THE UNIVERSITY OF MANITOBA

THE CANADIAN BASE METAL MINING INDUSTRY (NON-FERROUS) AND ITS IMPACT ON ECONOMIC DEVELOPMENT IN CANADA, 1918-55

by

ALEXANDER C. DOW

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ABSTRACT

Mining in Canada has been perceived as a prime source of Canadian economic development in the twentieth century. Yet Canada has failed to achieve industrial diversification around a mining base such that autonomous economic development could proceed in the absence of successive extractive staples. The purpose of this thesis is to provide an explanation for this failure with respect to the non-ferrous base metals, especially nickel, copper, lead and zinc. Thus the thesis is a contribution to the economic history of Canadian mining.

The theoretical concepts employed in pursuing the analysis are those of the staple theory, of linkages and of economic rent.

The staple theory has been Canada's original contribution to the world of economic ideas. The observations of Harold Innis and others in the 1930's led to an understanding that the nature of natural resource based industry differed from that of other industrial sectors, so that a country heavily dependent upon the export of natural resources would tend to develop in ways shaped by the staple. Within the sphere of extractive industry it is the inevitability of exhaustion at any one location which gives a particular flavour to the political economy of the staple.

Linkages analysis serves to render some of the insights of

the staple theory more precise. One of the theoretical advances of development economics, the technique, systematised by Albert Hirschman, is one of a family ranging from Myrdal's spread/backwash effects at the qualitative level to Leontief's input/output methods at the quantitative level. The unifying characteristic of this set of techniques is that they are concerned with the impact of one part of an economy on other parts of the economy. The concept of linkages is sufficiently precise to allow an assessment of developmental impact while not requiring unavailable data.

Economic rent involves the identification of a sort of economic surplus. Ricardian economic rent, as used in this thesis, appears in the long run. The sum of the Ricardian economic rents attaching to a particular extractive resource over time is viewed as a valuation of that resource's worth to the economy. The concept of economic rent proves to be insightful in the context of an analysis of the Canadian mining industry, though no attempt at quantification is made.

This thesis finds that private enterprise, unsupervised by the state, has failed to realise some linkages warranted by the richness of Canadian ore bodies and that, by leaving Ricardian economic rent in private hands, much of the economic surplus created has escaped the Canadian economy or has been used inefficiently within the mining industry. In short Canadian economic development based on extractive industry, to the extent that non-ferrous base metals are typical, has been impeded by a view of property rights and a pattern of ownership inimical to the full achievement of the economy's development potential.

In the course of the study attention is paid to the sources of finance of the major base metal mining companies in Canada from 1918 to 1955. Over the same period the small extent of the taxation of mining enterprise is also demonstrated.

ALEXANDER C. DOW

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INTRODUCTION

Exhaustible natural resources possess unique features as sources for economic development. In exhaustion the economic activity deriving from their production ends. For the locale the end of production may mean the end of prosperity. In the South Pacific the republic of Nauru negotiates with Australia for another island to which to evacuate when the phosphate, which is the sole product of the economy, exhausts in the 1980's.

Of course, a larger jurisdiction may be fortunate enough to contain several exhaustible resources and to discover new ones as the earlier cease to produce. For Canada this has been the situation in the twentieth century. Gold and silver, the base metals and the mineral fuels have overlapped and are again being supplemented by the non-metallic minerals of potash and uranium.

Dependence on natural resources in situ, which are exported in relatively unprocessed form, is the normal mark of a staples economy. The sort of development which occurs will depend in large part upon the staple. If the staple is derived from an exhaustible resource the economy created will not be the same as with older, renewable natural resources such as fur, timber or wheat. The mode of production will be different and the class tensions arising from it will be different also.

In Canada extractive resources have been the basis of

industries of a thoroughly capitalist sort. A labor force has been organised on a wage basis and subjected to industrial discipline. The spirit of enterprise has governed the pace and direction of exploitation of these staple exports. Profits have been the source of incentive and the key to expansion.

Unfortunately for Canada private enterprise, unsupervised, is unlikely to maximise social welfare over time if a significant part of the economy depends upon extractive industry. In the absence of futures markets to give signs as to future prices this conclusion is indicated even for the "ideal case" of perfect competition in a closed economy. In the world of staple exports, industry specific capital, dividend remissions abroad and transfer pricing the conclusion is unshakeable. Free private enterprise does not offer the best economic system by which society may secure the benefits of extractive industry. Canada would have benefitted more had the Canadian state been prepared to intervene by taxation or by direct production to secure the surplus from extractive industry and to re-direct it into the economy in the form of manufacturing capital. That this did not happen, explicable as it is in cultural and ideological terms, calls spectres to mind of deserted regions: of Cornwall, once rich in tin, dependent now on its natural beauty as a last natural resource to draw tourists for economic survival, of Nauru as an immense deserted shell and of the Yukon after the goldrush. For Canada these spectres are too stark, for some benefit there has been from extractive industry here. However, the losses have been quite as real. To understand this is to comprehend the weakness of

extractive industry as the twentieth century staple on which Canada's prosperity has depended.

In this Introduction I set out in general terms the perspective which guides this thesis. In what follows I seek to substantiate, for non-ferrous base metal mining, what is asserted here. The chapters contribute as follows.

In reviewing the literature in Chapter I it becomes clear that comparatively little academic research has been undertaken on the development of base metal mining in Canada. Indeed, there has been no attempt for many years to relate the experience of base metal mining in the twentieth century to the wider themes which illuminate the sweep of Canada's economic history.

The theoretical basis for the thesis is presented in the second and third chapters. Chapter II provides a definition of economic development and explains how the concept of linkages can assist a staples analysis. The first of two guiding hypotheses is introduced in the final paragraphs. Chapter III considers the various sorts of economic rent, indicating with which this thesis is concerned. It is shown that a modified rent model is applicable to Canadian mining. Finally the second of the two guiding hypotheses is introduced.

Entitled "An Outline History of the Industry" Chapter IV first sketches the expansion of mining as a whole then, after considering two main data sources, describes in detail the experience of copper, nickel, lead and zinc from 1918-55. Next the importance of technological advance is stressed in a consideration of demand and supply changes. In a final section the structure of the

industry is described as it existed throughout this period.

The economic linkages typically created by non-ferrous base metal mining in Canada are considered in Chapter V. It is suggested that the promotion of mining itself came to have an importance for policy makers in government, eager for frontier development, greater than would have been best advised. Briefly the likely balance of payments impact of the industry is also delineated.

The ownership pattern of Canadian extractive industries is important for understanding what has happened to economic rents. Initially in Chapter VI the facts as to foreign ownership are established. The bulk of the chapter examines in detail the experience of the important base metal mining companies, posing the question whether increased foreign ownership resulted from a need for foreign financing in general, and for U.S. entrepreneurship in particular.

Chapter VII demonstrates that in the absence of royalties, the tax system collected virtually no economic rent in normal times from base metal mining in Canada. The legislative basis of taxation is described and data are introduced to show how little rent was paid by mining firms.

The final chapter, Chapter VIII, presents my conclusions, and integrates them into some differing interpretations of Canada's economic history in the twentieth century.

The contribution of this thesis has several aspects, as described above, but the most important, I believe, is to study an area previously neglected. The extractive resources of Canada have been, and continue to be, too significant for the economy in the twentieth century to be ignored by Canadian economic historians.

CHAPTER I

A SURVEY OF THE LITERATURE

Economic historians have done little research on base metal mining in Canada. If the following survey of relevant literature seems remarkably lacking in interpretive works, this is but an indication of a general lacuna, which becomes even more evident when attention is restricted to non-ferrous base metals.[1] Of course there are many books and articles dealing with Canadian mining from other perspectives. Geology, and the technical aspects of the mining industry's progress, are relatively well documented. So too are the more romantic events encountered in the discovery and mining of precious metals, especially gold.[2] However, the economic implications of extractive industry in general, and the economic history of, in particular, non-ferrous base metal mining has been decidedly neglected.[3]

The publications mentioned in this survey, historical works and contemporary accounts, do not serve to provide a thorough historical perspective on an important industry. The positive developmental impact of extractive industry, an assumption scored deep into the Canadian consciousness, has rarely been subjected to vigorous intellectual scrutiny. Instead writers laud the romantic figure of the rugged prospector and dwell on the epic theme of man overcoming nature. What good minerals extraction has done for Canada is a question seldom posed and never rigorously answered.

Interpretive History: Innis and Nelles

This intellectual void is the more surprising in that Harold Innis, the doyen of Canadian social science, wrote in the 1930s on mining and economic development; analysing the characteristics of mining in terms of the staple theory with which he sought to explain Canada's economic development.[4] Yet even Innis published only one monograph and two article-length pieces dealing directly with mining in Canada, and his emphasis tended to rest in these treatments rather on the precious metals than on base metals.[5] Partly this was because Innis wrote on this subject in the 1930s. Non-ferrous base metals had yet to attain the prominence they came to possess in later years, both in terms of their contribution to the national income and to exports.[6]

Harold Innis' monograph was published in 1936 as part of the Macmillan series entitled Canadian Frontiers of Settlement, the general editors of which were W. A. Mackintosh and W. L. G. Joeng.[7] In his brief forward to Settlement and the Forest and Mining Frontier (a study on the Forest Frontier by A. R. M. Lower was bound in the same volume) it is demonstrated by Mackintosh that the economic problem of extractive industry was recognised at this time.

In discussing settlement associated with forestry and mining Mackintosh observes as follows:

"Such settlement is likely to be temporary and leave in its wake those serious social and economic problems associated with shrinking incomes, declining population and abandoned homes, unless during the period of exploitation there have been built up subsidiary industries, capable ultimately of independent existence. The exploiting industries build up subsidiary developments not only in their immediate neighbourhood but also throughout the whole country."8

Yet Innis was at his most ambiguous in this monograph. At one point in his discussion of the Klondike / gold rush he writes that:

"The geographical limitations of the Yukon from the standpoint of subsidiary and diversified development and the general character of that development brought out sharply the essential characteristics of placer mining and of the mining industry generally in pioneer communities, namely, the terrific drive towards the development of industrial growth."9

This was Innis' basic attitude to base as well as precious metal mining. It emerges most strongly in his conclusion to Settlement and the Mining Frontier and, significant in revealing his essential views, in that published work in which he refers in passing to the economic effects of mining.[10] But in the monograph the inevitable qualification appears in the Yukon chapters:

"There remains a vast shell of equipment in terms of buildings, transport facilities, and mining equipment. Empty houses in Dawson, engines formerly on the Klondike Mines Railway and now locked in the roundhouse, abandoned saw-mills - these are indications that the economic cyclone has spent its force. The problems of the Yukon are the problems of all mining camps but focused in a clearer light."11

In his examination of the effects of mining in the Kootenay area of B.C., Innis' position becomes clearer. Base metal mining is deemed responsible for the geographical spread of the transportation system. Population is attracted by the industry's labour demands increasing the scope for agricultural production along the transportation links. Eventually a locally specialised agriculture (e.g. the fruit farming of eastern B.C.) may expand from serving a local market to exporting via the rail network. Goods demanded by the mines are shipped in by a railway eager for traffic to spread the vast overhead costs of construction. After mine exhaustion new extractive resources are developed by the mining (and smelting) organisations which have taken over from the earlier, entrepreneurial miners.

Innis does not face up to the question of why mining will on occasion bequeath a viable industrial and agricultural base and, elsewhere, leave only the shell of exhausted workings and a derelict ghost town. The stimulus of spreading overhead costs is given the

credit for successful outcomes without pause to explain its failure in other circumstances. Overall, Innis' treatment of mining as a staple must be judged the least satisfactory of the various staple products he examined throughout his career. Yet, nonetheless, it is seminal.

Innis focuses attention on the major factors bearing upon the development of mining in Canada. He views transportation as a prerequisite to economic development; and mining provided the financial returns to pay, at least in part, for the heavy fixed costs of the rail links which were the major means of transportation. He has a geographer's conception of power sources as a magnet for industrial activities. Mining demands for hydro-electric power again acted as a prime motive for the construction of expensive infrastructure. The demand for labour attracts a population which is molasses-like in its adherence to the subsidiary economic activities of an area after the initial source of employment disappears. The population does not merely "take in its own washing" but creates inward rail traffic in food and manufactures from along the lines. Mining itself generates a year-round outward traffic in concentrates or smelter matte (useful in contrast to wheat's seasonality) and provides a steady demand for industrial inputs such as explosives and chemicals produced in the Canadian urban centres. The perceived need to encourage mining has involved government in the financing and subsidising of railway construction which would otherwise never have come into existence.

Two factors, however, receive scant attention. The U.S. presence in Canadian base metal mining is merely acknowledged and the extent to which the industry became capital-intensive is noted, but not pursued in its implications for reduced population attraction and increased specialised imports from abroad. Since

the Innis of the '20s and'30s had not yet become suspicious of the U.S. influence on Canada and since the trend towards ever greater capital intensity was only then beginning, his omission is understandable. Unfortunately these two neglected factors are important in the subsequent growth of non-ferrous base metal mining in Canada and in its effect on the Canadian economy and society. Thus, Harold Innis is to be regarded as the guiding light, rather than the pilot, in charting the economic impact on Canada of non-ferrous base metal mining from the Great War to the 1950s.

The follow-through on Innis' conception of Canadian development has been insubstantial as far as mining is concerned. Directly in the staples theory tradition, however, is the work of H. V. Nelles, whose The Politics of Development was published in 1974.[12] The focus of this book is on the political economy of the development of three staples in Ontario from 1849-1941. These are the forest and mineral staples and hydro-electric energy. Nelles is especially interested in why the state chose to intervene in the production of hydro power but merely regulated lightly the forest and mining staples. The thesis he proposes is that the Ontario provincial authority was enrolled by Ontario business interests to provide a natural monopoly product, electrical energy, at near cost. Otherwise the province adopted in its public utterances a laissez-faire philosophy, while often acting as the spokesman for mining and forest interests to the Canadian government. Nelles' assessment is as follows:

> "The province received substantial revenue from the development process and enjoyed the appearance of control over it, while industrialists used the government - as had the nineteenth century commercial classes before - to provide key services at public expense, promote and protect vested interests, and confer the status of law on private decisions."13

Nelles' book puts flesh on one element in the staple theory for one province. He demonstrates vividly the role assumed by the state in supporting production and marketing of the staple product, only with the twist that it is the provincial representatives of the crown who are shown to settle into a role supportive of the staple. (Of course, natural resources fall within the provincial jurisdiction according to the B.N.A. Act). Interestingly Nelles indicates that both politicians and businessmen sought to maximise the degree of manufacturing that took place in Canada before the shipment of the staples abroad. Few details are given by Nelles on revenue collection from mining other than to suggest that it was exceptionally favourable to the industry by world standards in the early 1930's.[14]

Within his chosen bounds Nelles' book is innovative and valuable. It is unique in its meticulous examination of new Canadian staple products in the framework of Innis' staple theory. It is perspicacious in its posing of key questions concerning the relations of the province and the staple producers. Nelles, working in the tradition of the pure narrative historian, has illuminated successfully a corner of Canada's economic history.

Industrial Organisation: Main on I.N.C.O.

From the mainstream economic tradition has emerged one outstanding work on Canadian non-ferrous base metals. O. W. Main's The Canadian Nickel Industry is a work in industrial organisation with the International Nickel Company (I.N.C.O.) at Sudbury as its pivot.[15] This book is a Canadian classic in revealing the behaviour over the years to 1953 of a monopoly producer of a natural resource with unique properties. Described by its author as "the study of one monopoly in its historical setting" the book is not directly

concerned with the developmental impact of the metal industry. However, for such a study it furnishes a valuable source.

Companies

Information can be obtained from company histories. These range from public relations exercises to stinging attacks. For the Years to Come by John F. Thomson (with Norman Beasley) is an example of the former.[16] Thomson, recently retired, lauded I.N.C.O.'s achievements after having served for a decade as Chairman of the Board. D. M. LeBourdais' The Sudbury Basin is a responsible account of the Sudbury area's growth with some emphasis on The Falconbridge Nickel Company which sponsored the work.[17] No analytical insights emerge from this work. A hostile account of the same company's growth and business practice is Falconbridge by John Deverell.[18] The second and third chapters provide some interesting information of a gossipy sort on the exploitation of nickel in Ontario in the early decades of this century. However, Deverell relies heavily on Main for historical materials in what is essentially a contemporary analysis directed at a general audience. Noranda by Leslie Roberts is a friendly history of the company written in a narrative style.[19] Though promoted by I.N.C.O., The Winning of Nickel by J. R. Boldt and Paul Queneau is a most useful textbook describing the evolution of mining methods and the advance of metallurgy relevant to nickel.[20] It aspires to be, as its publishers claim, a comprehensive review of the industrial methods used in nickel recovery.

Descriptive Works

From time to time there have appeared works descriptive of Canadian mining in some broad manner from which reliable information

on non-ferrous base metals can be gleaned. Pre-eminent among these is T. W. Gibson's Mining in Ontario published in 1937 by the Province of Ontario's Department of Mines.[21] Gibson was for many years deputy minister of mines in Ontario and served on The Royal Ontario Nickel Commission which reported in 1917. His history of mining in Ontario reflects an encyclopaedic knowledge of the business, acquired through a lifetime of government employment in which he observed the industry's growth. Only one chapter is devoted to nickel and copper and only a few pages of that are relevant to the post-1918 period. Even those, however, are of some interest as they deal with I.N.C.O.'s corporate strategy in the 1920's and provide some essential facts about the mineral deposits in the Sudbury area (ore content, further processing characteristics, etc.) Brief mention should also be made of T. W. Gibson's earlier more specialised work, The Mining Laws of Ontario, which outlined the evolution and rationale of the body of Ontario law relevant to the mining industry and sketched the changing role and structure of the Department of Mines.[22]

At the factual level there are three further books to consider, only the first of which was written as history. The self-avowed aim of D. M. LeBourdais in Metals and Men was to present an account of the discovery and early development of Canadian mines ignoring, for the most part, further processing. The style is that of a detailed narrative without analytic pretensions. Non-ferrous base metals figure prominently. Much broader in scope is G. B. Langford's Out of the Earth, the distillation of the knowledge dispensed by a variety of lecturers during a "series of popular lectures on the Canadian mineral industry delivered under the auspices of the Department of University Extension, University of Toronto."[23]

Short chapters are devoted to mining and metallurgical methods, financing a mining company and the interaction of government with the mining industry. Composed for a general audience the book has little information that is specific to non-ferrous base metals. The Mineral Resources of Canada by E. S. Moore is a puzzling work in that, after a first chapter which seems about to establish an analytic framework facing up to the inevitable exhaustion of mineral bodies, all that ensues is a factual litany of the extent and geological characteristics of the known mineral deposits in Canada as of 1928.[24] While reviewing informative secondary sources there should be mentioned a brief article by J. Graeme Watson entitled "Mining Finance in Canada", a contribution to Canadian Investment and Foreign Exchange Problems edited by J. F. Parkinson. The Watson article is a rare attempt to analyse the sources of capital tapped by the mining industry in Canada.

