

Patterns of Investment in the Shipping Industries of Atlantic Canada, 1820-1900

Eric W. Sager and Louis R. Fischer

Volume 9, Number 1, Autumn 1979

URI: https://id.erudit.org/iderudit/acad9_1art02

[See table of contents](#)

Publisher(s)

The Department of History of the University of New Brunswick

ISSN

0044-5851 (print)

1712-7432 (digital)

[Explore this journal](#)

Cite this article

Sager, E. W. & Fischer, L. R. (1979). Patterns of Investment in the Shipping Industries of Atlantic Canada, 1820-1900. *Acadiensis*, 9(1), 19–43.

ERIC W. SAGER
LEWIS R. FISCHER

Patterns of Investment in The Shipping Industries of Atlantic Canada, 1820-1900

The wooden ships which once sailed from the builders' yards of Atlantic Canada are prominent symbols of this region's past, but until recently we have known very little about our great-grandfathers' sailing fleets. While our folklorists and bards have given the sailing ship a place in our collective mythology, historians have lagged behind, daunted perhaps by the size of those fleets and the difficulty of perceiving patterns among so vast an assembly of wooden hulls. Gradually, however, the shrouds are being removed and historians are developing a perspective on the golden age of sail.¹ We hope to contribute to this process by providing some basic data on vessels registered in five major ports in the nineteenth century.² What emerges from this data is not a single regional industry, but several industries with different structures which followed a similar pattern of decline in the last decades of the century. The decline is remarkable only because the achievement which preceded it was so considerable. Out of the resources of the region emerged shipping industries which served their own locality and the markets of the mother country and eventually competed in most of the world's major carrying trades. The decline which followed was a price paid for this last bold initiative, for the shipping fleets of Atlantic Canada declined, at least in part, because of factors in international trade over which the entrepreneurs of the region had no control.

In comparing patterns of investment over eight decades we have used tonnage registered in each port as our measure of investment, since the size of physical capital deployed is the only index which at present allows us to measure capital formation over time with any precision.³ Attaching dollar figures to this investment at this stage of our research would yield only imprecise estimates, since base-line time series on the cost of newly purchased vessels do not exist. While it will eventually be possible to estimate cost factors in shipping, as part of a study of rates of return on capital investment, physical investment remains the only

1 For a review of recent literature in the field see David Sutherland, "Wooden Ships and Iron Men Revisited", *Acadiensis*, VIII (Autumn 1978), pp. 101-7.

2 Data for Saint John, Yarmouth, Halifax, Charlottetown and St. John's are taken from the Board of Trade series 107 and 108 vessel registries in the Public Record Office, London, supplemented where necessary by data from port copies of registries in the Public Archives of Canada. The authors wish to thank David Alexander for providing data on the port of Yarmouth, and Keith Matthews for providing data on freight rates.

3 Before 1854 we use net burthen; after 1854, gross registered tonnage. Particularly after 1854 tonnage measurements were an attempt to estimate carrying capacity. We are using tonnage in this paper as a rough surrogate for capacity.

20 *Acadiensis*

measure which allows an accurate comparative perspective on the shipping industries of the region. Much of our discussion relates to investment in vessels having particular rigs — especially those rigged as brigs, barques, barquentines and ships, and designed by virtue of their rig for ocean-going transport — but it is important to note the high correlation between rig and tonnage. Over 90% of schooners in all ports were under 100 tons; most brigs and brigantines were between 100 and 249 tons, while most barques and barquentines were above 250 tons and most ships above 500 tons.⁴

Only a few ports in the region contributed substantially to Canada's ocean going merchant marine, and the most important of these were the ports of the Fundy rim. Saint John was unique because of the size and early development of its fleet and because of the high proportion of ocean-going rigs within that fleet (see Table 1). With a registration in excess of 1.8 million tons between 1820 and 1914, Saint John dwarfed all other ports in the Atlantic region. This was, moreover, a locally-owned fleet: residents of the port of registry owned almost three quarters of newly-registered tonnage. At the peak of its development in 1877 the Saint John fleet accounted for a third of all shipping tonnage registered in the Maritimes, and a quarter of Canada's total. During the period for which we have comparable figures (1840-1889) Newfoundland's fleet was only 22% of the Saint John total, Yarmouth 29%, Halifax 32% and Prince Edward Island 42%. In its structure the Saint John fleet differed markedly from the fleets of the other ports. In the others over half of the fleet consisted of schooners; in Saint John schooners accounted for only 40% of all vessels and less than 10% of all tonnage. Saint John's shipowners showed a preference for ocean-going rigs, and in particular for the full-rigged ship. These 911 ships, averaging 982 tons, were the bulk carriers of the Saint John fleet. The barques and ships of Saint John were the principal ocean-going fleet in the Atlantic region, and the only vessels which participated extensively in trades beyond the Atlantic Ocean.⁵

If the port of Saint John were studied in isolation it might reasonably be concluded that the conditions necessary for the development of an ocean-going

4 Mean tonnages across the five ports examined here were as follows: schooners, 56 tons; brigantines, 150 tons; brigs, 197 tons; barques, 506 tons; barquentines, 391 tons; ships, 965 tons. Schooners had fore and aft sails only; the brigantine had one fore and aft sail and one square sail; the brig had two square sails; the barque had two square sails and one fore and aft; the barquentine generally had one square sail and two fore and aft sails; ships had three or more square sails. On the correlation between rig and tonnage see also David Alexander and Gerry Panting, "The Mercantile Fleet and its Owners: Yarmouth, Nova Scotia, 1840-1889", *Acadiensis*, VII (Spring 1978), p. 6, note 12.

5 There was, however, a shifting of Yarmouth vessels into the South Atlantic and Pacific in the 1880s. See David Alexander, "Output and Productivity in the Yarmouth Ocean Fleet, 1863-1901" (paper presented to the third annual conference of the Atlantic Canada Shipping Project, Memorial University of Newfoundland, 1979); this paper is forthcoming in the *Proceedings* of that conference, edited by David Alexander and Rosemary Ommer and entitled *Volumes Not Values; Canadian Sailing Ships and World Trades* (St. John's, forthcoming in 1979).

Table 1

DISTRIBUTION OF NEW SHIPPING BY RIG

Rig	Saint John 1820-1914		Yarmouth* 1840-1889		Halifax 1820-1903		Prince Edward Island 1787-1914		Newfoundland 1820-1909	
	Tons	% Of Total	Tons	% Of Total	Tons	% Of Total	Tons	% Of Total	Tons	% Of Total
Schooner	166,730	9.2%	41,979	10.0%	216,710	32.7%	166,407	22.1%	312,958	60.6%
Brigantine	88,110	4.8	29,160	6.9	104,141	15.7	190,623	25.3	88,623	17.2
Brig	134,115	7.4	25,195	6.0	87,152	13.2	146,174	19.4	40,778	7.9
Barque	416,176	22.9	161,677	38.5	156,961	23.7	168,486	22.4	9,221	1.8
Barquentine	13,323	0.7	1,302	0.3	3,720	0.6	23,507	3.1	1,690	0.3
Ship	894,203	49.2	158,955	37.9	60,366	9.1	38,998	5.2	795	0.2
Steam	93,322	5.1	—*	—	26,720	4.0	9,426	1.3	53,278	10.3
Sloop	2,278	0.1	—	—	1,113	0.2	585	0.1	1,703	0.3
Other	10,802	0.6	1,398	0.3	5,017	0.8	8,104	1.0	7,277	1.4
Total	1,819,059		419,666		661,900		752,310		516,323	
1840-89:	1,424,143		419,666		452,360		603,844		310,137	

* The number of steamers in Yarmouth was insignificant; most of the "Other" category consists of small steamers. Dates have been determined by availability of registries in Board of Trade records; Yarmouth did not open as a port of registry until 1840.

Source: B.T. 107/108 vessel registries.

