

Losing Steam: The Boiler and Engine Industry as an Index of British Columbia's Deindustrialization, 1880-1915

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Résumé de l'article

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1860 et 1915 d'une industrie primaire et secondaire intégrée à une industrie primaire liée

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Or, ce sont les producteurs de l'Ontario, des États-Unis et de la Grande-Bretagne qui y répondent, pendant que décroît l'industrie secondaire de la Colombie britannique.

L'examen des coûts de production comme des facteurs qui les expliquent révèle les

principales causes de ce changement: l'accessibilité rendue possible par le Canadien

Pacifique aux marchés de l'Est favorisés par une main-d'oeuvre à bon marché; la

discrimination dans les tarifs ferroviaires; le passage du contrôle de l'économie entre des

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Losing Steam: The Boiler and Engine Industry as an Index of British Columbia's Deindustrialization, 1880-1915

JOHN LUTZ

Résumé

This paper examines the process whereby the resource industries on the British Columbia frontier were disconnected from the local secondary manufacturing industries and coupled to the growing manufacturing economies of southern Ontario, the United States, and Great Britain between 1860 and 1915. The resource extractive industries were closely linked, in British Columbia, to the boiler and engine-making industry and prior to 1900 both sectors grew apace. After 1900 the growing demand for boilers and engines was met by producers in Ontario, the United States, and Britain while the British Columbia industry went into decline. An examination of both the costs of production and the social determinants of those costs reveals that the main causes of this displacement were the linking of the high-wage British Columbia economy to the lower wage east by the Canadian Pacific Railway; the railway's discriminatory rate structure; and a shift towards nonlocal ownership of the main components in the economy which was accompanied by new purchasing patterns that favoured nonlocal secondary manufacturers

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Cette communication explique le passage qui s'est fait en Colombie britannique entre 1860 et 1915 d'une industrie primaire et secondaire intégrée à une industrie primaire liée à l'industrie secondaire du Sud de l'Ontario, des États-Unis et de la Grande-Bretagne. Avant 1900, l'extraction des matières premières était étroitement liée à la fabrication de la chaudière et de la machine, et les deux industries étaient en pleine croissance. Après 1900, il y a une demande croissante de l'industrie primaire pour ces produits.

This forms part of a larger research project which I am engaged in with Peter Baskerville who has been generous with his research and suggestions. I also thank George Young and Lorne Hammond, who assisted with research in the ship registries and boiler inspection records; Ken Cruikshank for his help with the Board of Railway Commission Records; and the help of Kay McElwain and the staff of the Vancouver Ship Registry Office. This paper has been improved by commentator/referees Matt Bray, R.A.J. McDonald, and Patricia Roy. Thanks also to Colin Coates, Cheryl Coull, Megan Davies, Lorna Farmer, Dan Hawthorne, Roderick Hay, Richard Mackie, Eric Sager, and Malcolm Rutherford, all of whom have made valuable comments on earlier drafts.

Or, ce sont les producteurs de l'Ontario, des États-Unis et de la Grande-Bretagne qui y répondent, pendant que décroît l'industrie secondaire de la Colombie britannique. L'examen des coûts de production comme des facteurs qui les expliquent révèle les principales causes de ce changement: l'accessibilité rendue possible par le Canadien Pacifique aux marchés de l'Est favorisés par une main-d'oeuvre à bon marché; la discrimination dans les tarifs ferroviaires; le passage du contrôle de l'économie entre des mains étrangères joint à une politique d'achat défavorable aux industries secondaires locales.

The sibilant sound of escaping steam, the whir of a myriad rapidly revolving wheels, and half as many long connecting belts chasing up and down, pursuing and pursued, as if all were engaged in a field race for dear life against swift winged time, the loud ringing of numerous well plied iron hammers producing a veritable "anvil chorus."¹

The *anvil chorus* ringing out of Victoria's Albion Iron Works in 1883 sang of promise for the future of the newly incorporated company, for the city, and for the province. That year Albion, the province's largest manufacturer of boilers and engines,² posted an annual profit of \$40,692, a return of 22 per cent to its shareholders.³ With the construction of the Canadian Pacific Railway, the Esquimalt and Nanaimo Railway, and the local drydock, Victoria was secure in its position as the commercial capital of Canada's west coast.⁴ By 1890 Victoria ranked tenth among Canadian urban centres in manufacturing output and Albion was the largest iron works north of San Francisco.⁵ The province, led by the manufacturing sector, was in the midst of a boom of a magnitude unprecedented in Canadian experience.⁶ By 1890 British Columbia was manufacturing more goods per capita than any other Canadian province.⁷

At the end of 1915, however, Albion's *anvil chorus* was no longer being sung in Victoria. The city produced fewer manufactured goods than it had twenty-five years before.⁸ The province, which in 1890 had a diversified and growing manufacturing sector, had instead slipped into the specialization of extracting natural resource products. Despite tremendous growth in the resource sector, the output of the province's boiler and engine industry had declined.

1. A description of the Albion Iron Works from *Resources of British Columbia* 1:6 (1 August 1883), 3.
2. Albion supplied 71 per cent of all boilers and 75 per cent of the engines built in British Columbia and installed in B.C. ships between 1871 and 1891; Registrar of Shipping and Canada, Department of Steamship Inspection Records, Provincial Archives of British Columbia (PABC), GR 806.
3. Albion Iron Works Financial Statements.
4. Peter A. Baskerville, *Beyond the Island, An Illustrated History of Victoria* (Burlington, 1986), 46-8.
5. Canada, Department of Agriculture, *Census of Canada 1891*, Bulletin No. 12 (Ottawa, 1892), 39; R. T. Williams, *Williams' British Columbia Directory, 1892* (Victoria, 1892), 410.
6. Robert C. Allen, "The B.C. Economy: Past, Present and Future," in R. C. Allen and Gideon Rosenbluth, *Restraining the economy: Social Credit Economic Policies for B.C. in the Eighties* (Vancouver, 1986), 23, Table 4. A. Green, *Regional Aspects of Canada's Economic Growth* (Toronto, 1971), 63-4.
7. Canada, Department of Agriculture, *Census of Canada, 1891, Bulletin 10* (Ottawa, 1892), 4.
8. Canada, *Postal Census of Manufactures, 1916* (Ottawa, 1916), Table XI.

This paper uses ship registries and the records of boiler inspectors to investigate the decline of the engine and boiler-making industry in British Columbia as an example of a larger process of absolute and relative deindustrialization that occurred in British Columbia between 1890-1915.⁹ Comparison of these records with the census, *Tables of Trade and Navigation*, and business records of British Columbia's largest manufacturer of boilers and engines until 1900, reveals the linkages between resource extraction and local secondary manufacturing. The data also illustrate how resources on the British Columbia *frontier* became uncoupled from the local secondary manufacturing sector and became linked to manufacturing growth in such places as Ontario, New York, and Glasgow.

The boiler and engine industry is especially valuable as a case study of regional deindustrialization in Canada for several reasons.¹⁰ First, as a key component of the SIC (Standard Industrial Classification) iron and steel category, and of what Dales and Gilmour call the "Finished Producer Investment Goods Sector," it is generally regarded as an index of economic maturity.¹¹ Second, inside and outside British Columbia, boilers and engines were a growth industry. Taken together, the steam and gasoline engine industry was one of the fastest growing sectors in the North American economy and was the "high technology" industry of its day.¹² Third, the boiler and engine industry

9. PABC, Canada. Steamship Inspection Records, GR 806; annual reports of the B.C. Inspector of Machinery in B.C. *Sessional Papers*, 1902 to 1915; Canada, Registrar of Shipping; for the period under consideration British Columbia had three ports of registry: Victoria, which opened either in or before 1860; New Westminster, which opened in 1880; and Vancouver, which was declared a port of registry in 1890. Registries for Victoria for 1867-1908, New Westminster for 1880-1913, and Vancouver for 1890-98 are available at the National Archives of Canada (NA) on microfilm. Copies of some of these are also located at the PABC as are the registries for Victoria, 1860-66. Beyond these dates the registries for Victoria are kept at the Victoria Custom House with the exception of the registry from 1908-11 which is presently missing. The unmicrofilmed registries for New Westminster and Vancouver are held at the Vancouver Custom House.
10. Unfortunately the word "deindustrialization" is an awkward one. With its prefix "undoing," and suffix, "becoming," it is a word unravelling itself. It also seems to imply the existence of a single process called "industrialization," a concept which no longer has credence. Here it is used with the particular meaning of an economy changing specialization towards resource processing and away from secondary manufacturing.
11. In 1900, for example, boilers and engines accounted for half the output and employment in the iron and steel SIC category in Ontario and Quebec; Morris Altman, "Resource Endowments and Location Theory in Economic History: A Case Study of Quebec and Ontario at the Turn of the Twentieth Century," *Journal of Economic History* 45:7 (December 1986): Table 2; J. H. Dales, "Estimates of Canadian Manufacturing Output by Markets, 1870-1915," *Papers*, Canadian Political Science Association Conference on Statistics, 1962-63, 61-89; and James Gilmour, *Spatial Evolution of Manufacturing: Southern Ontario, 1851-1891* (Toronto, 1972), 40; G. W. Bertram, "Historical Statistics on Growth and the Structure of Manufacturing in Canada, 1870-1957," *Papers*, Canadian Political Science Association Conference on Statistics, 1962-63.
12. Carroll W. Pursell, Jr., *Early Stationary Steam Engines in America: A Study in the Migration of Technology* (Washington, 1969), 135; Jeremy Atack *et al.*, "Regional Diffusion and Adoption of the Steam Engine in American Manufacturing," *Journal of Economic History* 40:2 (1980): 281-308.

is central to the discussion of Canadian economic centralization. Pinchen, for example, argues that "the massive concentration of Canada's manufacturing sector in Ontario between 1880 and 1915 was, above all, due to the rapid growth of the Canadian iron and steel industry [primary and industrial machinery] in this region."¹³ The boiler and engine industry is also a focus of the discussion of the decline of regional economies in Canada — the failure of the Maritime economy to make the transition from wind power and wood hulls to steam power and iron hulls, and the rise of Ontario producer-goods industries relative to Quebec.¹⁴ Beyond providing an empirical set of data which reveals the extent and speed of the displacement of regional manufacturers by those from Ontario, the United States, and Great Britain, the boiler and engine industry also suggests some preliminary explanations for this pattern.

In the years between 1858 and 1915 the extractive industries in British Columbia were an unqualified success in terms of steady growth. Few regions have seen their industrial resource base grow so fast, or so consistently. A quick overview of the resource extractive sector up to 1915 reveals a boom in terms of gold production in the years 1858 to 1863, followed by a decline which lasted until coal production started to make gains in the late 1870s. The mineral industry "bottomed out" in the four years between 1878 to 1882 and then grew steadily for a decade, whereupon the value of its output skyrocketed through to 1915. The late 1870s saw dramatic expansion in the fishing industry, including the beginnings of salmon canning and sealing. Between 1889, when records of the timber cut begin, and 1891, the timber cut in the province nearly doubled; it more than doubled again by 1899, doubled again by 1905, and again by 1910 (see Figure 1).

The resource industries needed power and the most immediate backward linkage to secondary manufacturing was to the boiler and engine makers who could supply it.¹⁵ As early as 1854 in British Columbia, saw and flour mills were using steam power¹⁶ and by 1860 Victoria's foundries were producing steam engines.¹⁷

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13. H. Pinchen, *The Regional Impact of the Canadian Tariff* (Ottawa, 1979), 108.
 14. See S.A. Saunders, *Economic History of the Maritime Provinces* (Ottawa, 1939); L.D. McCann, "The Mercantile Industrial Transition in the Metal Towns of Pictou County, 1857-1931," *Acadiensis* 10:2 (Spring 1981): 29-64; P. Felt and L. Felt, "Capital Accumulation and Industrial Development in New Brunswick," in L. Fischer and E. Sager, *Merchant Shipping and Economic Development in Atlantic Canada* (St. John's, 1979), 57-70; T.W. Acheson, "The National Policy and the Industrialization of the Maritimes, 1880-1910," *Acadiensis* 1:2 (Spring 1972): 2-28; Roy George, *A Leader and a Laggard: Manufacturing Industry in Nova Scotia, Quebec and Ontario* (Toronto, 1970), 10; A. Faucher and M. Lamontagne "History of Industrial Development," in *French Canadian Society*, eds. Marcel Rioux and Yves Martin (Montreal, 1964), 259, 260, and 264; Altman, "Resource Endowments"; see also D. Kerr, "Geography of the Iron and Steel Industry of Canada," *Economic Geography* 35 (April 1959): 151-63.
 15. *Industrial Canada* (June 1905): 719, noted that "in a general way the development of the engine and boiler making in Canada has been marked and to some degree epitomized by the sawmill and threshing machine."
 16. Richard Mackie, "Colonial Land, Indian Labour and Company Capital: The Economy of Vancouver Island, 1849-1859," MA diss. University of Victoria, 1984, 147.
 17. Alexander Rattray, *Vancouver Island and British Columbia...* (London, 1862), 111.