Influence of the U.S.A.

In this survey it has been judged appropriate to include a selection of works, not written as economic history, but capable or providing relevant insights or information to the economic historian. On this basis it is proper to refer to a few publications which are concerned with the U.S. role in Canadian mining.

The pioneer study in examining the inter-relationship of U.S. and Canadian industry was H. Marshall, F. A. Southard and K. W. Taylor's Canadian-American Industry - A Study in International Investment, published in 1936.[25] As part of the Carnegie-sponsored series The Relations of Canada and the United States, which paralleled the Canadian Frontiers of Settlement series, it is worthy of note that both Harold Innis and Jacob Viner were charged as editors with the planning and oversight of this volume.

The first half of the study is concerned with the penetration of U.S. capital into Canadian commerce. Industry by industry the facts are exposed as to the extent, regional pattern and chronology of U.S. capital investment. No qualms are expressed at the importance of the phenomenon revealed.

In their investigation the authors consider briefly individual companies such as I.N.C.O., Hudson Bay Mining and Smelting, Granby Consolidated Mining, Smelting and Power (Anyox mine, B.C.) and the Howe Sound Company (Britannia Beach mine, B.C.) A mass of useful research findings is presented, classified by non-ferrous metals in many instances. Unfortunately precious metal production was included by them in this category. Their view of the rate of return earned by U.S. capital in the Canadian mining industry was that it was not excessive. They did not consider the possibility of transfer pricing, now known to be the bane of inter-country corporate analysis of the type they were initiating.

E. S. Moore's American Influence in Canadian Mining addresses directly the topic of the U.S. role in Canadian mining.[26] In constrast to his 1933 tome the author deals in his book with economic as well as technical matters. Moore comes to no conclusion, but does provide a useful primary analysis of where and when American capital had entered into the Canadian mining industry as of 1941.

Moore's is still the only published work concentrating on this topic. Like the previously mentioned study this book was part of The Relations of Canada and the United States series.

American Capital and Canadian Resources by Hugh Aitken is an analytical work centred on broad issues which are very relevant to non-ferrous base metal production.[27] Aitken concludes that:

"The dominant motive for American direct investment in the Canadian resource industries is the desire to secure access to raw materials that are either not available, or available only at higher real costs, in the United States."28

These natural resources, moreover, have commanded a market because of the technology of "the new industrialism" (the term is used by Innis) which requires certain metallic minerals, fuel (including hydro power) and newsprint in ready supply. Thus the demand for Canadian extractive resources is tied to the mode of production of modern capitalism. With the nature of the demand determined thus it becomes inevitable that risk-avoiding U.S. corporate interests will seek security of supply by obtaining control of, and transferring capital into, the Canadian resource sector. The prospect of profit is viewed rather as one necessary condition for this investment than as a sufficient explanation of what is, in fact, a complex decision process.

It is in the U.S. that the technological impetus arises. So, for example, in mining "the machine drill, the selective flotation process.... the cyanidation process, and a whole variety of milling, hoisting and excavating devices, most of them originating in the United States, were crucial to the successful exploitation of Canada's ore deposits."[29] From this spillover of technology as a means of extraction (as distinct from determining the nature of demand), and from the apparent entrepreneurial enthusiasm and ready capital of the major U.S. resource producers, Aitken deduces that U.S. involvement in the Canadian resource sector has been an important dynamic element. A considerable impetus has ensued to economic growth in Canada. Assuming an inexorable desire for such growth, it is Aitken's opinion that the development of these trends will contribute to an ever greater economic integration of the Canadian and U.S. economies.

The analysis provided by Aitken is provocative and challenging. However, it asserts rather than substantiates the view that Canada's economic growth has been aided greatly by U.S. resource investment. Aitken does not consider whether the time pattern of production may have been distorted towards earlier output by a pattern of preferences Canadian in neither their consumer or producer aspects. His view of economic growth seems to be the narrow one focusing on Gross Domestic Product, and certainly ignoring the "asset depletion" inherent in utilising non-renewable natural resources. It would seem moreover that an impressive framework of analysis has been constructed on a rather limited data base, despite a useful Appendix integrating Dominion Bureau of Statistics and U.S. Department of Commerce data. More detailed work has to be undertaken before Aitken's hypotheses can be either proved or disproved.

Finally in considering relevant works on U.S. - Canadian relations mention should be made of Hugh Aitken et alia, The American Economic Impact on Canada.[30] In his contribution to this volume, "The Structure of the Canadian Economy", Hugh Aitken writes briefly about the building of the Port Colborne nickel refinery during the First World War, attributing this decision of I.N.C.O. to the development of the electrolytic refining method (requiring cheap hydro power) rather than the very considerable political pressure applied to the corporation. No evidence is adduced for this remarkable judgement.

Royal Commissions

This survey concludes with several Royal Commissions which have dealt with mining or aspects of it. The reports and

commissioned research of these inquiries represent a major source of information on matters related to the mining of nickel, copper, lead and zinc in Canada.

The Report of the Royal Ontario Nickel Commission was a landmark in the development of the nickel industry in Ontario.[31] When published in 1917 it had by its deliberations already prompted I.N.C.O. to initiate construction of the Port Colborne refinery.[32] Indeed it has been argued by H. V. Nelles that the conservative nature of the Commission's conclusions acted to protect I.N.C.O. from a much greater degree of government involvement at that time.[33]

For many years I.N.C.O. had been refusing to build refining facilities in Canada in the face of mounting public pressure, arguing that to do so would be uneconomic. Threats were issued that production could be switched from Sudbury ores to New Caledonia ores.[34] During the war public indignation was roused when small quantities of Canadian nickel reached Germany by way of the United States, doubtless to be used against British and Canadian troops.[35] Had not the Report recommended so strongly against public involvement in nickel production, provincial ownership of the Sudbury production facilities might have resulted.

The evident thoroughness of the Report, which then lent weight to its advice, now makes the 500 pages of the text and the 200 pages of the Appendix an important source of information on the nickel industry in that period. The investigation included technology, taxation, production costs and company histories. As Sudbury was always a copper producing area too, the material refers to both nickel and copper.

In complete contrast the Report of the Royal Ontario Mining Commission, issued in 1944, was full of recommendations but

short of data.[36] A major emphasis was that the tax burden on the mining industry should be reduced to encourage exploration and development, and that a greater proportion of the taxes levied on mining should accrue to the province at the expense of the Dominion government. It is apparent from the text that the Commissioners viewed the mining industry in Ontario with considerable cordiality. Following on the Report the Dominion government did effect some reductions of the tax liability of mining companies.[37]

The Final Report of the Royal Commission on Canada's Economic Prospects (1957) devotes only some 20 pages to "Mining and Mineral Processing", but these are of considerable interest.[38] First, a new note is struck in public by the conclusion that:

> "as the industry grows, stablises and matures, it may well be unnecessary to accord it special treatment through subsidies and tax concessions in excess of those extended to many other Canadian industries."39

Second, the Report's discussion is based on a well-researched background study by John Davis which was published in 1957 as Mining and Mineral Processing in Canada.[40] This valuable review of the economic aspects of the mineral industry in Canada exhibits an informed historical sense. The study is replete with information on the development of non-ferrous base metal production in Canada, and is enhanced by an analytical approach to the economic effects of the industry.

In 1966 the Royal Commission on Taxation published its six volume Report. In Volume 4, Part C, all of Chapter 23 was devoted to the taxation of "Mining and Petroleum". The Commission concluded that, in the light of their other proposals on the taxation of business, the special tax concessions enjoyed by the mining and petroleum industries should be abolished. In particular,

"percentage depletion and the three year exemption for new mines are extremely costly in terms of revenue, and the available evidence suggests that these concessions are inefficient (i.e., that they have a relatively small effect on mineral and petroleum exploration and production per dollar of tax revenue foregone)."[42]

In thus condemning the traditional philosophy of taxing extractive industry in Canada the Commission relied on two background documents. These were The Taxation of Mineral Extraction by M. W. Bucovetsky and Taxation of the Mining Industry in Canada by D. Y. Timbrell.[43] In their analysis both studies contain some useful allusions to past practices. Timbrell includes sections which trace the mining tax provisions (as of 1964) back to the occasion of their incorporation into Canadian law.

Much of the material included in this survey is not of itself economic history. As the commentary has tried to emphasise, many of these works had other orientations. The only self-confessed economic historian to have examined non-ferrous base metal mining in Canada was Harold Innis. Even his contribution, though suggestive, fell well short of a comprehensive treatment. In any event the industry was changing fundamentally even as he studied it.

There is no published economic history of the mineral industry in Canada. Likewise there is no book which attempts a history of non-ferrous base metal mining. It is not the objective of this thesis to fill this gap. The intent is rather to address for the non-ferrous case one particular question, which should figure prominently in any economic history of mining in Canada.

How has the Canadian economy benefited from the mining and processing of Canadian ores? The particular case of non-ferrous base metal mining is one important element in the transient structure that is Canadian mining. The methods chosen to grapple with this question are explained in detail in Chapters II and III which follow.

FOOTNOTES

1. Extractive industry is in large part mineral mining, which is arranged by convention into several categories. These are a) Mineral Fuels b) Metallic Minerals and c) Non-Metallic Minerals. The category of metallic minerals is separated into base metals and precious metals. Finally base metals are subdivided into ferrous and non-ferrous. The main non-ferrous base metals in Canada are nickel, copper, lead and zinc. These share a similar technology of extraction, separation and further processing and are also alike in the normally advanced technology, or prestige consumer, uses to which they are directed. It is with these four metals, and their derivatives, that this thesis is concerned. (Extractive industry always exploits non-renewable resources)
2. See for a detailed bibliography, W. George Richardson, A Survey of Canadian Mining History (The Canadian Institute of Mining and Metallurgy, Special Volume 14, 1974).

3. In the first publication of the Centre for Resource Studies at Queen's University the same opinion is expressed. See R. M. Burns, Conflict and its Resolution in the Administration of Mineral Resources in Canada (Kingston: Centre for Resource Studies, Queen's University, 1976).

4. The staple theory is considered in detail in Chapter II of this thesis.

5. Harold A. Innis, Settlement and the Mining Frontier (Toronto: Macmillan, 1936); "The Canadian Mining Industry", in the posthumously published Essays in Canadian Economic History (University of Toronto Press, 1956). This essay was first published as a forewardto E. S. Moore, American Influence in Canadian Mining (University of Toronto Press, 1941); "Mining", Encyclopaedia of Canada, Vol. III (1936).

6. Substantiation of this observation can be found in John Davis, Mining and Mineral Processing in Canada, (Royal Commission on Canada's Economic Prospects, 1957) pp. 313-23.

7. Donald Creighton ties the conception of this series to an emerging unity of purpose in the 1930s among Canadian economists, historians and political scientists. Part of that purpose was to explain for the first time Canada's economic situation, an intention (since fragmented) which goes far to explain the meaning of those who still refer with respect to the "Innis tradition" in Canadian political economy. See Donald Creighton, Harold Innis - Portrait of a Scholar (University of Toronto Press, 1957) p. 78.

8. W. A. Mackintosh, "Foreword" in Harold Innis and A. R. M. Lower, Settlement and the Forest and Mining Frontiers (Toronto: Macmillan, 1936).

9. Harold Innis, Settlement and the Mining Frontier, p. 261.

10. See, for instance, Harold A. Innis, "The Hudson Bay Railway", The Geographical Review, Vol. XX, No. 1, (1930) pp. 16-30. The Fur Trade in Canada (Yale University Press, 1930). Revised edition (University of Toronto Press, 1970) pp. 399-402. H. A. Innis and A. W. Plumptre, The Canadian Economy and its Problems (Toronto: Canadian Institute of International Affairs, 1934) pp. 20-1.

11. Harold Innis, Settlement and the Mining Frontier, p. 267.

12. H. V. Nelles, The Politics of Development (Forests, Mines and Hydro-Electric Power in Ontario, 1849-1941) (Toronto: Macmillan, 1974). References are to the paperback edition (1975).

13. Ibid, p. IX.

14. Ibid. Most relevant are pp. 307-10, 326-385, 348-361, 427-43, 489-91.

15. O. W. Main, The Canadian Nickel Industry, a Study in Market Control and Public Policy (University of Toronto Press, 1955).

16. John F. Thomson (with Norman Beasley), For The Years to Come - A Story of the InternationalNickel Company of Canada (Toronto: Longman, Green and Co., 1960).

17. D. M. LeBourdais, The Sudbury Basin (Toronto: Ryerson Press, 1953).

18. John Deverell, Falconbridge (Toronto: James Lorimer, 1975).

19. Leslie Roberts, Noranda (Toronto: Clarke, Irwin and Co., 1956).

20. J. R. Boldt and Paul Queneau, The Winning of Nickel (Toronto: Longmans, 1967).

21. T. W. Gibson, Mining in Ontario (Toronto: Province of Ontario, Dept. of Mines, 1937).

22. T. W. Gibson, The Mining Laws of Ontario, and the Department of Mines (Toronto: Province of Ontario, Dept. of Mines, 1933).

23. G. B. Langford, Out of the Earth - the Mineral Industry in Canada (University of Toronto Press, 1954).

24. E. S. Moore, The Mineral Resources of Canada (Toronto: The Ryerson Press, 1933).

25. H. Marshall, F. A. Southard and K. W. Taylor, Canadian-American Industry: a Study in International Investment (New York: Russell and Russell, 1936).

26. E. S. Moore, American Influence in Canadian Mining (University of Toronto Press, 1941).

27. Hugh G. J. Aitken, American Capital and Canadian Resources (Cambridge: Harvard University Press, 1961).

28. Ibid, p. 85.

29. Ibid, p. 101.

30. Hugh G. J. Aitken et al, The American Economic Impact on Canada (Durham, N.C.: Duke University Press, 1959).

31. Royal Ontario Nickel Commission, Report (Toronto: King's Printer, 1917).

32. See, T. W. Gibson, Mining in Ontario, p.96.

33. H. V. Nelles, op.cit., pp. 359-60.

34. See, Royal Ontario Nickel Commission, op. cit., p.19.

35. Even those close to I.N.C.O. now admit that some nickel from Canada did reach Germany. It is explicit in the commentary in J. F. Thomson (with N. Beasley), op. cit., p.168.

36. Royal Ontario Mining Commission, Report (Toronto: King's Printer, 1944).

37. See, D. Y. Timbrell, Taxation of the Mining Industry in Canada (Royal Commission on Taxation, Study No. 9, 1964) pp. 140-2.

38. Royal Commission on Canada's Economic Prospects, Final Report (1957) (Ottawa: Queen's Printer, 1958) (The Gordon Commission)

39. Ibid, p. 229.

40. John Davis, Mining and Mineral Processing in Canada (Royal Commission on Canada's Economic Prospects, 1957).

41. Canada, Royal Commission on Taxation, Report (1966), Vol. IV, (Ottawa: The Queen's Printer, 1967) (The Carter Commission)

42. Ibid, p. 297.

43. M. W. Bucovetsky, The Taxation of Mineral Extraction (Royal Commission on Taxation, Study No. 8, 1964).
D. Y. Timbrell, Taxation of the Mining Industry in Canada (Royal Commission on Taxation, Study No. 9, 1964).

CHAPTER II

ECONOMIC DEVELOPMENT, LINKAGES ANALYSIS AND THE STAPLE THEORY

The Meaning of Economic Development

Economic development can be an amorphous concept. Indeed a crystalline definition is hardly possible, given the structural and normative connotations of the term. Different strategies for inducing economic advance and varying judgements as to the proper goals for an economy render the meanings of economic development as multifarious as the convictions of economists.[1] "Economic development" contrasts with the relatively incisive sense conveyed by "economic growth".[2]

Nevertheless the more important concept is economic development. To it is closely tied the general well-being of society. Economic growth is the production of more goods and services over time, normally with the values of external diseconomies excluded. More pollution, more congestion and ever less fulfilling manual labour might be the concomitants of economic growth, but measures of gross output or per capita income would encompass no adjustments for these details.

Some growth is a necessary condition for economic development to occur. Progress in the human condition is made

possible by the provision of a greater supply of goods and services. Economic development means the raising of per capita income (and consumption), with an ensuing expansion of the possibilities for civilisation. Improved nutrition, sound housing, better health standards, wider educational opportunity, more leisure and a broad cultural enrichment may result from income growth, either as a direct outcome of increased production (e.g. more food) or, if basic needs are satisfied more economically, from the freeing of resources for higher purposes.

It is a major purpose of this thesis to assess the extent and nature of the economic development promoted in Canada by the exploitation of nickel, copper, lead and zinc. Evidently this is to embark on what is, in some respects at least, a qualitative enterprise.

As a lodestone there is required a relatively hard-edged definition of economic development.[3] Some simplification is needed which will, with the minimum of distortion, reflect the economic complexities of development in a few clear principles. These criteria should be explicit and should have some degree of general acceptability. In short they should not be constructed in such a way that the outcome of the investigation is pre-determined.[4]

Economic growth has already been identified as a pre-requisite of economic development. It is a further condition that such economic growth be based on a mode of production which, being self-generating, is not inherently subject to retrogression. In a modern, industrial economy real capital formation permits this continuity.