22 *Acadiensis*

fleet were proximity to timber resources and labour, locally-induced demand for vessels to transport bulky staple products, access to British capital and brokerage services, and control of flourishing local industries from which profits could be channelled into shipbuilding. The experience of Yarmouth reminds us that a merchant fleet could emerge where few of these conditions existed. Yarmouth's shipping industry, it has been suggested, grew precisely because the town lacked a flourishing hinterland and the financial institutions which might have diverted savings elsewhere.⁶ In this, the least populous of the ports under study, a handful of merchants entered into deep-sea trading with a fleet of 410 barques and ships, registered mainly in the 1860s and 1870s. Ownership was heavily concentrated in the port of registry: owners in the town of Yarmouth accounted for over 70% of new tonnage, and they held over 93% of shares in vessels over 250 tons. At the same time other residents in the area invested heavily in schooners, and the result was a fleet of small vessels, a fleet of large vessels, and a much smaller proportion of medium-sized carriers than existed elsewhere.

The Halifax fleet had its own structure which reflected the very different conditions of its growth. Here was a regional entrepot heavily involved in British North American coastal trades and in the West Indies. These trades provided the opportunity, and the local merchants provided the capital for entry into shipping, and Haligonians accordingly ventured into the shipping industry with a fleet designed, initially at least, to meet the demands of coastal and West Indian trading.⁷ Halifax had the largest schooner fleet outside Newfoundland, and a very large fleet of vessels in the 100 to 500 ton range (45% of all tonnage compared to 27% in Saint John and 25% in Yarmouth). Barques and ships of 500 tons and more appeared even more briefly in Halifax than in Yarmouth or Saint John; the product of only one generation, most were registered in the 1860s and early 1870s. Ownership was less heavily concentrated in the home port than elsewhere. In all decades except the 1850s and 1890s owners resident in Halifax County contributed less than 50% of new tonnage.

Charlottetown, the only port of registry in P.E.I., was the second port in the region in terms of total tonnage registered. But island shipowners put a smaller proportion of their investments into deep-sea square-riggers than did the investors of Saint John, Yarmouth, or even Halifax. They showed a marked preference for brigs and brigantines, vessels which they produced not only for their

6 Alexander and Panting, "The Mercantile Fleet and its Owners", p. 27. On Yarmouth see also David Alexander, "The Port of Yarmouth, Nova Scotia, 1840-1889", in Keith Matthews and Gerald Panting, eds., *Ships and Shipbuilding in the North Atlantic Region* (St. John's, 1978), pp. 77-103.

7 On the trading activities of Halifax merchants see D.A. Sutherland, "The Merchants of Halifax, 1815-1850: A Commercial Class in Pursuit of Metropolitan Status" (unpublished PhD thesis, University of Toronto, 1975); "Halifax Merchants and the Pursuit of Development 1783-1850", *Canadian Historical Review*, LIX (1978), pp. 1-17.

own use but for sale to shipowners in Britain and Newfoundland. The structure of this fleet was dictated, more than in any other port except possibly Miramichi, by the demand for vessels in the British market. Shipbuilding activity was widely dispersed throughout the island, but Charlottetown residents contributed 50.5% of new tonnage, and only 4.3% of new tonnage was registered by owners outside the island.⁸

Newfoundland presents a sharp contrast to all other shipowning centres in the Atlantic region because of its heavy commitment to schooners, most of which were under 100 tons. But there are other startling contrasts. Newfoundland had the only wooden-hulled sailing fleet which not only survived but actually expanded after the turn of the century. This was the only major port with no ocean-going square-riggers, and the only port which had more than 10% of its carrying capacity in steam-powered vessels. The peculiar development of shipping in Newfoundland was the result of geographic circumstance and the unusual demands of the island's staple industries, which were predominantly marine-based throughout the nineteenth century. The fleet of brigs and brigantines, and the steamers, attracted investors very largely because of the demands of a local marine industry, the seal fishery. Although the schooner fleet was widely dispersed throughout the island, ownership was highly concentrated, and owners in St. John's accounted for 52% of new tonnage between 1840 and 1889.⁹

These five fleets differed not only in structure but also in their patterns of growth. All five grew rapidly in the first two decades of the nineteenth century, but the Saint John fleet reflected a level of investment matched in no other port. Gross physical investment peaked in Saint John in the 1850s, a decade before the peak in P.E.I. and two decades before the peaks in Halifax and Yarmouth (see Figure 1). Saint John's shipowners were the first to undertake substantial investment in larger ocean-going rigs (brigs, barques and ships), and as early as the 1820s 81% of new tonnage registered in Saint John consisted of these rigs. It was not until the 1870s that the owners of another port (Yarmouth) committed so substantial a proportion of their investments to ocean-going rigs. The early growth of the Saint John deep-sea fleet was also reflected in the average tonnage of the port's vessels. Saint John vessels averaged 172 tons in the 1820s compared to 128 tons in P.E.I., 71 tons in Halifax, and 64 tons in Newfoundland. By the

8 The P.E.I. fleet is examined in Lewis Fischer, *Enterprise in a Maritime Setting: The Shipping Industry of Prince Edward Island, 1787-1914* (St. John's, forthcoming in 1980); and Lewis Fischer, "The Port of Prince Edward Island 1840-1889: A Preliminary Analysis", in Matthews and Panting, *Ships and Shipbuilding*.

9 The Newfoundland fleet is examined in a forthcoming monograph by Eric Sager, entitled *Sailing Ships and the Traditional Economy of Newfoundland, 1820-1909*; and Sager, "The Port of St. John's, Newfoundland 1840-1889: A Preliminary Analysis", in Matthews and Panting, *Ships and Shipbuilding*.

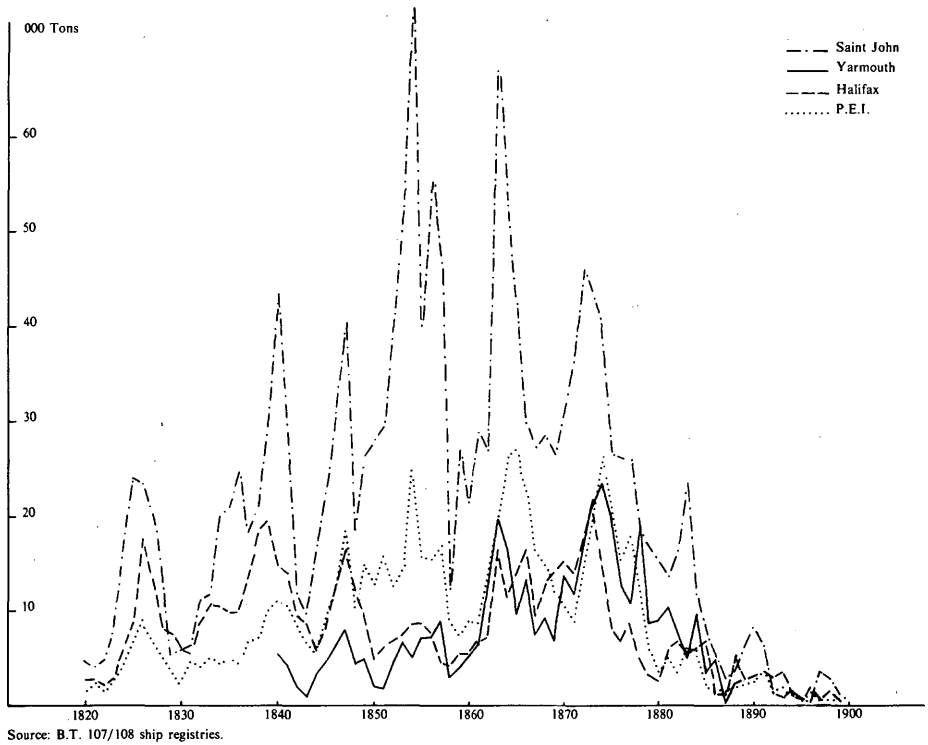


Figure 1: Tonnage Newly Registered in Four Major Ports, 1820-1900

1850s Saint John vessels were 178% larger, and in no other port did average capacity grow so quickly in these decades.