Table 1
Engines and Horsepower Used by Primary and Secondary Manufacturing
Industries in British Columbia, Census Years 1890-91, 1900, and 1910¹⁸

	Steam		Gas		Electric		% of all H.P.
	No.	H.P.	No.	H.P.	No.	H.P.	
1890-91							
Primary Manufacturing							
Brick/Tile/Pottery	—	355	—	—	—	—	2.9
Fish Canning	—	674	—	—	—	—	5.6
Flour/Grist Mill	—	386	—	—	—	—	3.2
Log Products	—	6,865	—	—	—	—	57.0
Lumber Products	—	938	—	—	—	—	7.8
Smelting	—	90	—	—	—	—	0.7
Total Primary Manufacturing	—	9,308	—	—	—	—	77.3
Total Secondary Manufacturing	—	2,732	—	—	—	—	22.7
1900							
Primary Manufacturing							
Fish Canning	73	631	1	4	—	—	2.8
Flour/Grist Mill	5	328	—	—	1	5	1.4
Log Products	194	15,397	—	—	3	47	67.1
Lumber Products	12	540	—	—	1	5	2.4
Smelting	34	2,060	—	—	—	—	8.9
Total Primary Manufacturing	318	18,956	1	4	5	67	82.6
Total Secondary Manufacturing	97	3,092	12	98	44	811	17.4
1910							
Primary Manufacturing							
Brick/Tile/Pottery	20	1,173	—	—	3	92	1.4
Butter/Cheese	16	133	—	—	—	—	0.1
Fish Canning	70	649	16	168	9	78	1.0
Flour/Grist Mill	5	211	—	—	2	100	0.3
Log Products	486	43,107	10	71	84	3,837	50.3
Lumber Products	56	6,321	1	6	97	2,275	9.2
Smelting	56	3,909	—	—	76	7,625	12.4
Total Primary Manufacturing	709	55,503	27	245	271	14,007	74.7
Total Secondary Manufacturing	214	14,407	49	280	470	8,933	25.3

Table 1 demonstrates how directly the manufacturers of boilers and engines were tied to the resource processing sector. Engine-produced horsepower nearly doubled in British Columbia between 1890 and 1900 and more than tripled over the next decade. Primary manufacturing accounted for three-quarters of the horsepower used. Moreover, the figures in Table 1 understate the extent of the linkages between the resource sector and the boiler and engine makers because it doesn't capture the

18. Log products include shingle and saw mills, lumber products include planing, moulding, and sash and door factories. Canada, *Census*, 1891, Bulletin No. 8, 20; 1901, vol. III, Table VI; 1911, vol. III, Table VI.

increasing use of steam powered "donkeys" to yard logs in the bush,¹⁹ haul ore at the mines, or to propel fish boats, tractors, threshers, and harvestors.²⁰ Finally the marine transportation sector, in so much as it was used to haul resources, was a backward linkage of the resource sector and it was demanding a growing number of boilers and engines (see Figures 4 and 5).²¹

Table 2
Annual Growth Rates in British Columbia
Manufacturing Industries, 1880-90 to 1910-15²²

	1880-90	1890-1900	1900-10	1910-15
Manufacturing				
Primary	14.1	10.2	12.6	* 0.9
Secondary	15.7	2.1	10.6	6.1
Boiler and Engine	24.2	17.2	5.1	** -10.6

* This low growth rate reflects a sudden and temporary drop in sawmill production 1913-15 (Figure 1).

** Highest possible growth rate based on estimates in Figure 2. The assumption that the three unlisted factories in Canada had equal output yields a rate of -37.8 per cent.

Obviously there was a growing market for boilers and engines in British Columbia throughout this period and the manufacturers in British Columbia might have been expected to share in the growth. Instead the whole SIC category containing boiler factories, engine factories, foundries, machine works, and specialized engine and foundry work declined relative to the British Columbian and Canadian economy. Isolating the boiler and engine making industry reveals the same general pattern of decline (Figure 2).²³

19. For a detailed discussion of the backward linkages of logging, see Marchak, *Green Gold, The Forest Industry of British Columbia* (Vancouver, 1983), 8-13; Robert D. Watt, "Early British Columbia Sawmill Machinery: 1869," *Material History Bulletin* 21 (1977): 47-54; R. Griffen, "Shingle Sawing Machinery in B.C. 1901-1925," *Material History Bulletin* 13 (Fall 1981): 21-38.
20. The increasing use of steam engines in the mining, fish processing, logging, sawmilling, and agricultural sectors, is recorded in the annual "Report of the Chief Inspector of Machinery," *British Columbia Sessional Papers, 1902-15*. For details on the interlinkages of specific resources and manufacturing sectors, see Duncan Stacey, *Sockeye and Tinplate: Technological Change in the Fraser River Canning Industry, 1871-1912* (Victoria, 1982); P.W. O'Bannon, "Technological Change in the Pacific Coast Salmon Industry 1900-1925: A Case Study," *Agricultural History* 56:1 (January 1982): 151-71; Griffen, "Shingle Sawing Machinery in B.C. 1901-1925."
21. In 1891 it was estimated that 19.1 per cent of steam horsepower in Canada was used by ships: *Census of Canada*, Bulletin No. 8, 10.
22. Compound annual growth rates based on current dollars: *Canada, Census, 1881, 1891, 1901, and 1911* and *Postal Census of Manufacturing, 1916*.
23. The decline happens ten years later than in the overall SIC category.

The pattern in the boiler and engine and iron and steel industries also characterized the whole secondary manufacturing industry. Until 1900 British Columbia was increasingly specialized in manufacturing but thereafter the manufacturing sector shrank relative to the resource extraction industries, the whole economy, and the population. This relative decline was felt most acutely in the secondary manufacturing sector where in many industries it translated into an absolute decline.²⁴

Table 3

	1880	1890	1900	1910	1915
a) Pinchin's Index of Regional Concentration of Manufacturing Industries²⁵					
British Columbia	1.09	1.55	1.42	1.14	0.85
Ontario	1.16	1.18	1.20	1.45	1.53
b) Location Quotients: British Columbia Iron and Steel Fabricating Industry²⁶					
	0.40	1.14	0.59	0.54	0.25

Bertram's and Pinchin's research on the centralization of Canadian manufacturing confirms the relative and absolute decline of British Columbia's manufacturing sector, starting from 1890.²⁷ Inwood and Chamard have examined Canadian centralization in the decade 1890-1900 and demonstrate substantial decreases in many of British Columbia's SIC manufacturing categories. Allen and Green record the same trend.²⁸

24. This process is dealt with in more detail in John Lutz, "Structural Change in the Manufacturing Economy of British Columbia, 1860-1915," MA diss., University of Victoria, 1988.
25. Pinchin's index is expressed as a location quotient and equals value added in manufacturing per capita divided by national value added per capita. British Columbia has never regained the degree of specialization it held in 1890-1900. Location quotients after 1915 are: 1926, -1.11; 1939, -.97; 1949, -.93; 1959, -.92; 1969, -.86.
26. See Pinchin, *Regional Impact*, Table A-16. For the decade 1890-1900, Inwood and Chamard record a real decline of 6 per cent in the iron and steel SIC Category after extracting the effects of the changing census definitions; see K. Inwood and J. Chamard, "Regional Industrial Growth during the 1890s: The Case of the Missing Artisans," *Acadiensis* 16:1 (Autumn 1986): Appendix.
27. Pinchin, *Regional Impact*, Table A-16; Bertram, "Historical Statistics," Tables 6 and 7.
28. Allen's estimates of British Columbia Gross Domestic Product suggest that the share of secondary manufacturing peaked in 1890 and has never reached the same share since. Green finds that the share of British Columbia gross value added contributed by manufacturing fell from 23.4 per cent in 1890 to 19.6 per cent in 1910 while in Ontario it rose from 24.6 per cent to 30.1 per cent. The year 1890 is a census date and not an indication that the process started then. While the relative share of primary versus secondary manufacturing is usable in Allen's estimates, his early figures for GDP shares are unreliable because secondary manufacturing wages are used as a proxy for value added in the service sector. Inwood and Chamard, "Regional Industrial Growth," Appendix; and Allen, "The B.C. Economy: Past, Present and Future," Table 4 and unpublished appendices; Alan G. Green, *Regional Aspects of Canada's Economic Growth*, Tables B-1 and B-2.

As British Columbia was becoming progressively less specialized in manufacturing, the structure of the manufacturing sector was also changing. The progression from concentration on primary manufacturing to secondary manufacturing²⁹ was reversed and the British Columbia manufacturing sector became increasingly specialized in resource processing (Tables 2 and 4). In the secondary sector the share of the food and beverage component grew over this period, a characteristic of underdeveloped economies. The producer-goods sector, the hallmark of the developed manufacturing economy — which includes the boiler and engine industry — shrank.³⁰

The same pattern of decline recorded in the census³¹ for the boiler and engine industry is independently verified by the share of the British Columbia market for boilers and engines held by local manufacturers. In all three markets for the products of the boiler and engine industry for which we have evidence,³³ there was a three-stage pattern. In the first stage, prior to 1885, British Columbia manufacturers displaced principally American and British manufacturers. In the five-year period before Confederation,

Table 4
Percentage Share of Employment and Production
in British Columbia by Manufacturing Sector, 1880-1910³²

	1880-81		1890-91		1900		1910	
	% of empl.	% of GVP	% of empl.	% of GVP	% of empl.	% of GVP	% of empl.	% of GVP
Secondary Manufacturing								
Consumer	21.1	36.9	15.9	33.6	21.9	32.3	8.4	16.7
Finished Producer	8.4	11.7	13.7	25.4	11.2	10.1	17.4	19.2
Unfinished Producer	4.6	10.7	2.0	3.6	1.2	1.2	3.1	3.7
Total Secondary Manufacturing	34.1	59.2	31.6	62.6	34.3	43.7	29.1	39.6
Total Primary Manufacturing	65.9	40.8	68.3	37.3	65.6	56.3	70.8	60.4

29. This pattern is predicted by Douglass North, "Location Theory and Regional Economic Growth," *Regional Development and Planning: A Reader*, ed. John Friedman and William Alonso (Cambridge, 1969), 252-53; Gilmour, *Spatial Evolution of Manufacturing*, 12-40.

30. These categories are developed by Gilmour, *Spatial Evolution of Manufacturing*, 12-40; for their application to British Columbia, see Lutz, "Structural Change," ch. 6.

31. Census coverage problems together with problems of allocating the production of establishments to the SIC commodity groupings caution against relying too heavily on the census data: see, for examples, the notes to Figure 2 and Table 6.

32. Canada, *Census*, 1881, 1891, 1901, 1911. For data manipulation, see Lutz, "Structural Change," Appendices 3 and 4. Due to rounding, columns may not total precisely.

33. After 1902 all boilers for stationary engines (not supplying steam to engines powering either boats or trains) and boilers installed on marine vessels were inspected regularly and their place of manufacture and date of installation recorded; therefore boiler records are essentially complete (they exclude railway locomotive boilers). Prior to 1902 boiler records are for those on marine vessels only. Despite this partial coverage there is no *a priori* reason to expect sampling bias; engine records are for those installed on registered ships only.

British Columbia firms produced 60 per cent of the marine boilers installed in the colony, and nearly 90 per cent by 1880-85 (Figure 4).³⁴ British Columbia manufacturers were almost as successful in displacing foreign engines, supplying two-thirds of the local marine engine market by the five-year period 1881-85 (Figure 5).

In the second stage, which lasted from 1886 to nearly 1900, and later with land-based boilers, eastern Canadian displaced British Columbia producers. Ontario manufacturers produced the overwhelming share of boilers and engines from eastern Canada.³⁵ The Klondike Gold Rush spurred a modest recovery for the British Columbia firms, which were well located to take advantage of the increased demand for shipping but this too had peaked before 1905 and the market share of British Columbia firms steadily eroded through to World War I.

In the third stage, in the ship engine and marine boiler market, the Ontario firms found themselves forced out by American and British firms, respectively. Import statistics substantiate this pattern. The "Tables of Trade and Navigation" reveal that the local demand for boilers and engines was met with very little resort to imports until the 1880s and even thereafter imports were not very significant until the late 1890s (see Table 5).³⁶

What happened, at least with regard to the market share of British Columbia manufacturers, is reasonably clear, at least at a macro level. The difficult venture is to identify the mechanisms which underlay the continental integration of markets for boilers, engines, and other manufactured goods as the modern Canadian regional industrial pattern was established. The debate over the mechanisms or regional deindustrialization in Atlantic Canada is well underway but there is little empirical evidence and even less consensus. On the west coast of Canada, however, this process remains largely unexplored. This attempt to explain the process, illustrated by the boiler and engine industry, is an exploratory venture. As such, it focusses primarily on the second stage of the process — the displacement of British Columbia manufacturers by Ontario firms in the post-1885 era.³⁷

34. "The entire demand of the Pacific Coast, whether it be for steamship, factory, mining or otherwise is supplied by local manufacturers, with the exception of small boilers for stationary engines which are occasionally shipped round the Horn...." John S. Hittell, *The commerce and industries of the Pacific coast of North America...* (San Francisco, 1882), 666.

35. For example, Ontario firms produced 93 per cent of the boilers made in eastern Canada and installed in British Columbia ships between 1866 and 1910. Fifty-two per cent of these were produced by a single firm, John Doty and Sons, and a further 25 per cent of the Ontario boilers were produced by Polson Engine Works, both in Toronto. PABC, Canada, Board of Steamboat Inspection Records.

36. With the exception of 1881.

37. Comparable census data for Ontario allows more detailed analysis of this stage than is now possible regarding the later incursion by American and British firms; however, the evidence that is available suggests that similar reasons account for both of these stages.

Table 5
The Value of Steam Engine and Boiler Imports into British Columbia
in Current Dollars, Fiscal Years 1872-1900³⁸

Year	Imports From			Year	Imports From		
	Great Britain	United States	Total Imports		Great Britain	United States	Total Imports
	\$	\$	\$		\$	\$	\$
1872	—	—	—	1886	89	1,362	1,451
1873	—	—	—	1887	—	3,340	3,340
1874	—	—	—	1888	678	136	814
1875	—	—	—	1889	—	2,780	2,780
1876	2,199	—	2,199	1890	4,137	275	4,412
1877	—	—	—	1891	n/a	n/a	1,055
1878	—	—	—	1892	n/a	n/a	13,036
1879	—	—	—	1893	n/a	n/a	9,018
1880	89	1,362	1,451	1894	n/a	n/a	423
1881	—	24,935	24,935	1895	n/a	n/a	3,221
1882	316	1,675	1,991	1896	n/a	n/a	5,120
1883	—	1,472	1,472	1897	n/a	n/a	15,767
1884	6,870	3,000	9,870	1898	n/a	n/a	15,338
1885	386	4,568	4,954	1899	n/a	n/a	29,764
				1900	n/a	n/a	55,536

Two analytical approaches have dominated the search for an explanation of Canadian economic patterns: the first falls broadly under the rubric of orthodox economics and is often cast in an export-base framework.³⁹ This approach tends to

38. Canada, Parliament, *Sessional Papers*, Tables of Trade and Navigation, 1872-1900. After the fiscal year 1900 the tables no longer listed imports by province. A dash represents zero imports.

