrium model of the labour market. It is hoped that the results of this exercise, which attempts to model the complex interactions of labour force participation, migration flows, and new job creation, will improve our knowledge of these effects and permit a more accurate estimate than is presented here.

¹Subsequent to the completion of this analysis, the Department of Industry, Trade and Commerce undertook an independent assessment of the primary and secondary effects of job losses in shipbuilding. This approach, which was based on the general equilibrium model referred to above, is outlined in Appendix D (Attachement 2). While the methodology employed in this latter approach was considerably different from that employed here, the estimated labour externality compared favourably with the estimates produced in this chapter.

The view adopted in the present study is that the direct and more easily measurable labour externality captures the major portion of the economic costs of adjustment in shipbuilding. The indirect or "ripple" effects will add to this cost of adjustment, but will by no means approach the first order effects. In the base case estimates given below, the indirect effects are assumed to equal 25 per cent of the calculated direct externality. The two estimates are then added to produce the total externality. In the high case estimates, the indirect effect is assumed to equal 50 per cent of the direct externality.

6. MODEL OF EMPLOYMENT AND UNEMPLOYMENT IN THE CANADIAN SHIPBUILDING INDUSTRY

(a) Overview

As noted previously, labour externalities were estimated by developing a model of employment and unemployment in the Canadian shipbuilding industry. The main characteristics of the data base, together with the procedures used in estimating the potential adjustment problem facing employees in Canadian shipyards, are outlined briefly below. A more complete explanation is provided in Appendix D.

Two data bases were used to generate estimates of labour externalities in the Canadian shipbuilding industry. The first, referred to as the employment summary file, contained information on the age, employment earnings, and unemployment insurance benefit weeks collected by individuals who had worked in the shipbuilding industry at some time in the years between 1972 and 1975. Using this information, it was possible to predict the number of individuals expected to be employed in constructing a vessel of a given size, and the earnings and weeks of unemployment experienced by these people during the period of construction. These estimates then formed the basis for developing the retention scenario which was used to predict the consequences of constructing a deep-sea vessel in Canada and consequently of postponing shipbuilding layoffs.

A second data base, referred to as the separation file, contained information on the weeks of unemployment experienced by individuals who had been separated from the Canadian shipbuilding industry in 1974 and 1975, and who had subsequently found alternative employment. Estimates of unemployment resulting from a shipbuilding layoff were derived from this data base, and these estimates were subsequently combined with separate estimates of the probability of the workers affected finding any subsequent employment, and the probability of such workers finding a permanent job. These latter probabilities were estimated by examining the employment summary file noted above, which contained information on the incomes and unemployment insurance benefit weeks collected by individuals in the year(s) after leaving shipbuilding. The resulting estimates were used to predict the incomes and weeks of unemployment experienced by persons laid off from the shipbuilding industry. This latter scenario was termed the immediate termination case, and was used to predict the consequences of not constructing a deep-sea vessel in Canada.

While the immediate termination case was developed from the experience of individuals leaving the shipbuilding industry in the past, all of the estimates used in developing this scenario were statistically related to both the individual characteristics of the workers in the sample and the regional unemployment rates prevailing at the time of layoff. By examining these relationships, it proved possible to use the estimates to predict the different labour market adjustment responses for groups of individuals with different socio-economic characteristics, and to relate these responses to the size of the regional unemployment rate. The model thus allows for predictions to be made for periods in which regional or cyclical conditions differ from those observed during the sample period.

As noted earlier, estimation of the externalities in the two scenarios was based on the assumption that the construction of a vessel in Canada would serve to postpone the layoff of a number of shipbuilding employees for a two-year period. In the first year of construction, the size of the externalities was determined by the duration of unemployment predicted for individuals who are expected to find subsequent employment and by the predicted probability of all workers not finding employment within one year. In the second year of construction, the estimated externalities were based on the difference between the earnings and weeks of unemployment if individuals had been retained in the industry, and the wages and weeks of unemployment they would have had if they had been laid off in the previous year. In the third year, the externalities are negative, however, and are determined by the difference between the unemployment expected if individuals had been retained for two years and subsequently laid off, and the amount of unemployment predicted if these individuals had left the industry two years previously.

(b) Development of the Retention Scenario

Since many of the individuals employed in shipbuilding do not receive all of their employment income from this industry, but rather have a pattern of intermittent employment spells in different industries (often separated by periods of unemployment or non-labour-force activity) the retention scenario cannot be captured adequately by assuming a one-to-one equivalence between the number of shipbuilding jobs and the number of individuals employed in shipbuilding. Rather, the more general situation is one in which some individuals would be employed full-time in shipbuilding for the two-year period, some would leave the industry in any event, and some would remain attached to shipbuilding but would experience spells of unemployment over the two year period. A final group of individuals would not be employed in the industry at the beginning of construction, but would be expected to enter the industry at some time during the two-year period.

The significant component of "temporary" employment in shipbuilding can be seen in Table 4.1 below, which indicates the distribution of employees working in the industry in an average year according to their attachment to shipbuilding. These statistics were derived from the employment summary file noted above. Individuals classified in the P1 sector are generally employed for the complete year in shipbuilding. Individuals in the P2 sector possess more than one job during the year,

Table 4.1

Classification of Workers in Shipbuilding by
Attachment to the Industry in an Average Year

P1 Sector¹

<u>Region</u>	<u>Per Cent of Total Individuals in Sector</u>	<u>Median Age</u>	<u>Average Earnings</u>
Atlantic	41.5	38.8	11,035
Quebec	46.2	45.0	11,434
Ontario	36.3	39.3	14,039
B.C.	33.9	45.3	15,451

P2 Sector²

<u>Region</u>	<u>Per Cent of Total Individuals in Sector</u>	<u>Median Age</u>	<u>Average Total Earnings</u>	<u>Per Cent of Average Total Earnings in Shipbuilding</u>
Atlantic	17.1	29.1	10,842	.45
Quebec	16.4	34.4	12,256	.64
Ontario	20.5	38.5	10,028	.29
B.C.	27.5	35.0	10,892	.34

Temporary Sector³

<u>Region</u>	<u>Per Cent of Total Individuals in Sector</u>	<u>Median Age</u>	<u>Average Total Earnings</u>	<u>Per Cent of Earnings in Shipbuilding</u>	<u>Average Benefit Weeks</u>
Atlantic	41.4	25.9	4,781	.68	11.8
Quebec	37.4	28.5	5,921	.76	15.8
Ontario	43.2	30.8	5,595	.39	12.6
B.C.	38.6	30.8	7,137	.54	11.6

¹ The P1 Sector consists of individuals employed full-time and working exclusively in shipbuilding.

² The P2 Sector consists of individuals employed full-time and working both in shipbuilding and other industries.

³ The Temporary Sector consists of individuals unemployed at some time in the year but working in shipbuilding and perhaps other industries for the remainder of the year.

Source: The Employment Summary File.

but do not generally experience any unemployment. Finally, all of those individuals who work in shipbuilding at some time in the year, but who also experience some unemployment in the year are assigned to the Temporary sector. Included in the latter category will be individuals who are employed in more than one industry, as well as those who work only in shipbuilding but are subject to temporary layoffs from which they will be recalled. On average, slightly over 60 per cent of the individuals in the P2 and Temporary sectors depart from the industry permanently in each year, whereas over 98 per cent of the P1 individuals work in shipbuilding in the subsequent year.

A number of points of interest emerge from Table 4.1. It can be seen that the median age declines when going from the P1 to the P2 and Temporary sectors. Average total employment earnings are of course much higher for individuals in the P1 and P2 sectors than in the Temporary sector, because individuals classified as being in the Temporary labour force only work part of the year. It might also be noted from Table 4.1 that shipbuilding wages are considerably higher in Ontario and B.C. than in the eastern provinces. In the P1 sector, for example, average earnings in Ontario and B.C. are 27 per cent and 40 per cent respectively above the average in the Atlantic region. For workers in the P2 and Temporary sectors, shipbuilding earnings form a much higher proportion of total employment income in the eastern provinces than in Ontario and B.C. Average unemployment insurance benefit weeks per individual in the Temporary sectors are similar in the Atlantic region, Ontario and B.C., but are considerably higher in Quebec.

As shown in Appendix D, the data underlying the estimates presented in Table 4.1 can also be used to predict the number of individuals who would be employed in the construction of a vessel involving a given number of man-years of work. The results of these calculations for a vessel providing 500 man-years of employment in the first year of construction are given in Table 4.2. It can be seen that the different structure of employment in the regions has important implications for the number of individuals associated with the same number of man-years of work. In Quebec, individuals in the P2 and Temporary sectors work much longer in shipbuilding (in a given year) than do their counterparts in Ontario, and this is reflected in the figures presented in the last three columns in Table 4.2. As a result of the relatively more permanent attachment to the industry in Quebec, however, the number of persons affected by the construction of a vessel is considerably less than in other regions. Thus it is predicted that construction of a vessel involving 500 man-years would result in the employment of a total of 715 persons in Quebec as compared to 1010 in Ontario.

After having determined the numbers of persons potentially employed in constructing a vessel, the retention scenario was completed by predicting their incomes and weeks of employment over the assumed two year period of construction. This was done by simply averaging values of these variables for individuals who worked in the industry in the past. In performing these tabulations, the figures were disaggregated on the basis of age, region and employment status (i.e., P1, P2 or Temporary). This procedure allowed for an explicit link to be made between the retention scenario and the immediate termination scenario.

Table 4.2

Number of Individuals Predicted to be Employed in
Shipbuilding for an Investment Involving 500 Man-Years

Region	No. of Man-years (proportions of total man-years)			No. of Individuals (proportions of total individuals)				No. of Individuals per man-year of work		
	P1	P2	Tempo- rary	P1	P2	Tempo- rary	Total	P1	P2	Tempo- rary
Atlantic	335 (.67)	62 (.12)	103 (.20)	335 (.42)	138 (.17)	333 (.41)	806	1	2.2	3.2
Quebec	315 (.63)	78 (.16)	108 (.21)	315 (.44)	112 (.16)	288 (.40)	715	1	1.4	2.7
Ontario	362 (.73)	56 (.11)	71 (.14)	362 (.36)	208 (.21)	440 (.44)	1010	1	2.9	6.2
B.C.	308 (.62)	103 (.21)	94 (.19)	308 (.34)	249 (.27)	352 (.39)	909	1	2.4	3.7

(c) Development of the Immediate Termination Scenario

In this scenario, it was assumed that all those individuals who would otherwise be employed in the construction of a particular deep-sea vessel would be laid off from the industry. Estimation of the consequences of such a layoff was accomplished by examining the experience of employees who had left the shipbuilding industry in the past. This required the estimation of three different regression equations, which related the post-separation employment and unemployment experience of these individuals to their age, region, previous attachment to the industry, and to the regional unemployment rate. The first three of these independent variables were included in order to standardize for the fact that the population of those leaving the industry is different from those who would potentially be affected by future layoffs. The last variable is included to measure the sensitivity of the adjustment problem to regional and cyclical conditions.

¹The population of those who have left the industry in the past has been dominated by younger individuals who have often worked in shipbuilding only for a short period of time. We may expect that the average experience of these individuals would be different from that of the older, more permanently attached workers who would tend to be affected by future layoffs. The regression analysis technique enables separate estimates to be made of the effects of layoffs on each region-age-previous employment status group, and thus allows for a linkage to be made between the retention and termination scenarios.

The dependent variables of the three regressions were as follows:

- (1) the probability of finding subsequent employment,
- (2) the number of weeks of unemployment experienced in the first year by individuals identified as finding subsequent employment,
- (3) the probability of finding a permanent job after an immediate spell of unemployment.

7. RESULTS OF THE REGRESSION ANALYSIS

A complete description of the results of the regression analysis is given in Appendix D. The following section reviews the predictions generated from this analysis, and indicates the necessary qualifications to the results where appropriate.

(a) Probability of Finding Subsequent Employment

As a result of technical limitations in the data base, the degree of very long term unemployment (i.e., more than one year) resulting from a layoff could not be predicted with a great deal of accuracy. Using information on the occurrence or non-occurrence of employment income in the year after individuals had separated from shipbuilding, however, it proved possible to establish upper and lower bound estimates for the probability of finding subsequent employment.

The information contained in the employment summary file was used to establish both upper and lower bound estimates of the probability of securing subsequent employment. In both cases, individuals who had collected unemployment insurance benefits after leaving shipbuilding, and who did not have employment income in the year following separation, were considered to be involuntarily unemployed for more than one year. The period of time covered by the data did not permit one to establish when, if ever, these individuals found subsequent employment. In evaluating this part of the externality, it was assumed that the persons concerned would not find employment within the three year period covered by the model. This assumption imparts an upward bias to externalities calculated from both the upper and lower bound estimates.

The upper bound estimate was derived from examining the incidence of alternative employment (i.e. non-long-term unemployment) in the complete sample of individuals who had left the shipbuilding industry in 1973 or 1974. This can be expected to produce a somewhat optimistic prediction of the ease with which subsequent jobs can be found in a layoff scenario, since this sample will include all those individuals who left the shipbuilding industry voluntarily.

The lower bound estimate of the probability of securing subsequent employment was derived by sampling only those individuals who had left the shipbuilding industry in 1973 or 1974 and who had collected unemployment insurance benefits in their last year in the industry (referred to as the beneficiary sample). We may expect that the incidence of alternative employment in this sample will understate the incidence in a layoff scenario, since the sample will exclude all those individuals who found

work almost immediately after layoff and hence did not establish an unemployment insurance claim. While the complete sample includes too many "optimistic" cases, the beneficiary sample suffers from the opposite problem.

While the estimated probabilities of finding subsequent employment were sensitive to the regional unemployment rate (the estimates indicated a 2 to 4 per cent decline in the probability of finding employment for every percentage point increase in the unemployment rate), the effect of this variable was often counteracted by the effects of other variables included in the regression equations. This is indicated in Figures 4-2 and 4-3 which show the estimated probabilities of finding subsequent employment at the unemployment rates prevailing in 1977. Regardless of which sample is used in deriving these predictions, the estimates indicate that the lowest probabilities of finding subsequent employment are observed among formerly P1 individuals in Quebec and the Atlantic region. The highest probabilities of finding employment are observed for the P2 and temporary workers in the Atlantic region and for the individuals in all sectors in Ontario.

(b) Average Duration of Unemployment for Individuals Identified as Finding Subsequent Jobs

Three different approaches were used in estimating the average duration of unemployment experienced by individuals finding jobs after separation from the industry. Essentially, the three estimates are based on different samples of individuals who have left the industry in the past and on different measures of the variable used to estimate weeks of unemployment.

Somewhat surprisingly, the regional unemployment rates did not appear to exert a significant influence on the average duration of unemployment in any of these regressions. Moreover, the regional differences which did emerge from the data were generally quite minor, and exhibited somewhat conflicting patterns in different regressions.

Individuals in the youngest and oldest age groups were predicted to be unemployed significantly longer than those in the age groups in between. Relatively minor differences were predicted in the average unemployment experience of individuals between 20 and 60 years of age. This age pattern effect can be seen in Figure 4-4, which indicates the estimated weeks of unemployment for those separated from the industry in British Columbia for each of the three different samples.

(c) Probability of Finding a Permanent Job

As noted earlier, the type of employment secured by individuals after leaving shipbuilding exerts an important influence on the size of the externality. If individuals are relatively successful in securing permanent jobs, we may expect that the externality persisting after the initial spell of unemployment will be comparatively minor. On the other hand, if a large percentage of individuals appear to secure employment which is of a temporary nature, and if these individuals would have held permanent jobs if retained in shipbuilding, the externality becomes larger in size.

Fig. 4-2

PROBABILITY OF FINDING ALTERNATIVE EMPLOYMENT
(Individuals under 60 years of age; unemployment insurance beneficiary sample; lower bound estimate)

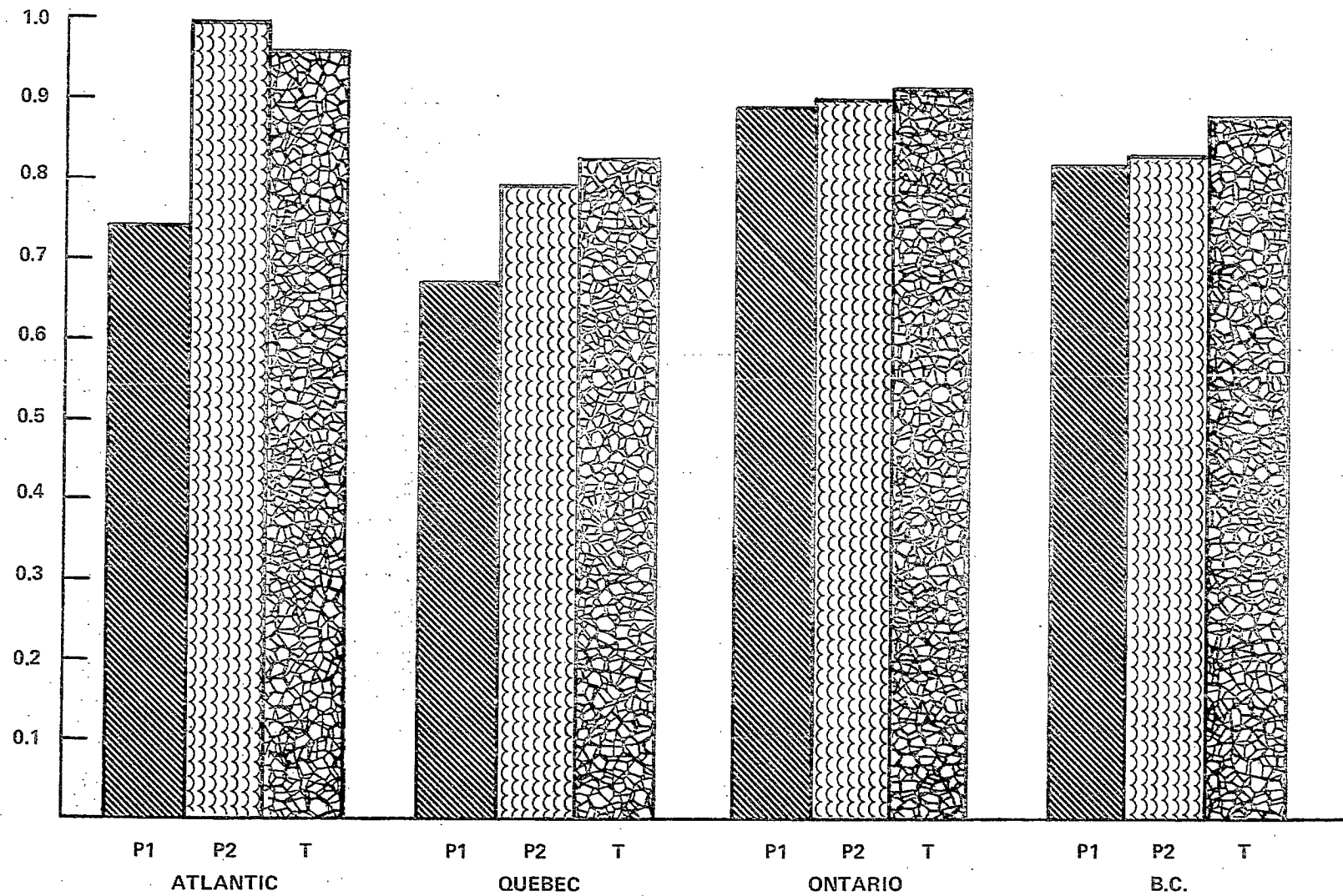


Fig. 4-3

PROBABILITY OF FINDING ALTERNATIVE EMPLOYMENT
(Individuals under 60 years of age; complete sample, upper bound estimate)