Gross physical investment is our most sensitive and accurate indicator of trends in investment, but it does not always tell us about tonnage actually intended for use by local owners. In P.E.I., for instance, a substantial proportion of new tonnage was rapidly sold in the British market. Estimates of tonnage on registry have been prepared for each port, and these reveal more clearly the differing patterns of growth of the various fleets actually retained by owners in the region (see Table 2).¹⁰ The very rapid early growth of the Saint John fleet is

¹⁰ In these fleet size estimates, the date when the vessel actually went out of service was used, rather than the official date of registry closure. Where the date of actual disposal is unknown, the vessel was given an estimated service life based on mean service lives of vessels with known dates of disposal. The result is a more accurate estimate of tonnage in service than that given in official figures.

Table 2

ANNUAL GROWTH RATES OF TONNAGE ON REGISTRY¹

	Saint John	Yarmouth	Halifax ²	P.E.I.	Nfld.	Maritimes	British Empire	U.K.	U.S.A.	Norway
1830-39	12.5%	n.a.	0.6%	7.9%	2.5%	5.5%	2.7%	n.a.	4.5%	9.7%
1840-49	1.1	12.4%	0.03	3.9	3.7	2.7	2.5	2.6%	5.8	0.8
1850-59	3.2	6.4	0.4	-0.6	5.4	3.0	3.0	2.7	4.8	6.5
1860-69	4.1	5.7	7.1	6.9	-1.4	4.7	2.1	2.2	-5.3	6.2
1870-75	3.5	7.4	4.5	7.3	1.8	4.3	} 1.7	} 1.5	-2.0	6.4
1875-79	0.2	3.5	-5.6	-2.0	2.5	2.2			-4.3	0.4
1880-89	-2.1	-3.6	-5.8	-6.3	-0.5	-2.7	1.4	2.0	-3.6	1.2
1890-99	-7.3	-12.5	-5.2	-4.9	1.4	-6.8	1.5	1.5	1.5	0.9

1. Growth rates for Saint John, Yarmouth, Halifax, P.E.I. and Newfoundland are calculated from regression equations of the form $\text{Log } Y = a + bt$. All other growth rates are estimated by end-point ratios.

2. Halifax growth rates were calculated for vessels with at least one owner resident in Halifax County in order to reduce the impact of fluctuations caused by the opening of new ports of registry in Nova Scotia. The large number of registrations in Halifax renders difficult an accurate fleet size calculation; further research may result in slight changes in growth rates for the first three decades.

Sources: Growth rates for Saint John, Yarmouth, Halifax, P.E.I. and Newfoundland were calculated from vessel registries in the B.T. 107 and B.T. 108 series, except for the rates for Yarmouth and Newfoundland in the 1890s, which were calculated from official figures in *Canada Sessional Papers* and Newfoundland *Journals of the House of Assembly*. Other growth rates were calculated from *Canada Sessional Papers*, *British Sessional Papers*, and *Historical Statistics of the United States*. The 1870s were divided into quinquennia in order to show the beginning of the decline in some Maritime ports.

clear enough, as is the more steady high growth rate of the Yarmouth fleet between the 1840s and its peak in 1879 (the pace of development in the 1840s is exaggerated because of its low base as a new port of registry in 1840). Annual growth rates were positive in all ports until the middle of the century, but the pace of growth was different in each port. Halifax appears not to have shared in the early investment booms; the shipping industry seems to have stagnated for three decades and then to have flourished in one brief period of intense investment activity. The low growth rates in Halifax were partly the result of the fact that Halifax vessels in the 100 to 500 ton class depreciated more rapidly in the 1830s and 1840s than they had in the 1820s (a phenomenon which remains unexplained).¹¹ Thus in many years new tonnage failed to replace assets which were lost at sea or otherwise disposed of, and the fleet's growth was arrested in spite of a positive growth rate for gross investment. But Halifax shipowners still appear cautious when compared to their contemporaries in the other ports.

Growth rates were consistently high in the 1860s and 1870s in all ports except Newfoundland. The Newfoundland fleet was more closely integrated with the local economy than were other fleets and it declined in the 1860s because of a serious short-term depression in both the cod and seal fisheries. All other fleets reached their maximum capacity in the 1870s, Saint John in 1877, Yarmouth in 1879, Halifax in 1873 and P.E.I. in 1878. The decline began first in Halifax, but the other ports soon followed. Growth rates were negative for all ports in the 1880s, and again for all ports but Newfoundland in the 1890s.¹² While the pace of earlier development had differed from port to port, all fleets (except that of Newfoundland) had high growth rates between 1860 and 1875, and all declined rapidly in the 1880s and 1890s. While the decline in the 1880s was least rapid in Saint John, even in this port it was steep in the 1890s. The decline did not result from the earlier sale or disposal of assets, but from the failure of shipowners to replace their stock of vessels. In all four major ports gross investment declined more rapidly than did tonnage on registry. Annual growth rates of gross investment from the beginning of the decline in each port were: Saint John, -12.2% (1872-1890); Yarmouth, -16.5% (1874-1889); Halifax, -8.7% (1873-1890); and P.E.I., -15.6% (1874-1890). In each case it was the failure to replace ocean-going classes of vessel which spearheaded the decline. Between 1874 and 1889 the annual growth rate for the sum of the four ports' gross investment in ocean-going rigs was -17.4%.¹³

This rapid decline in investment stands in marked contrast to the very healthy

11 Analysis of reasons for registry closure suggests that earlier sale or transfer to other ports did not cause the decline in mean service life.

12 Figures for the first decade of the twentieth century have not been included, but they would reveal further decline in all fleets except that of Newfoundland.

13 Unless otherwise indicated all growth rates are calculated from regression equations of the form $\text{Log } Y = a + bt$.

investment situation which prevailed until the mid-1870s. The growth rates for the Maritimes as a whole equalled or exceeded those for the British Empire and the United Kingdom in all decades between 1830 and 1880, and Yarmouth, Halifax and P.E.I. compared well with the very strong Norwegian performance in the 1860s and 1870s. One of the reasons for the high growth rates was the decline in the American fleet in the 1860s and 1870s and the resulting opportunities for Canadian vessels in American export trades in those decades.¹⁴ Comparisons with growth in other economic sectors within the Atlantic region are more difficult to make, since figures for net capital formation do not exist for the nineteenth century. But in colonial economies so heavily dependent upon the export of staple products, it is not farfetched to take the growth in the volume of exports as a surrogate for growth in the major staple industries in each colony. By comparing growth in shipping with growth in the volume of exports, we have at least a rough comparison between growth in shipping and growth in other major economic sectors.¹⁵ Export values for each colony have been deflated using Taylor's Canadian Export price index after 1870, and with a British price index before 1870 (since there is no Canadian index). Since after 1870 exports to other Canadian provinces are not included, the figures for the later decades may underestimate the real growth in external trade, particularly in the case of Nova Scotia and New Brunswick.¹⁶ Nonetheless, a comparison between Tables 2 and 3 suggests that shipping was a consistent growth sector within the colonial economies before the 1880s. The Saint John fleet grew more quickly than did New Brunswick exports in four out of five decades between 1830 and 1879. The Yarmouth fleet equalled or bettered the growth in Nova Scotian exports between 1840 and 1879, and the Halifax fleet equalled or exceeded the Nova Scotian growth rates in the 1830s, 1840s, 1860s and early 1870s. Newfoundland's fleet exceeded the island's growth rate in exports in every decade between 1830 and 1900, except during the depressed 1860s. The

14 On the importance of American trades for Canadian shipping see Keith Matthews, "The Canadian Deep Sea Merchant Marine and the American Export Trades, 1850-1890", forthcoming in Alexander and Ommer, *Proceedings of the third Atlantic Canada Shipping Project Conference*.

15 A more meaningful comparison, that between output in the shipping industry and output in other industries, will be attempted in future publications. It is worth noting that Alexander tentatively estimates gross output in the Yarmouth ocean fleet at 7.4% per annum between 1869 and 1879, and at a modest decline of -1.6% in the 1880s; output per vessel grew at 4.1% in the 1870s, and remained positive in the 1880s. Alexander, "Output and Productivity in the Yarmouth Ocean Fleet".