39. The export-base model is collapsed into neoclassical economic theory in Watkins, North, and Caves; while compatible with neoclassical general theory it is distinct from neoclassical "growth theory" although the two approaches have been synthesized in A. Guccione and W.J. Gillen, "Export Base and Neoclassical Type Models of Urban Growth: A Synthesis," *Canadian Journal of Economics* 13:4 (November 1980): 700-11. I have avoided the use of the term "staple approach" associated with the works of Innis and Macintosh, because it has been used to refer to diverse and contradictory concepts. Caves, Gunder Frank, Williams, and North — each calls the staple approach something quite different, respectively a neoclassical vent-for-surplus model, a dualist model, an import substitution strategy, and the export base theory. The staple approach of Marchak and the latter-day Watkins are neo-Marxist versions. McCalla and George refer to the staples and dependency approaches as "near relations." North, "Location Theory"; Marchak, *Green Gold*, 1 and 22; M.H. Watkins, "A Staple Theory of Economic Growth," in *Approaches to Canadian Economic History*, eds. W.T. Easterbrook and M.H. Watkins (Toronto, 1979), 49-73; D. McCalla and P. George, "Measurement, Myth and Reality: Reflections on the Economic History of Nineteenth Century Ontario," *Journal of Canadian Studies* 21 (1986): 74; W.A. Mackintosh, "Economic Factors in Canadian History," *Approaches to Canadian History*, ed. Carl Berger (Toronto, 1979); R.E. Caves, "Vent for Surplus Models of Trade

emphasize demand characteristics and comparative costs of factor inputs⁴⁰ and has been most useful in abstract modelling and aggregate analysis.⁴¹ The second approach is less cohesive but may be crudely lumped into the dependency, "structuralist," or neo-Marxist categories, and tends to emphasize considerations such as the structure of factor markets⁴² or how the factor prices are set.⁴³

The dependency approach is rarely this explicit but both it and the orthodox approaches converge at one level: capitalists will invest in any given activity if the anticipated profits exceed those in alternative possibilities. In other words, if manufacturing in British Columbia were more profitable than alternative uses of capital,

and Growth." *Trade, Growth and the Balance of Payments: Essays in Honour of Gottfried Haberler* (Chicago, 1965), 95-115; Andre Gunder Frank, *Dependent Accumulation and Underdevelopment* (New York, 1979), 111; Glen Williams, *Not for Export: Toward a Political Economy of Canada's Arrested Industrialization* (Toronto, 1983), 15-40 and 130-50.

40. See, for examples, Morris Altman, "Economic Development with High Wages: An Historical Perspective," *Explorations in Economic History* 25:2 (1988): 198-224 and Altman, "Resource Endowments"; Kris Inwood, "Economic Growth and Structural Change in Atlantic Canada, 1850-1910," in *Across the Broad Atlantic: Essays in Comparative Maritime History*, eds. L.R. Fischer and Helge Nordevik (Oslo, forthcoming); Inwood and Chamard, "Missing Artisans"; McCalla and George, "Measurement, Myth and Reality," 74; George, *Leader and a Laggard*.
41. See, for example, the article and discussion generated by Edward J. Chambers and Donald F. Gordon, "Primary Products and Economic Growth. An Empirical Measurement," reprinted in *Perspectives on Canadian Economic Growth*, ed. Douglas McCalla (Toronto, 1987), 201-20.
42. There is a difficulty in finding a common terminology that allows this kind of explicit comparison and I am aware that for comparative purposes I am shoe-horning some of the neo-Marxist concepts into orthodox "jargon." Still, the concepts manage to give good value despite this uncomfortable fit. For an example of an approach focussing on factor markets, based on preexisting class formations and social structures, see Phil Wood, "Marxism and the Maritimes: On the Determinants of Regional Capitalist Development," a paper delivered to the Atlantic Studies Conference, Edinburgh, 1988, 25. Acheson and Frost focus on the capital markets, Forbes on the structure of the transport markets: T.W. Acheson "The Maritimes and 'Empire Canada'," *Canada and the Burden of Unity*, ed. David Jay Bercuson (Toronto, 1977), 87-114; Acheson, "The National Policy"; James Frost, "The Nationalization of the Bank of Nova Scotia, 1880-1910," *Acadiensis* 12:1 (Autumn 1982); and E.R. Forbes, "Misguided Symmetry: The Destruction of Regional Transportation Policy for the Maritimes," in *Canada and the Burden of Unity*, 60-86;
43. See, for example, Clow, who focusses on the political influence on factor pricing; North makes the point that this avenue of analysis is important yet overlooked by the orthodox economists; Michael Clow, "Politics and Uneven Capitalist Development: The Maritime Challenge to the Study of Canadian Political Economy," *Studies in Political Economy* 13 (Spring 1984): 117-40; D.G. North, "Conference Summary," *Merchant Shipping and Economic Development in Canada*, eds. L.R. Fischer and E.W. Sager (St. John's, 1982), 232-34.

then it would have been pursued, by imported capital if not by local capital. A simple calculation of profit expressed as an equation might look like this:

$$\text{Profit} = [(\text{revenue}/\text{unit of output}) - (\text{cost}/\text{unit of output})]Xn$$

where "n" is the number of units of output and "X" a recognition that there are economies and diseconomies of scale. If, for the purpose of discussion, we accept that firms are small relative to the size of the market, then they must sell their products at the market price.⁴⁴ Since revenue per unit of output will not vary between firms, differences in levels of profitability must be sought at the cost-per-unit level.⁴⁵ A composite cost function — a list of all the costs that go into the production and, in this case, distribution of one unit of output — may be stated as follows:

$$\text{Total Cost} = \text{Costs of (Tariffs, Transportation, Capital, Material Resources Used, Labour, Entrepreneurial Talent)}$$

If eastern firms were able to produce and deliver goods to British Columbia more cheaply than British Columbia manufacturers, and therefore be more profitable, then the explanation ought to be found in an examination of the relative costs of the factors of production (labour, capital, resources, tariffs, acquiring entrepreneurial talent, and/or transportation) or in economies of scale/agglomeration (Xn).

Beyond this point the two analytical traditions cleave apart. The orthodox economic school generally treats factor markets as independent variables, and focusses, not on the markets themselves, but on prices. On the other hand, the dependency school considers both the structure of the market and the costs of the factors of production to be dependent variables, determined by the exchange relations of capitalism.

Rather than using either market or exchange relations, this paper utilizes production relations as the focus of analysis.⁴⁶ The production-system approach

44. This is the case for British Columbia firms relative to the national market after the arrival of the CPR; relaxing this assumption reinforces the arguments made below; Copithorne, *A Neo-classical Perspective on Natural Resource Led Economic Growth* (Ottawa, 1977), 1.

45. This assumes a consistent level of technology used to produce the product, and a homogenous product — an assumption considered in more detail below.

46. My use of the term "production system" owes a debt to, but is not interchangeable with, similar terminology used in the anthropological studies of precapitalist economic systems in, for example: C. Meillassoux, "From reproduction to production: a Marxist approach to economic anthropology," *Economy and Society* 1:1 (1972): 93-105; Norman Long and Bryan Roberts, *Miners, Peasants and Entrepreneurs: Regional Development in the Highlands of Peru* (London, 1984), 1-43. Although there is a debt in my adoption of the production systems approach to the "staple approach" of Innis, it is different in one key aspect. While Innis and other staple theorists considered the set of production relationships (production and cost functions) of a staple product to be the result of characteristics inherent in the staple itself, this approach focusses on the interaction between the technological requirements of the staple production with the existing social system. The point is developed in more detail in Lutz, "Structural Change."

examines production as an evolution of relationships and institutional structures. While, in the short run, market structures and factor prices are fixed and therefore independent variables in the analysis of any individual decision, in the long run components of the production function are variable depending on such considerations as changing organization of factor markets, cultural norms, and institutional constraints. In this approach, each of the organizational subsystems that create and establish prices for factors of production become objects of analysis. Following this approach, the remainder of the paper considers the price and some of the determinants of the price of each of the factors of production and their effect on the decline of British Columbia's boiler and engine industry.

TARIFFS

Once British Columbia joined Confederation in 1871, the adoption of the Canadian tariff and the National Policy tariffs in 1879 was unavoidable.⁴⁷ The National Policy is frequently cited both by the dependency school and some neoclassical theorists as a primary villain which caused, or at least encouraged, the decline of various regional economies.⁴⁸ Clow argues that the tariff had a negative effect on Maritime manufacturing by artificially stimulating uncompetitive industries and by encouraging over-expansion as regional manufacturers anticipated servicing a national market.⁴⁹ Whatever merit this hypothesis may have regarding the Maritimes,⁵⁰ neither of these problems faced British Columbia boiler and engine manufacturers. British Columbia

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47. Yet, as Clow has argued with respect to the Maritimes, the decision to join Confederation was neither inevitable nor irreversible. More than any other province, British Columbia has used the threat of secession to try and improve the province's position within Confederation. Clow, "The Maritime Challenge"; Ormsby calls the province "The Spoilt Child of Confederation" in *British Columbia, A History* (Toronto, 1958).
48. Clow, "The Maritime Challenge," 130; Acheson, "Empire Canada," 92-95. Pinchin argues that at an aggregate level there is no disputing the fact that tariff policy had the effect of encouraging the centralization of manufacturing in Ontario and penalizing the regional economies; Pinchin, *Regional Effect of the Tariff*, 1-21 and Appendix A. Melvin has provided a theoretical model which demonstrates that Pinchin's conclusions can be made consistent with neoclassical economic theory; James R. Melvin, "The Regional Economic Consequences of Tariffs and Domestic Transportation Costs," *Canadian Journal of Economics* 18:2 (May 1985): 237-57. Inwood considers and rejects this view, "Economic Growth and Structural Change," 12.
49. Clow, "The Maritime Challenge," 128 and 131.
50. There is some evidence that the National Policy did encourage the expansion of Maritime manufacturing or at least retarded the centralization process: Inwood, "Economic Growth and Structural Change," 12, and Peter DeLottinville, "Trouble in the Hives of Industry: The Cotton Industry Comes to Milltown, New Brunswick, 1879-1892," *Historical Papers* (1980): 100-15.

firms often found that they could not keep up with local demand, a fact which suggests that misplaced specialization and overexpansion were not problems.⁵¹

Before the arrival of the CPR in 1885 the tariff undoubtedly gave British Columbia producers some protection against American and British competition and they were "protected" from eastern Canadian companies by distance, transport time, and transportation costs. The tariffs were, however, reciprocal. British Columbia manufacturers were frozen out of American Pacific-coast markets by tariff walls of 35 per cent on imported boilers and engines.⁵² After 1885 British Columbia producers shared the tariff protection and the provincial market with the eastern Canadian firms that were directly responsible for the decline in British Columbia's market share.

Ultimately the National Policy tariffs were either unnecessary or ineffective in protecting the Canadian boiler and engine industry in British Columbia.⁵³ American boilers were an inconsequential part of the marine boiler market before and after the National Policy tariffs (Figure 4). British engine manufacturers captured a steady 10 per cent of the British Columbia (registered) ship engine market before and after the tariffs (Figure 5). British-made boilers were a decreasing share of the market throughout the period of increasing tariffs until 1896, but their share of the market did jump dramatically when the British preferential tariffs were introduced. On the other hand, while the share of US manufacturers in the engine market fell coincidentally with the rising tariff up to 1890, in spite of the high tariffs they dominated the British Columbia engine market by 1910.

Despite a consensus, stretching beyond the dependency school, that the origins of the National Policy tariff schedule were deeply embedded in the social and political interaction between the federal cabinet and the central Canadian business elite, and that the latter were able to harness the power of the state to their advantage, it is difficult to

51. This is supported by evidence from the reports of the inspectors of machinery: "The boiler makers of British Columbia have never been so busy as they were during 1902. Contracts and demands for new boilers have been so pressing that they have been compelled to install new and modern tools in their shops in order to cope with the business and many orders have been placed outside the province because local firms could not promise early delivery." (British Columbia, *Sessional Papers* [1903], L11.) "There has been an increase in the number of new boilers built during the year over previous years.... [which has] taxed the manufacturers to the limit.... In many cases purchasers who would have preferred their boilers built in British Columbia were compelled to import them from Seattle...." (British Columbia, *Sessional Papers* [1907], K17.)

52. Hittell, *The commerce and industries of the Pacific coast*, 654.

53. The CPR actually charged eastern American shippers less to ship to the Canadian west coast than they charged eastern Canadian firms and thus undermined the tariff protection; on average the differential was five cents per hundred pounds, a sum which was roughly equivalent to the tariff; see *Reports upon Railway Commissions, Railway Rate Grievances and Regulative Legislation in Canada, Sessional Papers* (1902) Return 20A, 70-73; the Board of Railway Commissioners quashed this differential rate in 1906 but the CPR was evidently still giving American shippers preferential rates until at least 1909: NA, RG 46, Board of Railway Commissioners, Transcripts, vol. 11-12, file 542, case 105 (23 March 1906); vol. 34 (23 February 1909), 3894-95.

find any appreciable effect of the tariffs on the decline of the boiler and engine industry in British Columbia.⁵⁴

TRANSPORTATION

The National Policy was brought to British Columbia, not by the 1879 tariff, but by the steam engine which pulled the first transcontinental train into Port Moody in 1886. From supplying only 3 per cent of the ship engines installed in British Columbia in the five years before the completion of the railway, eastern Canadian manufacturers captured 37 per cent of this market in the five years following. Similarly, from no presence in the British Columbia market for ship boilers, eastern Canadian producers captured 45 per cent of the market share in the five years after the arrival of the CPR, reaching 55 per cent in the period 1891-95 (see Figures 4 to 6).