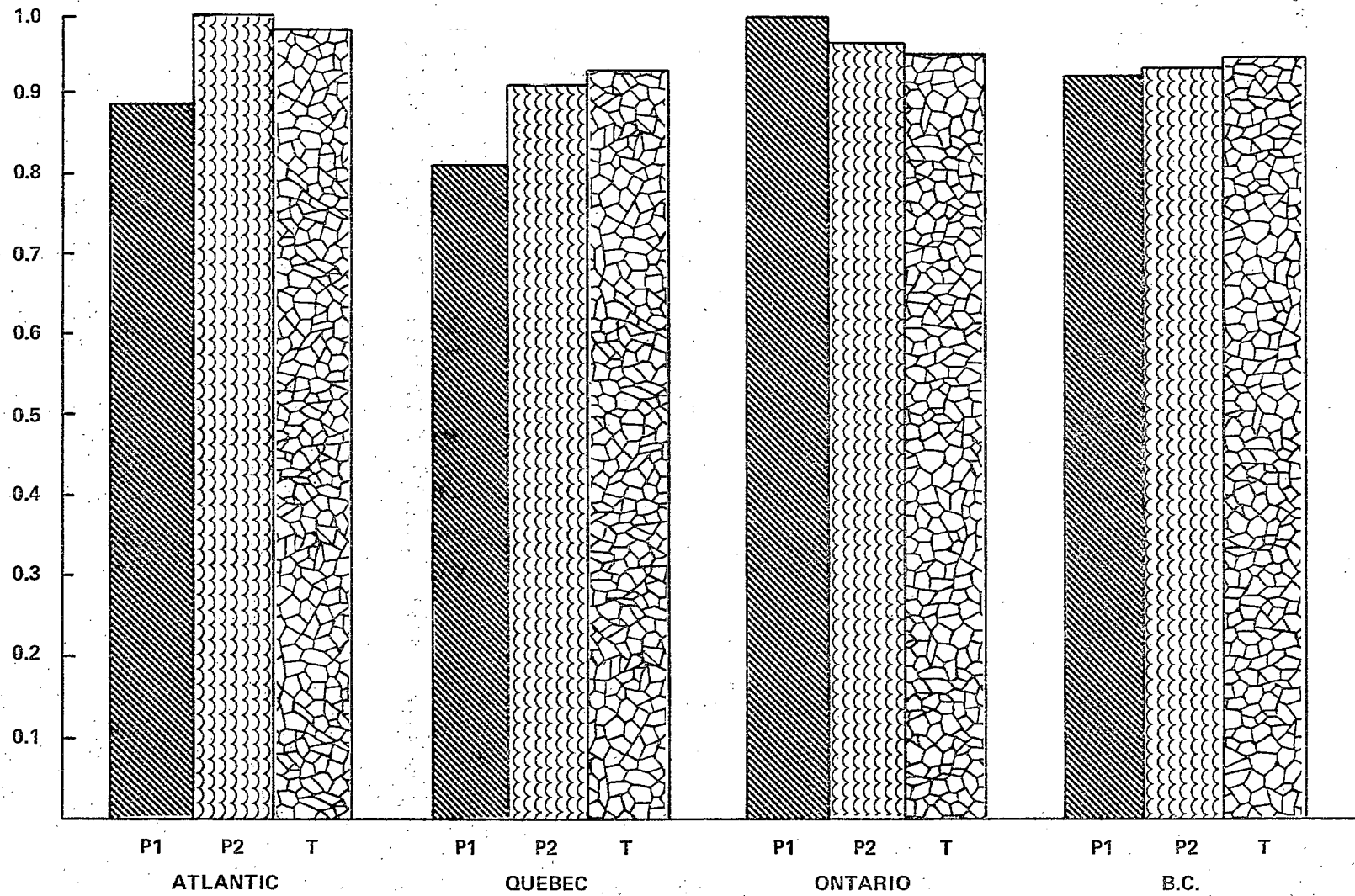
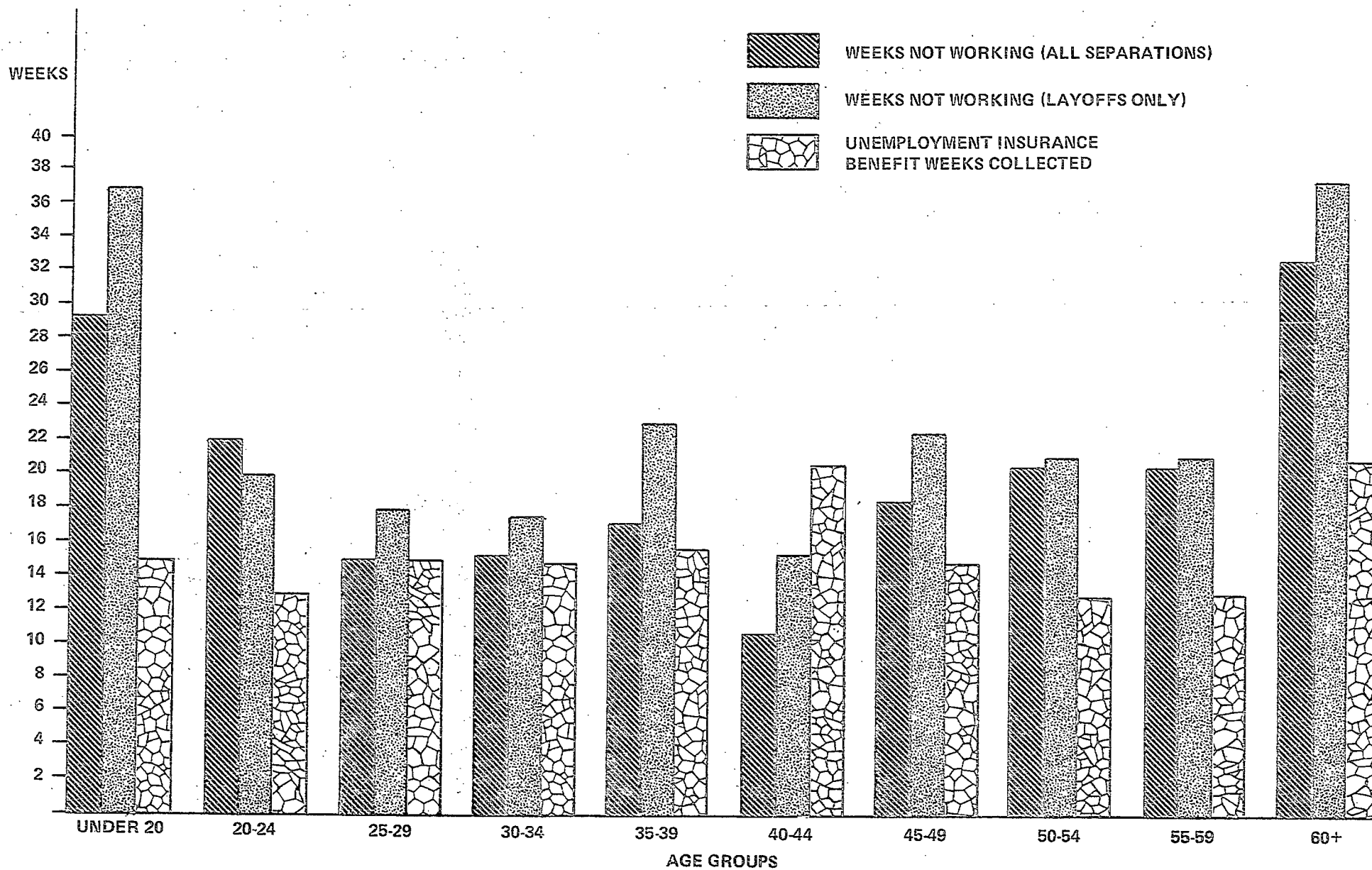


Fig. 4-4

AVERAGE WEEKS OF UNEMPLOYMENT EXPERIENCED BY INDIVIDUALS
IN THE YEAR AFTER LEAVING THE SHIPBUILDING INDUSTRY
(British Columbia)



The estimates of the probability of finding a permanent job were again based on a sample of individuals who had left the industry in 1973 and 1974. Individuals who had over \$5000 in income in the year after leaving, and who did not establish an unemployment insurance claim, were considered to have secured permanent employment elsewhere in the economy. All others were assumed to find jobs which were of a temporary nature.

The unemployment rate exerted a significant effect on the probability of finding a permanent job. For most individuals, the estimates indicated a 2 to 4 per cent decline in this probability for every percentage point increase in the unemployment rate. As in the regressions on the probability of finding any job after separation from shipbuilding, however, this did not necessarily imply that more difficulty in securing permanent employment was encountered in the eastern regions, since the effect of the unemployment rate variable was often counteracted by the effects of other variables in the equations.

In all regions, the estimates indicated that the probability of finding a permanent job was significantly higher for individuals who were formerly in the P1 and P2 sectors than for those who were formerly in the Temporary sector. These effects are illustrated in Figure 4-5, which shows the estimated probabilities for each group using the regional unemployment rates prevailing in 1977. It can be seen that in many instances the effect of previous employment status is quite striking.

The results suggest that the population of P1 individuals leaving the industry in the survey period was not homogeneous. The estimates mentioned earlier indicated that some of these individuals had great difficulty in securing subsequent employment, particularly in the Atlantic and Quebec regions. Those individuals in the P1 group who do secure subsequent employment, however, appear to have a high probability of finding good jobs. It seems that the P1 category is comprised of individuals at several different skill levels.

8. ESTIMATES OF THE LABOUR EXTERNALITY

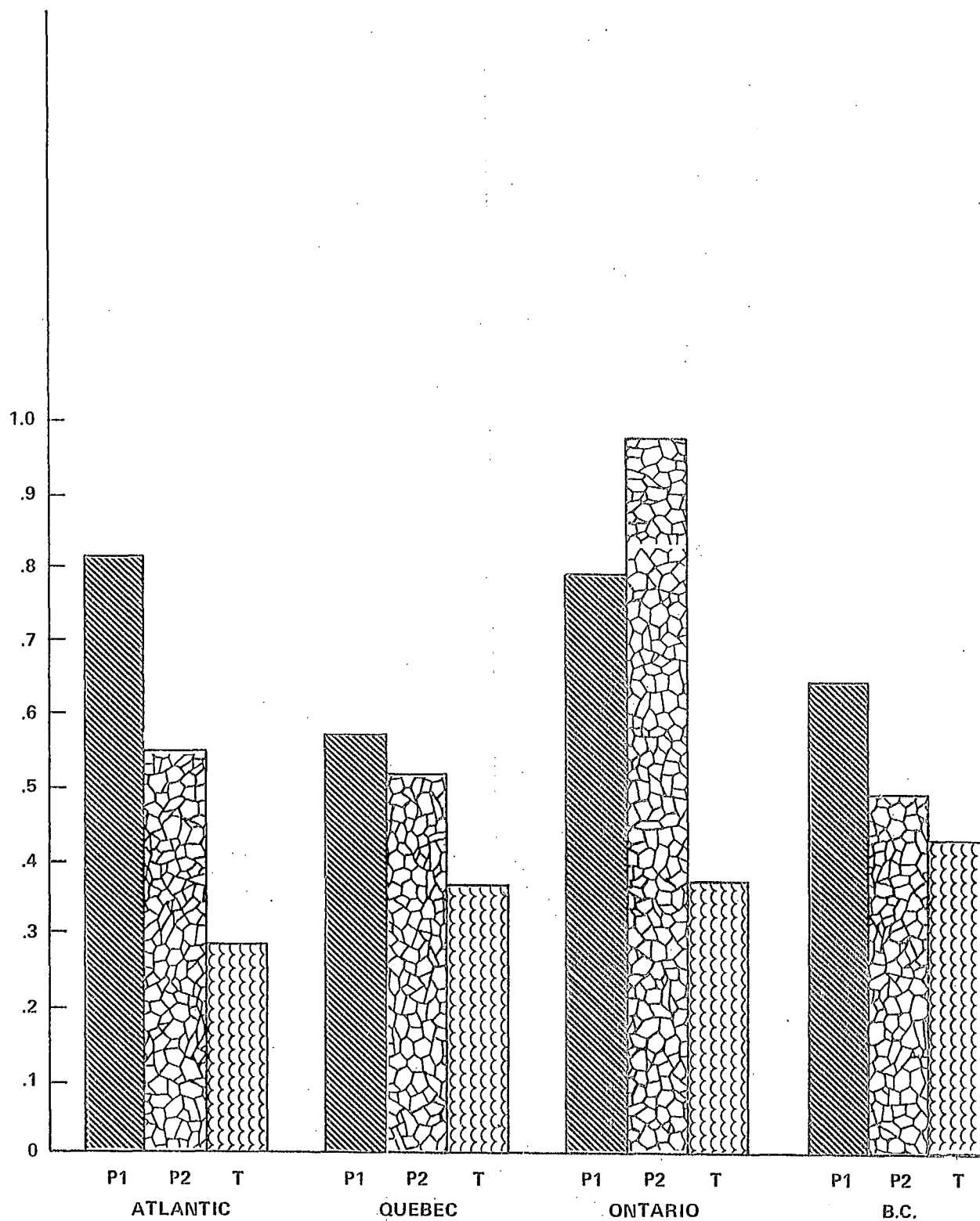
(a) Overview of the Main Results

The labour externality in shipbuilding associated with an Option 4 investment is estimated by "linking" the retention and immediate termination scenarios. Essentially, this involves:

- (i) calculating the number of individuals in each age-sector group predicted to be employed constructing a vessel of a given size;
- (ii) using the employment summary file to estimate average incomes and average weeks of unemployment for each group in the retention case;
- (iii) using the results of the three regression equations, together with estimates of the incomes and weeks of unemployment experienced by individuals in the years after leaving shipbuilding (again

Fig. 4-5

PROBABILITY OF FINDING A PERMANENT JOB



evaluated from the employment summary information) to estimate the average incomes and average weeks of unemployment experienced by each group in the immediate termination scenario;

- (iv) determining the difference in the incomes and weeks of unemployment in the two scenarios, and subsequently calculating the labour externality for each group on the basis of the procedures outlined above in Section 4;
- (v) calculating the total externality by multiplying the externalities for each of the groups as determined in (iv) by the appropriate number of individuals as determined in (i).

The preceding five steps were undertaken for each of the four regions in which shipbuilding employment occurs.

An illustration of the total externalities generated by this procedure is given in Figure 4.6. These estimates were derived for the case of a vessel involving 1000 man-years of construction over a two-year period. Unemployment rates were set equal to 1977 levels¹ for the purposes of evaluating the regression equations in Step (iii). The upper bound estimates of the externality refer to the results generated using the lower bound prediction of the probability of securing subsequent employment. Conversely, the lower bound estimates of the externality were evaluated using the upper bound prediction of this probability.

In both the upper and lower bound cases, the externality estimates for British Columbia are higher than those in other regions. In the upper bound case, approximately equal estimates were derived for Quebec and Ontario, while the results for the Atlantic region were the lowest in the country. In the lower bound case, the rankings of Ontario and the Atlantic region are interchanged.

The influence of high wages in B.C. has an important influence on these results. (Shipbuilding wages in this province are estimated to be 40 per cent higher than wages in the Atlantic region.) Since the externality associated with each extra week of unemployment in the immediate termination scenario is equal to a fixed percentage of the previous weekly wage, the larger estimated total externality in B.C. is partially a reflection of these higher wages. This result is to be expected if it is assumed that regional earnings differentials reflect productivity differences, i.e., in this case, the results would simply indicate that higher economic costs are associated with the loss of more productive employment.

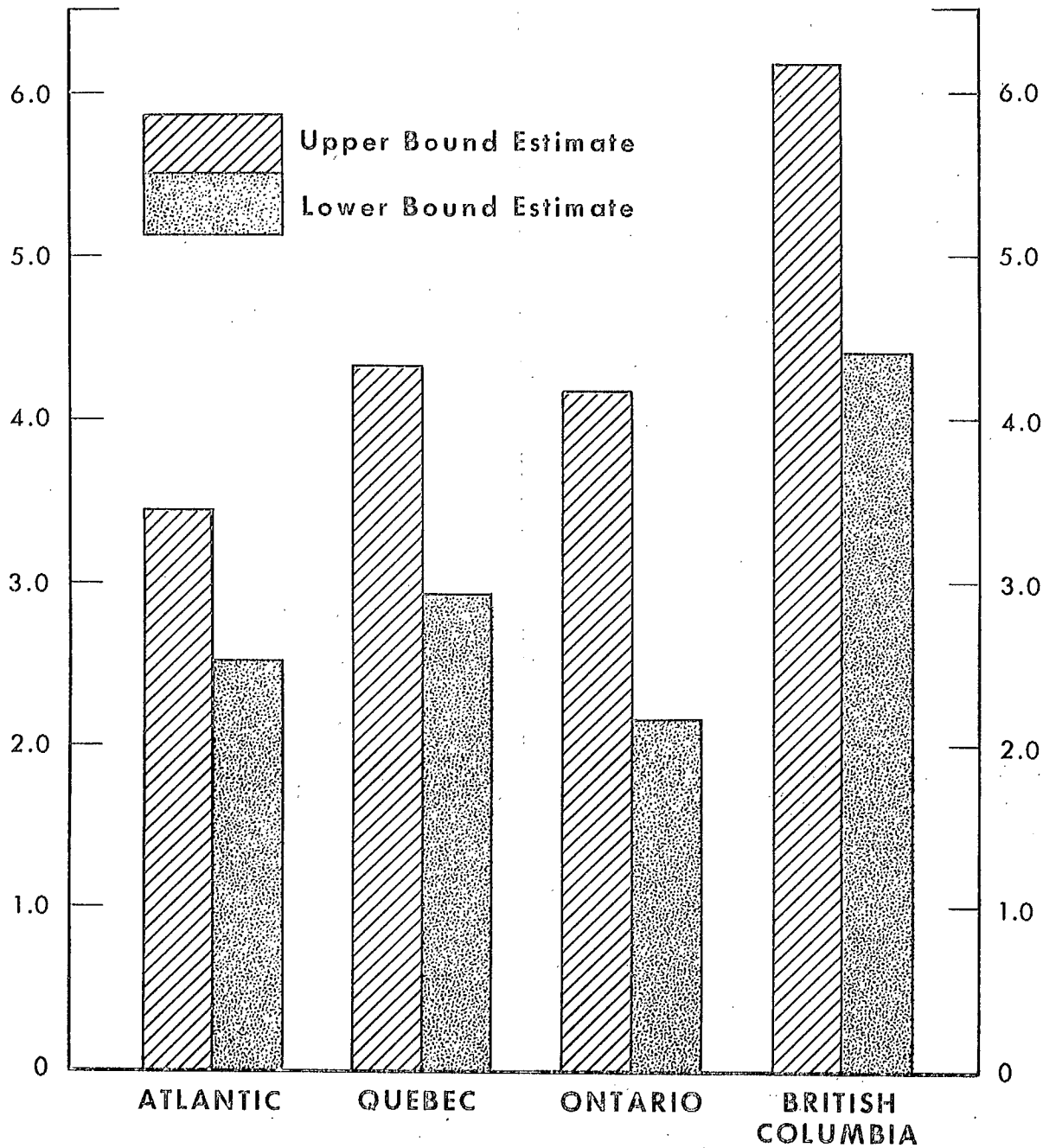
The effect of using different samples to estimate the probability of finding subsequent employment is also indicated in Figure 4.6. As noted previously, it is likely that both of these samples generate estimates at the extremes.