In another sense economic development is self-sustaining in that it creates a flexible economy able to respond to the constant ebb and flow of economic advantage. By this criterion the "one

crop" economy has experienced no real economic development until its earnings are used to diversify into a more broadly based structure of production. A developed economy commands the resources adequate to preserve its economic integrity if faced by shifts in demand or new trading circumstances in the international sphere, or if internal changes alter the production mix (e.g., resource exhaustion) or the desired institutional organisation of production.

There exist in all societies various levels of economic collective, usually parallelled by political and administrative structures. For Canada a threefold division would be the nation, the province and the rural area or township. Economic development imposes the further condition on economic growth that these several levels of economic collective should share in the income created. Similarly the various socio-economic groups in society should all benefit to a degree from increased output. If economic growth enriches only the few or only one small geographical area, then there is but small economic development. This is not only a moral judgement, but a recognition that a cumulating demand requires a broadly based increase in disposable income and that a flexible economy is based on a complex inter-regional network of economic institutions.[5]

Finally it is a condition of economic development that increased output should either increase domestic consumption immediately, or should give the promise, via greater investment, of higher domestic consumption in the future. Thus it is to either the satisfaction or to the enrichment of residents of the

Canadian economy that economic growth must contribute, if it is to be considered as Canadian economic development.[6]

These criteria are used to judge developmental impact in this thesis. They are here summarized.

Economic development takes place when there occur all of the following:

1. An increase in real, per capita income.
2. Limited external diseconomies.
3. A self-regenerating production process.
4. A diversified economy.
5. Inter-regional economic stimuli.
6. A broadly based distribution of income gains.
7. The benefits from production flowing in the main to domestic consumers.

These criteria reflect the qualitative nature of economic development. It is with the aid of the concepts of linkages and economic rent that the question can be handled as to whether non-ferrous, base metal mining in Canada has actually contributed to such economic development. The first of these tools is now introduced in the context of the staple theory.

Linkages and the Staple Theory

The utility of combining linkages analysis with the staple theory is in the added precision the former affords the latter.[7] The danger of such a graft is that the richness and breadth of the staples explanation may be reduced to a mechanistic growth model.[8] A middle course is attempted here.

One of the theoretical advances of development economics in its post-World War II expansion has been linkages analysis. This

is one of a family of techniques in modern economics ranging from Myrdal's spread/backwash effects at the qualitative level to Leontief's input/output methods at the quantitative level. The unifying characteristic of this set of techniques is that they are concerned with the impact of activities in one part of an economy (a production process, an industry, etc.) on other parts of the same economy. The concept of linkages is sufficiently precise to allow an assessment of developmental impact while not requiring unavailable data.

The elaboration of linkages as distinct theoretical constructs was first undertaken by Albert Hirschman. In 1958 he published The Strategy of Economic Development in which he defined forward linkage effects and backward linkage effects. His purpose was to search for developmental mechanisms "that tend to maximise induced investment decisions".[9]

Backward linkages exist in industries whose input requirements increase significantly with output. Satisfying such derived demands internally leads to induced economic growth. Input requirements are visualised as both materials and services; and their provision may be discrete, in the shape of costly fixed capital goods, or continuous, in the form of raw materials, energy or other supplies which vary with output levels.

Into the former category fall machine tools industry and infrastructure industries such as transportation and power supply. Often the latter category will include a number of satellite industries whose principal output is a minor input of the master industry. Motel accommodation in an isolated mining township is an example of such a dependent relationship.

As with other linkage concepts a backward linkage is both a stimulus and an opportunity. It is a potential which may be realised, rather than an accomplished fact. A demand is created in the satisfaction of which a profit seems likely to be made, or a level of use is projected sufficient to justify the state's support for the provision of social infrastructure. The concept has the great merit of focusing directly on the behavioural mechanisms by which economic growth and development occurs in a mixed, capitalist economy.

Forward linkages are defined for industries the output of which does not all go directly to satisfy final demands. It is suggested that the availability of intermediate goods - e.g., blister copper or copper wiring - will induce attempts to make use of the product in some manner. This might happen because of a transport cost advantage, especially if further processing involves substantial weight or volume reductions. To encourage such development is a major purpose of protective tariffs.

Linkage effects can be viewed as varying along two scales, the first a probability-based range from weak to strong and the second an output-based range from little to much. A "strong" linkage is one that is very likely to occur while an "important" linkage is one which will affect other output substantially if it does occur.[10] It is clear that a weak linkage, if of a sort already in existence, may cumulate with others to a larger scale. Thus a new industry demanding chemical agents may have limited needs which, however, when added to the needs of existing industries, are sufficient to induce formation of a domestic chemicals industry. Industries supplying such broadly based demand are particularly appropriate to a process of rounded economic development.

Following Hirschman's terminology subsequent writers have identified final demand linkages as an additional phenomenon.[11] The concept focuses on the extra purchasing power created by payments to an industry's factors of production, or, to be more precise, to their owners. Labour in particular obtains from employment the ability to purchase final goods and services which will have an important linkage effect spreading throughout the entire economy. The retail trade in town and city is obviously highly dependent on such linkages.

In the short run with unused resources available to expand output the final demand linkage amounts to the familiar income multiplier of macroeconomic theory. But from the point of view of economic development it is the long run which is important. Only in the absence of substantial unused capacity will new investment likely be encouraged in consumer goods industries and distribution networks. Thus the potential identified by the final demand linkage concept is different to that of the income multiplier. It involves longer time horizons and decisions rendered more complex by "the dark forces of time and ignorance which envelop our future".[12]

A broadening of the economic base of a nation may occur by means of economic agents embarking on linkage-induced investment. Banks, the media, fuel suppliers, retail stores and service centres are but some of the business forms attracted to a thriving economic centre. More far flung effects influence transportation provision, the planning of utilities and the workload of government bureaucracies. Manufactures find a market in the demand of the labour force created by a new or expanded mining or smelting operation. The form of the institutional reaction is determined by forces beyond the simple linkages framework. Family farms growing wheat and

cotton plantations each create linkages which generate domestic growth in the former case and which escape the region of settlement in the latter.[13] The insights given by the staple theory in explaining such divergences go beyond the linkages approach to form a political economy of economic development in dependent, natural resource rich economies.

It is possible to distinguish several variants of the Innis staple theory in much the same way that many distinctive macroeconomic models can be specified in the Keynesian theoretical tradition. Since the staple approach was implicit rather than explicit in Innis' work, there can occur needless dispute over what Innis "really" meant. In the following passages I outline the main features of a staple theory in the Innis tradition; I leave to others an evaluation of its pedigree.

The staples theory is about the development of society under an economic regime of dependent capitalism, where dependency results from concentration on the export of a few relatively unprocessed, staple products. One aspect of the staples thesis is a model of economic growth suited to economies rich in natural resources, but without an advanced industrial base.[14] The other aspect is an attempt to identify the social relations flowing from the particular mode of production suited to the natural resource in which the dependent economy is rich.[15] Together, the roots of staple development, and the social structure emanating from the organisation of the staple, explain the tensions and the potential of a maturing staples economy.

Both social relations and the growth pattern are determined within a framework formed of lingering institutions and habits of thought created in the heyday of past staples.[16]

Institutions, designed in the past, wield influence long after outward circumstances change.[17] Transformation of these institutional relics may be traumatic. Consider the opinion of the mature Innis:

"Concentration on the production of staples for export to more highly industrialised areas in Europe and later in the United States has broad implications for the Canadian economic, political and social structure. Each staple in its turn left its stamp, and the shift to new staples invariably produced periods of crises in which adjustments in the old structure were painfully made and a new pattern created in relation to a new staple."18

In the Innis version of the staples approach considerable attention is directed towards the physical characteristics of the particular staple product under consideration. The Fur Trade in Canada has as its first chapter a short description of the beaver and its typical locale, commencing with this passage:

"The history of Canada has been profoundly influenced by the habits of an animal which very fittingly occupies a prominent place on her coat of arms. The beaver was of dominant importance in the beginnings of the Canadian fur trade. It is impossible to understand the characteristic developments of the trade or of Canadian history without some knowledge of its life and habits."19

These physical attributes not only determine the geography of the staple's production but also influence significantly the economics of the process. In particular they help to determine the form a particular mode of staple production will assume. Will there be small independent producers or a labour force subject to industrial discipline? Will there be large overhead costs or a trade based mainly on working capital?[20] Will the combination of work and expected profit be such as to encourage exploitation by private capital alone or will the intervention of the state be required as a provider of capital or guarantor of a return on sunk capital?

Naturally the qualities of the commodity do not alone

cause the production mode to take the form it does, though they are a prime determinant. Also important are the prevailing technology and the nature of the demand for the exported staple. Most obviously the transportation and other communication elements in the mode of production will be subject to both the current level of technology and the direction from which the demand emanates.

As a theory of economic growth the staples theory can be expressed succinctly by means of the linkages terminology. There exists a metropolitan demand for basic commodities. Typically the staples economy based on such demand exhibits few forward linkages, but engenders substantial backward linkages involving heavy overhead costs. To the extent that income is received by foreign owners of resources and is not taxed domestically final demand linkages will be reduced. Economic development associated with the maturing of a staples economy will involve an increasing contribution by forward and final demand linkages to the diffusion of economic growth. To evaluate the part played by base metal mining in Canada in contributing to such progress is the goal to which this thesis is addressed. The questions posed and the analytical categories selected build on the insights given by the staples theory as described in this chapter.

Hypothesis I

Using the concepts elaborated in this chapter it is possible to introduce the first of the twin hypotheses which it is the central purpose of this thesis to examine. Baldly stated it is as follows:

> That the realised linkages of non-ferrous base metal mining on the basis of private enterprise have been inadequate to promote Canadian economic development to the extent warranted by the potential of the raw ore bodies.

It is proposed to examine this hypothesis in the context of the industry's rapid growth from 1918 to the mid-1950s.[21] The period coincides with the major shift from British Empire to American hegemony to which Canada is an eloquent witness. It is a corollary to the hypothesis that, as Canada languished, others flourished. Thus the possibility will be investigated that the linkages to Canadian staple production were enjoyed increasingly by the U.S.A. as the "new industrialism" came to be centred mainly in that country.

This hypothesis, along with the associated hypothesis to be introduced in Chapter III, provides a lodestar to an economic investigation of poorly charted intellectual waters (See Chapter I). In its form it is scientific in the strictest Popperian sense of being in principle falsifiable. Yet it is not the intention of this author to cloak in positive terminology an analysis which is intended to be normative in the best tradition of political economy. Research is at its most objective when it recognises the all-pervasive nature of subjective considerations.

1. Major texts echo with this evaluation. See, for instance, G. M. Meier, Leading Issues in Economic Development (2nd. ed. rev.; Oxford University Press, 1970)p. 8. A penetrating analysis of this important issue in semantics is given by Gunner Mydral. See, Gunnar Mydral, Asian Drama (Pantheon: New York, 1968) Vol. III, Appendix 1, Appendix 2 (7); Chapter 2 (2).

2. Of course, "economic growth" is also subject to considerable ambiguity. See, Simon Kuznets, "The Meaning and Measurement of Economic Growth", in B. Supple. (ed.), The Experience of Economic Growth (New York: Random House, 1963). J. D. Gould, Economic Growth in History (London: Methuen and Co., 1972), Chapter I.

3. Precision in such matters may be overdone, as Alfred Marshall took care to point out quoting Bagehot as follows:

   "Anyone who tries to express various meanings on complex things with a scanty vocabulary of fastened senses, will find that his style grows combrous without being accurate, that he has to use long periphrases (sic) for common thoughts, and that after all he does not come out right, for he is half the time falling back into the senses which fit the case in hand best, and these are sometimes one, sometimes another, and almost always different from his "hard and fast" sense. In such discussions we should learn to vary our definitions as we want .... and this, though they do not always avow it, is really the practice of the clearest and most effective writers."

   Alfred Marshall, Principles of Economics, ed. C. W. Guillebaud, (Variorum ed.; London: Royal Economic Society, 1961), Vol. I, p. 52.

4. See Gunnar Mydral, op cit., Appendix 2 (7), p. 1867.

   "To define development more precisely than is justified is logically faulty and yields 'persuasive definitions'."

5. It may be that inter-regional institutional connections are exploitative in nature, siphoning off all surplus from periphery to centre. In such circumstances the concept of economic development is overtaken by the still vaguer one of "imperialism". In Canada the work of R. T. Naylor seems to cast the banks in just such an exploitative role with respect to agriculture in particular. See, R. T. Naylor, The History of Canadian Business, 1867-1914, (Toronto: James Lorimer, 1975), Vol. I.

6. An economic activity, which used few domestic factors of production and exported its product, could create an economic enclave generating a high value of output (Gross Domestic Product) but few benefits for domestic customers. See, H. W. Singer, "The Distribution of Gains between Investing and Borrowing Countries", Papers and Proceedings, (American Economic Association, 1950).

7. See, M. H. Watkins, "A Staple Theory of Economic Growth", Canadian Journal of Economics and Political Science, Vol. XXIX, No. 2 (May, 1963). Reprinted in W. T. Easterbrook and M. H. Watkins (eds.), Approaches to Canadian Economic History. (Toronto: McClelland and Stewart, 1967).

8. See M. H. Watkins, "The Staple Theory Revisited", Journal of Canadian Studies, Vol. 12, No. 5 (Winter, 1977).

9. Albert O. Hirschman, The Strategy of Economic Development (New Haven: Yale University Press, 1958).

10. Ibid.

11. See, for instance, Watkins, "A Staple Theory of Economic Growth," loc. cit.

12. J. M. Keynes, The General Theory of Employment, Interest and Money, (London: MacMillan and Co., 1936), p.155.

13. D. C. North, The Economic Growth of the United States, 1790-1860 (Englewood Cliff, N. J.; Prentice Hall, 1961) Chapter I; R. F. Baldwin, "Patterns of Development in Newly Settled Regions", Manchester School (May, 1956).

14. G. W. Bertram, "Economic Growth in Canadian Industry, 1870-1915: The Staple Model and the Take-Off Hypothesis", Canadian Journal of Economics and Political Science, Vol. XXIX, No. 2. Reprinted in Easterbrook and Watkins, op. cit. Edward Vickery, "Exports and North American economic growth: 'Structuralist' and 'Staple' models in historical perspective", The Canadian Journal of Economics (February, 1974).

15. See, Daniel Drache, "Rediscovering Canadian Political Economy", Journal of Canadian Studies, Vol. XI, No. 3 (August, 1976); M. H. Watkins, "The Staple Theory Revisited", op. cit.

16. As is common with Innis' intricate intellectual tapestry a précis misses qualifications which broaden the analysis. The institutions and habits of thought of a staples society reflect a variety of influences. For instance "peoples who have become accustomed to the cultural traits of their civilisation - the social heritage - on which they subsist, find it difficult to work out new cultural traits suitable to a new environment". Furthermore "the methods by which the cultural traits of a civilisation may persist with the least possible depreciation involve an appreciable dependence on the peoples of the homeland". H. A. Innis, The Fur Trade in Canada (Yale University Press, 1930). Revised edition (University of Toronto Press, 1970), p. 386.

17. Watkins, "The Staple Theory Revisited," op.cit.; R. T. Naylor, The History of Canadian Business, 1867-1914 (Toronto: James Lorimer and Co., 1975), Vol. II, pp. 278-280.

18. H. A. Innis, Empire and Communications (Oxford University Press, 1950). Reprint (University of Toronto Press, 1972) p.5. (Emphasis added).

19. H. A. Innis, The Fur Trade in Canada, p.3.

20. The term "overhead costs" is used by Innis as an alternative to "fixed costs", but one which carries a much greater connotation of social infrastructure. See, for example, H. A. Innis, "The Canadian Economy and the Depression", in M. Q. Innis (ed.), Essays in Canadian Economic History (University of Toronto Press, 1956).

21. See Chapter IV of this thesis for details.

CHAPTER III

ECONOMIC RENT AND EXTRACTIVE INDUSTRY

The Subjective Concept of Rent

The institution of property is important in all civilised societies; under capitalism a particular form, private property, has come to predominate. The right of individuals and of corporate entities to own private property, and to enjoy the fruits of ownership, became a central tenet of liberal capitalism in the nineteenth century. The great utilitarian philosophers, Jeremy Bentham and John Stuart Mill, helped to shape the concept of property in this way.

Economic analysis of the returns to property requires political economy rather than positive economics. Expressed in the words of C.B. Macpherson:

> "Property is not thought to be a right because it is an enforceable claim: it is an enforceable claim because it is thought to be a human right. This is simply another way of saying that any institution of property requires a justifying theory. The legal right must be grounded in a public belief that it is morally right".[1]

For one particular class of private property, that in land, this moral right has been widely assailed. Henry George, the Fabians and R.H. Tawney condemned in their own way the right of private landowners to enjoy an income stream from their ownership. These are "socialist" views in some sense of the word. However, even liberal theorists, such as John Stuart Mill and Thomas H. Green,

qualified and limited in their writings the rights properly obtaining to private property in land.

Henry George is remembered best in the context of the "single-tax" movement of which he was the inspiration. Yet, for George, the taxing away of the entire return to privately owned land was but the pragmatic way of curtailing the institution of private property in land.[2] He expressed himself in these terms:

> "If there seems anything strange in the idea that all men have equal and unalienable rights to the use of the earth, it is merely that habit can blind us to the most obvious truths ..... Nothing is more repugnant to the natural perceptions of men than that land should be treated as subject to individual ownership, like things produced by labour".[3]

The most important plank for George's attitude was what he called "the law of rent". Writing in his major work, Progress and Poverty, he explained this principle:

> "The law of rent is, in fact, but a deduction from the law of competition, and amounts simply to the assertion that as wages and interest tend to a common level, all that part of the general production of wealth which exceeds what the labour and capital employed could have secured for themselves, if applied to the poorest natural agent in use, will go to landowners in the shape of rent. It rests, in the last analysis, upon the fundamental principle ..... that men will seek to gratify their desires with the least exertion.[4]

Henry George travelled in England periodically from 1883, lecturing and talking with a variety of intellectuals. In Scotland his theories influenced Keir Hardie and thereby the politics of the embryonic Labour Party.[5] However, it was from the thinking of the Fabians, rather than from George directly, that the theory of rent infused in Britain into a particular socialist view of property relations in capitalist societies.