16 There is another problem with the figures for the 1880s and 1890s, of course: they may not accurately reflect the volume of exports actually produced in these provinces. After 1874 the Inter-Colonial Railway meant that there is no way of determining the origins of exports from Maritime ports, nor of determining the proportion of Maritime produce exported from the port of Montreal. Much of the rise in New Brunswick exports in the 1890s, for instance, may have consisted of Manitoba wheat.

Table 3

ANNUAL GROWTH RATES OF THE VOLUME OF EXPORTS FROM THE ATLANTIC COLONIES

	Nova Scotia	New Brunswick	P.E.I.	Newfoundland
1830-39	0.6%	3.3%	4.1%	0.9%
1840-49	-5.4	3.9	3.9	0.4
1850-59	2.1	-.02	11.5	1.9
1860-66/69*	6.0	1.5	5.5	-1.0
1870-79	0.8	0.7	11.6	-1.3
1880-89	0.4	1.3	-5.9	-2.2
1890-99	2.0	4.8	2.3	0.4

* For Nova Scotia and New Brunswick, the figures are for the period 1860-1866; for P.E.I. and Newfoundland, the figures are for 1860-1869.

Sources: Journals of the Houses of Assembly of Nova Scotia, New Brunswick, P.E.I. and Newfoundland; Canada, *Sessional Papers*. Before 1870, export values were deflated by using the Rousseaux price index; after 1870, values were deflated by Taylor's Canadian export price index.

Table 4

ANNUAL GROWTH RATES OF GROSS PHYSICAL INVESTMENT AND OF TONNAGE ON REGISTRY FOR THE GROWTH PERIOD IN EACH PORT

Port	Years	Tonnage on Registry	Gross Physical Investment*
Yarmouth	1843-1879	6.9%	4.4%
Saint John	1826-1855	4.4%	4.7%
Saint John	1826-1877	4.0%	2.1%
Halifax	1826-1874	2.3%	3.0%
P.E.I.	1826-1875	3.9%	2.9%
Newfoundland	1826-1857	2.4%	2.0%
Newfoundland	1826-1874	2.1%	1.2%

* Calculated from three-year moving averages.

Source: B.T. 107/108 vessel registries. For Halifax, vessels having at least one owner resident in Halifax County were selected, in order to limit the impact of fluctuations caused by the opening of new ports of registry in Nova Scotia. Growth rates were estimated from regression equations.

volume of exports from P.E.I. grew more quickly than the shipping sector in the 1850s and 1870s because of the rapid development of agriculture and fishing in those decades. The available data on P.E.I., however, allow another measure of the importance of shipping and ship-building within the island's economy. The island's visible trade balance was usually negative during the nineteenth century. But official trade figures do not include exports of ships built on the island. When trade balances for nine sample years between 1830 and 1870 were recalculated, including an estimated value of all ships known to have been exported in those years, the visible trade balance turned positive for five of nine sample years. If estimates of returns from ship operation in world trades were included, the shipping and shipbuilding sectors would appear to have been even more significant contributors to the island's total trade balance.¹⁷

Interesting as the comparisons between shipping and export growth rates may be, they are not strict comparisons between investment in shipping and investment in the economy as a whole (unless we assume a constant capital-output ratio over time). While estimates of gross investment in physical assets do not exist for Canada for most of the nineteenth century, Firestone has estimated that such investment grew in Canada at 3.78% per annum between 1870 and 1890. He concluded that investment in machinery and equipment was growing at only 4.5% per annum in the same two decades, in spite of the very low total for the base year, 1870. By the standards of Canadian growth, at least at the beginning of the nation's period of industrialization, the sustained high growth rate of investment in shipping was thus a remarkable achievement (see Table 4). A more direct comparison may be made between gross domestic capital formation in the U.K., which grew at 2.4% per annum in the 1860s and 2.8% per annum in the 1870s. It also appears that the shipping industry in all ports (except Newfoundland) was growing faster than Canada's Gross National Product in the 1860s and early 1870s (the annual growth in GNP, according to Firestone, was 4.08% in the 1850s, 2.76% in the 1860s, and 2.54% in the 1870s).¹⁸ These comparisons are imperfect, since investment in shipping is not measured in dollar figures because of the lack of reliable data. But preliminary findings suggest that vessel prices were relatively flat between the 1850s and 1870s. Using tonnage as a surrogate for investment does not therefore diminish the value of

17 Fischer, *Enterprise in a Maritime Setting*. Further research will reveal how far this point applies to New Brunswick.

18 Firestone, *Canada's Economic Development 1867-1953* (London, 1958), pp. 101, 104; Firestone, "The Development of the Canadian Economy, 1850-1900", in National Bureau of Economic Research, *Trends in the American Economy in the Nineteenth Century* (Princeton, 1960), pp. 217-39; growth in the U.K. capital formation calculated from C.H. Feinstein, "Income and Investment in the United Kingdom, 1856-1914", *Economic Journal* (June 1961), cited in B.R. Mitchell and Phyllis Deane, *Abstract of British Historical Statistics* (Cambridge, 1962), p. 373.

the comparisons.¹⁹

Table 4 presents growth rates for net physical capital formation (estimated tonnage on registry) and gross capital formation to the peak year in each port (two figures are given for both Saint John and Newfoundland, because in these ports there were prominent peaks in the 1850s as well as in the 1870s). The highest long-term growth rates occurred in Saint John and Yarmouth, and both ports substantially exceeded the long-term growth in the volume of exports from New Brunswick and Nova Scotia. In all ports except Halifax tonnage on registry grew more quickly than gross investment, reflecting the increasing life expectancy of vessels over time. Even in P.E.I., where 64.5% of all vessels were transferred to owners elsewhere, there was a growing tendency to retain vessels on registry in the island, and so the fleet grew more quickly than did new registrations. The average age of vessels upon sale or transfer to registries elsewhere increased from 1.9 years in the 1840s to 4 years in the 1880s. The long-term trend in gross investment indicates a very favourable investment situation up to 1875. In Britain, by comparison, the tonnage of newly built and registered sailing ships grew by only 2.15% a year between 1827 and 1870.

The shipping industry was a dynamic growth sector within the regional economies, and investors in these ports were bold in seizing the opportunities afforded by the expansion in world trade in the second and third quarters of the nineteenth century. This strong and generally sustained growth in investment was a common feature of all five ports under study here. However, there are some indications that capital formation in shipping rested upon fragile foundations. This was an industry in which risks were very high and the rate of capital depreciation very rapid. Although there was a general improvement in mean service life of vessels over the century, in most ports the average life of ocean-going classes of vessel remained around 9 or 10 years. This meant that even a short-term failure to replace depreciating assets could result in a rapid collapse of the industry. One example will suffice: in 1889 the ocean-going fleet of Halifax was only a quarter as large as it had been fifteen years before (and this decline did not result from the sale of vessels to other ports).

A more precise measure of the vulnerability of the industry to high rates of capital consumption is provided by a detailed comparison of net physical capital formation with gross physical investment. Alexander and Panting have estimated that in a modern economy capital consumption is usually about 40% of gross domestic capital formation, which means that net capital formation is about 60% of gross capital formation. They concluded that capital consumption

19 Data on prices of vessels newly built in P.E.I. has been compiled from P.E.I. House of Assembly *Journals*, 1840-1870, Appendices; and from James Peake Letterbooks, Public Archives of Prince Edward Island. Prices remained fairly stable on average at six pounds sterling per ton between 1845 and the late 1850s, rose to six and a half pounds per ton by 1870, and declined slightly in the 1870s.

was much higher in the Yarmouth fleet than in most modern economies (see Table 5).²⁰ A comparison of physical capital formation in Yarmouth, Halifax, Saint John and Newfoundland suggests that an even higher rate of capital consumption prevailed within the industry than the Yarmouth experience suggested. Net capital formation was only 43.4% of gross in Yarmouth, and as low as 12.7% in Saint John. In the latter port the proportion was negative in the 1840s and 1850s because of the substantial disposal of obsolete vessels in the 250 to 1000 ton classes, and the proportion remained low in the 1860s and 1870s because of the relatively slow pace of gross investment in those decades (see Table 4). Detailed comparisons with shipping elsewhere are not yet possible, but a comparison can be made with investment in steam shipping in the United Kingdom in the 1870s and 1880s. In these decades net investment in steam ships was 57.3% of gross investment, which indicates a far lower rate of capital consumption.²¹ A comparison may also be made with capital consumption in the Canadian economy as a whole. Firestone estimated net capital formation to be 33% of gross investment in 1870, and 38% of gross investment in 1890.²² If we accept these estimates, it would appear that the sustained high rate of gross investment in the Yarmouth shipping industry was more than sufficient to compensate for vessel depreciation, and that capital consumption was relatively low by the standards of the time. But the same is not true for the other fleets of the region. In many periods net capital formation was negative, even during the middle decades of the century. The high rates of capital consumption meant that the sailing ship industry could be sustained only if profits from the international carrying trade remained very high, in order to encourage the replacement of highly perishable assets.