¹That is, 12.7 per cent in the Atlantic region, 10.3 per cent in Quebec, 7.0 per cent in Ontario, and 8.5 per cent in B.C.

Figure 4.6

ILLUSTRATIVE CALCULATIONS OF LABOUR EXTERNALITY
FOR VESSEL INVOLVING 1000 MAN-YEARS
(Unemployment Rates Set at 1977 Levels)

Estimated
Externality
(\$ Millions)



(b) Base Case Estimate of Externality:
Applicability to Analysis of Option 4

In order to apply the results of the model to the case of a particular vessel, it would be necessary to know the region in which the vessel was expected to be constructed, the regional unemployment rate prevailing at the time, and the number of man-years of construction involved. The location and timing of any possible future construction of deep-sea vessels, however, will depend on circumstances at the time, and cannot be predicted in advance for purposes of the present analysis.

In the face of these uncertainties, a range of possible labour externalities was estimated for each vessel identified in the analysis of deep-sea options. In each case, it was assumed that there was an¹ equal probability of the vessels being built in each of the regions.

In the base case estimates of the externality, it is assumed that the probability of finding subsequent employment is half-way between the upper and lower bound predictions noted above. The indirect externality is set equal to 25 per cent of the calculated direct externality. Unemployment rates were set equal to those observed in 1977. The estimate of the externality derived from the above procedure, when inflated to 1976 dollars, equalled \$5100 per man-year of shipbuilding employment. This figure consisted of a direct effect of \$4080, and an indirect externality of \$1020.

The use of 1977 rates in the estimation of the base case externality raises questions as to the applicability of the results for a long-term analysis. Inasmuch as unemployment in this year was high by historical standards, and is forecast to decline over the medium term, the assumption used imparts an upward bias to the estimated externality.

Under these circumstances, it was considered important to give some attention to the effect of using somewhat lower unemployment rates in the generation of labour externalities, as these could prove to be more appropriate for a longer-term analysis.

Figure 4.7 indicates the effect of assuming lower unemployment rates, while retaining all of the other assumptions underlying the base case estimates. The estimates on the extreme left hand side were derived

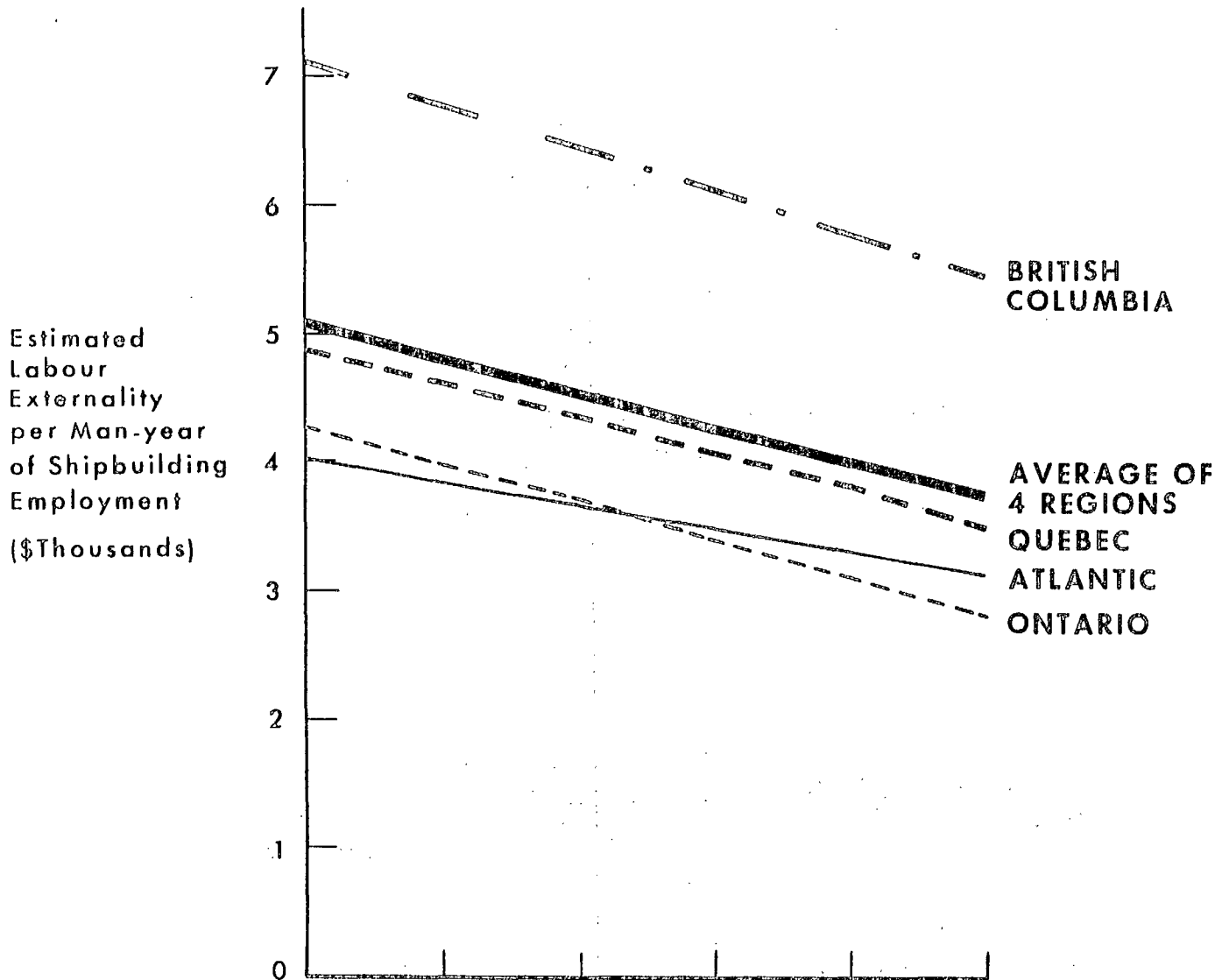
¹In 1976, employment in the shipyards represented by the Canadian Shipbuilding and Ship Repair Association (80 per cent of total employment or measured by Statistics Canada) was distributed as follows:

Atlantic	32.5%
Quebec	37.2%
Ontario	14.0%
B.C.	16.3%

Weighting the regional estimates by these proportions produces an average externality approximately 4 per cent lower than the base case externality derived by weighting all regions equally.

Figure 4.7

SENSITIVITY OF BASE CASE LABOUR EXTERNALITY TO REGIONAL UNEMPLOYMENT RATE ASSUMPTION



ATLANTIC	12.7	12.2	11.7	11.2	10.7	10.2
QUEBEC	10.3	9.8	9.3	8.8	8.3	7.8
ONTARIO	7.0	6.5	6.0	5.5	5.0	4.5
B.C.	8.5	8.0	7.5	7.0	6.5	6.0

Regional Unemployment Rates

using 1977 regional unemployment rates. These unemployment rates were progressively lowered by equivalent percentage points in each region to trace out the relationships indicated in the diagram. As can be seen, the rankings of Ontario and the Atlantic region are interchanged when the unemployment rate in each region falls more than one per cent below 1977 levels. When each of the regional rates fall by two percentage points, the estimated average externality falls by about 20 per cent. This relatively flat relationship is explained mainly by the finding noted above that estimated post-separation unemployment durations for most of the individuals in the sample proved relatively insensitive to the values of the regional unemployment rate at the time of layoff.

(c) High and Low Estimates of the Externality

The assumptions underlying the range of estimates given in Figure 4.7 are considered to be the most appropriate. It remains true, however, that some uncertainty exists with respect to the estimation procedure used to determine the probability of finding a subsequent job, and with respect to the size of the indirect externality. The high and low estimates given below were derived by combining upper and lower bound estimates of the above probability with a range of assumptions regarding both the indirect labour externality and the magnitude of future unemployment rates.

The low case estimate of the labour externality was derived using the upper bound prediction of the probability of securing alternative employment. As in the base case estimate, the indirect effect was assumed to equal 25 per cent of the direct externality. Unemployment rates in this case, however, were assumed to be 1.5 percentage points below 1977 levels.

The high case estimate of the externality was derived using the more pessimistic lower bound estimate of the probability of finding subsequent employment. The indirect externality in this case was assumed to equal 50 per cent of the direct effect, while unemployment rates were set 1.5 percentage points above those prevailing in 1977.

Using these assumptions a value of \$3400 per man-year of shipbuilding employment was derived for the low case, and a value of \$8400 for the high case.

(d) Estimates of the Externality Associated with Each Vessel Identified in the Deep-Sea Shipping Analysis

Using the above estimates, the externality applicable to the construction of an Option 4 vessel can be determined if the required number of man-years of construction is known. Based on the information available in the Statistics Canada publication Shipbuilding and Ship Repair, an estimate of one man-year for every \$40,000 in vessel construction costs was derived.¹ This estimate was subsequently used to determine

¹This figure was estimated by dividing the total value of construction in the Canadian shipbuilding and ship repair industry in 1975 by the average number of production and related workers working in the industry in that year.

the total number of man-years associated with each vessel size. The total externality for each vessel can then be determined by multiplying each of these¹ man-year estimates by the externality-per-man-year figures noted above.

9. EXTERNALITY ASSOCIATED WITH ON-SHIP LABOUR

As in the case of labour used in shipbuilding, it may be appropriate to include, in the social analysis of deep-sea shipping options, an externality for the labour used aboard ships. This externality applies to both Options 3 and 4, as both options are assumed to use Canadian labour. The average manning requirement per vessel for all routes considered in the commercial analysis of deep-sea shipping options is about 50 persons -- a figure which varies little with the size of the vessel. About half of the manning requirement is made up of officers, while the other half consists of crew.

It does not appear that any labour externality needs to be associated with the creation of employment for the relatively highly qualified marine officers who would staff a deep-sea fleet. It appears to be well documented that there has been a chronic shortage of officers available for Canadian flag shipping. This shortage has been dealt with partly by attracting experienced foreign workers. Expansion of a Canadian registered deep-sea fleet would presumably require further such immigration, at least in the medium term. The opportunity cost of attracting such immigrants would be equal to the wages they would receive and there would be thus no externality associated with the employment of such labour.

In the long term, training programs could be expected to reduce the need to "import" marine officers. Under these circumstances, the social opportunity cost of this labour for deep-sea shipping would be equal to the wages received, minus some measurement of the extent to which such job creation would reduce unemployment, plus the value of the real resources used in the training programs. At this juncture it is difficult to assess the direction, let alone the size of these net costs or benefits. Accordingly, this study makes no adjustment for any externality which might be associated with the training of officers for deep-sea employment.

On the other hand, an increase in demand for crew labour may have the potential to reduce unemployment as these jobs could be filled by relatively low skilled workers who traditionally have high unemployment rates. On the Great Lakes, such labour has been readily available, with 6000 men filling the 2100 available jobs on an irregular rotating basis. Such labour would presumably be available for use on deep-sea vessels.

¹Alternatively, the total externality can be determined by simply dividing the externality per man-year figure (\$5100) in the base case by the construction cost per man-year figure (\$40,000) to determine the externality as a percentage of construction costs. The base case estimate of the externality thus implies that the construction costs of Option 4 vessels should be reduced by 12.75 per cent in the deep-sea shipping analysis in order to take into account the economic benefits of preserving shipbuilding employment.

There was no detailed estimate made in this study of the externality associated with the employment of crew labour. There were many reasons for this decision. First, it was not felt that the benefits associated with the externality would have critical impact on the economic viability of the Canadian shipping options. The investments of \$8 to \$75 million per ship are so massive when compared to the 20 to 30 permanent jobs created in the non-officer category, that the benefits of the latter would seem likely to take on secondary importance to the other costs and benefits identified in the study. A second reason was the difficulties associated with acquiring data regarding the persons likely to be affected by deep-sea shipping investments. They could come from any region of the country, be of a broad spectrum of ages, and have widely varying employment opportunities. Such data has not been compiled and, as such, there is little on which to base an estimate of the social opportunity cost of crew labour. Finally, there is a lack of a rigorous methodology that could be used in this situation on 'hiring-up' labour, rather than preventing labour from being laid off. The former concept is appropriate for this situation.

It would, nevertheless, be inappropriate to ignore the externality associated with shipping labour. As such, a proxy for the externality was derived by considering the average DREE subsidy required to create permanent jobs. This figure can be thought of as the value society puts on the creation of permanent employment in the lower income and higher unemployment regions of Canada. This subsidy can be used as a measure of the average value that society will pay to have individuals in new permanent positions rather than being less than fully employed -- i.e., this value is assumed to approximate the externality associated with the individuals.

The most appropriate DREE program to examine in this situation is RDIA (Regional Development Incentives Act), as the primary purpose of this program is to create permanent jobs in new or expanding manufacturing or processing facilities. Other DREE programs, oriented towards the development of social infrastructure, tend to create only temporary employment. The latest statistics available from DREE indicate that the expenditure per permanent job was \$8,100.¹ This, of course, is a slight underestimate, as not all of the subsidized firms remain in business. The failure rate, however, appears to be quite low, so no adjustment is made to this figure. To determine the externality per vessel, the \$8,100 was multiplied by the number of crewmembers per vessel. The resulting figure was included as a benefit in the analysis of the Canadian-flag options.

¹Total RDIA grants in 1976/77 were \$81 million and 1000 jobs were created. (Department of Regional Economic Expansion, Annual Report, 1976/77, Statistical Highlights.)

Chapter 5

ECONOMIC ASSESSMENT OF CANADIAN DEEP-SEA SHIPPING OPTIONS: OVERALL RESULTS

1. INTRODUCTION

It will be recalled that the principal shipping options for Canadian deep-sea trade considered at the beginning of the study were the purchase of foreign shipping services (Option 1), the use of chartered vessels managed and operated by Canadians (Option 2), vessels purchased abroad but operating with Canadian crews (Option 3), and the use of vessels built in Canada and crewed by Canadians (Option 4). The first two represent foreign-flag options, while the latter two are Canadian - flag options.

It was noted in Chapter 2, however, that the chartering option was, in a quantitative sense, virtually indistinguishable from Option 1. Accordingly, Option 2 is not analyzed in detail in the subsequent economic assessment. Rather, the approach taken was to investigate the real resource effects of replacing the foreign flag options with either Option 3 or Option 4. The results of this analysis are outlined below.

A number of difficult decisions had to be made at different stages in the present study. Some of these decisions relate to technical benefit-cost questions, such as whether or not to attach a premium to foreign exchange generated by Canadian-flag shipping options. A more important problem has perhaps been the time horizon of the analysis, and there have been two different approaches to this problem.

In their commercial analysis of Canadian deep-sea shipping options, Alcan Shipping Services Ltd. opted to take a long-run view and to abstract from the present deep-sea shipping situation. In this spirit, the consultants estimated the cost of deep-sea shipping services on the basis of prices for newly-built vessels. One cannot, however, observe current shipbuilding prices for some of the vessels considered in the study -- such as large oil carriers -- because there have been few orders for this category of vessels in several years. There is also a hypothetical element in estimates of costs for Canadian-built vessels in the larger size categories, since no vessels of these sizes have been built in this country. The consultants also chose to calculate the costs of foreign-built vessels on the basis of ship prices quoted in 1976 by European shipyards, although these prices are comparatively high in today's market. The consultants did not use the lower vessel prices quoted by Asian yards in 1976, on the grounds that these prices apparently allowed for very little recovery of capital investment and hence would not be likely to prevail in the long run. The 1976 European prices, on the other hand, were considered to be more representative of cost recovery levels.

¹See the Alships Report, Part 1, p. 4.1.

Although the consultants intended to assist policy decisions relating to Canadian deep-sea shipping options by developing this long-run scenario which abstracted from current market conditions, the usefulness of such an approach may be questioned. From a policy point of view, it is relevant to ask how long the current disequilibrium conditions in shipping and shipbuilding are expected to last.

The approach of the consultants would have considerable relevance if current conditions in shipping and shipbuilding were temporary in nature. Both of these industries have been subject to cyclical fluctuations in the past, and there is evidence that current returns in some shipping markets reflect slow recovery from the downturn in the world economy in recent years.

The approach of the consultants becomes more questionable, however, if some of the problems of shipping and shipbuilding are not temporary in nature, but are likely to be more long-lasting. As was seen in Chapter 1, there is evidence that the problems in some of these markets are structural rather than cyclical in nature. For the foreseeable future, it appears that there will be substantial over-capacity in shipbuilding and in some shipping markets.

The present study has reflected concern about the need for structural adjustments in shipbuilding. It appears likely that the Canadian shipbuilding industry will share in the ongoing reductions in world shipbuilding capacity, and that lay-offs of Canadian workers could result. The calculations of the externality associated with layoffs of workers are based on such a scenario. Exactly what size of labour externality might be associated with some future revival of the Canadian shipbuilding industry after it had gone through a period of rationalization is a matter of conjecture, but it could be less than estimated in this report.

Two scenarios are probably necessary to capture the concerns noted above. In the long-run approach adopted by the commercial consultants, assumptions concerning ship prices consequent on recovery in shipbuilding may need to be associated with an estimate of the likely externality in Canadian shipbuilding from hiring-up labour at the time (i.e., the situation may be one not of forestalling the layoff of workers but of hiring additional workers). On the other hand, concern with current market conditions and the current prospects of the Canadian shipbuilding industry should be coupled with estimates of the costs of shipping services based on current market prices for ships.