In the absence of detailed study it has been assumed that the sudden penetration of the British Columbia market was the result of the lowered transport cost which resulted from the rail connection. How freight rate structures affected the province remains to be fully investigated but the assumption of lowered transport costs is problematic. The available evidence suggests that the CPR set its intercontinental freight rates to be competitive with existing ocean freight rates.⁵⁵ However, the CPR did reduce the nonmonetary costs of doing business in the west and in so doing reoriented the focus of eastern Canadian manufacturers. Prior to the arrival of the railway a contemporary analyst noted that "the distance from eastern cities and consequent loss of time in fulfillment of orders is a great advantage to Pacific Coast manufacturers. . . . In the language of one of our prominent iron founders, 'the short time that machinery has to be delivered after being ordered is our safeguard against eastern competition'."⁵⁶

With the arrival of the CPR in 1885, the Pacific coast was suddenly closer to Canada, in terms of the time it took a sales agent to travel, orders to be received, and

54. For a summary of some of the approaches to the National Policy, see J.H. Dales, *The Protective Tariff in Canada's Development* (Toronto, 1966), 159-66. For a recent look at the conjunction of interests between the federal government and the manufacturers of Ontario and Quebec, see Ben Forster, *A Conjunction of Interests: Business, Politics, and Tariffs, 1825-1879* (Toronto, 1986), 182-200.

55. In the judgement of the commissioner of the inquiry into freight rate discrimination, S.J. McLean, "The tariffs on transcontinental shipments are based on assumed operation of ocean competition in regards to all lines of shipments." McLean noted that some ocean rates were so low, the railway could not meet them. *Reports upon Railway Commissions, Railway Rate Grievances and Regulative Legislation*, 70-71. The CPR acknowledged that its rates to BC coastal points were set simply to meet ocean competition in their "Response of the CPR to Grievances submitted by S.J. McLean, Commissioner of Railway Rate Grievances," dated 2 December 1901 and signed by G.M. Bosworth, as well as in a letter from W.R. McInnes, freight traffic manager to F.W. Peters, assistant traffic manager, dated 17 February 1903 and cited in Board of Railway Commissioners, Transcripts, RG 46, vol. 10 (6 March 1906), 4173; NA, RG 43, Department of Railways and Canals, Office of the Commissioner on Railway Rate Grievances, "Evidence."

56. Hittell, *The commerce and industries of the Pacific coast*, 654-55.

goods delivered.⁵⁷ This is particularly important in the case of boilers and engines where a large percentage were custom ordered.⁵⁸ Boiler and engine makers in south-central Ontario immediately seized this opportunity and "formed national sales networks as swiftly as the CPR laid track."⁵⁹ In staking this new commercial territory these sales agents linked British Columbia's resource industries to manufacturing in Ontario and the American northeast and, in so doing, cemented the Pacific coast's ties to the continental economy.

The CPR may have "annihilated distance by time" as it laid tracks and redrew the commercial map of Canada but it did not annihilate transport costs. Even if the CPR lowered the real costs of transportation, eastern manufacturers still paid more to ship to coastal British Columbia markets than did British Columbia manufacturers. To overcome this cost differential eastern manufacturers must have had a preexisting advantage with respect to one of the remaining factors of production.

While eastern goods overcame transport cost disadvantages to serve coastal markets, they actually had transport advantages servicing the interior of the province and the Prairies. British Columbia manufacturers and boards of trade were constantly giving evidence before the railway commissioners that the CPR's freight rates shut them out of the main markets west of Toronto, the Prairies, and even the Kootenays.⁶⁰ On one such occasion the Vancouver Board of Trade reported that "a number of industries had planned to commence operations in and around Vancouver but that after careful study of western rates compared to eastern rates the promoters reluctantly agreed that the

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57. "In the case of shipments by water, there is the question of the time taken up in transportation, and in the interest on capital locked up in the shipments, as well as the cost of insurance. All these tend on certain lines to give the railways an advantage in competition." S.J. McLean, *Reports upon Railway Commissions, Railway Rate Grievances....* 71.
58. Hittell, *The commerce and industries of the Pacific coast*, 659.
59. John C. Weaver, "The Location of Manufacturing Enterprises: The Case of Hamilton's Attraction of Foundries, 1830-1890," *Critical Issues in the History of Canadian Science, Technology and Medicine*, ed. Richard A. Jarrell and Arnold E. Roos (Thornhill and Ottawa, 1983), 213-15; Norbert MacDonald, "The Canadian Pacific Railway and Vancouver's Development to 1900," 396-425; and R.A.J. McDonald, "Victoria, Vancouver, and the Economic Development of British Columbia, 1886-1914," in *British Columbia: Historical Readings*, eds. R.A.J. McDonald and W.P. Ward (Vancouver, 1981), 355. R.A.J. McDonald, "City Building in the Canadian West. A Case Study of the Economic Growth in Early Vancouver, 1886-1893," *B.C. Studies* 43 (Autumn 1979): 26; Vancouver Board of Trade, *Annual Report* (1892), 22. This phenomenon has been studied in the Maritimes by L.D. McCann, "Metropolitanism and Branch Businesses in the Maritimes, 1881-1931," in *Atlantic Canada After Confederation*, eds. P.A. Buchner and David Frank (Fredericton, 1985), 202-15.
60. See, for example, the complaints by the B.C. Box Factory, and the Victoria-based British American Paint Company, August 1901. Wholesalers had the same complaints; see F. Buscombe, crockery wholesaler and W.H. Malkin, grocery wholesaler, all in RG 43, "Evidence," 231, 243, 245 and ff.

discrimination in favour of the eastern manufacturers was so prohibitive that they considered it premature to commence operations until the rates had been fairly adjusted."⁶¹

The Canadian Pacific Railway appreciated its role in the National Policy. In one of their submissions to the Board of Railway Commissioners the company excused its rate discrimination: "Manufacturing industries in Eastern Canada already feel the effect of competition on similar goods which are brought from Europe by water to Vancouver, and marketed in British Columbia interior points and Alberta. Any reduction in the rates from Vancouver to points eastward thereof, would, of course, increase this competition, much to the detriment of Eastern Canadian manufacturers who are now serving that market."⁶²

The rate structure worked against British Columbia manufacturers in a variety of ways. The average freight rate per mile of railway track from 1901-14 was twice as expensive on the CPR between Vancouver and Canmore, Alberta as it was over any other mile of CPR track.⁶³ The effect, of course, was to move the point where the railway rates for westbound goods met the rate for eastbound goods, westward into British Columbia and thereby to limit the market for local producers. For example, in 1901 rates from Winnipeg met the rates from Vancouver at Golden, BC, a distance of 1007 miles from Winnipeg but only 475 miles from Vancouver. British Columbia producers were therefore effectively shut out of the Kootenay and Prairie markets.⁶⁴ Albion, the largest manufacturer of boilers and engines in British Columbia, sent a representative to the Kootenays but found that they could not undersell eastern firms.⁶⁵

To add insult to injury, cross-country rates blatantly favoured the east over the west. Taking an average of all the class rates 1-4,⁶⁶ it was 12.64 per cent cheaper to ship any item from Toronto to Vancouver than it was to send it from Vancouver to Toronto and 20.15 per cent cheaper to ship from Saint John to Vancouver than it was to send it

61. NA, RG 46. Board of Railway Commissioners of Canada, transcripts from hearing 27 March 1909, vol. 41, file 96, 14537.

62. *Ibid.*, 6 March 1906, vol. 10, 484.

63. The CPR justified this on the grounds that it was more expensive to build the railway in British Columbia and that maintenance costs were higher. H.W. Hewetson, "The Railway Rates Problems of Western Canada with Special Reference to British Columbia," MA diss., University of British Columbia, 1925, 65.

64. NA, RG 43, "Evidence - Meetings With the Boards of Trade," 30 August 1901, 247.

65. PABC, Albion Iron Works, Minute Books.

66. Most small- to mid-size manufacturers would have to use the class rates, rather than the bulk commodity rates, in shipping their products.

back.⁶⁷ Foundries from as far away as Nova Scotia were competing in British Columbia with local producers.⁶⁸ *Moody's Magazine* noted in 1913 that the freight-rate structure was a particular handicap to British Columbia iron and steel fabricators.⁶⁹

With the arrival of the CPR, British Columbia manufacturers felt the sudden jab of the transport *tine* of the National Policy *trident*. The small, but growing, literature on transport structures in Canada has a common thread which argues that Canadian transport rates were not based exclusively on geographic or technical considerations but were the result of "a complex of socio-cultural factors."⁷⁰ Limitations on the size of the market open to British Columbia manufacturers were a result, not of distance, but of a discriminatory freight-rate structure.

MATERIAL INPUTS

If the CPR gave eastern manufacturers an advantage in serving the interior markets, this factor alone did not account for their success in the coastal markets where eastern-built engines and boilers were being installed within earshot of British Columbia manufacturies. There must have been a cost advantage in some other combination of inputs: capital, labour, entrepreneurship, scale, or materials. Indeed, the cheaper cost of eastern manufactured goods was evidently a fear of British Columbia businessmen. In 1883, the *Victoria Colonist* warned:

In the unmistakable revival of business interests, the upward tendency of real estate and the general prosperity throughout the province, the establishment of more manufacturing industries should not be lost sight of. . . . A beginning must be made now, in order that the first year of struggling may be over before the completion of the CPR — and the consequent leveling of prices down to almost eastern rates which that event will bring about.⁷¹

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67. Vancouver rates apply equally to all coastal terminal points including Victoria, New Westminster, and, until 1915, Nanaimo; see NA, RG 46, Board of Railway Commissioners of Canada, Transcripts of Hearings, vol. 46, file 1922, 27 October 1909, 14537 ff. There were also other kinds of "hidden discrimination." Eastern manufacturers had the option to ship "full carloads" at the reduced rate for full cars and then break up the carload at various way stations but British Columbia manufacturers did not. NA, RG 43, "Evidence - Meeting With the Boards of Trade," 30 August 1901, 247; letter from the Nelson Board of Trade, 7 September 1901; also NA, RG 46, Board of Railway Commissioners, Transcripts, vol. 8, 19 September 1905, 3325.
 68. L.D. McCann, "Mercantile-Industrial Transition in The Metals Towns of Pictou County, 1857-1931," *Acadiensis* 10:2 (Spring 1981): 53.
 69. W. Martin Swift, "Industrial Future of British Columbia," *Moody's Magazine* 15:6 (June 1913): 483-90.
 70. Wood, "Marxism and the Maritimes," 27; Hewetson, "The Railway Rates Problem"; T.D. Regehr, "Western Canada and the Burden of National Transportation Policies," *Canada and the Burden of Unity*, 115-42; Forbes, "Misguided Symmetry."
 71. *Resources of British Columbia*, 1 March 1883, 8; California manufacturers had the same fears *vis-à-vis* eastern American producers; see Hittell, *The commerce and industries of the Pacific coast*, 653-54.

In Faucher and Lamontagne's comparison of the boiler and engine industries of Ontario and Quebec, the crucial factor was the cost of material inputs, particularly coal

Table 6
Material Costs as Share of Output of the Boiler and Engine
Industry for the Census Years 1880-1911

	B.C.	Ontario	Canada
1880-81	.349	.560	.491
1890-91	* .667 ⁷²	.337	.458
1900	.273	.384	.386
1910	.351	.394	.361

and iron.⁷³ In Table 6, which shows the value of all materials consumed in the boiler and engine industry to produce one dollar of output, a lower value implies that a smaller share of production costs are attributable to material inputs. It is clear that over the four censuses for which data is available, with one exception, a smaller share of the value of British Columbia production went to cover the cost of inputs.⁷⁴

72. The figure marked with an asterisk seems to be the result of a reporting anomaly. Only one firm was enumerated in this category in 1890-91, presumably the Albion Iron Works, and the figures reported are only a fraction of those reported in Albion's financial statements. Apparently a part of Albion's production was allocated to the boiler and engine category, and the roughness of the estimate is suggested by the fact that in this year only, the figures for production, wages, etc. are rounded to the nearest one thousand dollars. See Canada, *Census*, 1881, vol. III; 1891, vol. III; 1901, vol. III; 1911, vol. III; PABC, Albion Iron Works, Financial Statements.
73. Faucher and Lamontagne, "Industrial Development," 264-68. Inwood argues that this is one factor explaining slow Maritime industrial growth; however, Altman, Kerr, and Weaver all argue that market orientation is more important than material orientation in the case of the secondary iron and steel industry; Inwood, "Economic Growth and Structural Change," 21; Altman, "Resource Endowments"; Kerr, "Geography of the Iron and Steel Industry"; Weaver, "The Location of Manufacturing Enterprises."
74. The exceptional year appears to be the result of a reporting anomaly; see source note for Table 6. If overall production costs were higher-per-engine in British Columbia, then a lower relative cost of material inputs may still represent an absolute price disadvantage. The implicit assumption of identical units of output is not far off the mark, given that the registration data shows that British Columbia manufacturers could produce any of the types of engines imported. Other evidence suggests that British Columbia and west coast manufacturers could supply most of the same products as eastern manufacturers. See *Victoria Illustrated* (Victoria, B.C., 1891), 81; Hittell, *The commerce and industries of the Pacific coast*, 653 and 659; *The Mining Record* 10:7 (July 1903): 723-24; However, below I examine this assumption when discussing the effect of quality differences and technological lag.