There is other evidence to suggest that the shipping industries of Atlantic Canada were highly unstable even during their growth periods. All fleets were very vulnerable to short-term fluctuations in investment. The extent of these fluctuations can be measured by calculating the coefficient of variation for annual gross investment in each fleet (this coefficient is merely the standard deviation expressed as a percentage of the mean). The results suggest that investment in shipping in Atlantic Canada was highly unstable, even though investment stabilized considerably between the 1820s and 1870s (see Table 6). The Canadian industry was much more vulnerable to extreme fluctuations than was the British. Because estimates of gross domestic capital formation do not exist for Canada, some coefficients for gross domestic capital formation in the U.K.

20 Alexander and Panting, "The Mercantile Fleet and its Owners", p. 13; Simon Kuznets, *Modern Economic Growth* (New Haven, 1966), Table 5:4, p. 244; Phyllis Deane and W.A. Cole, *British Economic Growth 1688-1959* (Cambridge, 1964), p. 265.

21 Figures from Mitchell and Deane, *Abstract of British Historical Statistics*, and *British Sessional Papers*. Most of the British steam vessels would have been of iron construction.

22 O.J. Firestone, *Canada's Economic Development 1867-1953*, p. 112.

Table 5

NET PHYSICAL CAPITAL FORMATION AS % OF
GROSS CAPITAL FORMATION*

	Yarmouth	Halifax	Saint John	Newfoundland
1830-39		13.3%	41.2%	11.6%
1840-49	53.8%	14.1	-4.2	5.0
1850-59	38.8	-1.9	-3.3	41.1
1860-69	36.4	33.7	16.5	-23.5
1870-79	48.6	-62.8	19.2	22.5
To Peak Year	43.4	20.4	12.7	11.7
	(1844-79)	(1826-74)	(1826-77)	(1826-88)

* The figures given are decade averages of annual percentages; the annual percentages were calculated from three-year moving averages of new tonnage registered and estimated tonnage on registry. The Yarmouth figure for the 1840s is for 1844-49 only. P.E.I. is not included: since a large proportion of registered tonnage was quickly transferred from the island, it would be misleading to equate tonnage on registry with net capital formation.

Source: B.T. 107/108 vessel registries.

Table 6

COEFFICIENTS OF VARIATION FOR ANNUAL GROSS CAPITAL
FORMATION IN SELECTED SHIPPING AND OTHER INDUSTRIES

	Saint John	Yarmouth	P.E.I.	Ocean Fleets ¹	U.K. ²	U.K. Capital Formation ³
1820-29	65.1%	—	55.9%	76.0%	29.4%	—
1830-39	46.5	—	38.4	51.9	31.6	—
1840-49	44.7	46.1%	34.2	46.7	27.1	—
1850-59	43.5	48.2	21.9	44.6	26.8	—
1860-69	41.0	44.5	39.7	41.9	24.4	22.6%
1870-79	32.0	31.4	38.8	29.2	13.7	15.2
1880-89	61.4	62.8	52.1	67.3	31.9	14.6

1. Sum of ocean rig tonnage (brigs, barques, barquentines, ships) added to the fleets of Saint John, Yarmouth, Halifax and P.E.I.

2. All tonnage newly built and registered in the U.K.

3. Total gross domestic fixed capital formation in the U.K., from C.H. Feinstein.

Sources: B.T. 107/108 vessel registries; B.R. Mitchell and Phyllis Deane, *Abstract of British Historical Statistics* (Cambridge, 1962); C.H. Feinstein, "Income and Investment in the United Kingdom 1856-1914", *Economic Journal* (June 1961), cited in Mitchell and Deane, p. 373.

are included. These figures also suggest that capital formation in Canadian shipping was subject to extreme fluctuations. The volatile Canadian shipping industry presents a marked contrast to the British shipping industry, with its slower but more steady rate of growth.

There is one other reason for suggesting that investment in shipping rested upon a fragile base. Physical capital was highly concentrated, and the investment base was limited to a remarkably small number of investors. In Yarmouth a total of 110 individuals, or 5% of all investors in newly registered shipping, contributed 66% of all new tonnage.²³ In Saint John a mere 58 individuals contributed a third of all tonnage. In all ports concentration was particularly high among the larger classes of vessel. But even where small vessels were most numerous ownership was still highly concentrated: in Newfoundland, with its schooner fleet dispersed around the island, 3% of all investors held 40% of new tonnage.²⁴ Newfoundland's fleet of decked vessels served as productive inputs in the fisheries and as the essential means of supplying outport communities. But it would be wrong to assume that vessel ownership was widespread among the population: investors in newly-registered vessels were seldom more than one half of one per cent of the island's population between 1840 and 1889. The fate of the shipping industries depended upon small groups of wealthy investors in each port. These larger investors often entered into partnerships with others, but if they chose to divert their liquid assets elsewhere, then the narrow investment base which sustained the shipping industry would rapidly disappear. One of the reasons for the rapid decline of the Maritimes' fleets after the 1870s was that the industry depended upon investment decisions by small, closely associated groups of merchants who were well situated to take advantage of opportunities in non-maritime sectors of the new Canadian dominion.

Until the 1890s, however, Canadian merchant-shipowners responded very quickly and in similar ways to short-term trends in world demand for shipping, particularly during the years from 1820 to 1850 and from 1860 to 1900 (see Figure 1). Although this was not a monolithic regional industry, there were distinct and parallel cycles in the pattern of investment in all ports except St. John's, Newfoundland, particularly in the first half of the century, as Table 7 indicates. The relationship between ports remained strong during the last four decades of the century, as the decline in gross investment affected each port at

23 Alexander and Panting, "The Mercantile Fleet and its Owners", p. 21. Total investment for any owner is calculated as the sum of his share of tonnage in all vessels in which he held shares; each owner's share of tonnage in a vessel is calculated by dividing the tonnage of each vessel by 64 (since shares were given in 64ths) and multiplying by the number of shares the owner held out of 64.

24 Eric W. Sager, "The Merchants of Water Street and Capital Investment in Newfoundland's Traditional Economy", in Lewis R. Fischer and Eric W. Sager, eds., *The Enterprising Canadians: Entrepreneurs and Economic Development in Eastern Canada, 1820-1914* (St. John's, 1979), p.81.

Table 7

CORRELATION COEFFICIENTS OF TONNAGE FIRST REGISTERED

	I. 1820-1849			
	St. John	Halifax	P.E.I.	Newfoundland
St. John				
Halifax	+.72			
Prince Edward Island	+.82	+.82		
Newfoundland	-.04	-.03	+.02	
United Kingdom*	+.82	+.81	+.67	-.01

	II. 1860-1899		
	St. John	Yarmouth	Halifax
St. John			
Yarmouth	+.73		
Halifax	+.86	+.67	
Prince Edward Island	+.85	+.65	+.79

* Sailing ships built and first registered in the United Kingdom.

Sources: B.T. 107/108 vessel registries; B.R. Mitchell and Phyllis Deane, *Abstract of British Historical Statistics* (Cambridge, 1962).