The approach outlined below, however, attempts to combine considerations of whether Canadian-flag deep-sea shipping services could be economically viable in the long-run with concern about current prospects for Canadian shipbuilding. To this end, a scenario will initially be considered that is favourable to the Canadian-flag options -- and especially to Option 4, where vessels would be constructed in Canada. It will be assumed that the competition for such Canadian shipping options would be foreign shipping services using newly built vessels whose prices reflect 1976 European cost levels. These prices were thought by Alcan Shipping Services to be likely to prevail when the world shipbuilding

market returns to cost-recovery levels. The shipbuilding externality associated with Canadian shipbuilding, however, will be that applicable at the present time. A favourable scenario for both Canadian-flag options will also be generated in other ways -- for example, by assuming that a premium applies to any net foreign exchange earnings they might generate.

In subsequent sensitivity analyses, these assumptions will be relaxed to indicate some scenarios that are less favorable to Canadian-flag shipping options.

Section 2 below describes the various changes used in transforming the analysis from a financial to an economic perspective. These changes are first illustrated for the route B-3.

As will be seen, the direction of the effects of the economic adjustments described for B-3 are the same for all of the other routes. The magnitude of each of the separate effects, however, will vary according to the particular cost characteristics identified for each of the routes. These effects will be reviewed in Section 3, which presents the results for all 23 trade routes considered in the analysis.

Finally, the sensitivity of these estimates to changes in various input parameters is discussed in Section 4.

2. THE RESULTS FOR TRADE ROUTE B-3 (PACIFIC-JAPAN: COAL)

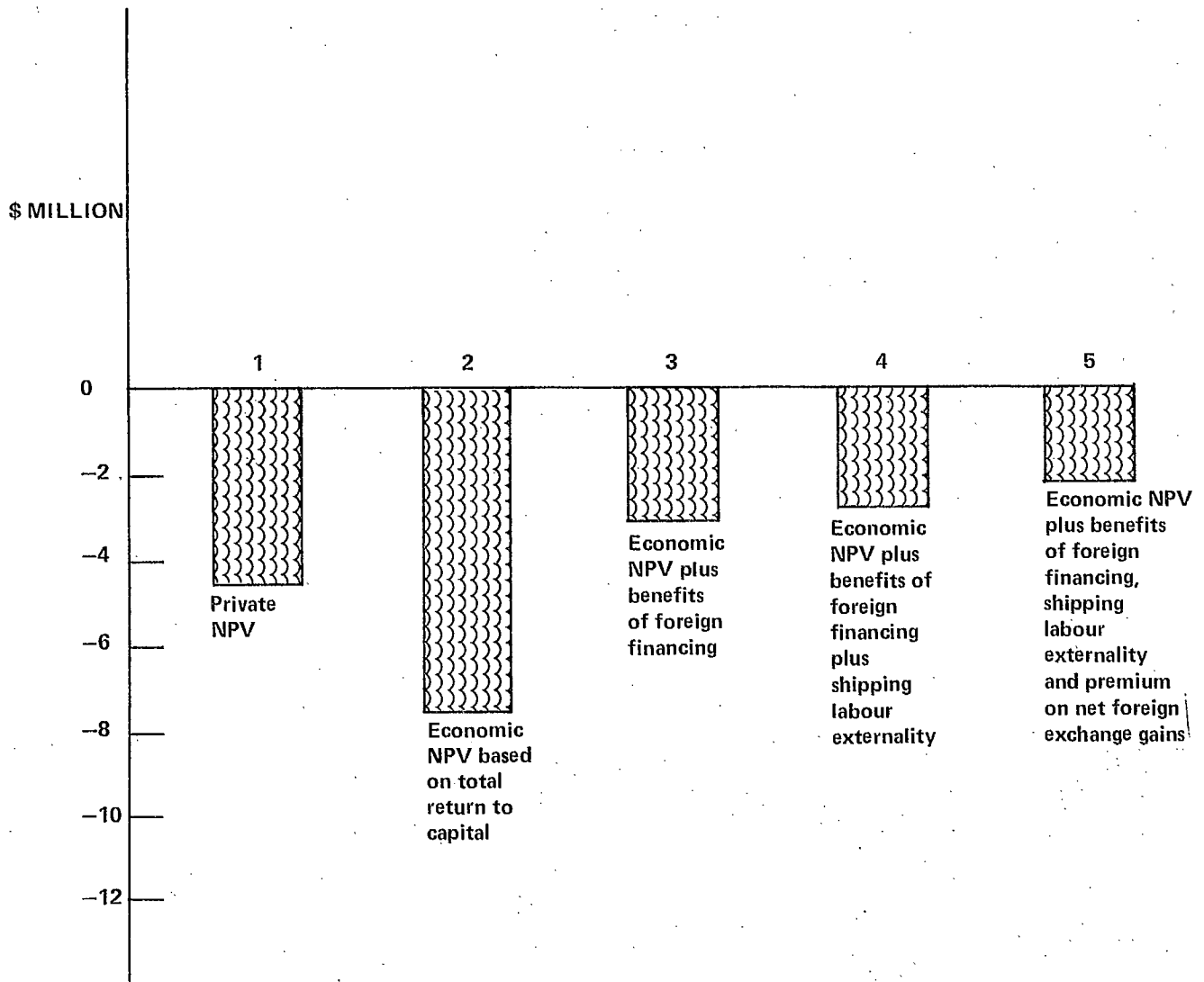
The effects of the various adjustments described in the preceding two chapters are indicated in Figures 5-1 and 5-2 for Options 3 and 4 respectively.

(a) Option 3

In Figure 5-1, the first bar indicates the Option 3 private (i.e., commercial) net present value for route B-3 of \$-4.55 million. The second bar indicates the effect of transforming the cash flows by evaluating the investment in terms of its total return to capital. As noted in Chapter 3, this adjustment involves, on the one hand, adding in taxes and principal and interest payments as part of the total return and, on the other hand, adding in as part of the total cost the portion of vessel cost financed by debt. The effect of adding in the benefits of foreign financing for vessel acquisition is then indicated in the third bar.

It will be noted that the effect of the first adjustment is to reduce the attractiveness of Option 3, while the effect of the second is to improve substantially that option's estimated net present value (although the net present value still remains negative). The first adjustment decreases the net present value because the effect of including the total return as a benefit is outweighed by the effect of discounting

Fig. 5-1
Option 3
Route B-3
Vancouver — Japan; Coal — Ballast; 150,000 DWT.



the total cash flow at 10 per cent per annum.¹ The latter part of this adjustment can be considered as essentially "removing" the benefits of foreign financing. Were it assumed that the (real) capital supplied to the Canadian economy when a foreign vessel was purchased was not incremental, but rather served simply to displace other capital inflows, this adjustment could stand on its own. That is, if the real return on capital in the Canadian economy is 10 per cent per annum, then it is appropriate to evaluate investment projects using this discount rate, even though the nominal financing terms of projects may imply a considerably lower rate of interest. The reason is that the real capital made available to ship purchasers could be said to "squeeze out" other potential flows of capital into Canada (perhaps in an entirely different sector of the economy) which could have earned a rate of return of 10 per cent per annum.

As has been argued previously, however, there is reason to believe that the capital supplied to Canada when a foreign-built vessel is purchased can be viewed as incremental to the economy in the sense that it does not displace other uses of funds. Under such circumstances, but only under such circumstances, it is necessary to include the benefits to the Canadian economy that result from this "capital gift" in the economic results for Option 3. This effect is indicated in the third bar of Figure 5-1.

The combined effect of the two adjustments is to improve the economic net present value of Option 3 compared to the net present value as measured in the private financial analysis. The reason is that the inclusion of the benefits of foreign financing in the second step

¹In the private analysis, only the cash flow to the equity holders is discounted at this rate, while the proportion of vessel costs covered by foreign financing is, in effect, only required to earn a rate of return of one and one-half per cent per annum.

indicated above serves to equate the costs under both perspectives.¹ The return earned in the economic analysis, however, includes the taxes generated on the investment.

The fourth bar in Figure 5-1 indicates the effect on Option 3 of including the externality associated with shipping labour. It can be seen that this effect is quite small, mainly because the jobs provided for Canadians are relatively few in number. The fifth and final bar in Figure 5-1 indicates the effect of including a premium for the net foreign exchange earned by an Option 3 vessel.

When all of these effects are taken into account, the economic net present value of route B-3 under Option 3 is \$-2.22 million, as compared to a commercial net present value of \$-4.6 million. While incorporating the economic adjustments does serve to put Option 3 in a somewhat more attractive light, the estimates indicate that an investment in this option on route B-3 would, nevertheless, represent an inefficient use of Canadian resources.

The basic reason for the result is that the benefits made available to the Canadian economy through subsidized foreign vessel financing under Option 3 are also available to Canadians indirectly under Option 1. That is, operators in flag-of-convenience countries

¹In the commercial analysis, the private investor is assumed to require a rate of return of 10 per cent per annum on his equity investment after having covered the financial costs associated with the foreign loan. In the first step of the economic analysis, the Canadian economy is assumed to require a rate of return of 10 per cent per annum on the total investment. The inclusion of the benefits of foreign financing in the second step, however, effectively serves to reduce this required return on the loan portion to the costs of servicing this loan, which is identical to the costs to the private investor. The remaining portion of the vessel cost, i.e., that financed by equity, involves the transfer of Canadian resources to the foreign shipbuilder. Since this capital could otherwise have been invested in Canada, it is appropriate to discount this portion at a real rate of return of 10 per cent per annum.

It should be noted, however, that this equation of capital costs results from the fact that the assumed required after-tax rate of return to the private investor (10 per cent per annum) on his equity investment happens to equal the estimated real productivity of capital in the Canadian economy (also 10 per cent per annum). There was no a priori reason why this should be the case, however, since the former is a financial variable while the latter is an economic concept. Indeed, some uncertainty exists regarding the required private return on equity in deep-sea shipping investments. If a lower or higher figure had been used for this financial variable, the costs would not be equivalent under the two approaches.

also benefit from these subsidies for vessel purchase loans, and these subsidies are in turn reflected in the freight rates charged under Option 1. While such subsidized financing schemes help to put Option 3 in a more favourable light relative to Option 4, no competitive advantage (i.e., vis-à-vis Option 1) is imparted to Option 3. While the inclusion of the shipping labour externality and foreign exchange benefit reduces the negative net present value of Option 3, the changes are not sufficient to outweigh this option's net economic costs. The principal contribution to these higher costs for Option 3 is the portage bill for Canadian labour, which was estimated to be approximately \$460,000 higher than foreign labour costs in each year of vessel operation on route B-3.

(b) Option 4

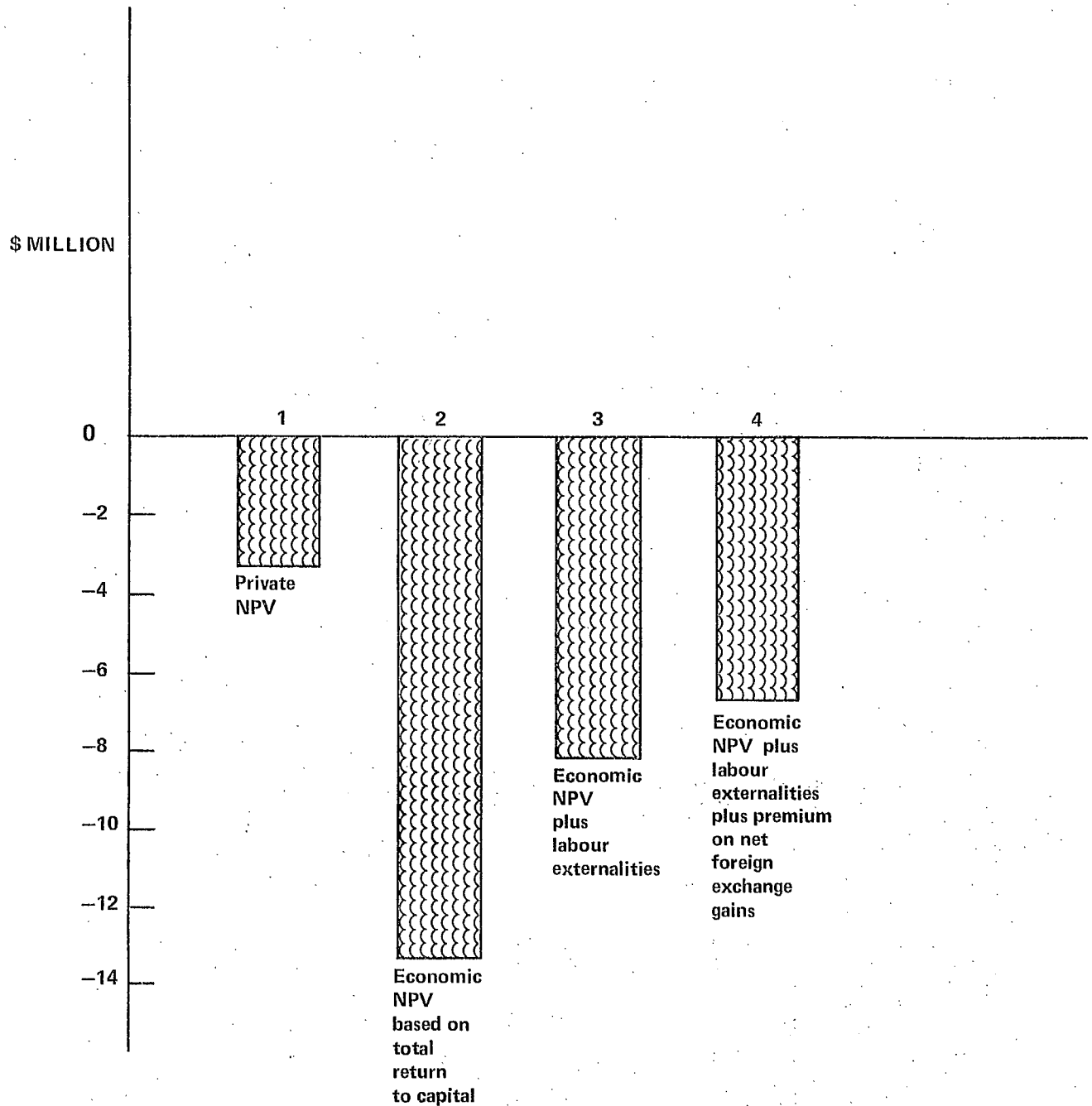
Figure 5-2 indicates the effect for Option 4 of moving from a private financial analysis to an economic analysis. The first bar of the graph indicates a net present value of \$-3.35 million for the commercial operator. The second bar indicates the effect of expressing the cash flows in terms of the total (pre-tax) return on capital. It can be seen that this produces a very substantial decline in the net present value, from \$-3.35 million to \$-13.4 million.

Two effects in particular contribute to this decline. The first is the inclusion of the total cost of the vessel, including the federal shipbuilding subsidy, as an economic cost of the investment. The second effect relates to the capital cost allowance and the package of loan terms available to Option 4. As noted previously, a major reason for Option 4 ranking ahead of Option 3 in the commercial analysis was the availability to the former of more attractive depreciation provisions for taxation purposes.¹ In an economic assessment, however, the depreciation provision, as well as the other financial variables, have no impact on the real resource implications of the investment.

What is relevant in the economic analysis is the total return (including taxes) on capital invested, and the return that could be expected if the resources were employed in alternative activities. Changes in the financial variables simply alter the distribution of this return between the private investor, financial institutions and government, and are not relevant in the economic analysis. The reasons for the large "drop" in the net present value of Option 4 which occurs in the second bar of Figure 5-2, therefore, is that the subsidy, capital cost allowance, and financial terms available to this option serve to render the investment more attractive in purely commercial terms than would be justified on the basis of the real economics of the option.

¹ It will be recalled that the different loan term packages for the two options had a comparatively minor effect on their commercial viability, with the effect of the lower rate of interest under Option 3 being offset by the effect of the lower equity requirement under Option 4.

Fig. 5-2
Option 4
Route B-3
Vancouver — Japan; Coal — Ballast; 150,000 DWT.



Since the capital used in constructing vessels under Option 4 could otherwise be diverted to alternative uses in Canada, and since -- in contrast to Option 3 -- this capital cannot be considered incremental to the Canadian economy, the total resource flows under this option are discounted at 10 per cent per annum.

The resulting money costs for these resources are then adjusted to take into account external effects not captured in market prices. The third bar in Figure 5-2 indicates the effect of including the labour externality in shipping and shipbuilding. On route B-3, these externalities reduce the economic costs of Option 4 to \$-8.1 million. The fourth and final bar indicates the effect of including a premium for the net foreign exchange generated by Option 4.

The effect of these adjustments is to produce a negative net present value of \$6.6 million for Option 4 on route B-3, indicating that investment in this option would not represent an efficient use of Canadian resources.

In comparing the results for Options 3 and 4, it can be noted that the estimated labour externality in construction of Option 4 vessels (\$4.97 million) approximates in size the benefits of foreign financing for vessel purchases (\$5.34 million) available under Option 3. Since these effects virtually cancel each other out, the primary reason for the different economic costs of the two options relates to the higher costs of the Canadian-built vessels used in Option 4.

3. RESULTS FOR ALL ROUTES

Figure 5.3 indicates results of the economic analysis of Options 3 and 4 for all routes. The table at the end of this chapter provides detail on the various elements of the commercial and economic analysis.

The most striking and important result is that all of the trade routes have negative net present values under both Options 3 and 4. These results indicate that it is preferable, from an economic perspective, to rely on foreign flag shipping services rather than to build up a Canadian-flag deep-sea fleet.

The second finding of importance is that the net present values associated with Option 3 are consistently less negative than those associated with Option 4. It appears that the major benefits accruing to Option 3 through foreign financing and lower vessel costs more than offset the shipbuilding labour externality and the larger foreign exchange benefits associated with Option 4.

¹On route B-3, Option 4 results in a direct foreign exchange gain of \$12.93 million, while the amount of forgone foreign exchange associated with this option is estimated to be \$2.6 million. Should one want to attach a premium to these net foreign exchange gains along the lines indicated in Chapter 3, the value of the net foreign exchange gain for Option 4 on route B-3 would, therefore, be 15 per cent of \$10.33 million, or \$1.55 million, which reduces the net economic costs of the option accordingly.

Another significant result is the much more negative Option 4 net present values associated with the larger bulk and container vessels (Routes B-1, B-2, B-3, B-4, B-5, C-1, C-2, C-3). The dollar value of the difference between Canadian and foreign vessel costs is higher on these routes, and this more than offsets the greater labour externalities associated with construction of these larger vessels.

The results for the container and general cargo routes are particularly interesting, inasmuch as they were excluded from the Hedlin-Menzies study and were cited as areas of interest in the Darling Report. The results show that these routes would have net economic costs approximately equal to or greater than most other routes in the analysis. That is, these routes do not seem to merit any closer attention than the bulk routes on the basis of the results of the economic analysis.

There is little variation in net present values of the various routes under Option 3. This is because there are no differences between Options 1 and 3 except for labour costs, the shipping labour externality, and a possible premium for the value of foreign exchange. Since these variables do not change a great deal from trade route to trade route, it is not surprising that the net present values for Option 3 exhibit little variance.