The Fabian Society began in 1884 as a group of friends concerned with social problems. The influence it had came from the

work of a few leading members; in the first two decades George Bernard Shaw, Sidney Webb and Beatrice Webb were prominent.[6] A central element in their economic analysis was a theory of rent as a form of exploitation.[7] In his essay "The Economic Basis of Socialism", published in 1889 in Fabian Essays, George Bernard Shaw elaborated:

> "As we have seen, incomes derived from private property consist partly of economic rent; partly of pensions, also called rent, obtaining by the sub-letting of tenant rights; and partly of a form of rent called interest, obtained by special adaptions of land to production by the application of capital: all these being finally paid out of the difference between the produce of the worker's labour and the price of that labour sold in the open market for wages, salary, fees or profit. The whole, except economic rent, can be added directly to the incomes of the workers by simply discontinuing its exaction from them. Economic rent, arising as it does from variations of fertility or advantages of situation, must always be held as common or social wealth, and used, as the revenue raised by taxation are now used, for public purposes, among which Socialism would make national insurance and the provision of capital matters of the first importance".[8]

Shaw had been powerfully influenced by Henry George during the latter's visit to England in 1882.[9]

The Fabian Society in launching its political attack on the capitalist system used the rent concept for a wide ranging critique of the existing income distribution. However, the private ownership of land, and the private earning of economic rent, was deemed particularly offensive. Though "unearned income" was deplored wherever it arose, the private enjoyment of the return to natural advantages of land, whether advantages of fertility or location, was considered heinous.[10]

Some Fabians proposed a solution. George Bernard Shaw wrote some thirty-five years later:

"When there is a natural difference between the yield of one field and another, or one coal-mine and another, or between the advantages of one building site and another, people will pay more for the better than for the worse; and that extra price is rent. Similarly, when there is a difference between the business ability of one person and another, the price of that difference is rent. You cannot abolish rent, because you cannot abolish the natural difference between one cornfield and another, one coal-field and another, or one person and another; but you can nationalise it by nationalising the land, the mines, and the labour of the country either directly or by national appropriation of their product by taxation, as to which latter method, as we have seen, there are limits".[11]

To recollect the nature of property rights, the ethical basis of Shaw's Fabian approach is obvious. The contentious nature of rent in modern economic discussions is perhaps due to the suspicion with which positive economics, the ruling paradigm, views concepts associated with such a subjective view of the world.

In the work of R.H. Tawney private property in land was denounced quite explicity when it was "functionless". Reward for Tawney was the corollary of service. Reward without service, such as "the right to receive the product of superior sites", was one of the principal foundations of economic privilege.[12] Though Tawney was familiar with the Fabian thinkers his view, based on a Christian socialism, is distinctive.[13] For Tawney puts lucidly the question: does the owner of land perform any service to society for which he deserves reward? This moral principle lies at the heart of the issues concerning economic rent and its distribution.

Tawney makes an important observation:

"All these rights - royalties, ground rents, monopoly profits - are "Property". The criticism most fatal to them is not that of socialists. It is contained in the arguments by which property is usually defended. (Emphasis added). For if the meaning of the institution is to encourage industry by securing that the worker shall receive the produce of his toil, then precisely in proportion as it is important to preserve the property which a man has in the results of his own efforts, is it important to abolish that which he has in the results of the efforts of someone else".[14]

The condemnation by Tawney of functionless property related to more than land ownership; he was equally hostile to capital "which the capitalist cannot himself use but puts at the disposal of those who can".[15] However, his question pointed to a weakness in the liberal justification of property which had required explicit consideration by the liberal theorists. If natural resources are the "free gift of nature", how is their private alienation to be justified if their owners perform no service to society in return?

Tawney recognised a distinction:

> "To the economist rent and interest are distinguished by the fact that the latter, though it is often accompanied by surplus elements which are merged with it in dividends, is the price of an instrument of production which would not be forthcoming for industry if the price were not paid, while the former is a differential surplus which does not affect the supply".[16]

The socialist challenge to ownership of natural resources has been influential in Britain, but much less so in Canada. Indeed hostility to socialist principles may well have misled public policy-makers in Canada into dismissing economic rent arguments as outside their preferred ideology. Such response was ill-informed. Even liberal theorists, to whom many of Canada's leaders would have felt akin (in the first half of the twentieth century), qualify the rights of individuals to private property in land.

In the liberal tradition a sharp distinction is to be drawn between the return to land and the return to capital. From society's viewpoint the economic return to land is an unearned income even in a capitalist society. <u>As such its private appropriation or alternative disposition is a matter of expediency</u>. Thus for settlement purposes it may well be proper to sanction the private ownership of

farmland. The transitory nature of much mining activity gives pause to consider whether an equivalent justification can exist for alienating mining land to private ownership, if this entails directing economic rent into private hands.

The liberal position can be illustrated from the writings of John Stuart Mill, perhaps the leading liberal theorist of later Victorian England. In a famous passage he writes:

"Suppose that there is a kind of income which constantly tends to increase, without any exertion or sacrifice on the part of the owners: those owners constituting a class in the community, whom the natural course of things progressively enriches, consistently with complete passiveness on their own part. In such a case it would be no violation of the principles on which private property is grounded, if the state should appropriate this increase of wealth, or part of it, as it arises. This would not properly be taking anything from anybody; it would merely be applying an accession of wealth, created by circumstances, to the benefit of society, instead of allowing it to become an unearned appendage to the riches of a particular class.

Now this is actually the case with rent. The ordinary progress of a society which increases in wealth, is at all times tending to augment the incomes of landlords; to give them both a greater amount and a greater proportion of the wealth of the community, independently of any trouble or outlay incurred by themselves. They grow richer, as it were in their sleep, without working, risking, or economizing. What claim have they, on the general principle of social justice, to this accession or riches? In what would they have been wronged if society had, from the beginning, reserved the right of taxing the spontaneous increase of rent, to the highest amount required by financial exigencies?"[17]

To make his views quite clear he repeated them later in the same work:

"When the 'sacredness of property' is talked of, it should always be remembered, that any such sacredness does not belong in the same degree to landed property. No man made the land. It is the original inheritance of the whole species. Its appropriation is wholly a question of general expediency. When private property in land is not expedient, it is unjust".[18]

Toward the end of the nineteenth century the utilitarian liberal position was challenged by the Idealist philosophers, also

liberals. One such philospher, Thomas H. Green, defended private property, not as a desideratum of progress, but as an "essential individual right". Even this approach accepted that:

> "The earth is just as much an original natural material necessary to productive industry, as are air, light, and water, but while the latter from the nature of the case cannot be appropriated, the earth can be and has been. The only justification for this appropriation, as for any other, is that it contributes on the whole to social well-being; that the earth as appropriated by individuals under certain conditions becomes more serviceable to society as a whole, including those who are not proprietors of the soil, than if it were held in common. The justification disappears if these conditions are not observed; and from government having been chiefly in the hands of appropriators of the soil, they have not been duly observed".[19]

Liberals and socialists share the attitude that private property rights in land deserve to be curtailed in the best interests of society. For liberals the criterion for such rights became expediency, if pragmatic advantage could result then society might sanction private land ownership. For socialists the moral test was whether the landowner performed a service to the community of which he was part. Both schools of thought saw private ownership of capital as different from private property in land. Whether land meant soil, forest or mine this conclusion applied. At the level of ethics no justification could be found for private appropriation of the free gifts of nature.

In this ethical vacuum four lines of argument remain open to defend private property in natural resources. While one is abstract and metaphysical, three are empirical in principle. These propositions are:

1. Natural resources do not exist.

2. The return to natural resources is miniscule.

3. Separating the return to natural resources from the return to capital is impossible in practice, so to confiscate the former risks deterring private capital investment.

4. Private ownership of natural resources produces social benefit.

Startling as is the first proposition, that natural resources do not exist, the intellectual basis of much modern natural resource economics implies exactly this. Natural resources, it is suggested, are best viewed as just a particular sort of capital. Naturally the ethical dilemma disappears.

In his pioneering work, Anthony Scott explicitly chose this conceptual framework:

"The point of departure for this examination of the use of natural resources is that natural resources are a part, but only a part of the social capital. They share with buildings, factories, transportation, and equipment the quality that they may be combined with labour and other current services in the production of final, consumable goods and services. The fact that resources have been created naturally instead of by the "coagulation" of inputs of past labour is irrelevant to any study of how capital ought to be used. While there are certain aspects of the use of natural resources which do require special emphasis, these are merely matters of emphasis: differences in degree, not in kind".[20]

Over a decade later, itshould be acknowledged, Anthony Scott seemed less sure that the framework was useful:

"It will be seen that the economists' analysis of the conservation question depends heavily upon the theory of capital, which ..... is probably the least rewarding branch of economic theory in terms of useful generalisations about the real world".[21]

Of the three remaining propositions little can be said other than that, the moral basis of social organisation being accepted as paramount, the burden of proof for such propositions in particular circumstances would seem to rest with those who advance them. However, this thesis suggests (with respect to point 4) that uncontrolled private enterprise, based on land alienated to private ownership, did not represent the most advantageous way of exploiting the base metal deposits of Canada in the first half of the twentieth century.

An "a priori" case is put against point 2 later in this chapter. Taxes are dealt with in Chapter VII, in a discussion which implicitly assumes that collecting economic rent, whether by royalty or by special taxation, is possible without destroying the economic activity on which the charge is levied.

Types of Economic Rent

Concepts of rent have in common the characteristic that some sort of economic surplus is involved. In an economy with functioning markets an objective principle can be stated which clarifies this association of rent with surplus. If owners of factors of production are paid in some time period more than is required to induce the supply of some (or all) of the factor services in that time period, then an economic surplus is earned on such supply. This surplus is economic rent.[22]

This characteristic means that, whenever the supply responses of a productive factor are less than infinitely elastic (i.e., the

supply curve has some positive slope) in a given time period, some units of the factor's earnings are a type of economic rent. What this implies is that all types of rent are rooted in scarcity, where scarcity means limited supplies of at least one factor relative to demand over a specified time interval. (See below P.51)

In classifying rent into types attention focuses on the causes of the scarcity creating the rent. Three rent types are common in the mainstream economics literature.[23] These are quasi-rent, Ricardian rent and monopoly rent.

Quasi-Rent

Quasi-rent is the yield of an asset of which the supply is rigid in the short run but can be altered in the long run. As Alfred Marshall made clear, in crafting the concept, it is a short run construct. The cause of the scarcity, creating the rent, is the truncated supply response of factors in the momentary and short-run period. Thus quasi-rent is ephemeral. There is no quasi-rent in the long run, only natural inhibitions to the responsiveness of factor supply, such as a scarcity of land of any given quality, and the artificial restrictions associated with monopoly.

From a long run perspective quasi-rents result from a necessary price signal. Shortages are signalled by the emergence of quasi-rents, and factors are attracted to particular occupations by the higher rewards arising from short-run shortages. Man made assets are the factor most likely to be fixed in the short run yet responsive to changing rates of return in the long run. An installed machine (a fixed capital asset) assumes its value from

"the aggregate of the discounted values of the future quasi-rents, which it is expected to earn".[24] According to the value of various machines at any point in time decisions as to the future allocation of capital will be made by profit seeking entrepreneurs.

This thesis is not concerned with quasi-rents. As a transitory phenomenon they are legitimately part of realised profits in a private enterprise economy. It is intended here to distinguish sharply the short-run, quasi-rent concept from Ricardian and other rents which emerge in the long run. It is with the disbursement of Ricardian rent that the hypothesis, which concludes this chapter, deals.

Ricardian Rent

Rent concepts are of the same vintage as economics itself, both originating in the political economy of the late eighteenth century. An agricultural society at that time, Britain saw the evolution of the discipline of economics coextensive with the Industrial Revolution; the times inspired the seminal works of Adam Smith, Thomas Malthus and David Ricardo. For each of these thinkers rent was an issue to be analysed, usually in an agricultural setting, and rent of a differential sort, appropriate to that setting, took precedence in their analysis.

Of course, these famous names were but the most eminent of a large number of minds bent to the study of economic phenomena. The credit for originating the notion of differential rent has been given to James Anderson, a minor figure in the Scottish Enlightenment.[25] However, it was David Ricardo who was most closely associated with

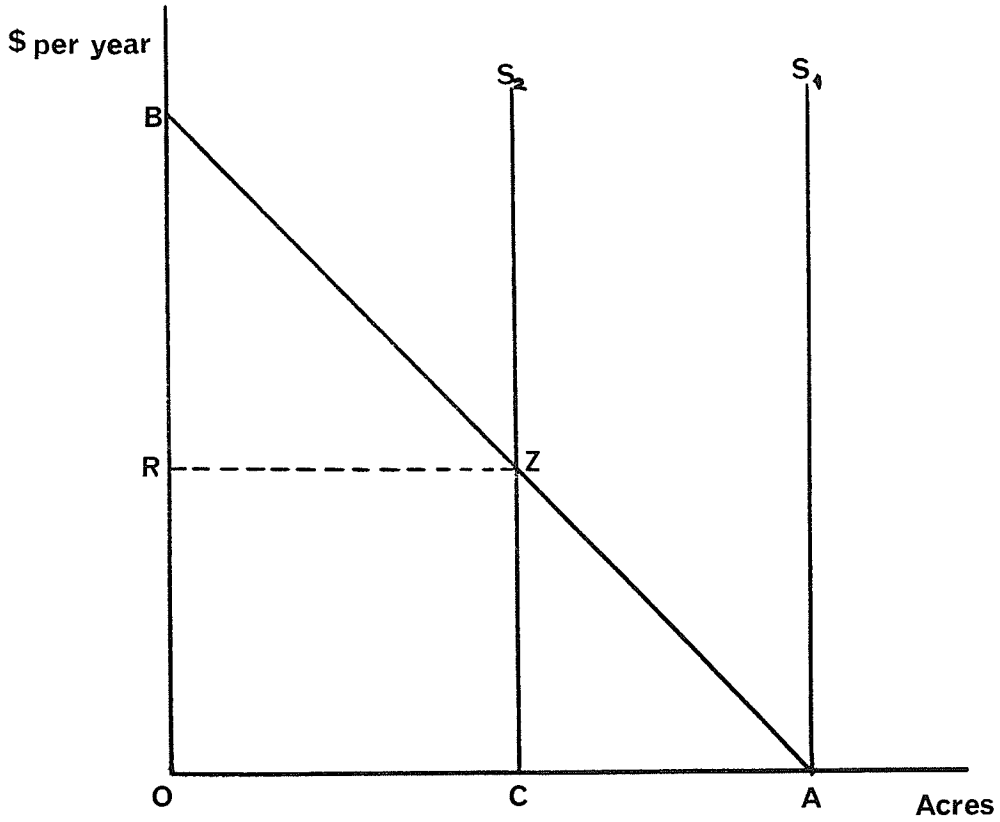
the development of rent theory at this time.[26]

In Ricardo's theory, corresponding to the economic categories of rent and profit, were the new political divisions between landlord and capitalist. In an agricultural setting (with tenant farmers) differential rent emerges as a surplus accruing to landowners. The tenant farmers supply capital and employ labour, so incurring costs. The price paid by a farmer for one unit of land services (e.g., an acre for one year) is determined at the productive margin, application of other factors to a given acreage of land revealing diminishing marginal returns. With an increasing demand for agricultural produce (Ricardo's symbolic "corn") land of the best quality will be cultivated more intensively and poorer qualities of land will be taken into cultivation at ever increasing cost, until the annual costs of cultivating the least productive land just equal the annual revenues. (Naturally the annual costs are the payments to capital and to labour to work the land).

Holdings of land, which are more productive than the marginal land, produce at lower unit cost a crop which sells for the same price as produce from the marginal quality of land. Therefore, intra-marginal land holdings generate an economic surplus over the cost of capital and labour.

It should be emphasised that scarcity of each grade of land is fundamental to this rent type. Consider a simple model, expressed in a diagram, of one grade of land (an inexhaustible resource) in the economy described above (see Figure 3.1). Assume homogeneous land, a single product (e.g. corn) and many agricultural producers who are tenant entrepreneurs. Land is in completely inelastic supply, at an

Figure 3.1: The Rent of Land



amount OA. The demand curve for land is based on the value of the marginal product of land. The market price of the only product (corn), the return on capital, wage rates and the prices of intermediate inputs are exogenously given and held constant by the "ceteris paribus" convention.

In this abstract setting land of this quality is not scarce if, as described, supply is AS_1 and demand is BA. There is no rent created.

Now consider another economy identical to the above in every respect except that only OC acres of land of this quality are available. In short, supply of this quality of land is naturally limited. The supply curve is CS_2. Each of the OC acres supplied earns OR, of annual resource rent per acre. The owners of this land collect a total resource rent of ORZC because their land is scarce in the sense that, at a price of zero or, indeed, at any price lower than OR more is demanded than is available. Thus, even though the land is a "free gift of nature" from society's perspective, its services have a price charged by the private owners.

According to Ricardo factor market conditions were such in English agriculture that rent of this type accrued entirely to the landowners. There was an unlimited supply of entrepreneurial, tenant farmers with plentiful capital and willing, unemployed labour eager to work any one holding of land at the going rates for capital and agricultural labour. Land was scarce in the sense described. Thus landowners could demand, and obtain, payment of the whole rent surplus from their tenant farmers.

Ricardo also recognised that the division of economic rent depends upon bargaining power. If they did provide capital to tenants, in the form of farm buildings, fences, etc., acquiring the rent surplus from the productive process was rendered all the more easy for the landlords. It is a brave individual who argues strenuously with the underwriter of his livelihood.