Table 7
Comparison of Average Prices of Pig Iron and Boiler Plate
Imported into British Columbia and Ontario in Current Dollars
5 Year Internals 1881-1900⁷⁵

	Pig Iron \$/ton		Boiler Plate \$/cwt	
	B.C.	Ont.	B.C.	Ont.
1881-1885	14.49	15.05	3.93	2.56
1886-1890	12.67	14.24	2.61	1.79
1891-1895	13.44	12.90	2.21	1.67
1896-1900	13.54	10.29	1.71	1.63

Since both eastern and west-coast Canadian boiler and engine manufacturers imported all of their iron and steel to build boilers and engines, it is possible to compare the costs of these inputs up to 1900 from the "Tables of Trade and Navigation."⁷⁶ Comparing the costs of imported iron, a key input for engine construction in British Columbia and Ontario (Figure 9), it is evident that British Columbia actually had a cost advantage up to 1890. White boiler plate cost more to import into British Columbia between 1880 and 1900, the price difference fell as the British Columbia industry declined. Depending on the product and the mix of inputs, it would not be surprising if British Columbia had cheaper access to inputs up to the 1890s. In any case, it is clear from the relative comparisons in Table 6 that material costs alone cannot account for higher production costs for British Columbia manufacturers. Table 8 allows a comparison of the share of total output accounted for by fuel costs in British Columbia with Ontario and Canada in 1900 and 1910. In 1910 British Columbia fuel was relatively cheaper than in the rest of Canada and, in 1900, slightly more expensive. However Tables 6 and 8 illustrate that, compared to other inputs, fuel was a trivial percentage of costs. Material costs, including the cost of fuel inputs, apparently did not work to the disadvantage of British Columbia boiler and engine makers and may have worked to their advantage.⁷⁷

75. Canada, Parliament, *Sessional Papers*, "Tables of Trade and Navigation," 1882-1901. For the years 1897, 1898, and 1899 boiler plate included all rolled iron and steel plates and in 1900 no data are available in this category. After 1900 imports are no longer listed by province.

76. *Industrial Canada* (June 1905): 720. At least up through the 1880s San Francisco manufacturers also imported their steel from Europe and the eastern United States; Hittell reports that the average cost of iron in San Francisco between 1876 and 1882 ranged between twenty-four dollars to thirty dollars per ton; Hittell, *The commerce and industries of the Pacific coast*, 654.

77. British steel was much cheaper in this period than American steel and British Columbia relied more heavily on imports from Britain; "Tables of Trade and Navigation," 1882-92; James H. Hamilton, *Western Shores* (Vancouver, 1932), 156; see also *Victoria Illustrated*, 81.

Table 8
Power Costs (in \$) and as a Share of Output of
Boiler and Engine Industry for 1900 and 1910⁷⁸

	Foreign Coal	Canadian Coal	Other Fuel	Total Fuel	Share of Total Output
1900					
British Columbia	—	—	—	8,270	.022
Ontario	—	—	—	45,762	.018
Canada	—	—	—	100,485	.021
1910					
British Columbia	—	892	8,400	9,292	.015
Ontario	75,000	—	21,234	96,234	.020
Canada	86,706	72,411	61,028	220,145	.019

CAPITAL

Beyond the dramatic and visible effect of linking the Pacific coast of Canada directly to the continental "product market," the completion of the Canadian Pacific Railway prompted an integration of capital markets. The cost of, and ability to attract, capital into the production process in developing regions have become a central part of the debate over Maritime deindustrialization.⁷⁹ The existence of multiple definitions of the word "capital" has meant that the term has entered the discussion of economic development in Canada with different implications. From a neoclassical perspective, capital appears as a factor of production, much like the others, and is available to all manufacturers at a market price. The discussion which follows from this tack focusses on the price of capital as an independent variable. Inwood, for example, has argued that eastern Canadian firms organized capital more efficiently and hence more cheaply by using different corporate structures than was possible in the Maritimes with its smaller firms in small urban centres.⁸⁰

Table 9
Profit or Return to Capital for the Boiler and Engine
Industry for the Census Years 1880-1911

	British Columbia	Ontario	Canada
1880-81	.141	.211	.285
1890-91	* .529 ⁸¹	.592	.342
1900	.098	.171	.154
1910	.237	.115	.253

78. Canada, *Census*, 1901, vol. III, Table IV; Canada, *Census*, 1911, vol. III, Table IV.

79. For example, see Acheson, "National Policy," and "Empire Canada"; Frost, "The Nationalization of the Bank of Nova Scotia, 1880-1910"; Inwood, "Economic Growth and Structural Change," 24-26.

80. Inwood, "Economic Growth and Cultural Change," 18 and 22-24.

81. The figure with an asterisk seems to be the result of a reporting anomaly; see Table 6 for explanation and sources. Return to Capital = $([\text{Output} - (\text{Wages \& Material Costs})] - \text{Depreciation}) / \text{Capital Invested}$. Depreciation is estimated at 5 per cent (following Inwood and Wood) and salaries are included with wages. Inwood, "Economic Growth and Structural Change," and Wood, "Marxism and the Maritimes."

According to this formulation, capital responds to the highest anticipated profits relative to other opportunities. It follows that, if boiler and engine production was more profitable in Ontario than in British Columbia, then that is where investment capital would flow. Table 9 illustrates the return to investment in the boiler and engine making industry in British Columbia, Ontario, and Canada. This admittedly crude measurement of profitability suggests that, in the first thirty years of this study period, rates of profit in Ontario exceeded those in British Columbia; but in 1910, while lagging behind the Canadian average, the profits of British Columbia producers exceeded those of Ontario. The consistently lower profit rates from 1880 to 1900 suggest why capital may have been flowing to boiler and engine making outside of British Columbia, but begs the question of why profits were lower.

Could low profitability have resulted from the British Columbia boiler and engine industry being undercapitalized?⁸² In terms of average capital investment per firm, British Columbia firms were smaller than Ontario's and the Canadian average in the census years 1880 and 1890, but were twice as large in 1900. Perhaps due to the failure of the largest manufacturer, Albion Iron Works, the average investment per firm plummeted again in the 1910 census.⁸³

If we examine capital as an independent variable and consider the question of whether it was more expensive to raise capital in British Columbia after the influx of eastern Canadian banks who came with the CPR, it is difficult to find a conclusive answer. In the case of the Albion Iron Works it is true that after 1901 the company had more difficulty borrowing funds from the Bank of British Columbia after the latter's takeover by the eastern Bank of Commerce, but this coincided with Albion's financial woes and labour difficulties; the degree of causality is therefore unclear.

At the same time Albion was finding itself unable to raise capital to refinance, there was large-scale investment occurring in British Columbia, primarily in the resource industries.⁸⁴ Apparently, capital was available for investment in British Columbia, at

82. Inwood argues that Maritime manufacturing was undercapitalized, the result being an inability to reap economies of scale. Below I consider the question of economies of scale separately. See Inwood, "Economic Growth and Structural Change," 24-26.

83. Canada, *Census*, 1910. The snapshot measure of profitability shown in Table 9 will always show an inverse relationship between profits and capital investment. A sudden infusion of capital which may increase the long-run profitability of an industry will depress this short-term profit index. The apparent surge in profits of the British Columbia industry in 1910 may actually reflect undercapitalization instead.

84. In the salmon canning industry there had been over-investment and in 1901 a large amount of eastern American capital was marshalled to create a monopoly and rationalize the salmon industry; from the mid-1890s there was also unprecedented investment occurring in the hard-rock mining industry in the Kootenays. For British investment patterns, see Patterson, *British Direct Investment Patterns*, 59-61, 63, 67, 75-76, and 97; see, for salmon, Reid, "Company Mergers"; Alicja Muszynski, "Major Processors to 1940 and Early Labour Force: Historical Notes," 50-51, and John McMullan, "State Capital and the B.C. Salmon-Fishing Industry," 107-110, both in *Uncommon Property, The Fishing and Fish*

least by nonlocals, and they were channelling it into the resource and transportation sectors, not the boiler and engine industry.⁸⁵ That this might be so is readily explained if we accept the figures demonstrating lower profitability in the British Columbia boiler and engine industry but it brings us no closer to understanding why the industry was less profitable in British Columbia.

In the dependency approach "capital" is associated with a network of power relationships between the centre and the periphery and, insofar as the cost of capital is an issue, the price of capital available to different capitalists is dependent on their location in the power grid. Acheson, for example, argues that the centralized nature of the banking system meant that capital was available at better terms to central Canadian capitalists.⁸⁶ With others, he argues that the physical location of the ownership of capital, outside the region where it is employed, has disadvantageous effects on that region.⁸⁷

Although little is known about the structure of the capital market in British Columbia, before or after the railway,⁸⁸ the boiler and engine data reveal an important, and largely overlooked, effect of an infusion of nonlocal capital on a regional economy. The purchasing patterns of nonlocally owned firms differed from those owned in British Columbia. From the two sets of data which show the linkage between purchaser and supplier, the ship engine and the ship boiler records, it is clear that local capitalists and locally owned firms had a greater tendency than nonlocals (not living or based in British Columbia) to buy their ships from local shipyards. Moreover, of the ships built in the province for local and nonlocal owners, the former tended to purchase boilers and engines for the vessels locally while the latter tended to import them. Three examples suggest the broader pattern.

Processing Industries in British Columbia, eds. Patricia Marchak, Neil Guppy, and John McMullan (Toronto, 1987); for hard-rock mining, see J.S. Church, "Mining Companies in the West Kootenay District of British Columbia, 1890-1900," MA diss., University of British Columbia, 1961.

85. There was a proposal in 1902 to use eastern capital to consolidate the boiler and engine and shipbuilding industries but it did not get off the ground; PABC, O'Reilly Papers provides further details.
86. Acheson, "Empire Canada," 95.
87. Acheson, "National Policy," and "Empire Canada"; Marchak, *Green Gold*, 24-25. Allen "B.C. Past, Present and Future," admits this is possible but argues that evidence is missing; Copithorne demonstrates that this is theoretically compatible with the orthodox approach in Copithorne, *A Neo-classical Perspective*, 18-20.
88. See Peter Baskerville, "Financial Capital and the Municipal State: The Case of Victoria, British Columbia, 1910-1936," *Studies in Political Economy* 21 (Autumn 1986): 83-106; Donald G. Patterson, *British Direct Investment in Canada 1890-1914: Estimates and Determinants* (Toronto, 1976) and D.G. Patterson, "European Financial Capital and British Columbia: An Essay on the Role of the Regional Entrepreneur," *B.C. Studies* 21 (Spring 1974): 33-47; Victor Ross, *The Story of the Imperial Bank of Commerce* (Toronto, 1921).

The first two examples involve the purchase of locally owned shipping companies by the eastern-based Canadian Pacific Railway and clearly illustrate the changing purchasing patterns which accompanied changing ownership. The first case involves the Columbia and Kootenay Steamship Navigation Company (C&KSNCo) which was formed in 1889 by British Columbia capitalists J.A. Mara, F.S. Barnard, and John Irving to provide steamship services on the Columbia and Kootenay chain of rivers and lakes. In 1897, in order to gain control over the shipment of ore and the water connections of its competitors, the CPR purchased the C&KSNCo. The twelve vessels that had been built for the locally owned C&KSNCo were all built in British Columbia. In contrast, one third of the CPR's twenty-eight-vessel successor to the C&KSNCo were built in eastern Canada. Of the vessels built for the C&KSNCo, eight used new engines, and half of these (for which records survive) were supplied by British Columbia firms. Of the ten ships built in British Columbia for the CPR-owned successor (for which we have engine data), less than a third used boilers or engines made in British Columbia.⁸⁹

Even more dramatic was the 1901 takeover of the locally owned Canadian Pacific Navigation Company (CPN) by the Canadian Pacific Railway. Of the seven vessels in the CPN fleet, six were built locally and all used locally made boilers and engines. After the CPN was purchased by the CPR, only six of the sixteen new ships added to the fleet before 1915 were built locally and *all* of these used engines built in eastern Canada or Great Britain.⁹⁰

The third example is the Union Steamship Company. Established in Vancouver in 1889 but financed largely by capital from Glasgow, this company purchased all of its new vessels from Scottish, primarily Glasgow, shipyards.⁹¹ Naturally, they had no demand for local ships' boilers and engines. Nor are these isolated examples. The CPR alone owned 13.4 per cent of the tonnage registered in British Columbia between 1867 and 1914 and a quarter of all of the iron/steel hull tonnage. Other steamship companies, predominantly nonlocally owned, by the end of the period owned 28 per cent of all tonnage and over a third of the iron/steel-hulled tonnage.⁹² Eastern Canadian owners steadily increased their ownership of the British Columbia shipping industry from the 1880s onward and accounted for nearly one fourth of the new direct investment in shipping in the province by 1910-14.⁹³

89. The editor of the *B.C. Mining Record* (April 1897) remarked that "since the CPR took over the boats of the C & KSNCo [these] boats will hereafter be run purely in the interests of the CPR system." See also R.D. Turner, *Sternwheelers and Steam Tugs, An Illustrated History of Canadian Pacific Railway's British Columbia Lake and River Service* (Victoria, 1984), Appendix I and PABC, GR806, Ship Registries, Ports of Victoria, Vancouver and New Westminster, and Steamboat Inspector Reports.

90. R.D. Turner, *The Pacific Princesses, An Illustrated History of Canadian Pacific Railway's Princess Fleet on the Northwest Coast* (Victoria, 1977), Appendix I and PABC, GR806, Ship Registries, Ports of Victoria, Vancouver and New Westminster, and Steamboat Inspector Reports.

91. PABC, Ship Registries and Steamship Boiler Inspection Records.

92. Eric W. Sager, "The Shipping Industry of British Columbia," paper presented to the Canadian Historical Association Annual Meeting, June 1983, Table 4.

93. *Ibid.*, 21-22.