The consistency in the direction of the results for both Options 3 and 4 is to be expected, inasmuch as the freight rate chosen (the "required" freight rate for Option 1) effectively strips the routes of all characteristics not directly related to the cost structures of the different options. The reasons for using this freight rate were explained in Chapter 2, and related to the unreliability of market freight rate forecasts and the desirability of investigating the structural characteristics of different options without confusing the analysis by introducing widely divergent revenue forecasts.

Figures 5.4 and 5.5 compare the economic and commercial base case results for Options 3 and 4 respectively. The results under both types of analysis and for both options are negative on all trade routes. This indicates that the options not only represent an economically inefficient use of resources but that investment in these options is not likely to be undertaken by the private sector. While there are differences in ranking between options based on the perspective considered (i.e., the Option 4 commercial results are less negative than those of Option 3, whereas the Option 3 economic results are less negative than those of Option 4), the negative signs imply consistency between the results of the commercial and economic analyses. That is, the interests of the Canadian economy as a whole are best served by relying on foreign shipping services, and the commercial analysis indicates this is likely to be the outcome in the future.

Fig. 5-3

RESULTS OF THE ECONOMIC ANALYSIS

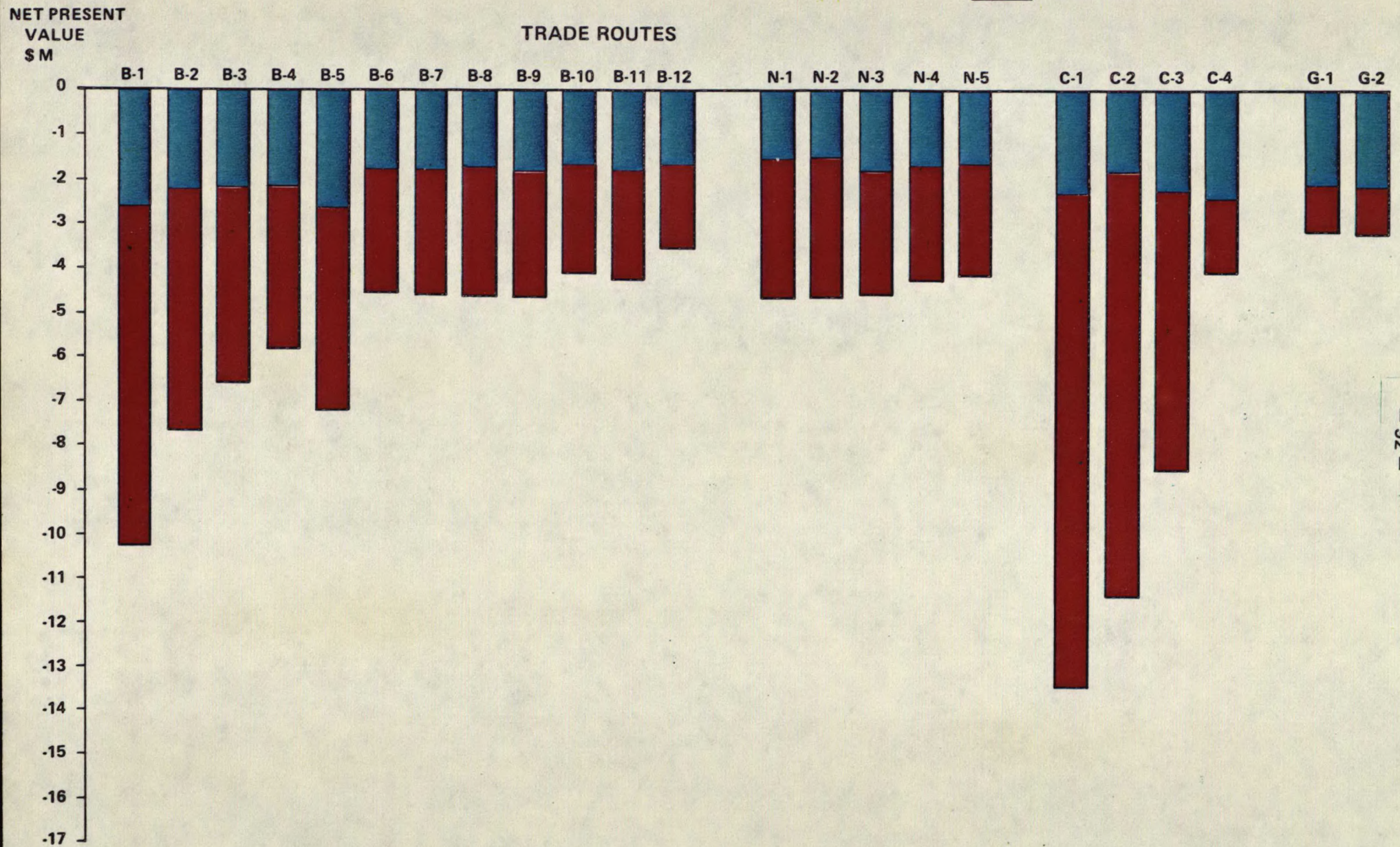
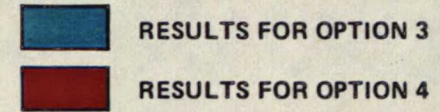


Fig. 5-4

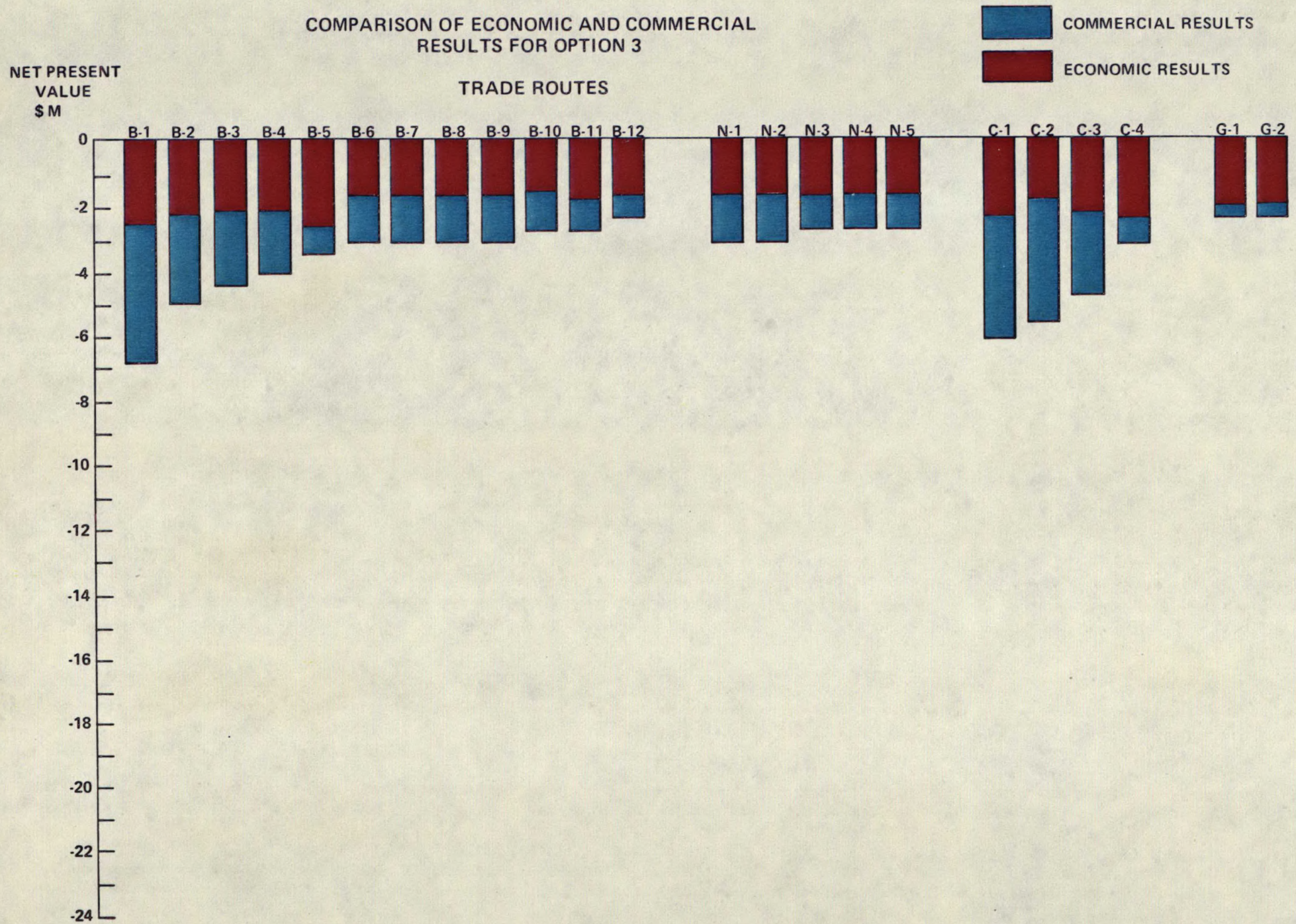


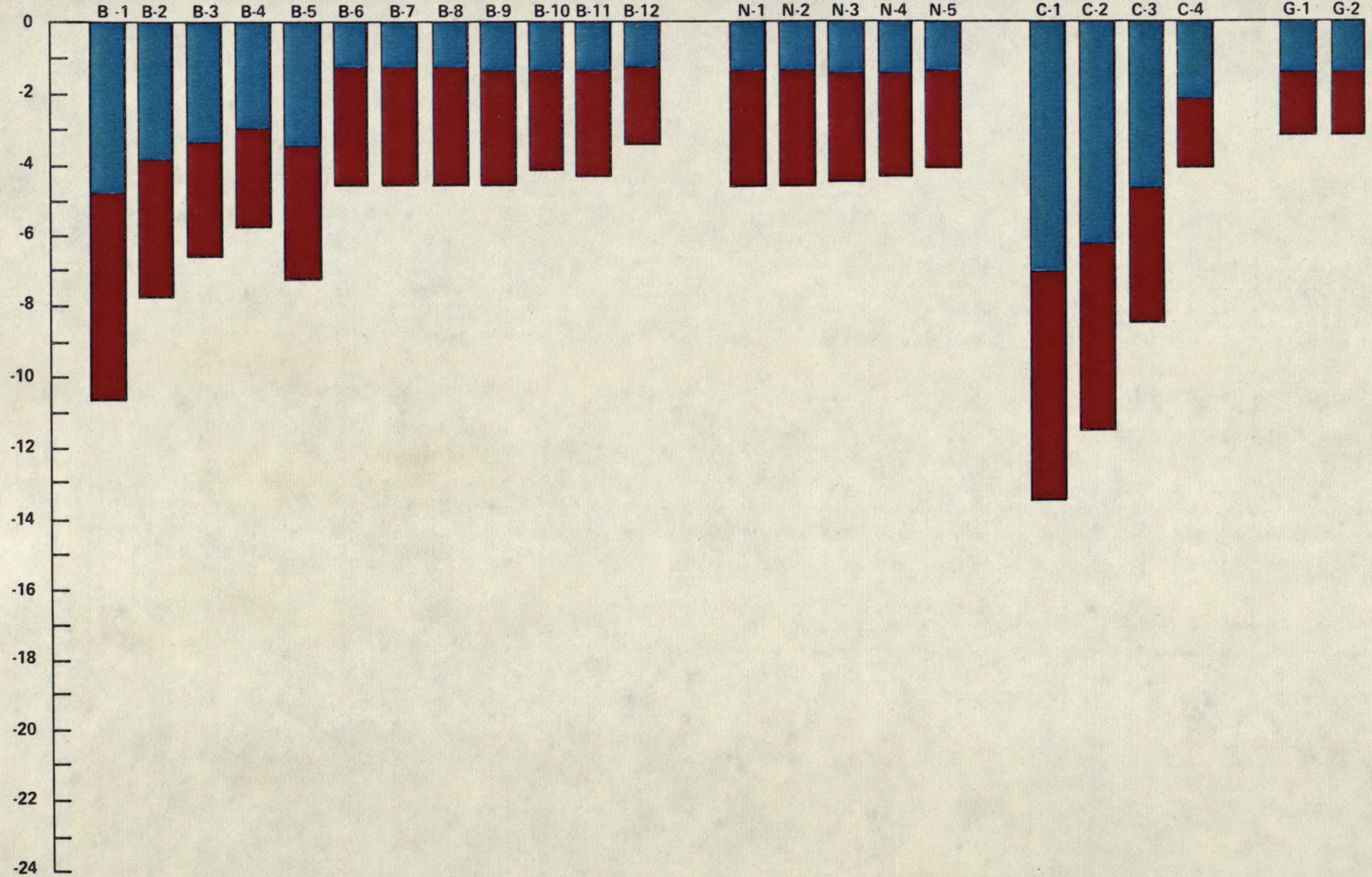
Fig. 5-5

COMPARISON OF ECONOMIC AND COMMERCIAL
RESULTS FOR OPTION 4

NET PRESENT
VALUE
\$M

COMMERCIAL RESULTS
ECONOMIC RESULTS

TRADE ROUTES



4. SENSITIVITY ANALYSIS

As in the case of the commercial analysis, many of the variables that could be changed to test the impact on the economic results are not significant. This is because both the size and the timing of the costs associated with these variables as estimated by the consultants are identical for Options 1, 3 and 4.¹ Changes in these factors will have no effect on net present values, since any effect on the operating economics of Options 3 and 4 will be offset by changes in RFR1.²

Furthermore, variations in the rate at which capital cost allowances are claimed are not considered in the economic analysis, as depreciation allowances are not an economic cost. Vessel loan terms and payment schedules are similarly not relevant in an economic analysis of Option 4, as we are concerned with the timing of real resource use, and not with the timing of the payments for these resources.

The five variables considered in the sensitivity analysis, therefore, are the value of the foreign exchange premium, portage (the wage bill), the discount rate, vessel cost and the shipbuilding labour externality. These variables are unique to one or two of the three options, and affect the estimates of economic costs and benefits. Accordingly, changes in these variables alter the size of the economic net present values for Options 3 and 4, and could also affect the ranking of the two Canadian-flag options.

(i) Value of Net Foreign Exchange Earnings

To this point in the economic analysis, the Canadian-flag shipping options have been credited with "benefits" because of the net foreign exchange earnings they would generate. As was seen in Chapter 3, however, there are good reasons for not attributing a premium to the net foreign exchange earnings of projects. If foreign exchange benefits are excluded from the economic analysis of shipping options, the net present values of Option 3 and 4 would fall by 24 per cent and 21 per cent respectively, compared to the base case results for these options. The base case findings are not disturbed, of course, since Option 3 continues to have lower economic costs than Option 4 and both Canadian-flag options would continue to represent an inefficient use of Canadian resources.

¹These variables include surveys/repairs/maintenance, the vessel load factor, days per voyage, port costs, and fuel costs.

²It will be recalled from Chapter 2 (and Appendix A) that a change in any variable used in the analysis of Option 1 results in a change in the required freight rate for Option 1 (RFR1). In the case of the variables mentioned in the preceding footnote, any change in the revenues of Options 3 or 4 resulting from a changed RFR1 will be offset by an identical but opposite change in the costs of Options 3 and 4. The costs and revenues offset each other because the level of the variables must be identical for Options 1, 3 and 4 in order for the analysis to be consistent.

(ii) Portage

The portage bills for Option 3 and 4 were allowed to vary by 25 per cent. The table below gives the percentage deviations from the base case results when the figures are averaged over all routes.

	Percentage Change in Portage Costs	Percentage Change in Net Present Value
Option 3	+25	-80
	-25	+80
Option 4	+25	-31
	-25	+31

The average deviation for Option 3 is much greater than for Option 4. This occurs because the base on which the percentage change is calculated is lower in Option 3, while the absolute values of the changes in portage are identical for both options on every trade route.

None of the changes in portage resulted in a changed sign in the net present value of Options 3 and 4. The relatively small portion of the total economic costs represented by portage suggests that this is not an unreasonable result. Furthermore, because changes in portage affect both Options 3 and 4 equally in dollar value terms, there was no change in the ranking of these options.

(iii) Discount Rate

The social discount rate was varied from 5 to 15 per cent on both options. No corresponding changes were made in the discount rate used in determining RFRL, however, since there is no a priori reason to believe that the after-tax return on equity required by Option 1 investors, and the social discount rate used in the economic analysis, need be equalized. This contrasts with the procedure used in the commercial analysis, where the discount rates reflected the same concept in all options.

The impact on net present values was, as might be expected, quite significant, as the following table indicates. Variations in the discount rate had an effect not only on the primary cash flows but also on the premium that may be ascribed to net foreign exchange earnings. Both effects were taken into consideration in determining the economic net present values of options.

	Discount Rate Assumption	Percentage Change In Net Present Value
Option 3	5%	+206
	15%	-108
Option 4	5%	+ 98
	15%	- 62

The large changes in the net present values at the low discount rate were accompanied by a change in sign on many trade routes. Under Option 3, all but three of the trade routes (B-12, G-1, G-2) had a positive net present value when a 5 per cent discount rate was used. A similar but not so striking result occurred under Option 4, where eleven of the twenty-three trade routes had a positive net present value with a 5 per cent discount rate.

This result reflects the critical importance of the discount rate in projects of a highly capital-intensive nature. Most of the benefits in the economic analysis do not occur until the third year of the analysis. A lower discount rate makes these benefits more attractive in present value terms and accounts for the changes in sign. The 5 per cent discount rate did not, however, result in changes in the rankings of Options 3 and 4.

The results when a higher social discount rate is used are not particularly surprising. With a 15 per cent discount rate, the net present values became substantially more negative. The rankings between options did not change (i.e., Option 3 had smaller negative net present values than Option 4), and in no situation was there a change in the sign of the net present values.

Empirical evidence on the subject of discount rates is given in Appendix B. This evidence indicates that the social opportunity cost of capital in the Canadian economy (i.e., the rate of return sacrificed on other activities when resources are diverted to particular investments) equals 10 per cent per annum. On the basis of similar evidence, the Benefit-Cost Analysis Guide issued by the Treasury Board Secretariat recommends that a social discount rate of 10 per cent per annum be used in the evaluation of public projects. The Guide also recommends, however, that sensitivity analyses be undertaken for discount rates of 5 and 15 per cent per annum. These sensitivity analyses have accordingly been undertaken in the present study, although it is not felt that the suggested sensitivity bounds are firmly grounded in empirical evidence or represent any realistic bound of uncertainty.

(iv) Shipbuilding Labour Externality

The shipbuilding labour externality taken into account in the case of Option 4 was allowed to vary from the base case of \$5,100 per man-year to \$3,400 and \$8,400 per man-year. The average deviations from the base results are:

	<u>Externality per man-year</u>	<u>Percentage Change in Net Present Value</u>
Option 4:	8,400	+44%
	3,400	-23%

In neither case do the results for Option 4 change in sign. While this effect would, of course, be expected in the situation where the externality was lower than in the base case, the finding that the net present values for Option 4 remained negative when a higher externality was assumed is significant. In deriving the high estimate of the labour externality in Chapter 4, a conscious attempt was made to bias the estimates in an upward direction. Even under these circumstances, however, it would not appear that the development of a fleet using domestically produced vessels would represent an efficient use of Canadian resources.