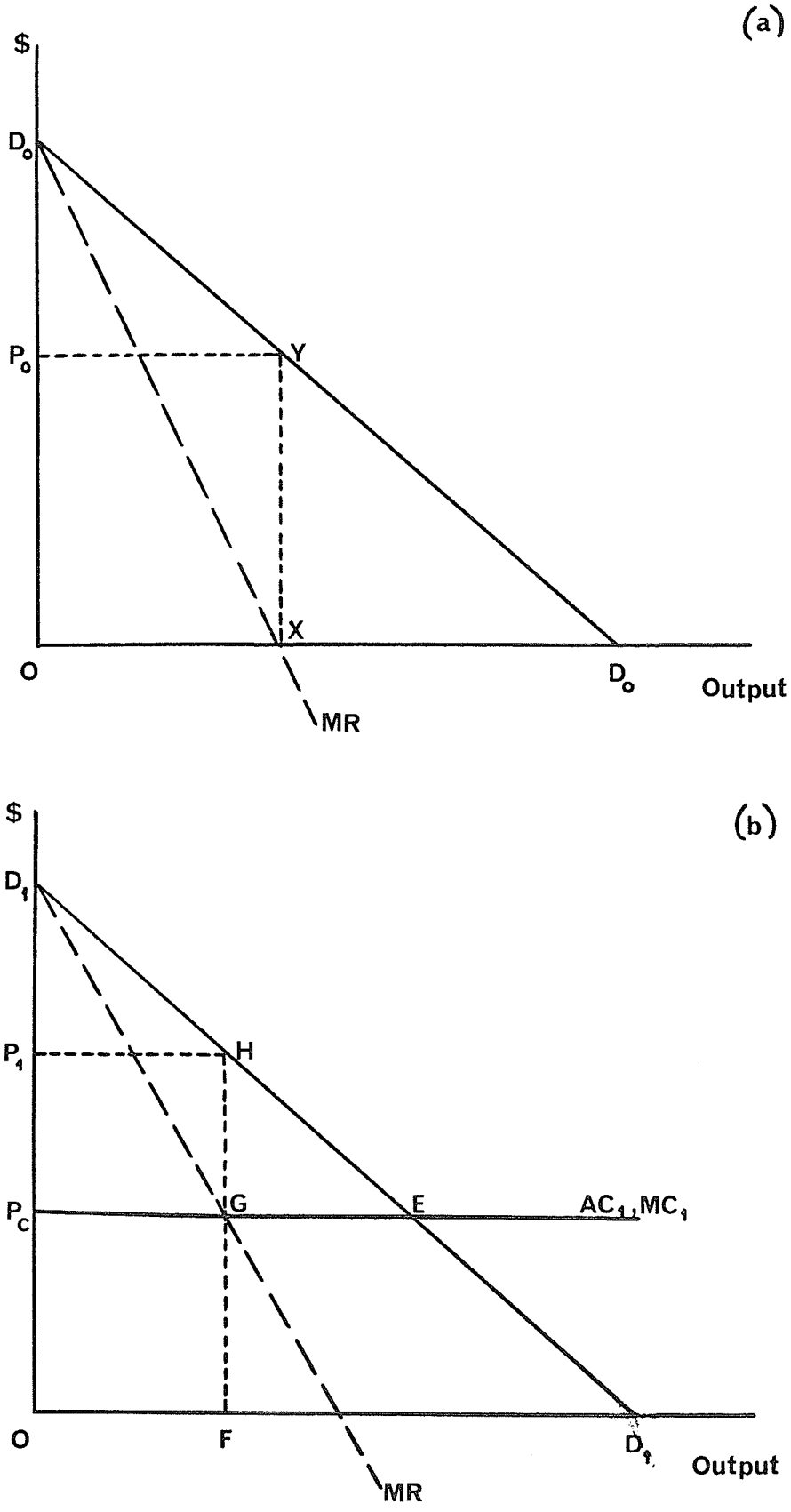
Monopoly Rent

All rent arises due to scarcity, but on occasion such scarcity may be artificially contrived by the exercise of monopoly power. The surplus which results is monopoly rent.

Such rent arises whenever monopoly power is present whether in the resource industry or any other industry. Consider the simple case of a zero cost industry which is a monopoly (Figure 3.2a). The market demand curve for the industry's product is D_oD_o. To maximise profits the monopoly firm will produce and sell OX at a price P_o. The monopoly profit, or monopoly rent in our terms is $OXYP_o$.

Next take the case of another monopolised industry with constant costs (Figure 3.2b). The market demand curve for the product is D_1D_1. To maximise profits the monopoly firm will produce and sell OF at a price P_1. The monopoly profit, or monopoly rent, is P_CGHP_1. Costs of production are $OFGP_C$. It must be noted that consumers have lost GEH of consumer's surplus, but, as the monopolist and the consumers are different economic agents, the lost consumer's surplus is not netted out of the firm's monopoly profit or rent.

Figure 3.2: Monopoly Rent



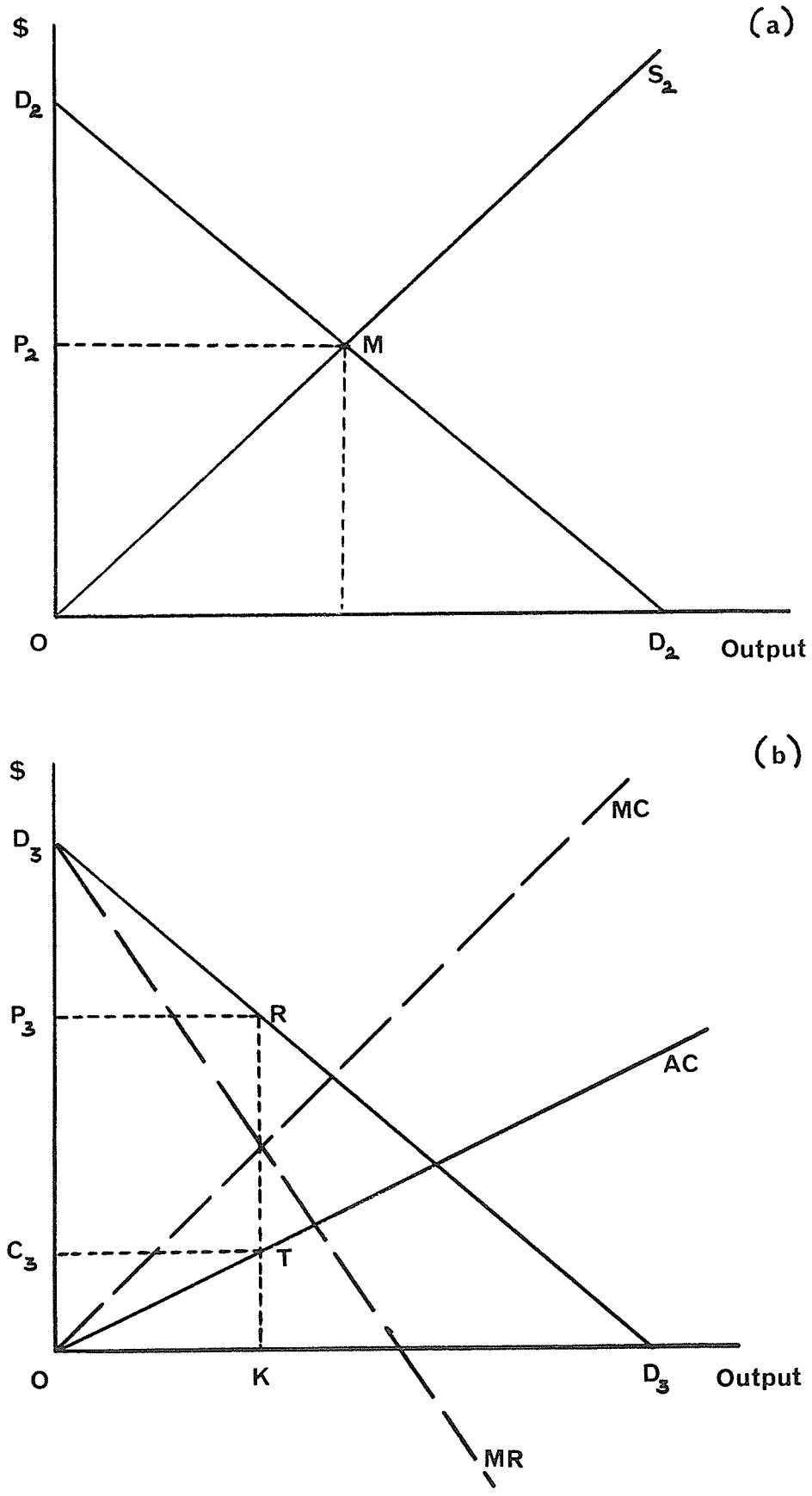
Of course, social welfare has declined, the triangle GEH being a corollary of this outcome.

Finally what happens if factors of production employed by a monopoly firm themselves earn scarcity rents? To be the more general no attempt is made to identify land, labour or capital as the source of the rents. Consider first an industry which is competitive. (Figure 3.3a). The market demand curve for the product is D_2D_2. The supply curve slopes upwards due to diminishing returns to at least one factor. Factor rents are OMP_2. There is no monopoly rent.

Next take the case of another industry which is a monopoly. The market demand curve is D_3D_3. Strictly, the concept of a supply curve is illegitimate for a monopoly. However, an average cost curve and a marginal cost curve slope up due to diminishing returns to at least one factor. It cannot be presumed that, were the monopoly industry to become a competitive one, the cost conditions would be in any way the same.[27]

Given this situation a profit maximising monopolist would produce OK at a price OP_3. Total revenue would be $OKRP_3$ and total costs $OKTC_3$. There is a surplus over costs of C_3TRP_3. Is this monopoly rent or factor rent? Obviously it is what is normally called monopoly profit. Plainly both consumers and the sellers of factor services lose in comparison with a competitive outcome. However, this is known only because the competitive outcome in terms of output is likely to be higher, even though at what output level it would be on Figure 3.3b cannot be established. To repeat, the

Figure 3.3: Factor Rent and Monopoly Rent



reason for caution is that a supply curve cannot be properly constructed for a monopoly and the monopolist's cost curves will not be the same as those for a competitive industry.

For present purposes the precise terminology is not important. The concern of this thesis is with Ricardian rent. However, it is worth noting that monopoly may diminish factor rents. Ricardian rent as well as consumer's surplus may be lost through the exercise of monopoly power. Monopoly profits include both these sources of surplus in common useage.

Rent and Canadian Minerals

For Ricardo matters of distribution were at the heart of the intellectual study of economic affairs. From the Preface to The Principles of Political Economy and Taxation comes this passage:

> "The produce of the earth - all that is derived from its surface by the united application of labour, machinery, and capital, is divided among three classes of the community; namely, the proprietor of the land, the owner of the stock or capital necessary for its cultivation, and the labourers by whose industry it is cultivated.
>
> But in different stages of society, the proportions of the whole produce of the earth which will be allotted to each of these classes, under the names of rent, profit, and wages, will be essentially different; depending mainly on the actual fertility of the soil, on the accumulation of capital and population, and on the skill, ingenuity, and instruments employed in agriculture.
>
> To determine the laws which regulate this distribution, is the principal problem in Political Economy."[28]

The classes to which Ricardo refers were the landowning, capitalist and labouring classes; and, in his agricultural rent analysis, he was concerned to establish the principles which governed the apportioning of income to landowners within the stylised production mode of his model. His work, based on this model, was

also directed towards an understanding of economic growth.[29]

In fact Ricardo was attacked by J M Keynes, in the course of an appreciation of Malthus' correspondence, on these grounds precisely:

> "Here, indeed, are to be found the seeds of economic theory, and also the divergent lines - so divergent at the outset that the destination can scarcely be recognised as the same until it is reached - along which the subject can be developed. Ricardo is investigating the theory of the distribution of the product in conditions of equilibrium and Malthus is concerned with what determines the volume of output day by day in the real world."[30]

In Ricardo's model land was important. It was given characteristics, being heterogeneous, with each quality in inelastic supply. The distinctiveness of labour and capital was also recognised, but for analytical purposes they were treated, in discussing rent,almost like a combined factor in infinitely elastic supply to agricultural production.

Modern economics takes a different view. Capital is placed at the centre of natural resource economics, with labour in the wings. In the neo-classical model natural resources are but a kind of capital, to be analysed using the tools of capital theory.[31] Distribution is no longer the key concern, the neo-classical model dwelling on efficiency in allocating resources above all else.

For extractive industries, subject to exhaustion of the natural resource, the conditions, under which efficient exploitation will occur, require special attention. How should the owner of an exhausting resource view its depletion in making production decisions? The concepts of user cost and marginal user cost are required to explain this matter properly.

User cost is the opportunity cost to the owner of a fixed asset (e.g. an ore body) of using up the asset which would otherwise be available for exploitation in the future. The user cost takes the form of the discounted present value of the expected return to the asset, or to that part which will be depleted, in its most profitable future use.[32] Firms are assumed to pursue the goal of maximising their present value in each decision period. Therefore, marginal user cost can be defined for extractive industry as the change in present value associated with using one more unit of an exhausting natural resource.

The major finding of the economics of extractive resources, first suggested by Gray in 1913, can be expressed in these terms.[33] In conditions of certainty, and in the absence of externalities, the private owner of a non-renewable resource should behave in this way in any decision period.

Let q equal marginal user cost, r equal the social rate of discount, t denote time and j denote a particular unit of the extractive resource.

1. If $\frac{\frac{dq_j}{dt}}{q_j} < r$, then the j^{th} unit of the resource should be extracted.

2. If $\frac{\frac{dq_j}{dt}}{q_j} > r$, then the j^{th} unit of the resource should be left unexploited.

Intuitively the result means that if assets in the ground are appreciating faster than the social discount rate, then society should leave them unexploited. On the other hand if assets in the

ground can be extracted, and have their value invested at the social discount rate, higher than their expected rate of appreciation, then society should use up these resources in that period. Maximum welfare for society and equilibrium for the private firm will occur, if social and private discount rates are equal, under one condition.[34]

$$3. \qquad \frac{\frac{dq_j}{dt}}{q_j} = r$$

Perhaps one implication of this analysis needs emphasis. Unlike a normal profit-maximising firm the mining company will not set marginal revenue equal to marginal factor cost. Instead the profit maximising condition is to equate marginal revenue and marginal cost plus marginal user cost.[35] As long as marginal user cost is positive a firm in the non-renewable natural resource sector should produce less in each time period than the unamended theory of the firm would suggest. Thus the concepts of user cost and marginal user cost imply a slower exhaustion of extractive resources, to achieve the goals of the firms and of society, than the straightforward profit maximising criterion would suggest. The importance of these concepts to analysis of the efficient use of non-renewable natural resources over time is considerable.

With respect to non-renewable resources society faces important choices about what is an appropriate rate of use. The conservation movement, and the rise of ecology, have in recent decades sharpened concern about the eventual exhaustion of non-renewable resources in the world. The importance of the exhaustion question

to the world's future is hard to exaggerate.

Thus, three approaches can be identified towards natural resource questions in modern times. First, there is the conservation approach, often based on systems analysis, made famous by the Limits to Growth report of the Club of Rome.[36] Next, in the approach of modern natural resource economics, the definition is attempted of conditions under which natural resource use will be efficient in a private enterprise economy over time, where efficient natural resource use is society's postulated goal. The capital-theoretic approach of natural resource economics is employed to this end. Finally scholars exist whose concern is with matters of distribution and economic growth associated with natural resource exploitation. In Canada the staples tradition gives direction to this purpose.

Of course, all this is a matter of degree. Analysis is never conducted in watertight boxes, especially economic history; but it should be clear that the last of these three approaches is the intellectual inspiration of the work in this thesis.

The essential postulate for such a study of the distribution of rent, is that rent exists. For "a priori"reasons the existence of rent in non-ferrous base metal mining in Canada between 1918 and 1955 seems very plausible indeed. The theory indicates that with a change in demand causing unforseen increases in price rent will be created on existing ore bodies in production. Once mineral rights are alienated there will be windfall gains to the private owners, unless society devises a way to recoup such appreciation. The exceptional richness of the Sudbury mines and of the Sullivan Mine

in B.C. are well attested. Rent on such mines there must have been as Canadian mining expanded onto ever more marginal fields.[37] Naturally, at any particular time, the mines which were marginal, given the selling price of their ore, enjoyed no rent surplus.

Hypothesis II

Minerals out of the ground are departed never to return. Sooner or later non-renewable resources will be exhausted in particular locations. The economic development of mineral rich economies thus acquires a considerable urgency.

Economic rent is the realised value of mineral assets. If an economy is to grow and to maintain its prosperity economic rent must be retained within the national borders. Rent earned by natural assets, transformed into productive capital, becomes a self-renewing asset which perpetuates growth in the Canadian economy.

Indigeneous capitalists as well as the state might invest in Canada rents earned by natural assets. Though private capture of rent is indefensible by the usual tenets of capitalism, national expediency might justify state largesse if economic development were the outcome. In this it is important to identify a Canadian national interest wider than simply that of the elite of capitalists existing at any particular time. In this framework private interest may or may not correspond to public interest.

The second of the two hypotheses which guide this thesis may now be introduced. It is as follows:

That the part of the return to base metal mining in Canada which is Ricardian economic rent has been privately appropriated for the most part. Further, that this rent came to be garnered to an increasing extent by foreign owners of the Canadian industry. In this way the value of real Canadian assets, in the form of ore bodies, has been partially dissipated, and lost to Canada.

As with the prior hypothesis (see Chapter II) the time period involved runs from 1918 to the mid-1950's. It is a corollary to this hypothesis that the system of property rights and the pattern of ownership has somewhat impeded the full achievement of the Canadian economy's development potential.

FOOTNOTES

1. C.B. Macpherson, (ed.), Property: Mainstream and Critical Positions (University of Toronto Press, 1978) p.11.

2. Henry George, Progress and Poverty (London: Everyman's Library, 1930) First edition, 1880. Book VI, Chapter II.

   Charles A. Barker, "Henry George", International Encyclopedia of the Social Sciences (MacMillan: 1968) p.154.