This study highlights another feature of the impact of "transportation capital." There was virtually no cost to the transport companies to carry manufactured goods that they would use themselves or supply to their corporate connections. The additional cost to the CPR, for example, to ship a boiler or engine for their own use from Toronto, or Glasgow, to Vancouver was nearly nil. In taking advantage of this privileged position, the CPR built at least five vessels in Toronto and shipped them, disassembled, by railway to British Columbia. One of the vessels alone filled nineteen carloads. No other firms operating in British Columbia built or delivered vessels in this way.⁹⁴ This "no-cost" transport available to companies like the CPR or the Union Steamship Company may help account for the surge in the use of British boilers in the early twentieth century (Figure 6).⁹⁵

Nonlocal ownership was increasingly prevalent in all sectors of the British Columbia economy, not just the water transportation sector. In 1905 the CPR bought the locally owned Esquimalt and Nanaimo Railway and Steamship Line on Vancouver Island and, from the 1890s on, had been busy buying railways in the southern part of the province. The CPR also bought interests in mines and by 1898 controlled what became the massive Cominco smelter operations in the Kootenays. In 1891 the directors of the CPR financed Vancouver's sugar refinery. MacKenzie and Mann, the principal figures in the Great Northern, bought out the prominent local Dunsmuir family's Vancouver Island coal-mining interests. The influx of capital came not just from eastern Canada. Eastern American capitalists financed a merger in the fish-processing industry in 1902 which saw 60 per cent of the locally owned canneries swallowed up by the eastern American-backed B.C. Packers Company. American firms dominated the Kootenay mines until the turn of the century and after that there was increasing American presence in forest resources. British investment came largely via infrastructure and utility investments.⁹⁶

The boiler and engine data establish that nonlocally owned firms tended to have different purchasing patterns which favoured nonlocal manufacturers, but leaves open the question of why this should be the case. If price alone were the main determinant we would expect no difference in the purchasing patterns of nonlocal and local capitalists.

94. The CPR's assembly of ships at Nelson, British Columbia in 1899, for example, made Nelson among the largest "shipbuilding" centres in Canada in that year, second only to Montreal; see Canada, *Sessional Papers*, "Tables of Trade and Navigation," 1900. The Bonnington, assembled in Nakusp in 1911, filled nineteen cars; see Turner, *Sternwheelers and Steam Tugs*, 54 and 78.

95. Both the CPR and Union Steamship Co. bought vessels from Scotland. There was a considerable UK presence in ships' boilers installed in BC-built ships but almost no British presence in the boilers used on land.

96. Nonlocal ownership is not synonymous with nonlocal control but overall there will be a greater tendency to nonlocal control with nonlocal ownership than without. For the presence of nonlocal capital, see Baskerville, "Financial Capital and the Municipal State"; Patterson, *British Direct Investment in Canada 1890-1914*; Reid, "Company Mergers in the Fraser," 306-27; J. C. Lawrence, "Markets and Capital: A History of the Lumber Industry of British Columbia 1778-1952," MA diss., University of British Columbia, 1951; Church, "Mining Companies...."

Both of the two possibilities — the orthodox explanation that nonlocal firms tended to purchase from other nonlocal firms based on historic trading relationships, personal contacts, or physical proximity to the purchasing agents.⁹⁷ and the neo-Marxist approach which predicts that nonlocal capitalists will syphon off the “linkages” from the staple industries to benefit the metropolis⁹⁸ — are consistent with the evidence.

Clearly, though, capital represents more than a physical commodity. It is also located in a social network of power relations which have to be traced if the role of capital in the production system is to be understood. New levels of nonlocal ownership of capital and resources brought with it a new network of relationships and new purchasing patterns which uncoupled the linkages that had existed to the local manufacturing sector. “Linkages” have to be seen, not merely as relationships between suppliers and consumers nor as propensity of the specific characteristics of a product, but also as a product of the social relations of capital.

ENTREPRENEURSHIP

The relative success of nonlocal capitalists *is* the relative failure of local capitalists. As a result explanations for the decline of regional economies in both the export base and dependency approaches have looked to the entrepreneurial component of the production system.⁹⁹ It is *the* crucial factor to the extent that it is the key to the organization of all the others. The supply of entrepreneurial talent is, however, difficult to measure and even more difficult to explain. Also problematic is the question of whether entrepreneurship is an independent factor of production or whether certain cultures or production structures encourage entrepreneurship.¹⁰⁰ These questions assume importance where the supply of entrepreneurial talent is insufficient but if we can measure the supply of entrepreneurial skills by economic success and innovation,¹⁰¹ a cursory look at nineteenth-century British Columbia suggests that the region was producing skilful local entrepreneurs.¹⁰² Why many of these same successful

97. Copithorne, *A Neo-classical Perspective*, 17 and 22.

98. Marchak, *Green Gold*, 17. Another possibility, that nonlocal capital and resource companies had specific requirements for manufactured goods not available in British Columbia, is considered below. Detailed research into the records of the companies involved may yield a more complete explanation of why companies acted as they did.

99. George, *Leader and Laggard*; John Fogarty, “Economic History and the Limits of the Staple Theory,” in *Clio's Craft: A Primer of Historical Methods*, ed. Terry Crowley (Toronto, 1988), 184; Tom Naylor, “History of Domestic and Foreign Capital in Canada,” in *Canada Ltd.: The Political Economy of Dependency*, ed. Robert Laxer (Toronto, 1973), 44-45; Acheson, “National Policy.”

100. Watkins, “The Staple Theory,” 57.

101. There is a *post hoc ergo propter hoc* problem with this type of argument.

102. See J.M.S. Careless, “The Business Community in Victoria,” *Historical Essays on British Columbia*, ed. J. Friesen and H.K. Ralston (Toronto, 1976), 155-66; his “The Lowe Brothers, 1852-1870. A Study of the Business Relationships on the North Pacific Coast,” *B.C. Studies* 2 (Summer 1969): 1-18; G.W.S. Brooks, “Edgar Crow Baker: An Entrepreneur in Early British Columbia,” *B.C. Studies* 31 (Autumn 1976): 23-45; D.G. Patterson,

entrepreneurs sold off their industrial and transportation investments to nonlocal firms and invested in real estate and commercial ventures at the turn of the century requires further investigation but may turn, as well, on the question of profitability.¹⁰³

LABOUR

The remaining factor of production left to be considered is labour. Table 10 illustrates the share of labour cost per unit of output and demonstrates that over the entire study period, wages accounted for a much higher share of the value of output in British Columbia than in the rest of Canada. Figure 8 illustrates that the wages paid in British Columbia boiler and engine factories were as much as 50 per cent higher than in Ontario

Table 10
Wage Costs as Share of Output of Boiler and Engine
Industry for the Census Years 1880-1911

	British Columbia	Ontario	Canada
1880-81	.473	.276	.290
1890-91	* .133 ¹⁰⁴	.285	.285
1900	.494	.387	.399
1910	.382	.377	.307

"European Capital and British Columbia," 33-47; H.K. Ralston, "Patterns of Trade and Investment on the Pacific Coast, 1867-1892: The Case of the British Columbia Salmon Packing Industry," in *Historical Essays*, 167-76 and "John Sullivan Deas: A Black Entrepreneur in the British Columbia Salmon Canning Industry," *B.C. Studies* 32 (Winter 1976-1977): 64-78; Irene Robertson, "The Business Community and the Development of Victoria, 1858-1900," MA diss., University of Victoria, 1981.

103. On the disintegration of the local capitalist class, see P.A. Baskerville, "De-industrializing the Island: Vancouver Island and the Industrial World 1881-1901," unpublished paper presented to Islands 86 Conference, University of Victoria, 1986.

104. The asterisked figure seems to be the result of a reporting anomaly. Only one firm is enumerated in this category, presumably Albion, and in their 1890 financial statements for all their branches, wages as a share of output equalled .446. For more details see the note to Table 6; Canada, *Census*, 1881, vol. III; 1891, vol. III; 1901, vol. III; 1911, vol. III; PABC, Albion Iron Works, Financial Statements.

Table 11
Value Added per Employee in the Boiler and Engine
Industry for the Census Years 1880-1911 in Dollars

	British Columbia	Ontario	Canada
1880-81	1120	579	608
1890-91	* 1388 ¹⁰⁵	988	779
1900	1283	699	705
1910	1271	955	1293

and other evidence suggests that British Columbia manufacturing wages had been higher at least back to the 1880-81 census.¹⁰⁶

High wages definitely affected the largest boiler and engine factory in British Columbia and was one of the reasons for its demise. The share of wages as a percentage of the Albion Iron Works sales had increased from 37.9 per cent in 1885 to 50.3 per cent by 1901. Faced with fixed factor prices and markets, the directors of Albion attempted to reduce the cost of the only input over which they had any control.¹⁰⁷ The company balked at paying union rates in 1901 and refused to hire union boilermakers. The boilermakers struck the iron works and were supported in their strike by shipwrights and longshoremen. In 1902 a handbill was posted around Victoria warning potential customers that Albion boilers were unsafe and that their other products were inferior due to the use of scab labour.¹⁰⁸ Albion's 1901 annual report noted that "The disappointing profit on the company's operations at Victoria, \$5,605.58 only, is due to the serious labour troubles . . . coupled with keen increasing competition on the part of other concerns. . . . Contracts amounting to over \$100,000 were secured by the directors but had to be abandoned due to a series of strikes . . . which rendered their fulfillment impossible."¹⁰⁹ Two years later the board of directors were still refusing to hire union labour but lamented that, "owing to the difficulty of finding qualified workmen for this branch, the output was limited and the retail store in consequence did not handle the

105. The asterisked figure seems to be the result of a reporting anomaly; see Table 6 for explanation and sources.

106. For comparative wages for 1900-1915, see Canada, Department of Labour, *Wages and Hours of Labour in Canada, 1901-1920*, Report No. 1 (Ottawa, 1921), and Canada, Board of Inquiry into Cost of Living, *Report of the Board* (Ottawa, 1915), 1: 558-90. Earlier data is available from the annual reports of the immigration agents in Canada. *Sessional Papers*, 1891. M.C. Urquhart and K.A.H. Buckley, *Historical Statistics of Canada* (Toronto, 1965) provide some general comparisons for 1887-89, and the decennial censuses provide average income per worker estimates.

107. They also initiated a "Buy Local" campaign but this was somewhat counteracted by a union sponsored boycott of Albion products; PABC, O'Reilly Papers.

108. Minute Books of the Victoria Lodge (191) of the Brotherhood of Boilermakers, Iron Ship Builders of America, 10 Dec. 1901; 1 Jan. and 11 Feb. 1902; held at the offices of Lodge 191, Esquimalt Road, Victoria B.C. and PABC, O'Reilly Papers.

109. Albion Iron Works, Annual Report, 1901, in *ibid*.

business they might have."¹¹⁰ By 1904 the Bank of Commerce was calling on the directors to make good their personal guarantees of the thirty thousand dollar overdraft, but the company struggled on to 1907, when fire destroyed the boilerworks and the company confined its operations to making stoves.¹¹¹ Nor was Albion alone in its attempts to avoid paying union rates. At least one of its British Columbia competitors, Vancouver Engineering Works, refused to recognize the union and brought in strikebreakers from Seattle in March of 1904.¹¹²

Table 12
Value Added Per Dollar of Wages in the
Boiler and Engine Industry for the Census Years 1880-1911

	British Columbia	Ontario	Canada
1880-81	1.36	1.59	1.75
1890-91	* 2.50 ¹¹³	2.32	1.90
1900	1.47	1.59	1.54
1910	1.70	1.61	2.08

Altman, however, has recently argued that higher wages need not be a handicap to a firm's or economy's competitiveness if they are a reward for higher productivity.¹¹⁴ Table 11 suggests that British Columbia labourers were in fact more productive than their eastern counterparts and this may account for some part of the wage premium paid in British Columbia.¹¹⁵ In the 1880s, foundrymen in California claimed that their moderate climate meant that "men do more work in a day" than in the eastern United States and if true this relationship would presumably hold comparing British Columbia to eastern Canada.¹¹⁶

110. Albion Iron Works, Annual Report, 1901, in *ibid.*

111. In 1928 the company was sold to a New Brunswick firm and became the Enamel and Heating Plate Factory; see City of Victoria Archives, clipping file.

112. *Industrial Canada* (July 1904): 587.

113. The asterisked figure seems to be the result of a reporting anomaly; see Table 6 for explanation and sources.

114. Altman, "Economic Development with High Wages"; R.C. Allen, "Trade Unions and the B.C. Economy," *Restraining the Economy* (Vancouver, 1986), 225-53, also makes this point.

115. Studying wages in 1951, Messerschmidt concluded that British Columbia workers were 27 per cent more productive than the Canadian average and this accounted for some of the wage premium they were paid. F.R. Messerschmidt, "British Columbia's Regional Wage Advantage," MA diss. University of Washington, 1959.

116. In 1882 California foundry workers' wages were roughly 35 per cent higher than in the eastern United States. Despite the higher productivity "there is still a large percentage in favour of Eastern manufacturers on the score of wages"; Hittell, *The commerce and industries of the Pacific coast*, 654.

Table 12 is an attempt to evaluate whether or not the rewards to labour were greater than their higher productivity would suggest. By expressing value added per dollar of wage labour Table 12 shows that labour was paid more than its higher productivity taken alone would warrant. Wages definitely ate into the profitability of British Columbia firms. What accounts for the high costs of labour?

McDonald and Allen argue that there were chronic labour shortages in British Columbia until the First World War.¹¹⁷ In other words, while the CPR merged the continental capital and product markets, it did not integrate the labour market. *Moody's*, "The National Investor Magazine," estimated in 1913 that British Columbia manufacturers had to pay a premium of between 20 and 30 per cent to labourers on top of what their eastern competitors paid, "owing to the well organized condition of labour."¹¹⁸ Persistent labour shortages would have enhanced both the bargaining power of labour and its ability to organize¹¹⁹ and thus reinforce labour's ability to capture some of the economic surplus (rent) from the rich British Columbia resources. Allen argues that the resources were rich enough to produce economic rent above and beyond a normal profit and this was split between capital and labour in the resource and construction industries. Copithorne suggests that the high wages in the resource industries would also spill over to their local backward linkages, specifically the metal fabricating (boiler and engine making) sector.¹²⁰ If the labour market were not fully integrated into the national market, then, as long as labour was able to capture part of the resource rent in the resource industries, the manufacturing industries would have to compete for the same labourers and offer comparable wages.¹²¹

117. R.A.J. McDonald, "Working Class Vancouver, 1886-1914: Urbanism and Class in British Columbia," *B.C. Studies* 69/70 (Spring/Summer 1986): 48; Allen, "Past, Present and Future," 14-15.