The ranking between options did not change when the low externality was used. When the high externality was used, the same ranking was observed on all routes except C-4. On this route, the net present value for Option 4 was slightly less negative than that of Option 3. In general, however, the use of the high estimate of the shipbuilding labour externality was not large enough to reduce the estimated net economic cost of Option 4 below that of Option 3.

(v) Foreign Vessel Cost

The effect of varying the foreign vessel cost assumption is particularly important in light of the current and projected excess supply of shipping and shipbuilding capacity, which was referred to in Chapter 1. The vessel cost, therefore, was allowed to change for Options 1 and 3, as under both options it is assumed that vessels will be purchased from the lowest cost source. Changing the vessel cost for Option 1 naturally changes the Required Freight Rate for Option 1, and thus has an impact on the other options. Any change in RFR1 will also have an effect on the foreign exchange flows. These latter effects have, as indicated earlier, been incorporated in the calculation of economic costs and benefits associated with Options 3 and 4.

The following table identifies the average percentage deviations from the base case when the vessel costs for Options 1 and 3 are varied.

Foreign Vessel Cost Estimate	Percentage Change in Net Present Value: Option 3	Percentage Change in Net Present Value: Option 4
low (-15% to -39%) ¹	+15	-93%

¹The low vessel prices represent the consultants' estimates of Japanese ship prices in 1976. Given the situation in world shipping, small discounts on the order of 15 to 20 per cent are available on small ships because there is relatively strong demand for such vessels. The current demand for new large vessels, however, is almost non-existent, forcing builders to offer large price discounts estimated by the consultants to be up to 39 per cent in 1976.

The relatively small changes observed for Option 3 reflect the fact that a lowering of foreign vessel prices is offset by a corresponding lowering of revenues resulting from different levels of RFR1.

Option 4, of course, does not have such offsetting factors. When a low vessel cost is used in Option 1, the lowering of RFR1 is so drastic as to make the net present values of Option 4 drop an average of almost 100 per cent. This drop makes Option 4 appear substantially worse as compared to the base case results. Figure 5-6 indicates the economic results for both Options 3 and 4 on a route-by-route basis if the low foreign vessel price assumption is used.

The sensitivity analysis of vessel costs is quite important, as it highlights a situation that many observers expect to exist over the medium term. That is, the view is often expressed that the condition of excess shipbuilding capacity and consequent low vessel prices is unlikely to be reversed in the next few years. If this were so, and freight rate charges reflect the low vessel prices, then the net economic costs associated with Option 4 would be substantially greater than those presented in the base case -- as illustrated in Figure 5-6, as compared with Figure 5-3.

Conclusions of the Sensitivity Analysis

Five variables were varied to analyse their impact on the results of the economic analysis. Changes in the levels of portage, the value of net foreign exchange earnings and the shipbuilding labour externality had a not inconsiderable effect on the size of the net present values, but did not alter the ranking between Options 3 and 4, and did not lead to these options having any positive net present values. When the discount rate was lowered to 5 per cent, almost all of the trade routes under Option 3 and nearly half of the trade routes under Option 4 had positive net present values. For reasons indicated, however, very little significance can be attached to this result. Changes in foreign vessel costs had a substantial impact on the results. With lower foreign vessel costs, the net present values of Option 4 fell dramatically. This result is significant in light of the current and projected excess shipbuilding capacity which will tend to keep foreign vessel prices low.

The overall conclusion from the sensitivity analysis would be that the base case results are fairly rigorous, both in terms of the ranking of the Canadian options and in terms of the basic finding that investment in the Canadian-flag options would represent an inefficient use of Canadian resources.

Fig. 5-6

RESULTS OF THE ECONOMIC ANALYSIS WHEN LOW
FOREIGN VESSEL COST ASSUMPTION IS UTILIZED

NET PRESENT
VALUE
\$M

TRADE ROUTES

RESULTS FOR OPTION 3
RESULTS FOR OPTION 4

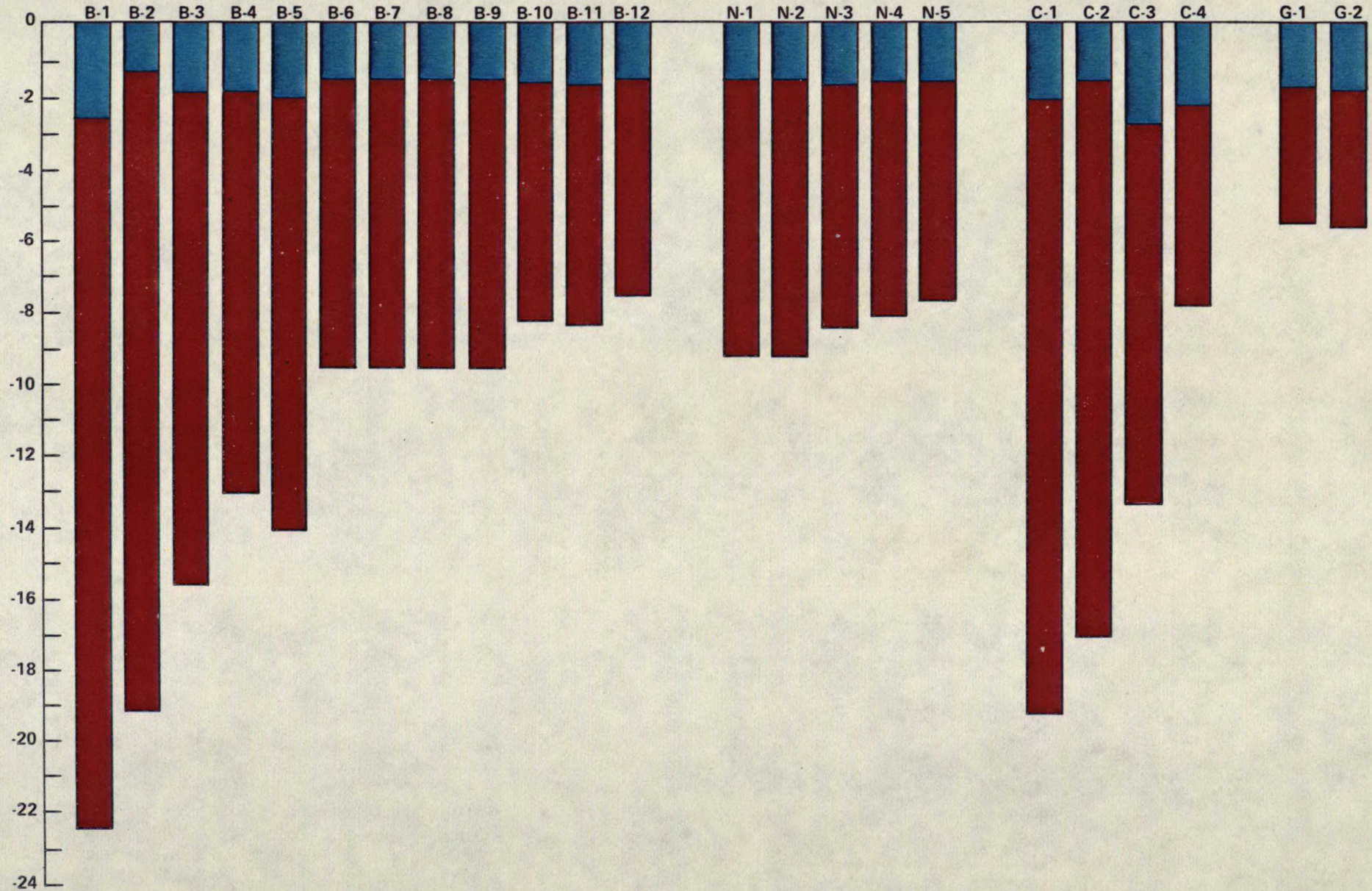


TABLE 5-1

ELEMENTS OF THE ECONOMIC ANALYSIS
Bulk Routes B-1 to B-6

	B-1		B-2		B-3		B-4		B-5		B-6	
	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4
1. Commercial NPV	-6.85	-4.77	-5.08	-3.94	-4.55	-3.35	-4.24	-3.03	-3.64	-3.52	-3.31	-1.33
2. Social NPV	-11.10	-21.05	-8.37	-14.99	-7.54	-13.35	-7.08	-12.04	-7.23	-13.06	-5.63	-9.34
3. BFF ⁽¹⁾	7.86	—	5.34	—	4.49	—	4.07	—	4.22	—	3.09	—
4. Shipbuilding Labour Externality	—	8.67	—	5.87	—	4.97	—	4.46	—	4.72	—	3.38
5. Shipping Labour Externality	.26	.26	.24	.24	.24	.24	.24	.24	.24	.24	.21	.21
6. Value of foreign ⁽²⁾ Exchange	.34	2.59	.54	1.58	.59	1.94	.60	1.80	.10	1.31	.55	1.47
7. Value of foregone foreign exchange	—	-.67	—	-.45	—	-.39	—	-.35	—	-.37	—	-.27
8. Total Social NPV	-2.64	-10.20	-2.25	-7.75	-2.22	-6.59	-2.17	-5.89	-2.67	-7.16	-1.78	-4.55

(1) Benefits of foreign financing

(2) 15% of the net foreign exchange generated when moving from Option 1 to Option 3 or 4.

TABLE 5-1(cont'd)

ELEMENTS OF THE ECONOMIC ANALYSIS
Bulk Routes B-7 to B-12

	B-7		B-8		B-9		B-10		B-11		B-12	
	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4
1. Commercial NPV	-3.31	-1.34	-3.31	-1.34	-3.31	-1.35	-2.91	-1.40	-2.91	-1.41	-2.46	-1.34
2. Social NPV	-5.63	-9.35	-5.61	-9.37	-5.66	-9.37	-5.00	-8.31	-5.01	-8.34	-4.31	-6.63
3. BFF ⁽¹⁾	3.09	—	3.09	—	3.09	—	2.52	—	2.52	—	1.83	—
4. Shipbuilding Labour Externality	—	3.38	—	3.38	—	3.38	—	2.81	—	2.81	—	2.02
5. Shipping Labour Externality	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21
6. Value of foreign ⁽²⁾ Exchange	.57	1.47	.56	1.47	.56	1.48	.54	1.26	.42	1.15	.52	1.04
7. Value of foregone foreign exchange	—	-.27	—	-.27	—	-.27	—	-.20	—	-.20	—	-.16
8. Total Social NPV	-1.76	-4.56	-1.75	-4.58	-1.80	-4.58	-1.73	-4.23	-1.86	-4.37	-1.75	-3.52

(1) Benefits of foreign financing

(2) 15% of the net foreign exchange generated when moving from Option 1 to Option 3 or 4.

TABLE 5-1(cont'd)

ELEMENTS OF THE ECONOMIC ANALYSIS
Neo-Bulk Routes N-1 to N-5

	N-1		N-2		N-3		N-4		N-5	
	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4
1. Commercial NPV	-3.21	-1.40	-3.21	-1.41	-2.93	-1.45	-2.94	-1.45	-2.86	-1.44
2. Social NPV	-5.45	-9.44	-5.45	-9.44	-5.04	-8.53	-5.04	-8.54	-4.93	-8.26
3. BFF(1)	3.03	—	3.03	—	2.57	—	2.57	—	2.46	—
4. Shipbuilding Labour Externality	—	3.37	—	3.37	—	2.74	—	2.87	—	2.87
5. Shipping Labour Externality	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21
6. Value of foreign ⁽²⁾ Exchange	.54	1.41	.55	1.42	.43	1.17	.53	1.33	.52	1.21
7. Value of foregone foreign exchange	—	-.26	—	-.26	—	-.22	—	-.22	—	-.21
8. Total Social NPV	-1.67	-4.71	-1.66	-4.70	-1.83	-4.63	-1.73	-4.35	-1.74	-4.18

(1) Benefits of foreign financing

(2) 15% of the net foreign exchange generated when moving from Option 1 to Option 3 or 4.

TABLE 5-1(cont'd)

ELEMENTS OF THE ECONOMIC ANALYSIS
Container and General Cargo Routes C-1 to C-4 and G-1, G-2

	C-1		C-2		C-3		C-4		G-1		G-2	
	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4	Option 3	Option 4
1. Commercial NPV	-6.31	-7.16	-5.80	-6.25	-4.85	-4.73	-3.31	-2.21	-2.48	-1.39	-2.48	-1.39
2. Social NPV	-9.68	-23.22	-8.82	-20.66	-7.55	-15.12	-5.93	-8.35	-4.28	-5.93	-4.28	-5.93
3. BFF ⁽¹⁾	6.59	—	6.17	—	4.49	—	2.81	—	1.54	—	1.54	—
4. Shipbuilding Labour Externality	—	8.03	—	7.40	—	5.23	—	2.94	—	1.66	—	1.66
5. Shipping Labour Externality	.24	.24	.24	.24	.24	.24	.17	.17	.17	.17	.17	.17
6. Value of foreign ⁽²⁾ Exchange	.48	2.06	.56	2.12	.53	1.54	.49	1.39	.54	1.03	.51	1.01
7. Value of foregone foreign exchange	—	-.62	—	-.58	—	-.41	—	-.23	—	-.13	—	-.13
8. Total Social NPV	-2.37	-13.51	-1.85	-11.48	-2.29	-8.52	-2.46	-4.08	-2.03	-3.20	-2.06	-3.22

(1) Benefits of foreign financing

(2) 15% of the net foreign exchange generated when moving from Option 1 to Option 3 or 4.

Chapter 6

FURTHER CONSIDERATIONS

1. INTRODUCTION

The commercial analysis reviewed in Chapter 2 indicated that Canadian-flag deep-sea shipping operations would be more costly than comparable operations under foreign flags. In circumstances where freight rates are set competitively, and reflect the costs of foreign operations, the after-tax return on equity earned from investment in Canadian-flag shipping would be less than might be expected from alternative investments. The implication that a private investor would not consider Canadian-flag deep-sea shipping to be an attractive business proposition is confirmed by the lack of substantial investment in such operations over the past thirty years.

As the results of private investments can be substantially influenced by government policy (through direct subsidies, tax and financial concessions, etc.), the above assessment conveys little information on the desirability of Canadian-flag shipping from the perspective of the Canadian economy. That is, the measures of commercial viability indicate whether an investment would take place in the existing institutional environment, but do not answer the more basic question of whether it is in Canada's economic interests that such an investment should take place.

The economic analysis undertaken in this study was designed to answer the latter, more fundamental question by focussing on the real resource implications of investment in Canadian shipping. The essential conclusion of this analysis was that Canadian-flag shipping options do not represent an efficient use of Canadian resources, and that investments in such operations should not be encouraged. The principal economic benefits which are usually attributed to a Canadian-flag deep-sea merchant marine -- employment and balance of payments effects -- were taken into account in this evaluation.

The above conclusions were based on the assumption that the freight rates faced by Canadian shippers are and will be predominantly determined by competitive forces in the international market. Some of the reasons often suggested for promoting a Canadian-flag deep-sea merchant marine, however, are based on a view that forces in world shipping are working to render this assumption invalid. The purpose of the present chapter will be to examine these and other considerations that have been put forward for encouraging a Canadian deep-sea merchant marine and, more generally, to identify Canada's interests in deep-sea shipping arrangements.

2. CANADA'S INTERESTS IN DEEP-SEA SHIPPING

Deep-sea shipping can, of course, be looked on as a potential investment opportunity although, as suggested above, Canadian-flag shipping is not necessarily an attractive investment outlet for

Canadian resources. Perhaps more importantly, however, shipping is necessary to service Canadian trade with overseas countries. With respect to the latter concern, Canada's trade interests are best served by an efficient transport system which provides an adequate supply of services at minimum cost.

In economic terms, it is easy to see why the latter objective is important, and to develop some of its implications for our trade and economic welfare. In the first place, the prices of most of our export commodities are set on world markets beyond our control. In these circumstances, increased shipping costs to Canadian exporters generally cannot be passed on to foreign consumers, but must be borne by the Canadian producer. Lower shipping costs, on the other hand, would normally be expected to benefit the Canadian producer.

In the case of imports, Canada -- as a small part of the world market -- would also appear to be primarily a "price-taker"; that is, the price of imports to Canada is generally unaffected by the quantity demanded. In such a situation, higher shipping costs result in higher prices of imports to Canadians, with the price received by the foreign producer being unaffected.

In these circumstances, it would seem that Canadian producers and consumers have everything to gain from lower shipping costs -- whether brought about by technical advances such as containerization, or even by subsidization of shipping by foreign governments. On the other hand, anything which raises deep-sea shipping costs -- for instance, as a result of actions by foreign governments or monopolies in shipping -- would seem to be to the detriment of Canadian producers and consumers. From whatever source, higher deep-sea shipping costs can be regarded as the equivalent of a tax on Canadian consumers and producers.

3. POSSIBLE THREATS TO CONTINUED AVAILABILITY OF LOW-COST SHIPPING

The arguments that will be examined below accept the hypothesis that, from the point of view of Canada's trade, our interests lie in the provision of efficient low-cost shipping services. These arguments maintain, however, that Canadian-flag participation in deep-sea shipping would benefit our trade, either by increasing the security of supply of shipping services or by reducing the cost of such services.

One of these arguments for promoting Canadian-flag participation in deep-sea shipping relates to a special set of demand conditions. Thus, it has been argued that Canadian-flag shipping would provide a "hedge" against the high cost of shipping services and against possible interruption of supply of such services when "boom" conditions occur in shipping markets.

By far the most serious of the arguments for promotion of Canadian-flag deep-sea shipping, however, imply that changes are occurring in deep-sea shipping markets which threaten to reduce the availability of low-cost foreign shipping to Canada. In particular, it has been suggested that competition in deep-sea shipping markets is being

reduced by cartelization on the one hand and increasing intervention by foreign governments on the other. The basis for the present benefit-cost analysis would appear to be thrown into question by these arguments, since it has been assumed that for the most part deep-sea shipping markets are competitive. The argument that deep-sea shipping markets are becoming increasingly less competitive, therefore, needs to be examined.

Threats to competitive outcomes in shipping markets may arise from several sources. One source of complaint is that economic forces at work in these markets may lead to the concentration of economic power in a limited number of hands: in the terminology of economists, it has been suggested that shipping markets are becoming "natural monopolies". Thus, Darling has hypothesized that the substantial amount of capital necessary for the acquisition of some specialized bulk cargo ships, oil carriers and container ships may impose "barriers to entry" in these shipping markets and hence lead to cartelization or monopoly.

A different type of threat is seen to arise from government intervention in shipping markets. In the first place, government financial assistance or subsidies to nationally supported shipping lines is often seen, not as a benefit to Canada, but as a means whereby shipping lines lacking such financial support may be driven out of our shipping markets. While this "predatory pricing" argument logically applies to any case in which shipping is subsidized by national governments, the threat most often cited concerns the support extended by the "State trading" or Communist bloc nations to their shipping.