3. Henry George, Social Problems (London: Kegan Paul, 1898) First edition, 1884. Chapter XIX, p.193.

4. Henry George, Progress and Poverty (London: Everyman's Library, 1930) First edition, 1880. Book III, p.122.

5. Charles A. Barker, op. cit., p.154.

6. See, Normand and Jeanne Mackenzie, The First Fabians (London: Quartet Books, 1979).

7. See, David M. Ricci, "Fabian Socialism: a Theory of Rent as Exploitation; The Journal of British Studies, Vol. IX, No. 1 (November, 1969).

8. George Bernard Shaw, Essays in Fabian Socialism (London: Constable and Co., 1932), p.26. Reprinting "The Economic Basis of Socialism", Fabian Essays (1889).

9. Eric Bentley, Bernard Shaw (London: Methuen, 1947), p.2.

10. David Ricci, op. cit., p.110.

11. George Bernard Shaw, The Intelligent Woman's Guide to Socialism, Capitalism, Sovietism and Fascism (London: Constable, 1929). Popular edition, p.341.

12. The phrase is found in J.M. Winter and D.M. Joslin (eds.), R.H. Tawney's Commonplace Book (Cambridge University Press, 1972) p.38.

13. See, Ross Terrill, R.H. Tawney and his Times (London: André Deutsch, 1974).

14. R.H. Tawney, "Property and Creative Work", in C.B. Macpherson (ed.), op. cit., p.144.

15. ibid., p.143.

16. ibid., p.143.

17. John Stuart Mill, Principles of Political Economy (London: Penguin, 1970). First edition, 1848 p.169.

18. ibid., p.384.

19. Thomas H. Green, "The Right of the State in Regard to Property", in C.B. Macpherson (ed.), op. cit., p.115.

20. Anthony Scott, Natural Resources: The Economics of Conservation (Toronto: McClelland and Stewart, 1973). First edition, 1955. p.3.

21. Anthony Scott, "Conservation: economic aspects", International Encyclopedia of the Social Sciences (MacMillan, 1968) p.285.

22. This echoes Joan Robinson's exposition:
"The essence of the conception of rent is the conception of a surplus earned by a particular factor of production over and above the minimum earnings necessary to induce it to do its work."
Joan Robinson, The Economics of Imperfect Competition (London: Macmillan, 1969) First edition, 1933. P.102.

23. Further definitions of rent types exist, sometimes emanating from non-neoclassical paradigms. For instance, Karl Marx spoke of "absolute ground rent" which he distinguished from differential rent and related to landowners' monopoly power. See, Karl Marx, Capital, Vol.III, Part VI. For some discussion see J.S. Keiper et al. Theory and Management of Rent (Philadelphia: Chilton Company, 1961).

24. Alfred Marshall, Industry and Trade (1920) Book II, Chap.I. Reproduced in Alfred Marshall, Principles of Economics, Variorum Edition, ed. C.W. Guilleb aud (The Royal Economic Society: 1961) Vol.I, p.424.

25. See J.S. Keifer et al. Theory and Management of Rent (Philadelphia: Chilton Company, 1961) p.19.

26. David Ricardo, On the Principles of Political Economy and Taxation (1817), ed. P. Sraffa, The Works and Correspondence of David Ricardo, Vol. I (Cambridge: Cambridge University Press, 1951) p.5.

27. Joan Robinson remarks:
"If we wish to discuss what will happen to output and prices if a certain commodity, hitherto produced by competing firms, is monopolised, we must assume that neither the demand curve for the commodity nor the costs of production of any given output are altered by the change. These assumptions are unlikely to be fulfilled in any actual situation, and in studying an

actual case changes in demand and in the efficiency of production must be allowed for." Joan Robinson, op. cit. p.143.

28. David Ricardo, op.cit., p.5.

29. R.M. Hartwell, "Introduction" to David Ricardo, On the Principles of Political Economy and Taxation (1817), ed. R.M. Hartwell (London: Penguin, 1971) p.16.

30. J.M. Keynes, Essays in Biography (1933), ed. E. Johnson and D. Moggridge, The Collected Writings of J.M. Keynes, Vol.X (Cambridge: Royal Economic Society, 1972) p.97.

31. See, O. Herfindahl and A.V. Kneese, Economic Theory of Natural Resources (Columbus, Ohio: Charles E. Merrill, 1974) Pp.67-69.

32. Consider Anthony Scott's definition. "We introduce the concept of user cost - the present value of the future profit foregone by a decision to produce a unit of output today. If the unit is small, marginal to present and future operations, the user cost is derived from the addition to total future profits of the opportunity to mine the unit then. If it might be mined in a number of future periods, user cost is defined as the maximum increment to the mine's present value that could be gained by a decision to allocate the unit of output to a future period." Anthony Scott, "The Mine under Conditions of Certainty", in M. Gaffney (ed.), Extractive Resources and Taxation (Madison: University of Wisconnon Press, 1967) p.34.

33. Lewis C. Gray, "Rent under the Assumption of Exhaustibility," Quarterly Journal of Economics (May, 1914), reprinted in M. Gaffney (ed.), ibid. Lewis C. Gray, "The Economic Possibilities of Conservation," Quarterly Journal of Economics Vol.XXVII (May, 1913).

34. "In other words, the mineral resource in the ground is a capital asset like any other, and equilibrium in the asset market requires that rates of return on all assets be the same." F.M. Peterson and A.C. Fisher, "The Exploitation of Extractive Resources: a Survey", The Economic Journal Vol.87, No.348(Dec., 1977) p.693.
See also R.M. Solow, "The Economics of Resources or the Resources of Economics," A.E.A. Papers and Proceedings, Vol.LXIV (May, 1974).
It should be noted that this conclusion ignores the possibility of a "stock effect". See, Peterson and Fisher, op. cit. Equation 8, p.693.

35. "A producer making decisions about output from such an (exhaustible) resource should not be thought of, as in the neo-Marshallion mode, as equalising only marginal costs and marginal revenues, but rather as equalising his marginal net revenue and his marginal user cost."
Anthony Scott, Natural Resources: the Economies of Conservation (Toronto: McClelland and Stewart, 1973) First edition, 1955. p.8.

36. D. Meadows et al., The Limits to Growth (The Club of Rome, 1972).

37. Regrettably the complexities of any empirical estimate of Ricardian rent are such in the historical context that in my judgement, it would not be enlightening to produce a figure purporting to value this surplus from 1918-55.

CHAPTER IV

AN OUTLINE HISTORY OF THE INDUSTRY

In March, 1917, the Report of the Royal Ontario Nickel Commission was issued.[1] Addressed to Sir John Strathearn Hendrie, Lieutenant-Governor of Ontario, this document, presented over the signatures of all four Commissioners, re-asserted the mode under which Canadian minerals were to be developed over the next half-century. Quite curtly in three paragraphs of text the Report considered "the suggestion ..... that government ownership would solve many of the questions which have been raised in connection with these (Sudbury) deposits."[2] The firm conclusion was as follows:

"There does not seem to be any good reason why the people of Ontario should be asked to adventure so large a sum of money as would be required for the purchase of the nickel deposits and plants."[3]

In this fashion early proposals to develop Canada's minerals under state ownership were aborted. Public opinion was ready for public control to be exercised.[4] The opportunity was ignored by Ontario and by the Dominion government. Throughout the twentieth century the history of metal mining in Canada has been a history of private ownership and of business enterprise. The part of the state has been reactive rather than controlling. Capital and the profit motive have been the engine of growth

determining the pace and pattern of metal mining expansion in Canada.

Expansion of Metallic Mineral Mining

Growth in the metallic minerals industry has been impressive measured in conventional terms.[5] The expansion is detailed in Table 4.1 for a category, Canadian metallic minerals, which includes the most important base metals and precious metals.[6] From 1923 to 1955 the gross value of this aggregated mining production rose from $48 million per annum to almost $670 million per annum.[7] In 1923 this value comprised 1.7% of G.D.P. whereas in 1955 the direct contribution was 2.8% of G.D.P. There is no doubt the Canadian metallic minerals industry grew markedly in both absolute and relative terms in this period. (More detail is provided later in this chapter for a more narrowly defined category, Major Base Metals).

The growth experience of base and precious metal mining, outlined in Table 4.1 exhibits periods of strength and of decline and contains other interesting features.

1. During the 1920s growth in the industry was strong but reasonably steady. Comparing 1923 with 1929 reveals almost a doubling of the value of production in dollar terms.[8] From 1923 onwards to 1929 only 1927 exhibited a small decline.[9] Lead and zinc from British Columbia contributed heavily to this advance.

2. Subsequent to the Great Crash in 1929 the value of production fell and employees were laid off. Production values fell immediately by about 18% in 1929/30 then stagnated, whereas employment declined slowly to a level in 1932 about 28% below the 1929 employment peak.[10] Thereafter recovery set in.

3. The decade of the 1930s was overall one of accelerating growth for Canadian metal mining. Only in 1930 and 1932 did the gross value of mineral production experience slight declines. The most pronounced surge in production values of any from 1923 to 1955 happened in the late 1930s and during the early years of the Second World War. Between 1933/37 and 1938/42 the annual average gross value of production rose by 95%. Wartime output peaked at $327 million in 1942, a level fourtimes that of 1932 in nominal terms.[11] It is necessary to note that increased gold production in response to the higher gold prices initiated in 1931 played a large part in expansion in the 1930s.[12]

4. The results of the reversal in growth experienced in the latter years of the Second World War emerge clearly from Table 4.1. From 1938/42 to 1943/47 the annual average value of production fell by 3.6%. In the same time span the annual average number of employees fell by 21%. Employment dropped from 48,000 in 1942 to 33,000 in 1945.[13] (Though no data are provided in this source a similar decline occurred after the First World War).

5. The decade from 1946 to 1955 was also marked by strong expansion in metal mining's value of production. (In dollar terms it doubled).[14] However, the advance was somewhat erratic with declines in 1947, 1952 and 1953. Price phenomena were influential in the value increases of this decade with the removal of wartime price controls, the Korean War and the programme of U.S. strategic stockpiles being especially beneficial to the value of base metal sales.

Data Review

For the present purpose the data in Table 4.1 can provide

Table 4.1: Growth of the Canadian Metallic Mineral Industry: Five Year Averages, 1923-52[a]

(1) Annual Average[b]	(2) Gross Value of Production		(3) Employees	
	$ million	% change[c]	No.	% change[c]
1923-27	69.5		11,800	
1928-32	83.8	21.0	20,000	69.0
1933-37	151.3	80.0	30,900	55.0
1938-42	295.7	95.0	45,500	47.0
1943-47	285.0	-3.6	36,000	-20.9
1947-52	473.4	66.0	48,700	35.0

[a] Includes base metals and precious metals. See Chapter IV, Footnote 6.

[b] No data are provided prior to 1923.

[c] % change between Five Year Annual Averages. This comparison is preferred to compound growth rates within 5-year periods to avoid the distorting effects of off-trend initial and terminal values.

Source: M. S. Urquhart and K. A. H. Buckley, Historical Statistics of Canada, p. 425, Series N83, N87.

only an overview. The inclusion of gold and other precious metals inflates the gross value of production in the decade of the 1930s so that the relative contribution of base metal sales is reduced (Appendix A, Table 3). In other words the precious metals component of the Canadian metallic mineral industry grew more rapidly in these ten years than did the base metals component. Provided this pattern is borne in mind these data give useful information on employees and costs not otherwise available.

What is needed in addition for my declared purpose is a separation of base metals from precious metals. For the type of data used so far such detail was not published by the Dominion Bureau of Statistics (D.B.S.).[15] Fortunately other data, equally suited to the purposes of this research, have been published by D.B.S. From this information source the required detail can be obtained to form a category entitled "Major Base Metals". Copper, lead, zinc and nickel constitute this category.

As the distinction between the two data types is a subtle one, it must be elaborated for the relative advantages and disadvantages of the two statistical series to be appreciated fully.

Series A. Survey Data

Table 4.1 relies on data collected by D.B.S. (after 1921) and published annually from 1949 under the table heading "Principal Statistics of the Mineral Industry".[16] Listed as one component was the category "The Metal Mining Industries" as summarised in Table 4.1.

The data collection method was a near universal survey, a questionnaire being mailed to all producing mines and smelters. Thus, the values entered in this series represent the actual

values received by mines from smelters to which their ores were sold. Such deals would be concluded on the basis of prices ruling in a specific metal market (e.g., Montreal) and in the light of any special arrangements between the transactors. Such arrangements might reflect market power, vertical integration or an ore particularly rich in recoverable trace metals (e.g., gold and zinc from the copper ores of the Britannia Beach mine, B.C.).[17] Transport costs on concentrates shipped from mine to smelter are presumed to have been excluded.[18] Only Canadian value added is included in this series.

Series B. Smelter Estimated Data

An older statistical series giving details of the volume and value of each mineral produced in Canada was taken over by D.B.S. in 1921.[19] With respect to metallic minerals the method underlying the series has always been to acquire by questionnaire from smelters the details of metals recovered in each year and to estimate a value by reference to an average price in a selected metal market.[20] Suitable modifications are made to allow for concentrate ores exported for smelting. Sometimes as a result values are included which accrued in the smelting and refining of metals outside Canada.

Not only are transport and delivery costs of concentrate and smelter matte included, but ores recovered from mines in the development stage are valued. (The "Principal Statistics" data explicitly excluded such incidental production). Thus the older series in most years aggregates to a value of production higher than the "Principal Statistics" of Series A. above.[21]

From time to time the markets selected for valuation

prices were changed. In particular 1926 saw several switches of market. Zinc valuation changed from St. Louis prices to London prices. Lead valuation also moved to London average monthly prices as opposed to Montreal prices. Copper and nickel had henceforth part of their valuation, that of Sudbury ores, based on an arbitrary figure agreed between D.B.S. and the Ontario Department of Mines.

During the years of the Second World War "prices (for lead and zinc) were the averages of those agreed upon by Canadian producers and the Government of the U.K."[22] Post-war years saw first New York then, in 1951, Montreal market prices used to value lead and zinc.[23]

Both the inclusion of some foreign value-added and the rather arbitrary nature of the valuation procedure (inevitable as it was) tell against this latter series, but its virtues predominate on balance. The coverage was more reliable. It is easier to collect data from a limited number of smelters than from a fluctuating plethora of mines of various sizes. Furthermore the valuation method was complete in including values attaching to the transportation function within Canada, which the survey method omitted completely.[24] Finally the B. series is available in the necessary detail distinguishing each individual metal's volume and value of production.[25]

However, it is useful to have both series available. By separately examining in this chapter first the expansion of output of Canadian metallic minerals (Series A) and, in the next section of this chapter, the expansion of output of base metals in Canada (Series B) it is shown that the trends of production are broadly

similar in each series. Only gold in the 1930s creates a serious distortion for analysis of non-ferrous base metals (Figure 4.1 and Appendix A, Table 3).

Once recognised, this temporary change in the proportions of base and precious minerals can be discounted. Throughout this Thesis further use is made of the Series A Survey Data as well as the more narrowly based Series B Smelter Estimated Data.

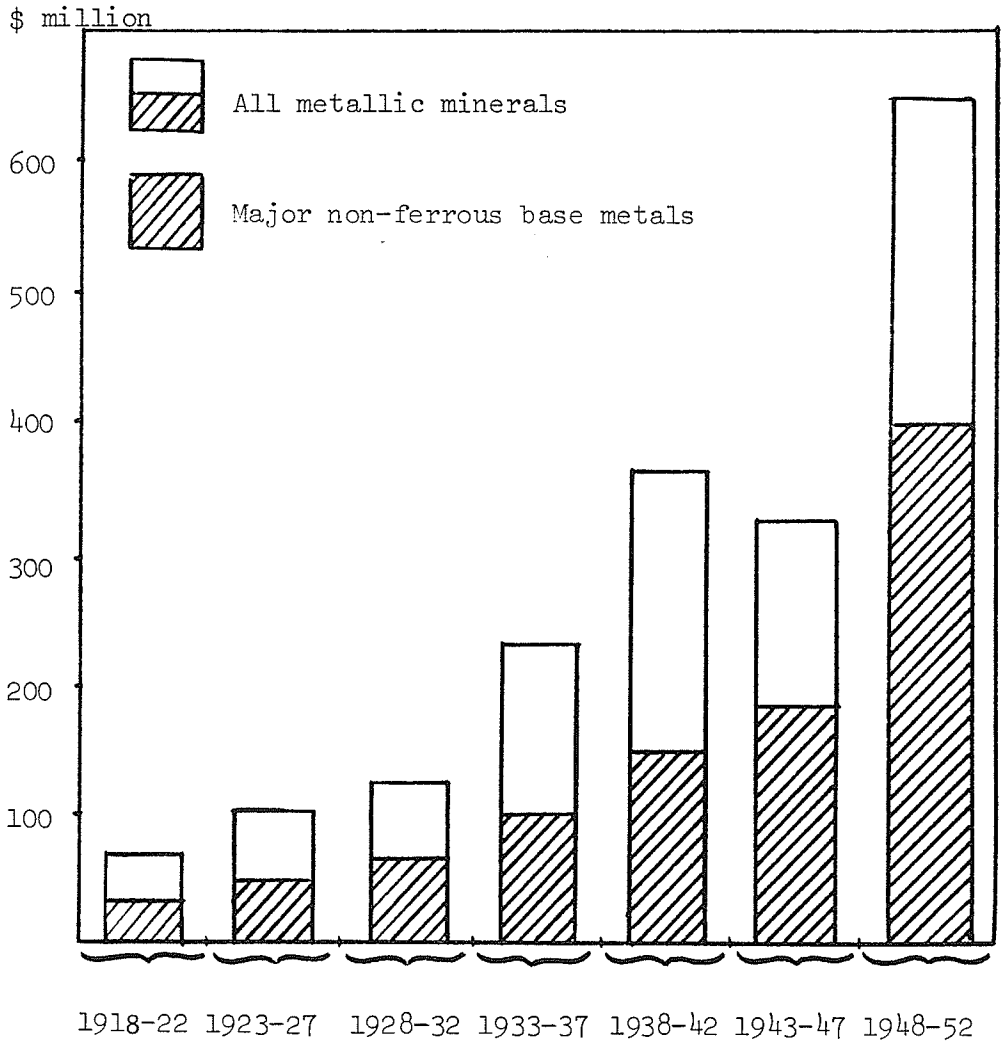
The Major Non-Ferrous Base Metals

The Study of non-ferrous base metals in Canada requires an account of their expansion and evolving importance. Obviously new regional patterns of exploitation emerged as expansion proceeded. The story of base metals unfolds as a history of a unique type of staple with which the emphasis usually placed on the nature of the staple demand is expanded to encompass important technological developments. These influenced strongly the supply price of the base metal staple. In turn the low-cost technology needed sizeable capital investment which tended to concentrate the industry. Only a very few mining firms in Canada engaged in smelting and refining where the technological impact was most pronounced.