118. He also suggested that eastern producers had savings on coal and power (although this appears not to be the case) as well as economies of scale, and notes the discriminatory effect of freight rates against British Columbia manufacturers. Swift, "Industrial Future of British Columbia," *Moody's Magazine*, 483-90. Other evidence suggests that the British Columbia wage scale was much higher than in the neighbouring United States and than in British shipyards; see Paul H. Douglas, *Real Wages and the United States, 1890-1926* (Boston and New York, 1930); Hamilton, *Western Shores*, 156-57.

119. Radicalism, militantism, and collective action on the part of labour in British Columbia have been attributed by different scholars to cultural and social factors as well as the unstable nature of the production process in the resource industries; D.J. Bercuson, "Labour Radicalism and the Western Industrial Frontier, 1897-1919," 451-73 and Stuart Jamieson, "Regional Factors in Industrial Conflict: The Case of British Columbia," 500-14, both in *British Columbia: Historical Readings*.

120. Allen, "B.C. Past, Present and Future," 25-27; Copithorne, *A Neo-classical Perspective*, 40-44.

121. This approach contrasts with the fixed-factor approach taken by Chambers and Gordon and others which assumes that it will be the manufacturing sector, not the resource sector, that sets the wage rate; see Chambers and Gordon, "Primary Products and Economic Growth."

A higher cost of living in British Columbia also bid up wages but price indices that allow us to compare the cost of living in British Columbia to the rest of Canada exist only from 1900. Comparing standard food budget indices compiled by the department of Labour, British Columbia food costs were the highest in the country. Taking all localities of population of ten thousand or more in Ontario and British Columbia and comparing the prices of thirty-six food items, British Columbia prices were 37.8 per cent higher than Ontario's in 1900, 36.6 per cent higher in 1905, and 43.9 per cent higher in 1910.¹²²

From census, wage, and price data it appears that labourers in the British Columbia boiler and engine industry were better paid than their counterparts elsewhere in Canada and that the higher wages posed a major disadvantage for British Columbia manufacturers. Once established, a high wage regime encouraged the specialization in capital-intensive, high-productivity industries which reinforced the wage structure.¹²³

SCALE OF PRODUCTION

One of the arguments frequently used to explain British Columbia's failure to sustain a secondary manufacturing sector is that the market was too limited.¹²⁴ This argument relies on the existence of economies of scale which a single firm servicing a regional market cannot achieve. The main problem with this line of argument is that British Columbia coastal manufacturers were geographically much closer to the Kootenays, the Klondike, and the expanding prairie west than their Ontario competitors. The decade 1900-10 witnessed the "wheat boom" based on the growth of the Prairie market, which, it has been argued, was one of the primary causes of the westward movement of Canadian manufacturing from the Maritimes to Ontario.¹²⁵ Moreover, the upturn in Canadian economic activity in 1896 generally attributed to the wheat boom was, until 1901, a product of the Klondike, on which British Columbia was ideally situated to capitalize.¹²⁶ As is evident in the case of the boiler and engine industry, market size was, however, a result of how freight rates were structured. Were there economies of scale that the freight-rate structure or other limitations on market size prevented British Columbia manufacturers from obtaining?

Economies of scale are difficult to measure and we often rely on a *post hoc* reasoning to establish their existence. The evidence that does exist from contemporary San Francisco foundries suggests that, while there were economies of scale in production, they were not as significant as the wage-rate differential.¹²⁷ The literature on

122. Board of Inquiry into Cost of Living, *Report of the Board*, 142, 199, 218 and 474-78.

123. Messerschmidt, "British Columbia's Regional Wage Advantage," 67.

124. Allen, "B.C. Past, Present and Future," 31-32; Shearer, "The Economy of British Columbia"; McCann, "Urban Growth in a Staple Economy"; McDonald, "Economic Development of B.C.," 379; Fred W. Field, *Capital Investment in Canada*, 3rd ed. (Montreal, 1914), 134-35.

125. Clow, "The Maritime Challenge," 117 and 135; Inwood, "Economic Growth and Structural Change," 22.

126. Pomfret, *Economic Development of Canada*, 157.

127. Hittell, *The commerce and industries of the Pacific coast*, 658.

whether or not economies of scale were a factor in the Canadian centralizing process is mixed, but those who claim that there were economies of scale estimate them to be quite small.¹²⁸ What are probably the most important "returns to scale" are the nonpecuniary ones which are nearly impossible to measure. Larger markets imply larger turnover, more cash flow, more employees, and more widely dispersed ownership. The result was that large eastern firms probably had more leverage negotiating freight-rate concessions, more influence with different levels of government, and other more prosaic benefits such as flexibility to diversify, the ability to weather price wars and to adopt national strategies, and more power to deal with labour.

Presuming that there were some economies of scale in this industry in this era, these "economies" have to be understood in their social and historic context. Previous to the arrival of the CPR and integration into the national market, one of the boiler and engine makers in British Columbia, Albion, was already one of the largest and best-equipped factories of its kind on the west coast of North America.¹²⁹ Tariff barriers prevented the firm from expanding in the growing markets south of the border. After the arrival of the railway, freight rates prevented British Columbia firms from expanding into the Kootenays and the Prairies, much less entering the national market. The national market was large enough to sustain dozens of boiler and engine makers. Freight rates determined which firms could have access to that market.

PRODUCT DIFFERENTIATION

Finally, a question which requires more consideration is whether or not British Columbia manufacturers and their competitors were really producing identical products. In the Maritimes it has been argued that changing technology shifted demand away from regional resources and linked industries such as shipbuilding, and the economy was unable to make the transition to the new technologies.¹³⁰ It is clear from the ship registries that steam boilers and engines, equivalent to those being imported from Ontario, were being produced in British Columbia.¹³¹ After 1900 it was American,

128. Dales, Caves, and Holton, and Chambers and Gordon, for example, discount the importance of economies of scale while Caves and Inwood give support to its importance. Dales, "National Policy Myths. . ."; R. Caves and R. Holton, *The Canadian Economy: Prospect and Retrospect* (Cambridge, Mass., 1959), 175; E. Chambers and D. Gordon, "Primary Products and Economic Growth," 315-32; R. Caves, "Export Led Growth and the New Economic History," in *Trade, Balance of Payments and Growth*, eds. J. Bhagwati et al (New York, 1971), 403-42; Inwood, "Economic Growth and Structural Change," 22-23.

129. R.T. Williams, *William's British Columbia Directory, 1892* (Victoria, 1892), 410; *The British Columbia Directory for the years 1882-83* (Victoria, 1882), 16; Hittell, *The commerce and industries of the Pacific coast*, 664.

130. Saunders provides a good example; see his *Economic History of the Maritime Provinces*.

131. This was also the case with ship hulls. While many of the imported vessels were steel-hulled, British Columbia shipyards had been building steel-hulled ships since 1891. Twenty-nine iron or steel vessels, or 10 per cent of the total iron/steel tonnage registered in British Columbia, were built by locally owned firms in British Columbia; the largest among these prior to 1915 was the Princess Maquinna, at 1777 tons; see Sager, "The Shipping Industry of British Columbia," 17.

and predominantly eastern American, firms that took an increasing share (see Figure 5) of the engine market and these were almost exclusively gas engines, a new technology. The ship registries show, however, that both British Columbia and Ontario producers manufactured gas engines equivalent to those that were imported, based on measurements of bore, stroke, and horsepower. As with the case of Ontario firms displacing British Columbia manufacturers, it appears that corporate linkages and (perhaps more critical in this case) wage rates outweighed the tariff and gave American firms advantages over eastern Canadians in servicing this burgeoning market.¹³²

While the early decline of the British Columbia manufacturers' share of the ship-boiler market was also a result of eastern Canadian incursions, the later decline came at the hands of predominantly Scottish producers (see Figure 4). Quality, reputation for quality, and marketing techniques may differentiate products as much as features internal to the product and in the early 1900s the Scottish shipyards and founders had developed a good reputation. The boiler data allows us to test for one, admittedly crude, measure of quality, if we assume that lower-quality manufacturers will have a greater percentage of their boilers fail inspection or explode. Reports of the boiler inspectors show no correlation between manufacturer and failure although more sophisticated tests need to be done.¹³³ The reasons for the British penetration of the ship-boiler market, in addition to a reputation for quality on behalf of Scottish firms, appear to be similar to those that allowed eastern Canadian manufacturers access. The increasing profile of the Scottish-financed shipping company, the Union Steamship Company, on the west coast affected overall purchase patterns. This company bought its ships, and hence its engines, exclusively from Scotland. Large purchases by the CPR, which in the post-1900 period exhibited a changing preference towards buying British instead of eastern Canadian goods, also affected the market. Also important is the fact that wage rates and material costs in Scotland, at least by the end of the period, were much cheaper than in British Columbia.¹³⁴ The evidence suggests that the most important change in the British Columbia manufacturing sector was not the technology but ownership. British Columbia firms met the requirements of the Columbia and Kootenay Steam Navigation Company, the Canadian Pacific Steam Navigation

132. Canadian firms were capable of producing the same engines, according to the ship registry information cited earlier, and *Industrial Canada* (June 1905): 720. As noted earlier, preferential freight rates accorded American shippers offset tariff protection; for the American advantage in wage rates, see Swift, "Industrial Future of British Columbia," 483-90. Patent regulations may have been another contributing factor.

133. PABC, GR806, Steamboat Inspector Reports; "Report of the Chief Inspector of Machinery," in British Columbia, *Sessional Papers*, 1902-15; for the Scottish reputation for quality, see Turner, *Sternwheelers and Steam Tugs*.

134. Hamilton, *Western Shores*, 156-57.

Company, and the E&N Steamship Company until these were bought by the CPR and after that point the linkages were transferred out of British Columbia.¹³⁵

SIBILANT SOUNDS OF ESCAPING STEAM...

The boiler and engine case study confirms that, in this industry at least, the transference of manufacturing from British Columbia to central Canada was occurring alongside a movement of manufacturing to the United States and Great Britain. The data forces us to shift the focus of the centralization debate. The deindustrialization of British Columbia was a regional manifestation of the process by which Canadian manufacturing production became *centralized* in southern Ontario, itself part of a global centralization of manufacturing in a few locations such as the northeastern United States and Britain. The orthodox staple approach focusses on the physical characteristics of natural-resource products. It is assumed *post hoc* that staples have weak linkages to manufacturing, especially to the capital-goods sector, and thus staples fail to generate the multiplier effects that would bring in a manufacturing labour force, stimulate consumer demand, and allow manufacturing thresholds to be reached.¹³⁶ The boiler and engine data, however, force the debate away from the question of the characteristics of the staple — clearly they had linkages to the manufacturing sector — to an examination of where those linkages would be located and why.

The focus on production relationships directs attention to other components of the production process that are as crucial as the technical requirements of production and that require more detailed study: the role of the state in setting tariff and transport policies and the legislative constraints on the organization of capital and labour; social-cultural factors which influence entrepreneurial skill, the mobility of capital and labour, labour collectivity, and class identity; and the role of ideology as it defines the interaction of labour, capital, and the state.

Within the limits of this present study, however, three parts of the process appear to have determined the pattern of the boiler and engine industry in British Columbia. First, British Columbia products were more expensive to make due to high labour costs. High wage rates in British Columbia testify to high labour productivity, a higher cost of living, the relative richness of the natural resource base, labour shortages, and the consequent high degree of labour's collective activity. Paradoxically, high local labour incomes, which ought to have created a local consumer market, adversely affected the ability of

135. In the specialty market for mining, canning, and lumbering machinery the technology and the products were more differentiated. Increasingly boilers and engines were purchased as part of a larger parcel of specialized machinery. British Columbia manufacturers, including Albion Iron Works, Letson & Burpee, and Murray Latta participated in this process of specialization and were responsible for patenting machinery specific to the logging and salmon-canning industry; see *The Resources of British Columbia* 1:10 (December 1883): 42; Stacey, *Sockeye and Tinplate*; Letson & Burpee, *Construction and Use of Automatic Canning Machinery for Can Making and Filled Cans* (Vancouver, 1902); University of British Columbia Special Collections, M462, Murray Latta Machine Co. Mss.

136. Pomfret, *Economic History of Canada*, 33-39; Inwood, "Economic Growth and Structural Change," 10.

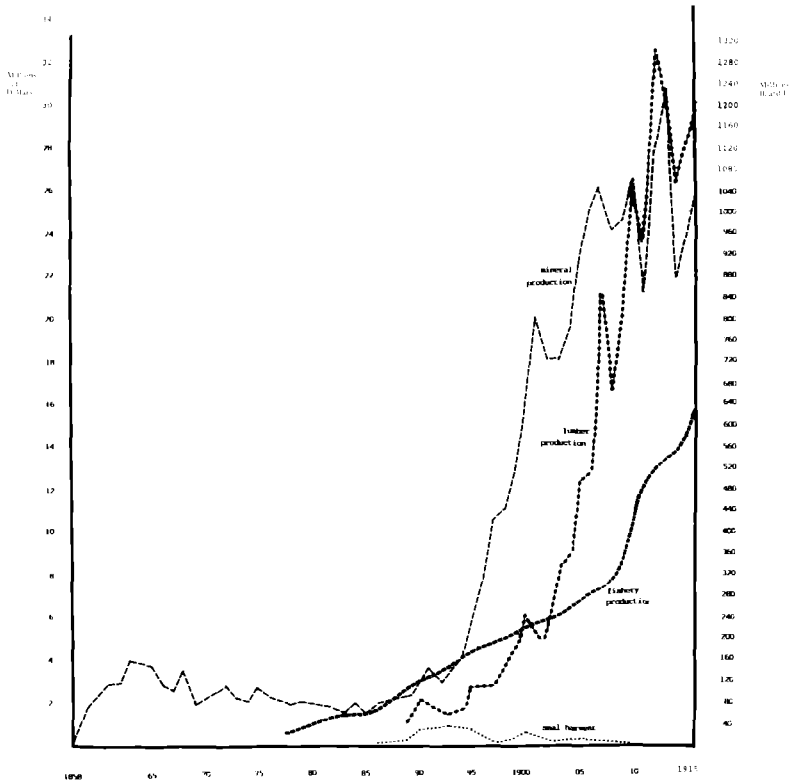
the British Columbia secondary sector to compete in continental markets. Ironically, the success of the resource industries, and not their failure, contributed to the decline of the secondary sector.