In recent years, the State trading nations have acquired some renown for competitive pricing, particularly in the general cargo trades. It is alleged that some of the freight rates offered by the fleets of the State trading nations are below the cost-recovery levels of Western shipowners, and that such pricing tactics may eventually drive the latter out of the shipping markets concerned. It is hypothesized that the State trading nations would then be in a position to impose monopoly prices on several important trade routes. The reliability of shipping services provided by these State trading countries is also questioned: it is thought that such services are more prone to interruptions for political reasons.

A second type of government intervention in shipping markets which could constitute a threat to Canadian interests in deep-sea shipping markets arises from cargo reservation for national flag fleets. It is commonly thought that this practice is affecting an increasing amount of international trade. Unilateral cargo reservation has been practised for some time by some of Canada's trading partners -- especially Latin American countries. It is feared that such arrangements will result in higher cost and lower quality shipping services for Canadian trade. Bilateral cargo-sharing treaties -- particularly between the United States and Latin American countries -- are also seen as a source of concern, as they may result in Canadian ports being abandoned by some shipping services.

A possible multilateral cargo-sharing agreement in one particular sector of the shipping market is also seen to threaten Canadian interests in deep-sea shipping markets. The reference is to potential ratification of the UN Convention on a Code of Conduct for Liner Conferences -- often referred to as the UNCTAD Code. Provisions in the Code would allocate the movement of general cargo carried by liner conferences according to an agreed upon formula, such as the commonly referred to 40-40-20 rule: 40 per cent of such cargo would be reserved for vessels of the exporting country, 40 per cent to vessels of the importing country, and 20 per cent would be allocated to third country vessels. In order to come into effect, the Code must be ratified by 24 countries having 25 per cent of world shipping tonnage. By 1978, 29 countries having some 6 per cent of world tonnage had acceded to the Code. Recently, however, the Commission of the European Economic Community has proposed that the EEC consider the possibility of acceding to the Code if certain concessions are made to EEC members. If the EEC were to accede to the Code, the cargo reservation principles outlined earlier would come into effect (except insofar as they were limited in their application by any joint EEC reservation).

In what follows, these arguments will be examined in two respects. First, the extent to which these concerns seem likely to pose a significant threat to Canadian trade will be considered, with a view to determining which of these issues require serious consideration. Secondly, a range of measures designed to counteract the more serious of these threats will be reviewed, with attention to the potential effectiveness of Canadian-flag shipping in relation to other possible initiatives.

4. ASSESSMENT OF PROBLEMS FOR CANADIAN TRADE IN DEEP-SEA SHIPPING MARKETS

(a) Security of Supply of Deep-Sea Shipping in "Boom" Shipping Markets

As noted above, it has been suggested that in conditions where demand for shipping is substantial, Canadian-flag vessels may provide cheaper and more continuous service than foreign-flag carriers. The conditions under which this argument might be relevant are clearly some distance in the future -- given current and projected excess capacity in shipping markets. Moreover, "boom" conditions in shipping markets may not affect all freight rates substantially. The effect would be most noticeable where shippers rely on "spot" voyage charter markets, rather than those markets where substantial volumes of cargo are handled under longer-term contracts of affreightment or time charters.¹ The argument would appear to be deficient on other grounds, however. "Boom" shipping markets imply that the real cost of freight movements are substantial, irrespective of the flag of the carrier. It is likely that the freight rates prevailing in "boom" markets would call forth additional supplies of higher cost shipping, and Canadian-flag shipping might be profitable

¹Thus, Alcan Shipping Services notes that over 85 per cent of all dry-bulk shipping movements are performed under contracts of affreightment. See the Alships Report, Part I, p. 5.9.

in these circumstances. It will be recalled, however, that a principal finding of earlier chapters of this study was that Canadian-flag deep-sea shipping would be uneconomic over the entire shipping cycle. Moreover, in boom shipping markets it is unlikely -- but conceivable -- that Canadian-flag carriers could be compelled to service Canadian trade routes and forgo higher freight rates obtained by international shipping in other markets. The real economic costs of freight movement would not be avoided by this manoeuvre, however, but would simply be shifted to Canadian-flag carriers. From the point of view of Canadian society as a whole, we would not avoid the burden of higher freight rates -- we can either pay them directly or pay them indirectly in the form of forgone earnings from a "captive" Canadian-flag fleet.

(b) "Natural Monopoly" and
Cartelization in Deep-Sea Shipping

There is little evidence that deep-sea shipping is developing into "natural monopolies" of the type postulated by Darling. The capital required to purchase specialized dry bulk vessels, large oil carriers and container ships is admittedly substantial -- although these capital requirements are presumably less of a "barrier to entry" in current circumstances of extensive world-wide government assistance to ship-builders and exceptionally low prices for many new and second-hand vessels. It might also be noted that substantial capital requirements have not prevented rapid expansion of shipping capacity in these markets -- as shown by the fact that the world's present dry bulk fleet was almost entirely constructed in the 1960's, for instance, or by the current rapid expansion of capacity in container tonnage¹. Finally, it might be observed that it is difficult to associate the capital requirements for entry into these markets with the existence of non-competitive behaviour, as an examination of individual shipping markets reveals.

Deep-sea shipping can be divided into the broad categories of bulk and general cargo shipping for the purposes of such an examination. As noted in Chapter 1, the provision of shipping services in the oil carriage and dry bulk markets is generally considered to be competitive. There are large numbers of independent vessel owners in these markets, and freight rate movements reflect changes in supply and demand for shipping capacity. It is worth noting that shipments of oil and the principal dry bulk commodities have made up an increasing share of world deep-sea trade over time, and assume even greater importance in Canada's external trade than in world trade as a whole².

¹See p. 109 above on past growth of the world dry-bulk fleet. Containerization International estimates that world container capacity will increase by 24 per cent in 1978, after a similar increase in 1977. (Ibid., Feb., 1978, p. 23.)

²As noted on p. 4 above, shipment of oil and the principal dry bulk commodities accounted for 76 per cent of tonnage shipped in world trade in 1974. According to the Department of Industry, Trade and Commerce, shipment of bulk commodities accounted for about 84 per cent of tonnage shipped in Canadian trade in 1976.

The monopoly elements in deep-sea shipping are in fact easily identifiable, and consist of liner conferences in the general cargo and container trades. These cartels are not a new phenomenon, (having existed in Canadian general cargo trades at least since the turn of the century) and there is little that is "natural" about them. It is relevant to note, however, that much general cargo movement takes place outside the conference system, by means of non-conference liner shipping and non-scheduled (tramp) services. In the case of cargo suitable for liner shipping in Canadian trade, the Department of Industry, Trade and Commerce has calculated that non-conference services account for roughly 60 per cent of total tonnage. It is clear that the existence of such non-conference shipping imposes restraint on the pricing policies of the conferences in many general cargo trades.

The assumption that Canadian deep-sea shipping markets are for the most part competitive would, therefore, appear to be broadly supported by the available evidence. As a final note, it might also be mentioned that the presence of excess capacity in many shipping markets, and the prospect of continued excess capacity for some time to come, will act to restrain the extent to which monopoly pricing affects Canada's deep-sea shipping services.

(c) Foreign Government Intervention in Deep-Sea Shipping

(i) Recent Trends in Shipping Shares

Before considering issues related to potential threats to Canadian interests that may be posed by government intervention in deep-sea shipping, it is important to review historical trends with respect to relative shares of the shipping market, so as to provide something of a context and perspective to the discussion. This can be done by examining trends in flag registration for the world fleet as a whole and in flag registration of vessels engaged in Canadian trade.

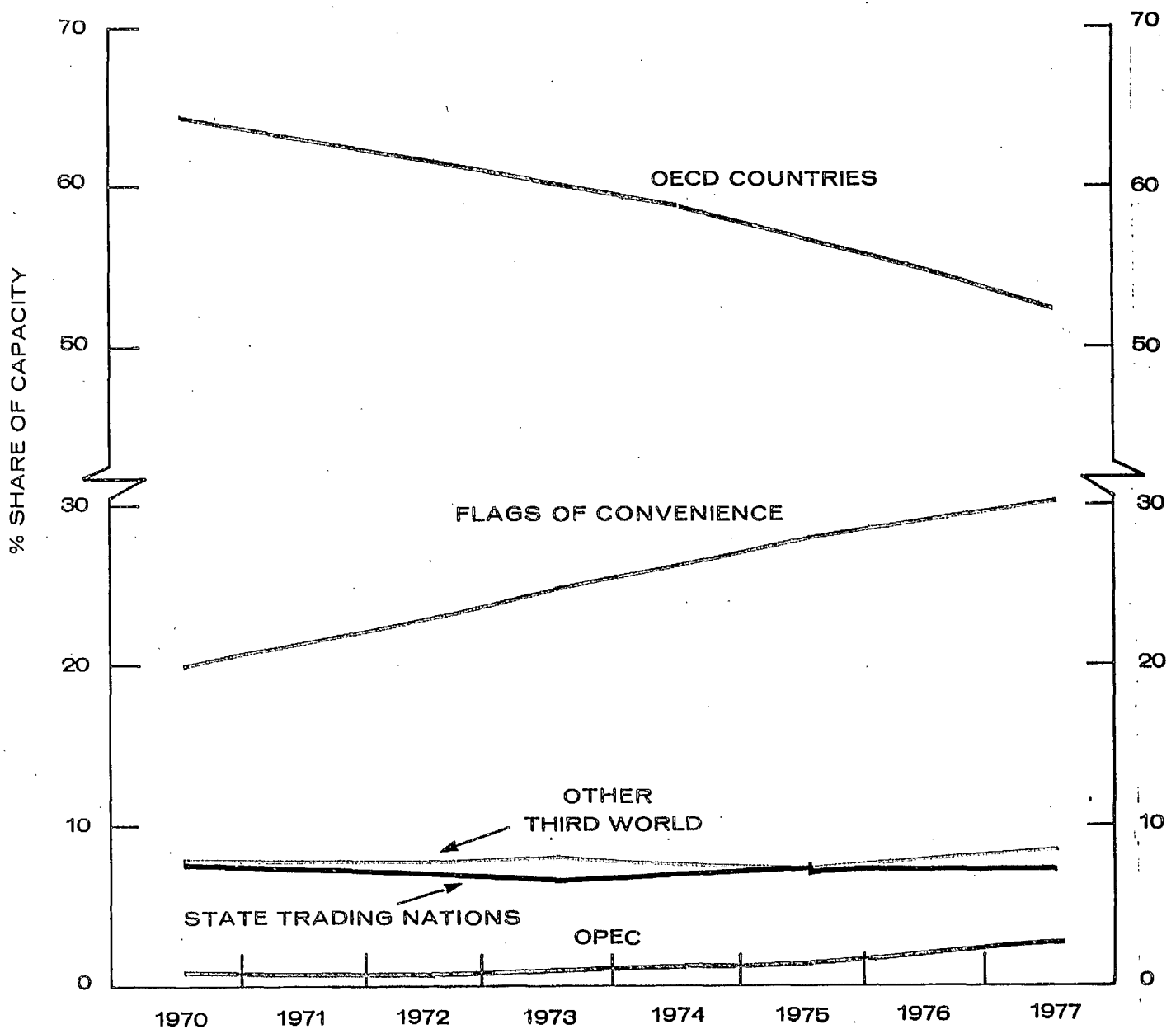
Various "blocs" of countries engaged in deep-sea shipping can be distinguished, and these shipping blocs can in turn be categorized according to the type and extent of intervention in deep-sea shipping markets practised by the governments concerned. Most OECD countries, for example, provide some form of financial assistance to their shipping industries. Cargo reservation measures, however, are not consistent with the principles of freer competition in shipping embodied in the OECD Code of Liberalization of Current Invisible Operations. Shipping of the State trading or Communist nations is fostered by direct government support. The third world countries, in turn, have come to be increasingly associated with the use of cargo reservation practices in deep-sea shipping. Finally, the flag-of-convenience countries are those which practise the least regulation and taxation of deep-sea shipping.

Figure 6-1 below presents data on the share of world trading vessel tonnage registered in various country groupings over the period 1970-77. It can be seen that by far the most significant development in the period was the growth of fleets registered in flag-of-convenience countries. Over the eight-year period, the share of the world trading fleet registered in these countries increased from 19.9 per cent to

FIGURE 6.1

ALL TRADING VESSELS

PERCENTAGE SHARE OF GROSS TONNAGE BY COUNTRY GROUPING



Source: Table E-1

30 per cent. This growth came primarily at the expense of the share of the world fleet held by the OECD countries. What is equally striking is that the share of the State trading nations remained virtually static over the period studied, while the share of the third world countries increased only marginally¹.

A more detailed analysis of trends in the principal categories of shipping is given in Appendix E. This analysis indicates that the increased share in the world trading fleet of flag-of-convenience vessels is not confined, say, to oil and dry bulk shipping (in which the dominance of flag-of-convenience shipping is recognized) but rather has occurred in all major shipping categories. Indeed, the increase in the share of flag-of-convenience fleets has been greater than that of any other shipping bloc in all major shipping categories -- oil carriers, ore and bulk, general cargo and container ships².

Figure 6-2 provides data on the shares of the various shipping blocs in tonnage actually carried in Canadian trade in the period 1970-77. Tonnage carried in vessels registered in the United States and Canada were excluded from this series, since these vessels are used principally in the Great Lakes and coastal trades, while the focus of this report is on deep-sea shipping. Comparing Figures 6-1 and 6-2, it can be seen that the ranking of the various shipping blocs with respect to tonnage carried in Canadian trade is the same as the ranking of the various shipping blocs with respect to tonnage in the world fleet. The fleets of the State trading nations and third world countries are, however, less important in the carriage of Canadian trade than in the world fleet as a whole. The principal fact of interest in Figure 6-2, however, is the virtual constancy of the shares of the various shipping blocs in Canadian trade over time.

(ii) Financial Assistance for National-Flag Shipping

Financial Assistance in General

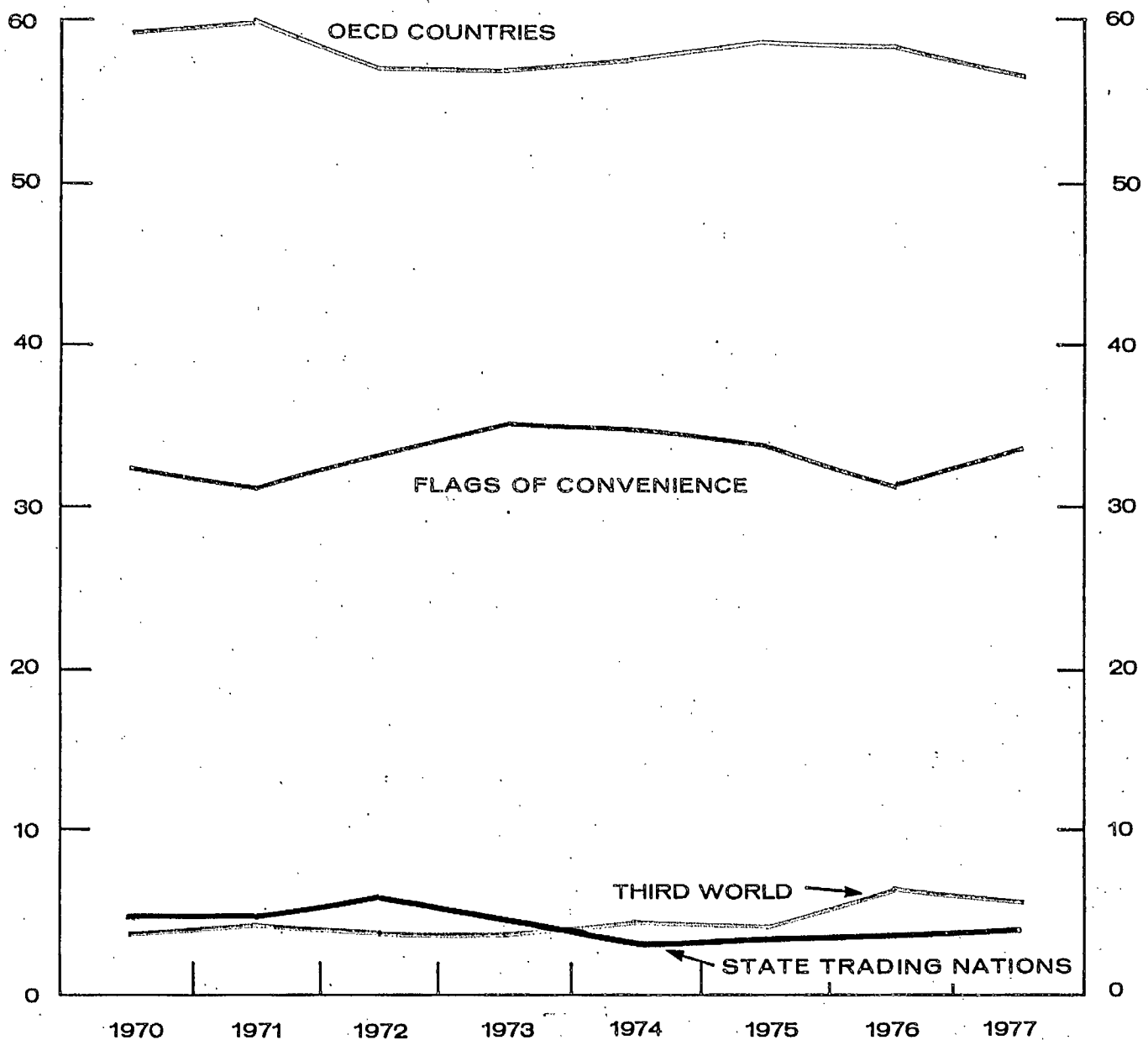
Although many countries have attempted to promote national-flag shipping by the provision of subsidies, taxation relief and other forms of financial assistance, Figure 6-1 leads to the conclusion that such assistance has not been as attractive to many shipowners as the

¹It might be noted that when the third world countries are divided into the OPEC bloc and other third world countries, the change in the share of tonnage obtained by OPEC countries is significant over the period studied, while the change in the share of other third world countries is not significant.

²Combination carriers constitute the only vessel type for which the flag-of-convenience share of total world trading tonnage did not increase over the period studied. This type of vessel is used in both the dry bulk and oil shipping markets. The flag-of-convenience share of world combination carrier tonnage remained relatively constant in the years 1970-77.

FIGURE 6.2

PERCENTAGE SHARE OF CARGO (TONNAGE)
CARRIED IN CANADIAN DEEP-SEA TRADE BY COUNTRY GROUPING *



* Excluding cargo carried by Canadian and USA vessels.

Source: Shipping Report, 54-202, Statistics Canada.

advantages conveyed by flag-of-convenience registration. Nor may it be sufficient for governments to promote national-flag shipping by providing assistance which offsets the financial advantages of flag-of-convenience shipping. Aversion by shipowners to organized labour markets and the administrative burden of government regulation, together with an unwillingness to be identified as the recipients of subsidies, may still result in a preference for flag-of-convenience registry¹.