Growth Rates

From 1918 to 1955 the Major Non-Ferrous Base Metals category, like the Metallic Mineral Industry as a whole, grew enormously. Copper, nickel, lead and zinc became important contributors to Canada's mining prosperity. The extent of their growth is depicted in Figure 4.1, which also serves to contrast

FIGURE 4.1
Growth of Major Non-Ferrous Base Metals
Compared with All Metallic Minerals.
Canada, 1918-52.



Source: D.B.S., Canadian Mineral Statistics, 1888-1956.

the growth of base metals with that of precious metals. The bar chart reveals the growth of the value of production of the Major Non-Ferrous Base Metals (hereafter called Major Base Metals) to have been steady, if five year averages are applied to smooth out cyclical fluctuations.

Also apparent from the chart is the surge in the value of precious metals mined in the 1930s when gold prices and output both increased. The facts of the gold surge are straightforward (Appendix A. Table 3). Throughout the decade of the 1930s the share of copper, nickel, lead and zinc dropped from a previous 50% or more of All Metallic Minerals to just over 40%. Thereafter the share of the Major Base Metals rose once again to reach 65% of All Metallic Minerals in the period 1948/52.

A fortunate coincidence enables ready comparisons to be made over three decades central to our period. Normally, it is misleading to compare nominal dollars, if many years separate the amounts, because of the effects of price inflation or deflation. The standard method by which nominal dollars are converted to constant dollars, so that comparisons may be made, uses an appropriate price index as a deflator.

After many declines and advances the Wholesale Price Index in Canada stood in 1950 at almost the same level as in 1920 (Appendix A. Table 13). If this is regarded as a suitable deflator, nominal values in 1920 and 1950 may be compared as though they were constant dollars. With this justification the following paragraphs compare directly the nominal dollar values of mineral output at each end of this three decade span.

In 1920 the value of production of copper, nickel, lead and zinc in Canada aggregated $45 million. In 1950 the

equivalent value was $381 million. This increase represented an average compound growth rate of 7.4% per annum (Table 4.2). For comparison, over the same time span G.D.P. at factor cost grew at an average compound growth rate of approximately 4.0% per annum.

The experience of each of the major base metals is worth considering separately.

(1) Nickel

In 1920 the production of nickel (down from wartime levels) was worth $24.5 million which compares with $112.1 million in 1950. The average compound growth rate for nickel production was therefore 5.2% per annum. (This was by far the lowest growth rate of the four major base metals, but starting from a substantially higher base). Moreover the increase in the value of nickel produced each year was attributable in its entirety in these three decades to the mines of the Sudbury area. The value increase was due in the main to an increase in output - the U.S. nickel price in 1950 was only marginally higher than in 1920.[26]

(2) Copper

The value of copper production in 1920 was $14.2 million which compares with a 1950 value of production of $123.2 million. Copper's growth rate was thus 7.5% per annum from a substantial base. In 1950 copper prices stood barely 25% higher than in 1920 (Appendix A. Table 14). Across the country there had occurred a formidable increase in copper mining capacity.

(3) Lead

Lead in 1920 had a rather depressed year in which the

Table 4.2: Major Non-Ferrous Base Metals: Growth Rates, 1920-50[a]

(1) Year	(2) Value of Copper $ million	(3) Value of Lead $ million	(4) Value of Zinc $ million	(5) Value of Nickel $ million	(6) Total $ million
1920	14.24	3.21	3.06	24.53	45.04
1950	123.21	47.89	98.04	112.11	381.25
Growth Rate[b]	7.5%	9.4%	12.3%	5.2%	7.4%

[a] The period is therefore 31 years. The nominal figures closely approximate to constant $ figures.

[b] Compound growth rate per annum.

Source: Appendix A. Table 2.

value of production just topped $3.2 million. By 1950 lead production was valued at $47.8 million. This advance represents a growth rate of 9.4% per annum from what was admittedly in 1920 a relatively small production base. In three decades annual output in volume terms had increased almost tenfold, but the rapid rise in lead prices subsequent to the Second World War was also important in this value result (Appendix A. Table 14). Lead was produced only in British Columbia.

(4) Zinc

Zinc production rose from $3.1 million in 1920 to $98 million in 1950, having experienced an annual growth rate of 12.3%. This growth rate, the largest of the four metals considered, was from a low base, roughly similar in 1920 to that of lead. Zinc prices in 1950 were less than 50% above 1920 price levels (Appendix A. Table 14). Again a large increase in the annual capacity to produce zinc, rather than price improvements, has to be acknowledged as responsible for the growth in value.

In 1950 as compared with 1920 prices of the major non-ferrous base metals had increased moderately, but output had increased immensely. As the quantity demanded increased utilising the extra output, the conclusion emerges that supply was able to respond in this industry without increasing costs relative to other products. (Base metal prices mirrored the Wholesale Price Index throughout). In short, as time passed, improved mining methods and technological advance in metallurgy enabled more Canadian ores, formerly marginal or newly discovered, to be mined and treated at the same, or lower,

average cost levels.

Expansionary Periods

From the conclusion of hostilities in World War I to the mid-1950's there were three periods of great expansion in base metal mining in Canada. Roughly dated these were 1921-29, 1932-42 and 1946-55. Each will be considered in turn.

1921-29

From the postwar trough in 1921 production advanced steadily throughout the 1920s on both a volume and a value basis. The reversal in the value figures in 1927 is probably more due to statistical changes than to a genuine decline.[27]

From 1921 to 1929 the value of production rose fourfold and the volume of output expanded nearly fourfold. Prices remained virtually constant over these years if month by month fluctuations are neglected. Thus the conclusion is evident that during the 1920s the growth of non-ferrous base metal mining was mostly attained by an expansion in output levels.

1932-42

The advance in the mid-1930s represented for base metals primarily a price recovery from the depression levels plumbed in 1932. Then from 1937 onwards output expanded while prices remained constant (Table 4.3). This latter phase, which culminated in 1942, was caused by preparations for World War II and by its initial demands for strategic raw materials. Base metals are essential to the conduct of twentieth century mechanised warfare dependent as it is on transportation equipment and various types of electron-

Table 4.3: Volume and Value Indices of Major Base Metals, 1916-55

(1937 = 100)

(1) Year	(2) Volume	(3) Value	(1) Year	(2) Volume	(3) Value
1916	17.2	40.2	1936	85.0	65.2
1917	16.6	41.5	1937	100.0	100.0
1918	19.4	44.1	1938	102.9	81.2
1919	12.7	22.2	1939	105.3	81.2
1920	14.2	26.8	1940	116.9	93.0
1921	12.1	11.4	1941	123.5	99.1
1922	13.7	12.5	1942	128.9	99.8
1923	20.9	25.5	1943	124.8	107.3
1924	29.2	32.0	1944	109.1	102.5
1925	35.7	37.5	1945	103.1	102.5
1926	41.1	37.1	1946	90.1	91.1
1927	44.5	35.4	1947	92.9	150.9
1928	53.5	45.6	1948	100.7	190.6
1929	57.4	58.2	1949	109.3	197.2
1930	65.6	50.8	1950	112.8	227.3
1931	56.1	31.5	1951	118.0	294.8
1932	45.9	19.1	1952	122.9	287.7
1933	55.2	32.5	1953	129.1	272.9
1934	74.1	45.5	1954	137.8	300.8
1935	79.2	52.5	1955	147.9	377.0

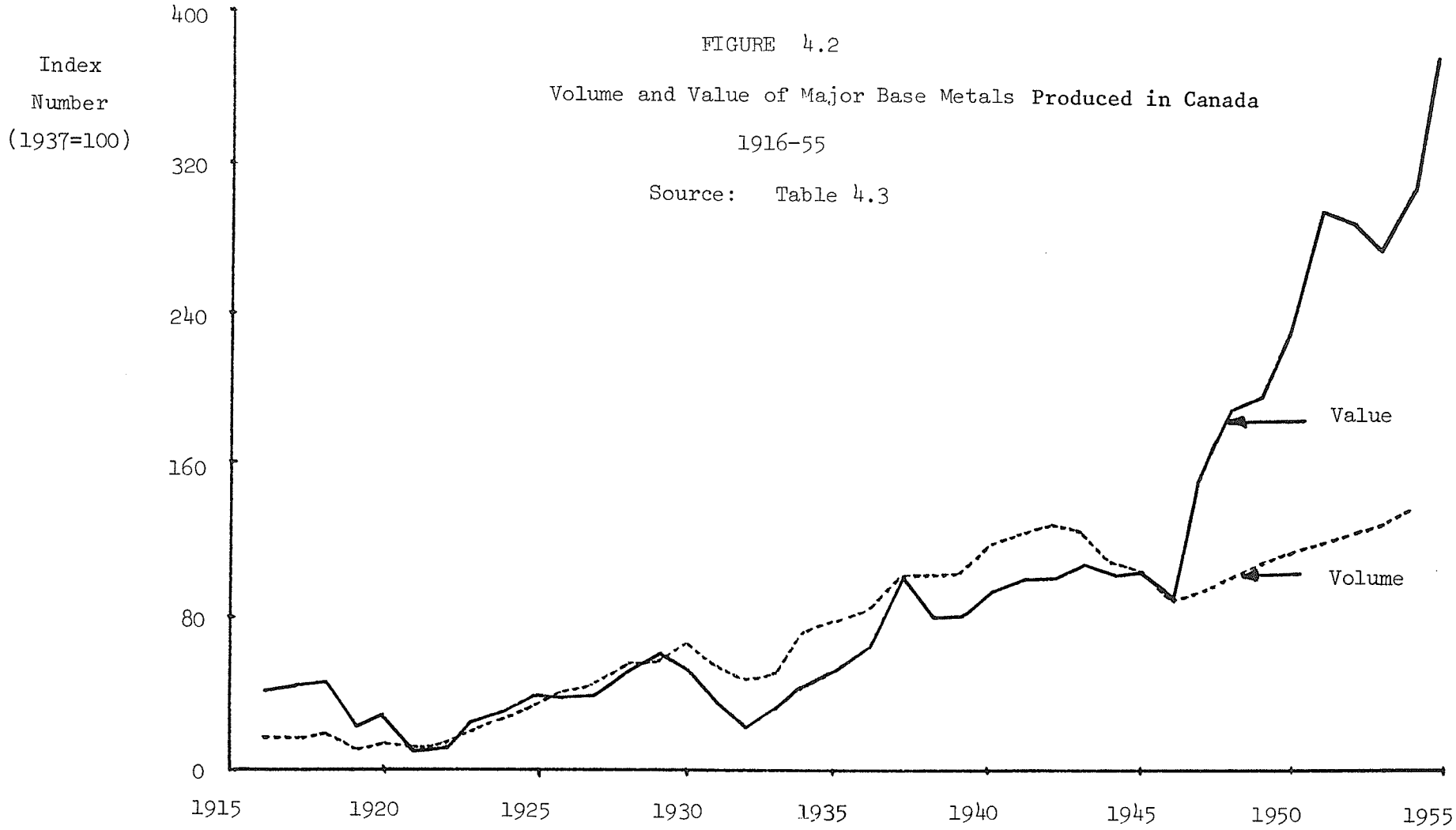
Source: Appendix A. Tables 1 and 2.

FIGURE 4.2

Volume and Value of Major Base Metals Produced in Canada

1916-55

Source: Table 4.3



ic circuitry.

1946-55

After World War II the value of base metal production rose considerably more than did the volume of output. In Table 4.3 this form of growth is manifest. Base metal prices rose sharply after hostilities ended due to price decontrol. In fact, between 1946 and 1955 output increased by around 64% whereas the value of production rose threefold.

Of the three periods of expansion detailed the advance subsequent to World War II was the most pronounced in value terms. The end of wartime price controls, the advent of the Korean War and the American programme of stockpiling strategic materials contributed sequentially to this boom.

Recessionary Periods

Mirroring the cyclical pattern of capitalist growth base metal mining experienced three recessionary periods from 1918 to 1955 juxtaposed to the periods of expansion. Approximating as before these were 1918-21, 1929-32 and 1942-46. Again they are considered one by one.

1918-21

In the aftermath of World War I the value of production of the major base metals halved in the year 1918/19 and by 1921 it had halved once more. In contrast the volume of output fell in 1918/19 by only 34%, and actually increased in 1920, though it fell again in 1921 to a nadir about 38% below the 1918 production apex. Price declines from high wartime levels were the main

agent of this postwar recession in base metal mining.

1929-32

The Great Crash of 1929 and the cumulative economic decline it initiated caused a period of recession in base metal mining. From the peak in 1929 the value of production of the major non-ferrous base metals declined each year reaching a low point in 1932, which spelt a fall of over two-thirds in the value of production. Peaking in 1930 the volume of output fell over two years to reach a low point also in 1932 which represented a fall of under one-third in the volume of output.

In these times with deflation general the base metal industry experienced a recession in which price declines overshadowed output shrinkage. Once again as in 1918-21 recession in the industry was mainly price related, a manifestation on this occasion of the trade cycle.

1942-46

The production build-up of base metals for World War II peaked (in volume terms) in 1942. In Canada the physical output of the four major base metals declined by 30% from 1942 to the end of the war.

The value of production behaved rather oddly in these few years. In 1943 the value of production rose slightly then eased in 1944 to the 1942 level which was maintained for two years. Only in 1946 did the value of production slump to a level 15% below the 1943 value apex.

The value figures for these years are somewhat anomalous given the volume decline and the reported fixity of base metal

prices (Table 4.3 and Appendix A. Tables 13 and 14). If both volume and value figures are to be believed the average price for smelted metal must have increased in 1943 and must have maintained its increase until 1945.

An explanation is at hand. The price control under which base metal mining operated during World War II had two aspects. Voluntarily the major companies had agreed with the British government that 80% of Canadian production would be delivered to Canadian tidewater at prices fixed in 1939. In addition the Canadian government controlled the price at which base metals were sold domestically. From 1941 any exports not covered by the agreement with Britain were not subject to price controls.

From 1943 some small price increases were allowed the base metal producers by the Canadian authorities. Also it happened that in 1943 the slackening of military demand for Canadian base metals permitted some diversion of exports to non-price controlled destinations. This accounts for the 1943 value increase.

The brief postwar slump was caused by the ending of the wartime contract in January, 1945. Though Canadian price controls were maintained, with alterations, until 1947, the prices received for Canadian exports first dropped then commenced the rapid advance which fuelled the expansion of the next decade. As most Canadian output was exported the reported fixity of price is illusory after January, 1945 (Appendix A. Table 14).

Regional Aspects

The regional base of non-ferrous base metal mining broadened from 1918 to 1955. That much is clear, whether volume or

value figures are adduced. Base metal extraction was largely confined to Ontario and British Columbia originally, but over the years Quebec established a substantial base metal mining presence. The Prairie provinces of Manitoba and Saskatchewan obtained from their sub-Arctic, northern districts an output which increased over four decades from zero to over 10% of the all-Canada Major Base Metals category. This regional movement is apparent in Tables 4.4 and 4.5.

Comparing these two tables shows that expansion by the three "new" mining provinces increased their share of output volumes more than their share of output values. Quebec, Manitoba and Saskatchewan accounted for 30.3% of the volume of output in 1948/52 but created only 25.6% of the value of production of Major Base Metals. The production mix of the new producing areas emphasised less valuable base metals than did the production mix of base metals in the older producing areas.

More specifically, Ontario and B.C. in 1918/22 produced 96.6% of the volume of output and 97.3% of the value of production. After fluctuations through the years Ontario's volume share was little changed in 1948/52 but the province's share of production value was down 23%. In contrast, B.C.'s volume share declined 40% and the value share by only 27%. From this it may be inferred that B.C.'s metals became relatively more valuable than those mined in other provinces.

For completeness there is included, in Tables 4.6 and 4.7, a breakdown of each metal's share of all Major Base Metals by volume and by value. A comparison of volumes and values in, respectively, 1918/22 and 1948/52 emphasises the increasing importance of zinc and lead to the industry. From this develop-

Table 4.4: Distribution of Regional Output of Major Base Metals in Canada by Volume: Five Year Averages as % of Canadian Total

Period	Quebec	Ontario	Manitoba	Saskatchewan	B.C.	Other	Total[a]
1918-22	1.9	33.8	0.8	0	62.8	0.6	100.0
1923-27	2.6	21.5	0	0	75.2	0.7	100.0
1928-32	8.6	21.1	4.2	0	65.3	0.8	100.0
1933-37	6.8	32.4	6.6	2.2	51.6	0.5	100.0
1938-42	9.4	32.5	5.8	4.6	47.3	0.4	100.0
1943-47	13.4	30.8	4.8	9.4	41.6	0	100.0
1948-52	18.0	30.8	4.2	8.1	37.9	1.1	100.0

[a] Totals may not add across due to rounding.

Source: Appendix A. Tables 4-12.

Table 4.5: Distribution of Regional Production of Major Base Metals in Canada by Value: Five Year Averages as % of Canadian Total

Period	Quebec	Ontario	Manitoba	Saskatchewan	B.C.	Other	Total[a]
1918-22	1.5	60.2	0.9	0	37.1	0.3	100.0
1923-27	1.9	39.4	0	0	58.3	0.5	100.0
1928-32	11.3	43.5	2.7	0	42.2	0.3	100.0
1933-37	7.4	61.2	4.9	1.8	24.5	0.2	100.0
1938-42	9.4	61.1	5.1	3.0	21.2	0.2	100.0
1943-47	11.1	52.0	4.1	8.0	24.8	0	100.0
1948-52	15.2	46.4	3.5	6.9	27.2	0.8	100.0

[a] Totals may not add across due to rounding.