Table 8

ANNUAL GROWTH RATES OF TONNAGE ON REGISTRY BY RIG, 1860-1889

	Schooner	Brigantine	Brig	Barque	Barquentine	Ship
1860-69:						
St. John	3.8%	11.1%	5.6%	19.4%	9.7%	0.1%
Yarmouth	-2.4	-2.9	-8.4	6.8	—	18.8
Halifax	-0.9	10.3	3.9	20.0	—	23.1
P.E.I.	-1.1	7.6	0.1	10.5	—	6.1
1870-79:						
St. John	-1.2	-4.8	-8.3	5.3	27.3	1.4
Yarmouth	0.4	-2.1	-29.0	2.2	—	11.2
Halifax	-0.9	-4.1	-13.9	0.6	30.8	-0.9
P.E.I.	0.4	-1.6	-1.7	6.0	—	-4.0
1880-89:						
St. John	2.0	-6.2	-12.1	-3.3	1.7	-6.8
Yarmouth	1.3	-1.1	—	-6.4	—	-9.2
Halifax	-1.7	-11.9	-14.8	-11.6	-12.1	-1.3
P.E.I.	-2.1	-10.9	—	6.6	0.7	—

Source: B.T. 107/108 vessel registries. All growth rates are estimated from end-point ratios, and from three-year averages at the beginning and end of each decade.

the same time. Investors in the Maritimes were responding to the same demands which influenced British investors, as the correlations in the first three decades suggest. The British and Canadian investment cycles remained strongly correlated until 1868 and then turned negative, since the sailing ship industry in Britain began to decline earlier but then recovered somewhat in the late 1870s and early 1880s. The cycle periods remain distinct if we consider only gross investment in ocean-going rigs (see Figure 2). Measured from trough to trough, the cycles appear as follows: 1820-1830; 1830-1843/4; 1843/4-1858; 1858-1867/8; 1867/8-1880. Correlation analysis confirms that investment in ocean going rigs followed very similar patterns in each cycle period.

The existence of these cycles is basic to our argument that factors affecting profitability of vessels in deep-sea trades were crucial to the decline of shipping in the region as a whole. This is not to say that the overall growth of the deep-sea fleets was the same across all ports; Saint John's fleet grew much earlier than did those of other ports, for instance. But the cyclic fluctuations were very similar in all fleets, and in the 1860s and 1870s there were parallel movements towards particular classes of vessel in all ports, and high growth rates for most ocean-going rigs. The fleet of barques and ships grew in all ports in the 1860s and for most of the 1870s, until the fleet of ships began to decline rapidly in Halifax and P.E.I. in the late 1870s (see Table 8). In some ports (particularly Yarmouth and Halifax) the movement of merchant shipowners towards larger classes of vessel appears to have adversely affected the growth of the small vessel fleets, which were left increasingly in the hands of fishermen and mariners. Analysis by tonnage class confirms this point not only for Halifax and Yarmouth but also for Saint John, where all tonnage classes between 10 and 500 tons declined while the fleet of larger vessels grew rapidly in the 1870s.²⁵ Analysis by rig also reveals a parallel trend towards barques and barquentines. This trend was led by the owners of Saint John in the 1860s, who were abandoning their earlier preference for the square-rigged ship. The growing preference for vessels with one or two fore and aft sails was an attempt to cut labour costs, since the fore and aft sail generally required fewer men than did the square sail. While growth rates for barquentines (vessels with two fore and aft sails and only one square sail) exaggerate the importance of this rig because of the low base from which growth began, the shift toward this rig suggests considerable ingenuity on the part of local owners and builders. Even in the 1880s owners in Saint John and P.E.I. maintained their investment in this rig while withdrawing from all others (over 100 barquentines appeared on registry in the five ports

25 This point is discussed further in Sager, "Sources of Productivity Change in the Halifax Ocean Fleet, 1863-1900", forthcoming in the Proceedings of the third Atlantic Canada Shipping Project Conference. For data on man-ton ratios and various rigs see Fischer, "The Great Mud Hole Fleet: Some Notes on the Voyages and Productivity of the Ocean-Going Sailing Vessels of Saint John, New Brunswick, 1863-1912", forthcoming in the same Proceedings.

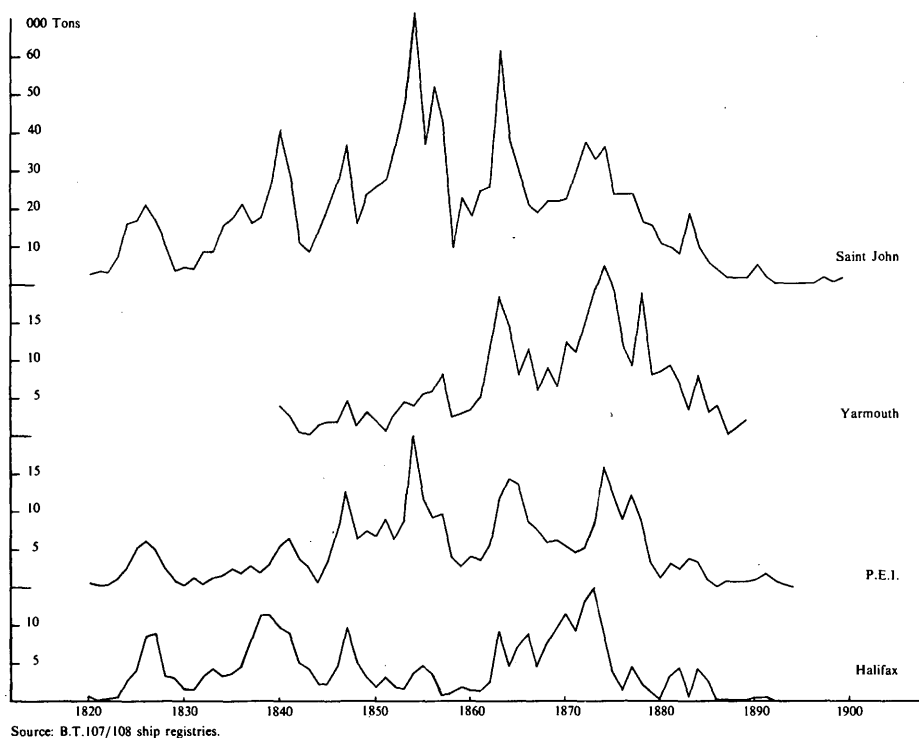


Figure 2: Ocean Rig Tonnage Newly Registered in Four Major Ports

under study). The brig, with its two square sails, was relatively inefficient and fell rapidly out of favour, and only Halifax's owners were tardy in dispensing with it.

The movement towards ocean-going rigs was reflected in the increasing average tonnage of new registrations in each port, as shipowners sought to reap the advantages of greater vessel size.²⁶ Yarmouth led the way with an increase in average capacity of 183% (from 187 tons to 530 tons) between the 1850s and 1870s, while P.E.I. recorded an increase of 37% (from 157 to 215 tons) and Halifax 118% (from 91 to 198 tons). Newfoundland's new registrations declined in average size after the 1850s as the island's shipowners failed to make the transition into large bulk carriers. In the Saint John fleet average capacity actually declined by 14% between the 1850s and 1860s (before increasing by

26 On these advantages see Douglass North, "Sources of Productivity Change in Ocean Shipping, 1600-1850", *Journal of Political Economy*, LXXVI (September/October 1968), pp. 953-70.