The hypothesis advanced in the introduction to this chapter was that financial assistance to deep-sea shipping by foreign governments benefits Canada's trade. There would seem to be no reason to modify this hypothesis on the basis of the information conveyed by Figures 6-1 and 6-2, inasmuch as government financial assistance does not seem to have been an effective method of achieving monopolistic power in shipping markets.

Competition from State Trading Countries in Deep-Sea Shipping Services

It is, nevertheless, worth examining separately the argument that the growth of State trading fleets represents a threat to Canadian interests in deep-sea shipping. Perhaps the principal issue is whether the pricing policies adopted by the fleets of the State trading countries reflect "predatory pricing" tactics or simply a healthy degree of competition in deep-sea shipping.² The data presented in Appendix E show that the greatest growth in tonnage of the State trading nation fleets has occurred in the category of general cargo shipping. It might be noted that many general cargo trades have hitherto been dominated by the conferences of the "traditional" Western maritime powers. Opposition to the expansion of the State trading fleets in these markets on the part of Western shipowners could, therefore, be interpreted either as an understandable concern regarding "unfair" competition, or simply a self-interested concern about threats to cartel prices. It might be noted that many of the Western countries emphasizing the political threat posed by competition from the State trading nations appear to be equally concerned by low-cost flag-of-convenience shipping, where "predatory pricing" arguments have rather less applicability.

¹See the Alships Report, Part I, Appendix B, pp. B.8-B.10.

²The pricing policies may also reflect the provision of lower cost services by State trading country fleets. For instance, the Soviet Union has argued that on North Atlantic general cargo routes

"small (Soviet) vessels designed to carry a mixture of container and non-container cargo would not be service-competitive with the large cellular ships used by the Conference carriers without rate concessions" Seatrade, August 1977, p.75.

The historical analysis of gross tonnage shares presented above indicates that the State trading nations have provided a small proportion of the shipping used in Canadian deep-sea trade. The likelihood of politically inspired withdrawal of the shipping services of State trading nations from Canadian trades also appears to be quite small. Aside from the lack of any historical evidence regarding the use of such tactics, it is a moot point whether any such withdrawal would be an effective political weapon, given the rather small share of our trade carried by the fleets of the State trading nations. Since there are a large number of countries both willing and able to carry Canadian trade, it is difficult to see why replacement services would not be readily available even if such an unlikely event were to occur. Indeed, since many of the Western lines are complaining about State trading shipping precisely because the Western Lines' load factors have been reduced, this would suggest that such replacement services are already in existence.

Furthermore, approximately 75 per cent of the tonnage carried on the State trading fleets consists of cargoes bound to or originating in those countries. Consequently, in the event of serious political difficulties, the question of the security of supply of shipping services from State trading nations is clearly a problem of second-order significance compared to the question of the security of trade itself with these nations. Others have observed, however, that discussions of maritime policy often tend to become pre-occupied with such questions of second-order significance.¹

Finally, it is often argued that state-trading nations value their shipping operations largely because of their potential for earning foreign exchange. Since the withdrawal of shipping services for political reasons would not further this objective, it is difficult to understand why the state-trading nations would want to engage in such self-sacrificing behaviour.

(iii) Cargo Reservation

Unilateral and Bilateral Cargo Reservation

It is understandable that the objective of reserving cargo for national-flag shipping is espoused throughout the world where shipowners have higher costs. Third world countries have been perhaps the principal

¹Thus, according to Jantscher, reflecting on U.S. policy:

"The maritime program illustrates the myopia of policy-makers who become preoccupied with optimizing the performance of some subsystem within a larger system whose total performance is far from optimal. The question whether the United States should depend on foreign sources for much of the oil and gas it needs touches U.S. security far more intimately than the minor question of how foreign oil and gas should be carried here. Until recently, however, the former question seems to have attracted less attention than the latter." Bread Upon the Waters, pp. 132-33.

proponents of cargo reservation measures in deep-sea shipping. Data on growth in the world fleet over time, however, do not suggest that cargo reservation has been a general or growing problem in world shipping. It is interesting to note that, with the exception of the OPEC bloc, the share of world tonnage registered in third world countries has remained relatively constant since 1970. Moreover, Appendix E demonstrates that growth in the share of the world fleet registered in flag-of-convenience countries has been greater than that in third world countries in all major shipping categories with the exception of combination carriers. Flag-of-convenience registration, of course, is associated with the provision of competitive shipping services and these fleets obviously do not have the protection conferred by cargo reservation measures.

With respect to Canadian trade, Figure 6-2 indicates that third world countries had a rather small and stable share of tonnage shipped over the period 1970-77, suggesting that the cargo reservation measures of these nations have not been a general or growing problem in Canadian trade. There are other indications of the lack of generality of problems for Canadian trade caused by the cargo reservation practices adopted by third world and other nations. First, while these practices are undoubtedly serious to individual Canadian exporters or importers, the number of complaints about such practices has not been large: comparisons might be made, for instance, with the volume of protest which arose from proposals in recent years to restrict coastal trade to Canadian-flag vessels. Secondly, it is also fair to note that most complaints arise in connection with trade with particular South American countries.

There may be a good reason why the effects of cargo reservation measures do not seem to have been reflected in tonnage shipped in Canadian trade or in increased shipping capacity of nations using these measures. Whereas government financial assistance to national-flag shipping can only increase trade and the demand for such shipping, cargo reservation measures may raise the costs of shipping to the point where trade is reduced. A number of examples of these trade-reducing effects of cargo reservation measures can be cited¹, and some of these examples have

¹Thus, according to S.A. Lawrence:

"Flag discrimination measures which disrupt and segment shipping markets place a double burden upon the domestic economy: first, in increased cost of shipping services and second, in less favorable transport arrangements for the nation's exports. The United States has on several occasions lost opportunities to make important sales of surplus wheat because of the reluctance of the potential buyer to take delivery in high cost U.S. flag ships; coffee imports to the U.S. are said to have shifted towards Africa from Brazil in part because of unsatisfactory shipping arrangements in the Brazilian coffee trade; both Burma and Uruguay have notoriously poor shipping services, and a declining foreign trade in part because of their insistence on discriminatory shipping practices; and so forth."

International Sea Transport: The Years Ahead, p. 284.

affected Canadian interests¹. The potential for disruption of trade by unilateral or bilateral cargo reservation measures clearly warrants attention to appropriate Canadian policy responses to these practices.

Multilateral Cargo Reservation

There is also the possibility that cargo reservation may assume a multilateral character by virtue of international ratification of the UNCTAD Code of Conduct on Liner Conferences. Until quite recently, the probability of the UNCTAD Code of Conduct for Liner Conferences coming into effect appeared to be rather small. The recent proposal by the Commission of the European Economic Community that members of the Community might accede to a modified version of the Code (effectively exempting intra-EEC trades and, on a reciprocal basis, trades between the EEC and OECD countries party to the Code, from the cargo-sharing provisions) increases the possibility of at least some of the cargo-sharing provisions coming into effect. It is, of course, not certain that the other signatories will accept the modifications suggested in the EEC proposals. It is nevertheless obvious that there may be a need for Canadian policy capable of responding to the contingency of EEC acceptance of the Code.

The practical effect of ratification of the UNCTAD Code on Canadian trade is somewhat in doubt, as much would depend on whatever modifications were made in the specific clauses relating to cargo preference. In particular, the EEC's proposal to exempt intra-OECD trade would mean that the major portion of Canadian general cargo trade would probably not be appreciably affected by the cargo reservation provisions of the Code.

There is an additional reason why the UNCTAD Code might not have a major effect on Canada's trade. As noted earlier, the Code applies only to trade carried by liner conferences. Only about 40 per cent of tonnage in Canada's general cargo trades is carried by liner conferences, the rest being transported by non-conference liners or non-scheduled services. Such non-conference competition will presumably continue to exist even if the UNCTAD Code is ratified, and could be expected to moderate the extent to which UNCTAD-type conferences could raise freight rates on Canadian trade.

There is no doubt, however, that ratification of the UNCTAD Code could raise freight rates on some of the lower volume Canadian trade routes which are dominated by the conference systems.

¹Thus, John L. Eyre, former President of Saguenay Shipping, observes that the market for shipment of lumber from the U.S. West Coast to the U.S. East Coast has "vanished" because of U.S. cabotage laws. Canadian West Coast mills now serve this trade: shipment being by vessels not registered in Canada. See "Canadian Deep-Sea Shipping" (unpublished paper, Saguenay Shipping Ltd.).

There is also a possibility that actual implementation of the cargo-sharing provisions in the UNCTAD Code could, in some circumstances, be extended to non-conference shipping despite statements in the Code to the contrary. On routes in which non-conference competition is significant, an attempt by one country to provide business for its fleet by implementing the UNCTAD cargo-sharing provisions may well induce third party shipping lines simply to leave the conference and continue to service the trade. Inasmuch as this would tend to defeat the primary purpose of implementing the provisions of the Code, with the national flag fleet only obtaining an increased portion of a declining sector of the market, attempts might be made to apply the cargo-sharing provisions to the entire trade. On the face of it, the exemption of non-conference shipping from the provisions of the Code might not prove to be an entirely stable situation, and the possibility exists that the scope of these provisions would be extended. At the present stage, however, such a development remains hypothetical.

Finally, there is a danger that acceptance of the cargo-sharing provisions for general cargo liner conferences as proposed in the UNCTAD Code may encourage some governments to press for the extension of cargo-sharing to bulk and other shipping. Indeed, proposals to this effect are on the agenda for the forthcoming UNCTAD V Conference in 1979.

While the extent of the possible impact of the UNCTAD Code, therefore, remains uncertain, the concept of multilateral cargo-sharing agreements in liner shipping is clearly a matter of some concern. By combining cargo reservation with international endorsement of cartels, the system could promote the worst features of both. Freight rates could be set to cover costs of the highest cost member of the cartel, who would be guaranteed admission to the cartel by virtue of cargo reservation. The prospect is clearly not one which can be regarded with equanimity.

5. IMPLICATIONS FOR CANADIAN POLICY OF POSSIBLE ADVERSE DEVELOPMENTS

Of the possible problems outlined in the preceding section, the possibility that Canada's trading partners might seek to impose cargo reservation provisions on their trade with Canada presents the greatest potential threat to Canada's interests. The reservation of all or a portion of the trade to the foreign national-flag carrier could result in raising freight rates on that trade to a level higher than if other carriers were permitted access and/or result in a level of service inferior to that available in a free market. Such an increase in rates can be compared in effect to an additional tariff on Canadian exports or a tax on Canadian imports moving in that trade.

It has been suggested that in these circumstances other governments might have to respond in kind by imposing cargo reservation measures of their own, if they already have national-flag fleets, or, indeed, might have to encourage such fleets in order to be able to respond in kind. Widespread movement towards broader application of cargo reservation measures would, however, carry with it very serious implications for the structure of world trade and not merely the movement

of specific goods. An additional layer would be added to existing institutional barriers to freer trade, and one which would tend to move countries in the direction of bilateral trading arrangements.

Given the importance of ensuring freer access to major markets for Canadian exports, Canada's interests clearly lie in ensuring to the extent possible the maintenance of a freer international trading framework, of which rules governing shipping are an element. In seeking to achieve the objective for Canadian shipping policy suggested above -- to ensure an economic low-cost transportation system to service Canadian trade -- these broader concerns need to be kept in mind.

The potential problems presented by cargo reservation measures on the part of Canada's trading partners should, therefore, be seen as analogous to, and be dealt with in the same manner as, other international trade problems. There is a need to deal with both the specific, essentially bilateral, problem that might threaten a particular Canadian trade and the broader threat posed by possible international acceptance of restrictive measures such as cargo reservation in the form, for example, of the UNCTAD Code. Canada's basic aim should be to seek elimination of cargo reservation provisions where specific Canadian trade is affected, as well as more generally.

(a) Cargo Reservation by Individual Trading Partners

As far as bilateral situations are concerned, full and intensive diplomatic efforts should be used to oppose the unilateral imposition of cargo reservation by any of Canada's trading partners. As with all other bilateral trade issues, Canada's bargaining strength and response would depend on a host of factors. There is no reason to assume that Canada would not be in a position to negotiate an acceptable solution. It is not inconceivable that, in the past, efforts to maximize Canadian leverage on specific bilateral issues have been less than fully coordinated in the full range of diplomatic, political, trade and aid dimensions. Such coordination is, of course, essential.

In some cases, it may be possible to persuade the other country that the proposed cargo reservation would adversely affect Canadian interests to an unacceptable degree and that some accommodation would be essential. Even if some countries then insisted on cargo reservation for a specified portion of their trade, there exist a range of possible options which would be acceptable to Canada and which could be considered in the light of the circumstances of the individual case. Canadian policy should presumably be directed, in the first instance, towards maximizing the non-reserved portion of the trade, and then, secondly, attempting to ensure that low-cost shipping services are available for the non-reserved portion of trade. The administrative and diplomatic arrangements appropriate in these circumstances would likely be case-specific. In many situations, the non-reserved portion could be simply carried by shipping obtained from the lowest cost source in the market. In other circumstances, the designation of a foreign line as a Canadian carrier (perhaps via a chartering arrangement) might need to be considered.

Given that the negotiation of some form of bilateral agreement might be required in certain situations, the question arises as to whether this should involve the use of Canadian-flag shipping. The analysis given in this report has indicated that Canadian-flag options could not be operated profitably under existing institutional arrangements, and would in any event involve an uneconomic use of resources. As such, it is difficult to envisage circumstances under which the use of Canadian-flag shipping would represent an appropriate policy. To put the issue in its simplest terms, the need to use some potentially higher cost shipping as a result of the actions of a particular foreign country does not necessarily imply that the introduction of an additional high-cost Canadian source of shipping services would represent an improvement in the situation. Indeed, the introduction of a Canadian carrier on lower volume routes would seem likely to aggravate the situation, since in many cases the cargo would be insufficient to support an additional carrier.

A concern might be raised that, in some cases, Canada's trading partners might conceivably be prepared to share cargoes with a Canadian-flag line, but insist on 100 per cent cargo reservation if there were no Canadian line available. It is unreasonable to assume that Canada would simply accept such a situation, if it were considered that such a 100 per cent cargo reservation implied excessively high freight rates. It has been suggested that if, for some reason, Canada had to accept such a situation (i.e., were excluded from designating as "Canadian" either third country or chartered vessels), and if the freight rates of the foreign carrier under cargo reservation were sufficiently high, perhaps it might be appropriate to encourage Canadian-flag deep-sea shipping as a "second best" solution. The suggestion is that, while not ensuring least-cost shipping services, this might at least ensure that some of the "monopoly" freight payments resulting from such cargo reservation were repatriated.

Given that the greatest pressures for cargo reservation appear to stem from developing countries, and given that the Canadian cargo carried in trade with these countries is generally not sufficient to justify full utilization of a vessel, it is difficult to envisage circumstances under which this line of argument would have validity. Before it became economically advantageous for Canada to provide incentives for use of Canadian-flag vessels in such circumstances, the freight rates for the Canadian portion of the cargo on these routes would have to rise sufficiently to offset the overall net economic costs associated with full utilization of the Canadian vessels involved, including any necessary cross-trading. It is unlikely that there would be many cases where an increase in freight rates on a particular regular commodity movement would be sufficient to offset the higher costs of the Canadian-flag option on the other routes and other cargo that the vessel in question would have to service to remain fully utilized.

Although some specific cases where one or other of Canada's trading partners has sought to impose cargo reservation have arisen recently, the proportion of Canadian trade affected is very small. In these cases, the Canadian government has really not yet responded to the problem with the coordinated diplomatic-trade-aid efforts described

above, that would seek either removal of the reservation policy or modification to permit continued access to lower cost shipping for a reasonable proportion of the trade. The most appropriate response would be to use such efforts in as forceful a way as required. Only in the event that the scope of such cases threatened to affect a substantial proportion of Canada's total trade and it proved impossible to secure accommodation by bilateral negotiation would there be any need to examine other policy approaches of a more restrictive, protectionist nature. There is, in fact, no evidence of a serious problem that cannot be dealt with as proposed, and until there is such evidence, serious policy responses that entail substantial economic costs to Canada would seem to be inappropriate.

(b) Multilateral Cargo Preference Agreements

As indicated in earlier sections, in addition to possible isolated efforts by individual countries to impose cargo reservation, the possibility exists that cargo-sharing arrangements may be given greater international application through multilateral agreements such as the UNCTAD Code of Conduct for Liner Conferences. The Code was, in fact, originally designed to afford protection to shippers against the monopolistic practices of the liner cartels. In its final form, however, its provisions, including the cargo-sharing provisions, promise more to foster the development high-cost national merchant marines -- with all of the attendant consequences for freight rates -- than to ensure the availability of freely competitive, least-cost international shipping services. While the original objective would have been consistent with Canada's interests, the present thrust of the Code is clearly contrary to Canada's continuing efforts to promote a freer international trading environment.

The continued functioning of conferences has always been controversial. These cartels have generally been sanctioned by the major trading countries, most of which have national shipping interests, and exempted from anti-trust legislation. Canada has tended to rely on the existence of non-conference competition and the countervailing power of shippers' organizations to moderate the effects of these cartels and has also exempted the conferences from the full scope of Canadian anti-combines legislation. While such an exemption has recently been extended for a further 5-year period, it is recognized that the costs and benefits for Canada of continuing such a policy deserve examination. The threat that ratification of the UNCTAD Code could strengthen the power of the conferences suggests the need for earlier rather than later reassessment of Canada's interest in this issue.

Possible ratification of the UNCTAD Code poses a more serious danger to Canadian interests than unilateral cargo reservation, since the impact on transport costs of the former is likely to be more pervasive than the latter. While, as indicated in earlier sections, it might well be that the direct impact on Canada of ratification of the Code would not be serious, Canadian interests would appear to lie in taking a strong stance internationally against the principle of cargo reservation and, indeed, any other measures restrictive of international trade and freer competition in shipping.

It should be recognized that, while concerted Canadian efforts should be made to avoid further movement towards restrictive measures such as cargo-sharing in international shipping, the possibility that, despite all such efforts, the UNCTAD Code might nonetheless come into effect does not in itself necessarily provide a justification for restrictive policies by Canada. If it appears that the Code might come into effect, Canada could and should take steps to seek appropriate modification of the Code's provisions to accommodate Canadian interests. As discussed in section 5(a) above, a variety of options relating to the non-reserved portion of bilateral trade and to the designation of third country vessels as "Canadian" carriers for the purposes of cargo-sharing could be pursued. The most appropriate Canadian strategy would remain to ensure that the largest proportion possible of Canada's trade could be carried by low-cost carriers. The specific response would depend on the terms of ratification of the Code and on other factors that might come to light. It remains clear, however, as discussed above, that -- except in rather extreme circumstances -- a Canadian-flag option would not seem likely to be economically advantageous, and until there were clear evidence that such circumstances would materialize, consideration of restrictive, protectionist options would seem to be inappropriate.