Labour costs, though, are only part of the answer and do not account for the timing of the deindustrialization. From Tables 10, 11, and 12, we know that high wages limited the profitability of the British Columbia boiler and engine industry even prior to the 1881 census; yet it is not until after 1885 that the relative decline begins. The relative decline of the industry dates from the arrival of the Canadian Pacific Railway in 1885, an event which tied the high wage economy to the continental market. The CPR also redrew the commercial map of Canada. It reduced the time it took eastern manufacturers to service this market and it established a rate structure that prevented British Columbia manufacturers access to the markets of the interior of their own province and those of the Prairies.

The final factor is the importance of ownership in determining where intersectoral linkages will be realized. The British Columbia secondary manufacturing sector declined, not because capital was too expensive or not available in British Columbia, but partly because that capital, and the resources it could command, were owned elsewhere. The physical location of the ownership of British Columbia's resource, transportation, and manufacturing industries directed where interindustry linkages would be located. As the economy was increasingly owned by nonlocal capitalists in the late 1890s the demand for British Columbia products was further reduced. Coupled with the preexisting low profitability, this ultimately contributed to the absolute decline of the industry.

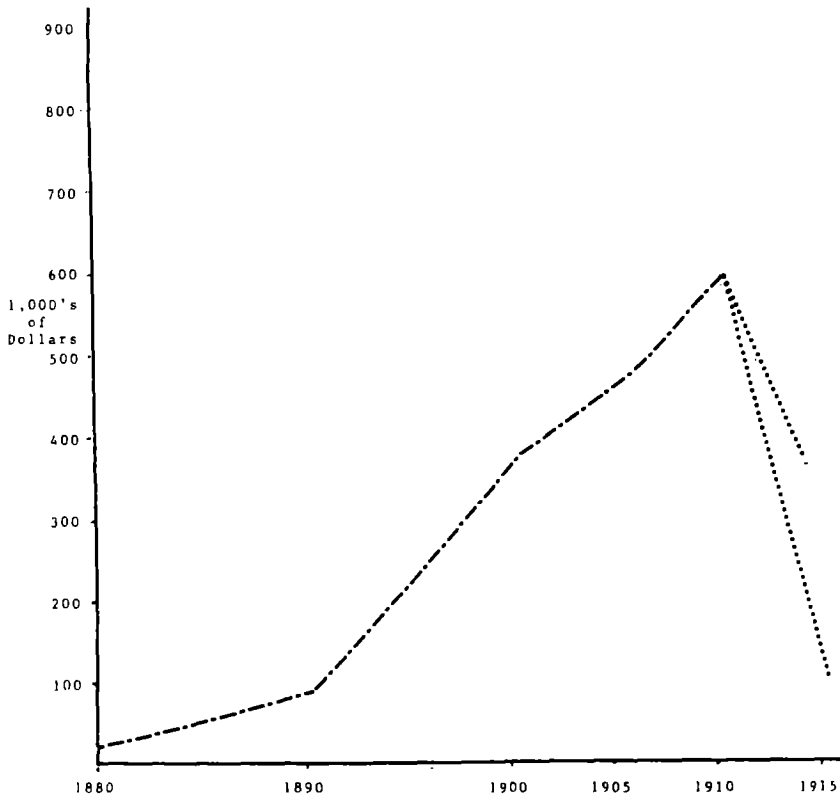
While prior to the turn of the century the resource sector was linked to local manufacturers by the demand for boilers and engines, thereafter these linkages were increasingly appropriated by Ontario, American, and British manufacturers. Even while the British Columbia resource sector was steaming ahead, the boiler and engine makers of British Columbia lost the "race for dear life against swift winged time."

Figure 1
Primary Production in British Columbia 1858-1915
(Mining, Fishing, and Sealing Production in Dollars
Lumber Production in Board Feet)



Sources: Lumber figures exclude wood cut from the Dominion or Esquimalt and Nanaimo Railway lands. A system of charging royalties on timber cut was first introduced in British Columbia in 1888 and prior to that there are few reliable estimates of the timber harvest. Totals for years 1889 to 1903 from "Timber Inspector's Report" or "Forestry Inspector's Report" in "Report of the Chief Commissioner of Lands and Works." *Sessional Papers, 1890-1904*. From 1903 to 1910 figures are obtained from R.E. Gosnell, *The Yearbook of British Columbia and Manual of Provincial Information 1911, 1914* (Victoria, 1914), 250; James D. Lacey and Co., *Important Facts Regarding B.C. Tidewater Timber* (New York, 1918), 1-11; fishing figures are a four-year moving average calculated from Economic Council of British Columbia, *Statistics of Industry in British Columbia, 1871-1914* (Victoria, 1935), Table FG1; figures for mining from "Annual Report of the Minister of Mines." *Sessional Papers, 1916*, K-14. Figures for sealing are from Canada. Department of Marine and Fisheries, "Annual Reports," compiled in D.G. Patterson and J. Wilen, "Depletion and Diplomacy: The North Pacific Seal Hunt, 1886-1910," *Research in Economic History* 2:81, 139.

Figure 2
Production of Boilers/Engines in Thousands of Current Dollars



Note:

Prior to 1905 a firm with several categories of output filed a return for each category. Apparently after 1905 each firm only filed one return. As there were less than three firms in this industry in 1915, the individual industry figures were not published. The figures given here for 1915 are estimates derived from subtracting the known output of boiler and engine manufacturing firms in Ontario, Quebec, and Nova Scotia from Canadian 1915 totals. The production listed here under 1915 (1) is the remaining national total which was comprised of the output of one firm each from British Columbia, Manitoba, and Prince Edward Island. As such it is the theoretical and practical maximum that would be accounted for by the British Columbia firm if the firms in Manitoba and Prince Edward Island had zero output. The production opposite 1915(2) is probably much closer to the actual British Columbia production and is the sum of the production of the British Columbia, Manitoba, and Prince Edward Island firms divided by three. Using either estimate it is clear that production in this industry fell by at least 40 per cent and probably closer to 80 per cent in the five year between 1910 and 1915.

For discussion about the reliability of the figures for 1890-91 see Table 6.

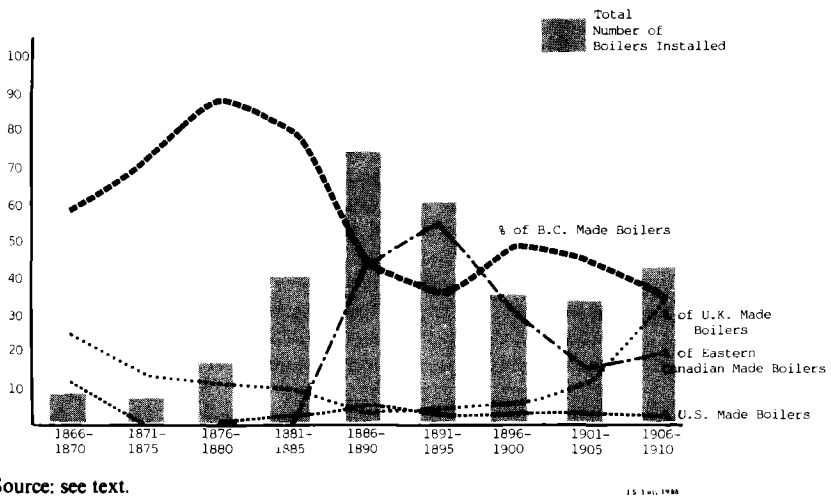
Source: Canada, *Census*, 1881, vol. III; 1891, vol. III; 1901, vol. III; 1911, vol. III; Bulletin II, 1907, vii ff., and the Postal Census of Manufactures, 1916.

Figure 3
Percentage Share of the British Columbia Boiler and Engine
Market Held by B.C. Manufacturers, Five Year Intervals
1860-1915



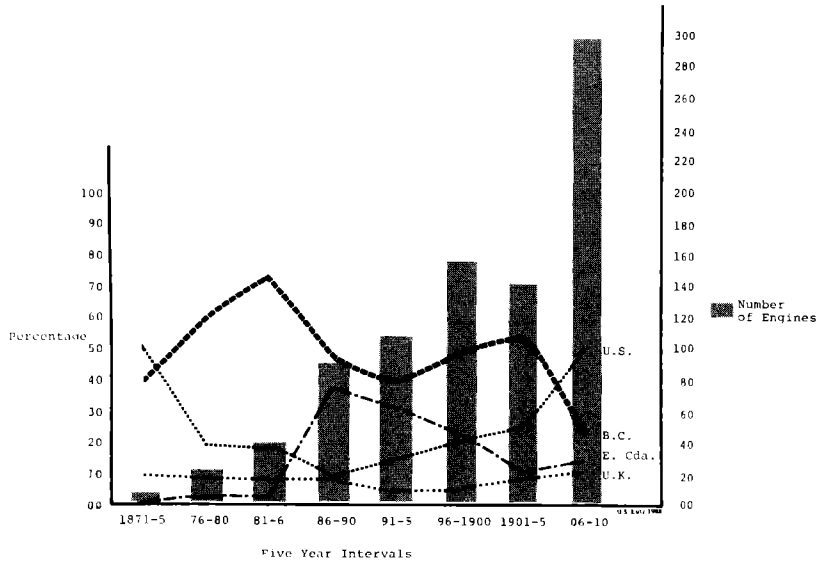
Source: see text.

Figure 4
Total Number of Boilers Installed in Ships Built in British Columbia
and Market Share by Place of Manufacture, Five Year Intervals,
1866-1910



Source: see text.

Figure 5
Percentage Share of Engines Installed in Ships Built
and Registered in British Columbia
Registered Ships by Place of Manufacture, Five Year Intervals,
1871-1910



Source: see text.

Figure 6
Number of Stationary Boilers Installed in British Columbia
by Place of Manufacture, 1902-1912

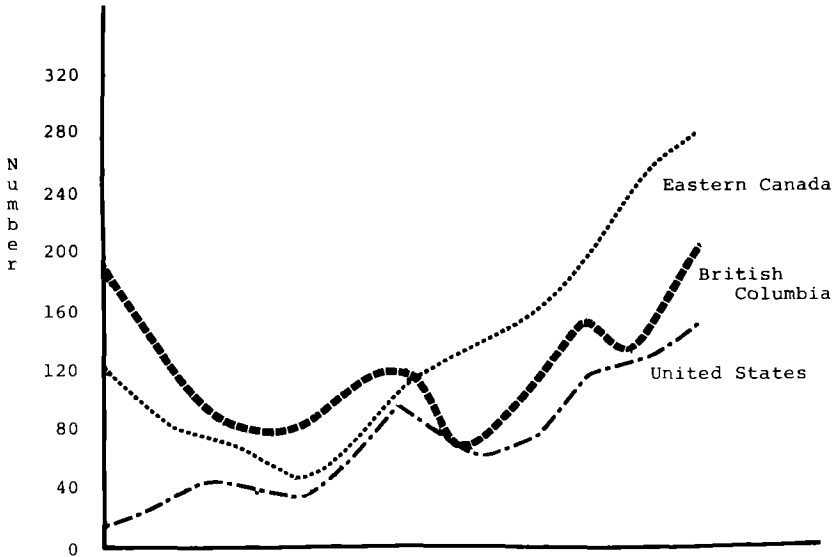
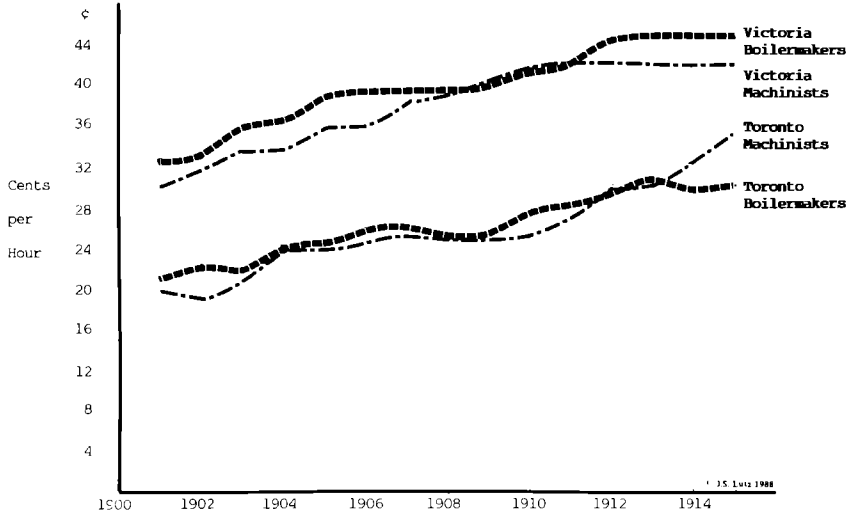


Figure 7
British Columbia Made Stationary Boilers as a Percentage of
Stationary Boilers Installed in British Columbia, 1902-1912



Source: "Report of the Inspector of Machinery," British Columbia, *Sessional Papers*.

Figure 8
Hourly Wages of Boiler Makers and Machinists,
Victoria and Toronto, 1901-1915



Source: Canada. Department of Labour, *Wages and Hours of Labour in Canada, 1901-1920*, Report No. 1 (Ottawa, 1921).