21%, to 495 tons, in the 1870s). This was the only exception to the general trend towards greater average size among ocean-going fleets in this period, and it coincided with the shift in investment away from ships and into the somewhat smaller barques. This anomaly appears to result not from any withdrawal from the bulk cargo trades, but from a unique reaction by some Saint John owners to developments in the North Atlantic in the 1860s.²⁷ A sample of Crew Lists for Saint John vessels for the decade after 1846 suggests that North Atlantic trade routes were by far the most important avenue of commerce for Saint John-owned vessels, regardless of size.²⁸ Approximately 80% of all long-distance voyages in this decade were in the North Atlantic. In the 1860s, however, all wooden sailing fleets were faced with increasing competition from iron and steam vessels in the North Atlantic. At Yarmouth and Halifax the solution was to opt for the familiar: Nova Scotian shipowners attempted to gain from the efficiencies associated with increased size, as they and their Saint John colleagues had done for decades. The owners in Saint John, however, invested in barques in the 250 to 499 ton class, and used these vessels on voyages to smaller British ports which were either not serviced by regular trans-atlantic steamers or were too small to accept large bulk shipments. At the same time Saint John owners shifted a proportion of their very large vessels into trade routes where competition from steam was less significant, and Saint John ships appeared in greater numbers in the Pacific and on the west coast of South America. This was the only one of the fleets under study to be deployed in any significant way outside the Atlantic Ocean in the 1860s and 1870s, and it may account for the slightly slower rate of disinvestment in Saint John compared to other ports.²⁹

While the response of Saint John's shipowners in the 1860s is the exception to a general trend towards larger vessels, all owners were responding in similar ways to developments in the international trading system, and particularly to developments in the North Atlantic. As Table 7 suggests, they were also responding to the same general incentives which influenced British investors. The correlations between new investment in the U.K. and new investment in our four major ports are high, and remain equally high if we compare investment in ocean-going rigs with total new tonnage in the U.K., at least until 1868.³⁰ This

27 It has been suggested to us that the decline in mean tonnage may reflect falling demand for large timber carriers as New Brunswick shifted to the production of deals. Changes in the timber industry, however, cannot tell us very much about changes in shipping by the 1860s; Saint John's fleet was used too heavily in other trade routes for a single new Brunswick export to have this effect.

28 Agreements on Account of Crew, Board of Trade series 98, Public Record Office, London.

29 Fischer, "The Great Mud Hole Fleet".

30 The correlations between new tonnage of ocean shipping in Maritime ports and sailing ship tonnage newly built and registered in the U.K. between 1858 and 1868 are: Saint John, +.64; P.E.I., +.88; Halifax, +.77; Yarmouth, +.78. U.K. figures from Mitchell and Deane, *Abstract of British Historical Statistics*.

close connection between the British and Canadian patterns is hardly surprising in the case of P.E.I., where a large proportion of new vessels were built in the expectation of sale in the British market. The relationship is in fact much closer than the figure in Table 7 would indicate: in four short-term cycle periods between 1840 and 1874 the correlation between annual changes in new registrations in P.E.I. and new registrations of sailing vessels in the U.K. yielded coefficients between $+ .84$ and $+ .91$. Clearly the demand for sailing vessels in Britain had a determining influence upon the pattern of investment in P.E.I. during these years. But most sailing vessels built in Atlantic Canada were not intended for immediate sale in the British market. While British demand was also an important factor in Saint John, where transfers to Britain were significant until the early 1860s, in other ports transfers were never very important.³¹ Instead most fleets — including that of Saint John — followed the British pattern because shipowners in the Maritimes were responding to the same general demand for ocean-going carrying capacity.

The link between investment in shipping in Canada and the general demand for shipping in international trades is not very surprising, but it is worth emphasizing, since it is further evidence of the vulnerability of this industry even during its period of growth. The fate of the industry would be decided, not in the coastal trades of North America, nor even in the opportunities afforded by the growth of Canadian exports. Continued investment in shipping would depend upon sustained high returns from the carrying trades of the North Atlantic, and that in turn would depend upon the competitive position of sailing vessels and the supply of carrying capacity throughout the international trading system. Thus the growth in the volume of exports from the Maritimes in the later nineteenth century, and the continued growth of total tonnage clearing Maritime ports, was no guarantee that the shipping industry would survive. The carrying trade in Canadian exports would be affected by the same cost and supply factors which operated throughout the Atlantic carrying trades. Moreover, the majority of Canada's shipping capacity in her larger ports was not deployed in the carrying trades of the home country after 1860.³² The boom in Canadian shipowning in the 1860s and 1870s was more closely linked to the export of

31 The number of transfers by Governor-General's pass (permits to sail to Britain without first being registered in Atlantic Canada) was not nearly so significant as some writers assume. In P.E.I., for instance, only a few dozen vessels between 1787 and 1854 were transferred to Britain without first being registered in Charlottetown.

32 Even before the 1860s Canadian shipping was an *international* industry. This point needs emphasizing. T.W. Acheson, in his discussion of the mid-century tariff debate in Saint John, suggests that tariffs on bread, flour and pork may have raised the cost of provisions in shipping, and so encouraged great merchants to oppose protection. This argument assumes, incorrectly, that Saint John-owned vessels were necessarily deployed from New Brunswick ports and so must have obtained provisions there. T.W. Acheson, "The Great Merchant and Economic Development in St. John 1820-1850", *Acadiensis*, VIII (Spring 1979), p. 22.

staple commodities from the United States to Britain and Europe. Because a very large proportion of Canadian investment in shipping became committed to these trades due to favourable opportunities in the 1860s and early 1870s, the shipping industry became increasingly vulnerable to direct competition with steam, and to any short-term decline in demand for carrying capacity in the American export trades.³³

It is still possible to argue that the earlier growth of shipping in Canada was linked not so much to the demand for vessels by British purchasers but to opportunities in the export trades from British North America. The origin of the Canadian shipping industry is not the subject of this paper, and it may be years before we know very much about the motives and incentives behind the early growth of these fleets. But it is likely that there was a connection between the growth of staple exports from the Maritimes and investment in shipping by local merchants. There are, indeed, some interesting coincidences between shipping investments and export trades in the first half of the century. The growth of the Halifax-owned fleet, for instance, is closely synchronized with the growth of Nova Scotia's exports in the 1820s and 1830s. The correlation between the volume of Nova Scotian exports and Halifax-owned tonnage on registry yields a coefficient of $+ .89$ between 1825 and 1843. The growth of the Halifax fleet is also closely synchronized with the growth of trade between the U.K. and British North America in the first half of the century, and new investment in shipping is positively correlated with the value of Nova Scotian exports to the West Indies between 1837 and the 1860s. Of even greater interest may be the connection between shipping and the timber trade. We do not yet know how many colonial-built and how many British vessels were used in this trade. But there is a closer fit between the pattern of investment in shipping in Saint John and the pattern in local exports than existed in any other port except Newfoundland. For instance, the correlation between annual *changes* in the declared values of New Brunswick exports and changes in gross physical investment in shipping in Saint John (lagging the latter by one year) results in a coefficient of $+ .68$ between 1823/2 and 1850/49. Similar results are obtained if we correlate changes in exports with net investment in shipping ($+ .69$), or shipping tonnage clearing New Brunswick with changes in gross investment in shipping ($+ .61$). These coincidences do not prove that a causal relationship existed between the variables considered. But in the absence of evidence to the contrary, it remains likely that the export of local staples provided an incentive and opportunity for a significant proportion of investment in shipping in Saint John.

We can assert with much more confidence that the opportunity to carry local

33 On the penetration of steam in major trade routes in this period see C.K. Harley, "The Shift from Sailing Ships to Steamships, 1850-1890: A Study in Technological Change and its Diffusion", in Donald N. McCloskey, ed., *Essays on a Mature Economy: Britain after 1840* (London, 1971), pp. 215-34.

exports was not a significant incentive for investment in ocean-going shipping after the 1850s. Preliminary analysis of the voyages of Halifax, Yarmouth and Saint John vessels from 1863 reveals the primary importance of the American-British and American-European traffic in bulk commodities such as wheat, cotton and petroleum. Keith Matthews, after a detailed analysis of clearances from American ports as reported in the *New York Maritime Register*, has concluded that as much as 39% of the total Canadian fleet may have been employed in American trades in the early 1880s. In a recent analysis of voyages by Yarmouth vessels, David Alexander concluded that the United Kingdom, the United States and Europe accounted for 76% of all entrances into port by Yarmouth ocean-going vessels. The American-U.K./Europe routes were no less important for the Halifax fleet. Even the Saint John fleet, deployed more often than others outside the North Atlantic, was heavily concentrated in the same routes: the U.K., U.S.A. and Europe accounted for 63% of all port entrances and 60% of all tonnage entering ports.³⁴ On the basis of this evidence, it is reasonable to assume that a decisive factor in the growth and decline of investment in shipping between the late 1850s and 1880s was the rate of return on investment in vessels deployed from American ports. When it is eventually possible to arrive at detailed estimates of the profitability of Canadian vessels in particular trade routes, a basic component in these estimates will be freight rates for American cargoes to Britain and Europe. For the moment an analysis based on these freight rates will serve to confirm the decisive impact of returns from particular American trades upon the growth and decline of the Canadian ocean-going fleets.

The compilation of freight rate data is still at a preliminary stage, but a few generalizations may be stated with confidence. Freight rates for most commodities followed the same general pattern in the 1860s and 1870s, shifting rapidly with the available supply of and demand for carrying capacity in international trades as a whole. There was a marked increase in most freight rates between the late 1850s, when there was apparently an over-supply of carrying capacity, and the early 1860s, when the volume of world trade grew and carrying capacity failed to keep pace, in part because of the decline in American merchant shipping and disruptions associated with the American Civil War. In the late 1860s a short-term decline in freight rates coincided with the down-turn in the international trade cycle. A significant increase in rates followed to 1873, and thereafter a long-term decline set in as supply more than kept pace with demand during the "depression" in international trade which lasted into the 1890s.³⁵ These trends coincided closely with trends in investment in shipping in

34 Matthews, "The Canadian Deep Sea Merchant Marine"; Alexander, "Output and Productivity in the Yarmouth Ocean Fleet"; Fischer, "The Great Mud Hole Fleet"; Sager, "Sources of Productivity Change in the Halifax Ocean Fleet".

35 On freight rates see Keith Matthews, "The Canadian Deep Sea Merchant Marine"; L. Isserlis,

our four Maritime ports. Table 9 suggests that the relationship between freight rates for certain American bulk cargoes and gross investment in particular ocean-going fleets was particularly close. The freight rates used in these calculations are annual averages of monthly freights for sailing ships only. They coincide fairly closely with the general index of tramp shipping freights constructed by Isserlis. The correlations are generally weakest for the Halifax fleet, which was involved in the West Indian and South American trades as well as the American trades.

A more precise measure of the importance of these freight rates may be obtained by analyzing the relationship between annual *changes* in all freights, and annual changes in gross physical investment in ocean shipping in our ports. For this purpose a general index has been constructed from six series of freight rates compiled by Keith Matthews.³⁶ The annual changes in this index were then correlated with annual changes in the sum of gross investment in ocean-going rigs in our four ports. A year's lag was introduced in the latter series, since presumably any change in freight rates would have a slightly delayed effect upon the registration of new vessels. The results are presented in Table 10. The correlations with the index constructed from American freights are higher in the 1870s and 1880s than for Isserlis' more general index, and the relationship appears to be strengthening over time. We may assume that we are observing a relationship between independent and dependent variables, since we know that Canadian vessels were heavily involved in American trades, and we know that freight rates were basic to profits in shipping. If the assumption is valid, then we may conclude that over 60% of changes in investment in ocean-going rigs may be accounted for by changes in sailing ship freights from American ports (for 1870/69-1880/79, $r^2 = .61$; for 1880/79-1886/5, $r^2 = .67$).

It should be stressed that this is a preliminary result, and that no precise conclusions about returns on investment can be offered until much further research is completed. But any conclusions about the decline of the Canadian shipping industry must take into account the highly speculative and risky nature of investment in shipping in the 1860s and 1870s. Freight rates fluctuated rapidly from month to month, and the deviation from the mean annual rate was very high even during the period when freight rates were relatively stable. The coefficient of variation for Matthews' annual index was 15% between 1855 and 1875, and the figure rose to 21% between 1875 and 1885. We know that ship-owners were under great pressure to cut costs during these decades since gross freights from trade in American bulk cargoes declined by as much as 40 or 50

"Tramp Shipping Cargoes and Freights", *Journal of the Royal Statistical Society* (1938), cited in Mitchell and Deane, *Abstract of British Historical Statistics*, p. 224; E.A.V. Angier, *Fifty Years' Freights 1869-1919* (London, 1920).

36 This freight rate data is presented more fully in Matthews, "The Canadian Deep Sea Merchant Marine".

Table 9

CORRELATION COEFFICIENTS BETWEEN SAILING SHIP FREIGHT RATES FOR SELECTED COMMODITIES AND GROSS PHYSICAL INVESTMENT IN OCEAN-GOING RIGS*

Commodity	Saint John r	Yarmouth r	Halifax r	P.E.I. r
Grain, New York-Liverpool, 1855-80	+.51	+.51	+.06	+.32
Cotton, New York-Liverpool, 1855-78	+.20	+.66	+.21	+.81
Cotton, New Orleans-Liverpool, 1855-82	+.45	+.40	+.51	+.70
Petroleum, New York-London, 1861-86	+.88	+.64	+.44	+.70
Grain, New York-Cork, 1863-84	+.82	+.79	+.45	+.74
Isserlis' Index of Tramp Freights, 1869-1889	+.88	+.77	+.75	+.75

* Investment in shipping has been lagged one year.

Sources: *Mitchell's Maritime Register*; *New York Maritime Register*; B.T. 107/108 vessel registries. For each month, the average of the highest and lowest quoted rates was calculated; the annual mean freight rate was then calculated from their monthly averages. Isserlis' index from Mitchell and Deane, *Abstract of British Historical Statistics*.

Table 10

CORRELATION COEFFICIENTS BETWEEN ANNUAL CHANGES IN TOTAL INVESTMENT IN OCEAN RIGS AND ANNUAL CHANGES IN FREIGHT RATES*

	Matthews' Index r		Isserlis Index r
1856/5-1870/69	+.57		
1870/69-1880/79	+.78	1870/69-1880/79	+.71
1880/79-1886/5	+.82	1880/79-1889/8	+.54
1856/5-1886/5	+.59	1870/69-1889/8	+.63

* Investment in ocean rigs has been lagged by one year.

Sources: *Mitchell's Maritime Register*; *New York Maritime Register*; L. Isserlis, "Tramp Shipping Cargoes and Freights", *Journal of the Royal Statistical Society* (1938), cited in Mitchell and Deane, *Abstract of British Historical Statistics*; B.T. 107/108 vessel registries.

percent between the early 1870s and the mid-1880s, or at an average annual rate of over 6%. In these circumstances it is hardly surprising that shipowners failed to reinvest in the industry, or to undertake the heavy capital investment which steam shipping required. The generation of shipowners who ventured into the deep-sea trades cannot be accused of undue caution. But by the 1880s the prudent businessman spread his investments more widely, and found more secure if less spectacular returns in a variety of landward enterprises.³⁷

Sailing fleets survived into the twentieth century only where coastal trades and local marine industries continued to demand such vessels. Newfoundland, hitherto the perennial exception, here provides the general lesson. Coastal shipping in Newfoundland's waters expanded rapidly in the 1890s and early 1900s; railways failed to compete as significantly as in the Maritimes, and failed to replace shipping as the main link with mainland markets. Mainland and local investors responded by purchasing iron-hulled steamers for use in the coastal trades. The seal fishery, although long since declining in importance, further stimulated demand for iron vessels. Sailing vessels remained a unit of production in the local staple industries. Here the life of the shipping industry was slightly prolonged, until the local marine industries themselves fell prey to neglect and decline. In the Maritimes the link between major shipping investments and the local export trades had long since been severed; a dense and expanding coastal traffic did not exist to tempt the next generation of shipowners' families. Sustained returns in the shipping industry would require a costly shift into the unfamiliar steam and iron technology. Gross output in manufacturing in the 1880s increased rapidly, offering attractive new opportunities for investment. Price levels were firm in the domestic economy, and external competition was limited after the introduction of high tariffs. When new markets and new opportunities appeared in the domestic economy, shipowners and their sons responded, not in undue haste, but with the same prudent calculation which earlier had guided them into the ocean trades of the North Atlantic.

37 On these landward opportunities see Gerald Panting, "Cradle of Enterprise: Yarmouth, Nova Scotia, 1840-1889", in Fischer and Sager, eds., *The Enterprising Canadians*; David Alexander, "Output and Productivity in the Yarmouth Ocean Fleet"; and T.W. Acheson, "The National Policy and the Industrialization of the Maritimes", *Acadiensis*, I (Spring 1972), pp. 3-28.