Source: Appendix A. Tables 4-12.

Table 4.6: Share of Each Metal in Total Production of the Four Major Base Metals by Volume, 1918-52[a]

(1) Period	(2) Copper %	(3) Lead %	(4) Zinc %	(5) Nickel %	Total[a] %
1918-22	33.0	26.3	19.5	21.2	100.0
1923-27	21.9	43.1	22.2	12.9	100.0
1928-32	30.2	35.5	24.7	9.5	100.0
1933-37	33.6	28.9	25.2	12.3	100.0
1938-42	34.7	25.4	25.8	14.1	100.0
1943-47	30.2	22.2	32.1	15.5	100.0
1948-52	29.9	18.9	35.7	15.3	100.0

[a] Strictly, as the assay is typical to each metal, only changes in the shares have significance.

[b] Rows may not add exactly to 100% due to rounding errors.

Source: Appendix A. Table 1.

Table 4.7: Share of Each Metal in Total Production of the Major Base Metals by Value, 1918-52.

(1) Period	(2) Copper %	(3) Lead %	(4) Zinc %	(5) Nickel %	Total[a] %
1918-22	25.3	10.6	7.2	47.0	100.0
1923-27	27.2	28.9	14.3	29.7	100.0
1928-32	43.4	16.8	11.8	28.0	100.0
1933-37	38.1	12.4	11.0	38.5	100.0
1938-42	40.4	9.8	9.9	39.8	100.0
1943-47	35.5	12.5	17.7	34.3	100.0
1948-52	31.4	13.5	25.2	29.9	100.0

[a] Rows may not add exactly to 100% due to rounding errors.

Source: Appendix A. Table 2.

ment and from favourable price movements, especially for lead, British Columbia benefited.

However, the regional diversification of base metal mining must be placed in proper perspective. Base metals in Ontario, which is to say copper and nickel, continued to dominate the Major Base Metals aggregation. Ontario has been throughout the first part of the twentieth century the premier Canadian province for base metal mining. In large part it is the special richness and vast extent of the Sudbury deposits which place Ontario in this position.

Prices and Markets

In observations on the value of production the movement of prices has already been mentioned. Obviously the product of the volume of output and the price at which it is valued equals the value of production. More specific attention to price behaviour is warranted to give some indication of the market situation in which the value of base metal mining expanded.[28]

A price index of non-ferrous metals and their products is compared with the general wholesale price index for 1914-55 in Figure 4.3.[29] The closeness of the two indices in terms of both levels and trends is remarkable. What this means is that in real terms the non-ferrous base metal industry, considered as a whole, neither lost nor gained from relative price movements during this period.

Only in wartime was the sympathy of the two indices destroyed. In the Great War non-ferrous metals enjoyed a positive price deviation above the wholesale price index which persisted till 1920. The reverse situation arose in the Second World War

when for six years controls kept non-ferrous metals at a practically constant price while other items in the wholesale price index moved ahead. Despite rapid price increases in the metals group postwar this differential was not eliminated till 1952, though 1951 saw the gap almost closed.

The absence of any pronounced deviations of non-ferrous base metal prices above the all-items index is evidence that demand pressures were not the main force propelling growth in the industry between the wars. Similarly the lack of rapid price increases, except for 1946-51, supports an interpretation that reduces demand to a secondary role in the industry's expansion. Demand was adequate with proper cultivation; in short a relatively elastic demand allowed sales increases as supply changed.[30] Only after the Second World War did a demand induced boom lead to massive industry expansion throughout the 1950s.

It is to developments on the supply side rather than the demand that the main force of the industry's peacetime expansion must be attributed. New technologies and the innovation and improvement of existing methods lowered costs; often by making into metals what would formerly have been waste rock.[31] Concentrating and refining saw the most dramatic technological change as selective flotation and electrolytic refining, at the experimental stage early in the century, were improved and adapted continuously by a growing body of skilled engineers and minerologists. Less dramatic, and so less obvious, were a raft of improvements in mining methods and processing technologies.[32] Of particular importance to costs was the introduction of methods utilising hydro-electric power.[33]

As a result of these changes the extraction and process-

ing of lower grade and more complex ores, which had previously been uneconomic (too costly) or impossible, became profitable. Private capital was attracted.

However, to evaluate this argument emphasising supply considerations the behaviour of individual prices must be considered. The movement of copper, lead and zinc prices can be compared with the general wholesale price index in Appendix Tables 13 and 14.[34] This is done in Figure 4.4. A qualification rendered necessary by such a product by product analysis relates to the mid 1920s; zinc and lead both enjoyed a period of relative price advantage from 1922 to 1930 with the peak advantage occurring in 1925. As has been noted in a prior section, zinc and lead production (in volume terms) advanced rapidly in this decade.

The nature of the elasticity of demand is not precisely known, nor is it likely to have remained the same over the years. However, it has been inferred that, for Canadian base metals, the price elasticity of demand in any period was in all probability reasonably high for each metal, with the exception of nickel. Price elasticity of demand depends mainly on the possibilities for substitution by buyers. In the "new industrialism" Canadian base metals had to compete with other products, such as bauxite, and with production of base metals in Australasia, Mexico and the U.S.A. The demand curve facing a Canadian producer selling in the open market would have been price elastic.

Until the 1950s INCO was a world wide monopolist in the nickel market. In this circumstance, given nickel's use in defence production, the demand for nickel may have been price inelastic when military demand was of importance.

To distinguish demand or supply as causal is notoriously difficult. However this theoretical analysis, together with the data on prices and production volumes, supports an interpretation of a supply-led inter war expansion of major base metals. Prices were not buoyant until the hostilities of the Second World War commenced, whereupon they were controlled in Canada until the war ended (Figure 4.3).

Behind the figures the processes at work can be summarised under three headings.

(1) Consumer Demand

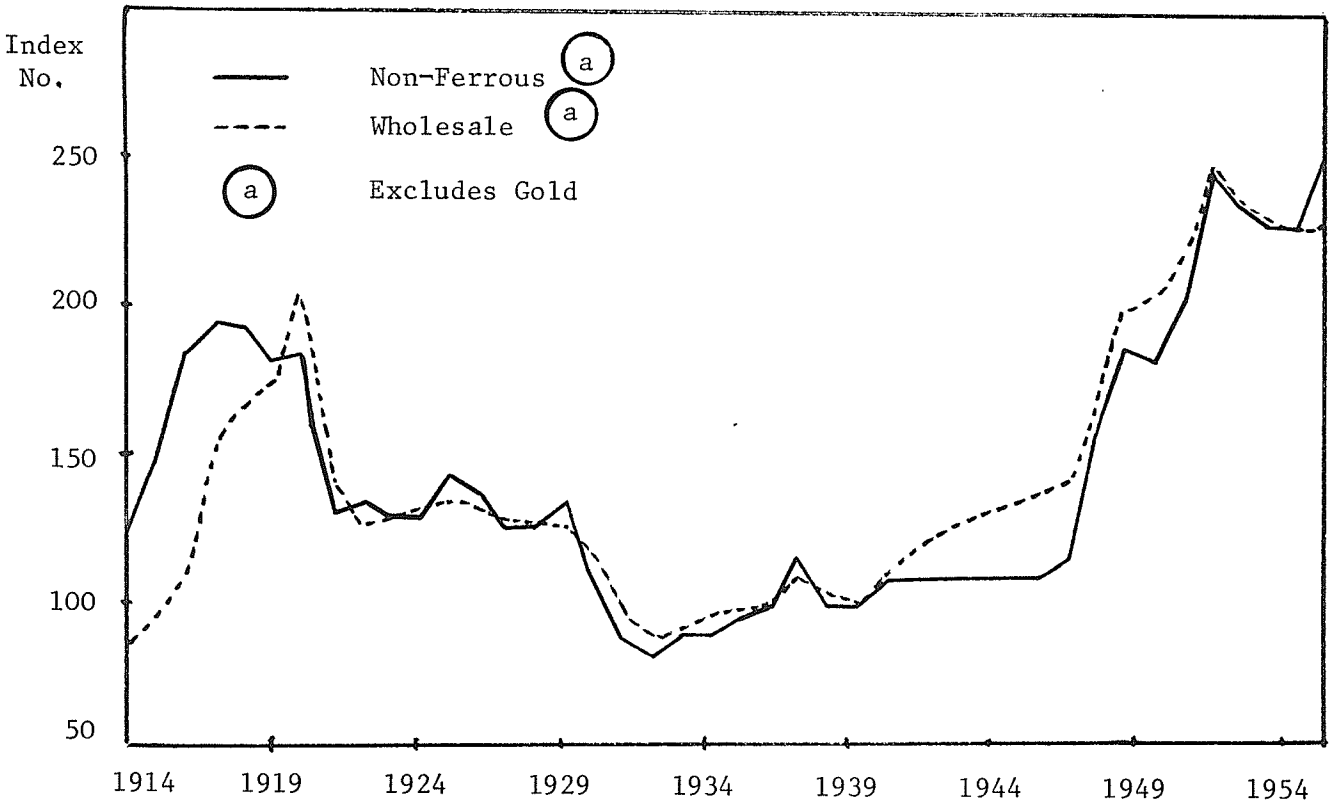
Base metals expanded in unison with the new consumer society evident in America from the 1920's. This source of demand for base metals provided for a steady increase in output interrupted only by the rocketing demands of nations at war (or fearing war) for strategic raw materials, and by those breakdowns in consumer demand which characterised capitalist economies before Keynes.

The goods demanded by newly affluent consumers were automobiles, radios and electrical equipment of all kinds. Lead was required for batteries. Nickel was used in steel alloys to give hardness and protection against corrosion. Copper wire was the conductor through which the expanding currents of electricity flowed in transmission lines and countless electrical machines. The main use for zinc remained that of galvanising to give iron and steel products a corrosion resistant coating. In various forms this product came to be used in the building trades but automobiles also used some galvanised zinc metal as well as zinc die-cast components.

The automobile and electric power were the dominant technological forces driving the new consumerism of North America

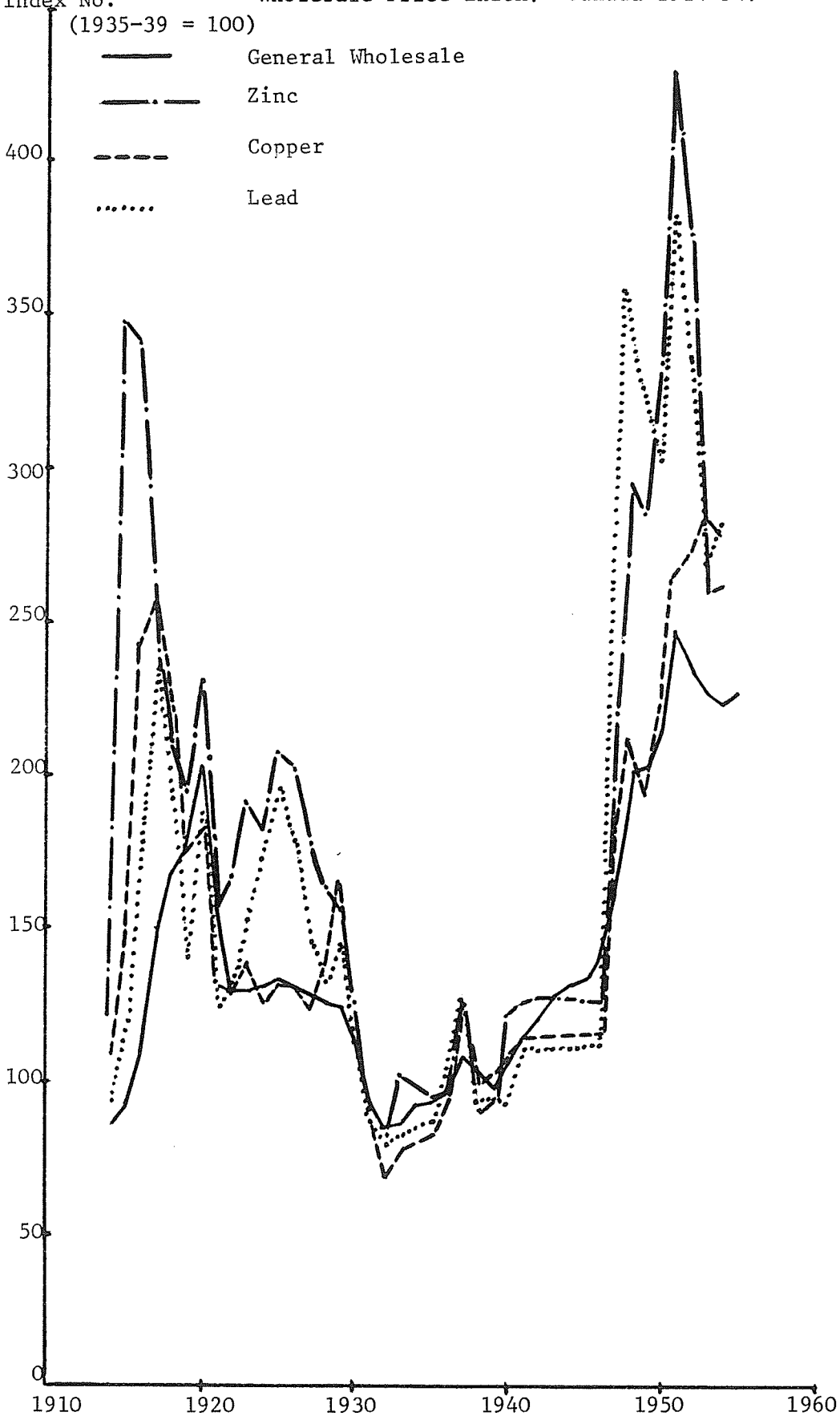
Figure 4.3: Price Index for Non-Ferrous Metals and their Products and General Wholesale Price Index. Canada, 1914-54.

(1935-39 = 100)



Source: Appendix A, Table 13.

Figure 4.4: Copper, Lead and Zinc Prices compared with the Wholesale Price Index. Canada 1914-54.



Source: Appendix A, Tables 13 and 14.

between 1918 and the 1950's. The steady increase in demand for Canadian base metals can be traced to this social transformation.

(2) Military Demand

On three occasions in the first half of the twentieth century military demand caused base metal production to expand rapidly. These were prior to and during the First World War, prior to and in the early stages of the Second World War, and during the Korean War and the subsequent relapse into a cold war posture between the U.S.A. and Soviet Russia.

Nickel was the war material 'par excellence'. Suitable in its steel alloys for armour plating, due to its extreme hardness, it clad the battle fleets of the Great War and protected the tanks of the Second World War. As the military use of aircraft expanded so did its armour plating role in the air.

Thomas Gibson in his book, Mining in Ontario, comments rather sadly of nickel that "this strongest of all metals was from birth dedicated to Mars, the God of War".[35] Writing in 1937 Gibson could express the hope that peaceful forms of nickel use had removed this stigma - presumably he was thinking primarily of stainless steel - but shortly the outbreak of hostilities was to shatter his hope.

Copper, lead and zinc also had strategic uses. Lead and bullets come naturally to mind as illustrative, but copper and zinc too, in the many electrical and automotive components which contribute to modern warfare, experienced strong military demands. Within the North American continent this military potential of base metal ores has tended to add a political dimension to the purely economic one in the development of Canadian base metal

mining. First in the British Empire and later as a supporter of U.S. world power Canada has had her mineral wealth viewed as a strategic consideration by foreign governments.[36]

(3) Technological Advance

What then of the contention that the industry's expansion was supply led rather than demand led? Now one must qualify this by specifying that it is consumer demand rather than military demand to which this conclusion applies. Prices before and during World War I and in the late 1940's and early 1950's reflected the pressures of military demand; and there can be no doubt that only price controls during World War II prevented prices exhibiting the same signals of a demand upsurge as are evident from 1914 to 1918 and 1947 to 1953.

Yet military demand has been erratic. The long run expansion of base metal mining depended between the wars on the new consumer uses of the metals. The periods 1922-29, 1932-37 and, to some extent, 1946-55 saw this groundswell of demand with semi-permanent characteristics advance. To an extent it was because these metals were available at prices more attractive than possible substitutes that research focused on their metallurgy and product potential rather than on substitutes. (Aluminium, for instance, has characteristics which compete with copper). Likely the technological innovations, symbolised by selective flotation and electrolytic refining, which permitted output to expand greatly without increasing prices are to be credited for the seizure by non-ferrous base metals of so many new market outlets as the new affluent society emerged.

The Structure of the Metallic Mineral Industry

The Metallic Mineral Industry consisted of firms which engaged in the mining, ore dressing and metallurgical treatment of metallic ores. To the industry were attached by wage contract a regular labour force and by sub-contract a range of employees from professionals in finance, to diamond drilling crews and old-fashioned prospectors. An analytical discussion of the industry helps to clarify the place of these relationships, formal and informal, in the industry as a whole. The analysis focuses on stages of production, each with an identifiable set of characteristics both technical and economic. With the aid of the flow chart (Figure 4.5) seven stages can be distinguished in non-ferrous base metal mining. These stages are exploration, proving, development, production of ores, ore dressing, smelting into matte and refining into industrial inputs.

Production entails real costs. Each of these stages has a real economic cost to society in terms of the labour and the capital employed and, with production, in terms of the exhaustible non-renewable resources removed from nature's storehouse. Wages, profits and rent are the payments required of the firm to obtain these resources. These three sorts of payment take place in institutional settings which differ in formality from the signed wage contract to the vague industry understanding with government to trade taxation for frontier development. Similarly, part of the institutional setting is the understanding of the syndicate, which "proves" a magnetic anomaly (found by exploration), that their claim will be bought out by a major producer at fair value granted the remaining uncertainties and anticipated production costs. By such payments, based on expectations,

regulated by law and by custom, the industry ran in the 1920's and 1930's. Often there were frictions, as is often the case when profit is the father of initiative.

Parallel to the production ladder there existed a financial framework. At one extreme the prospector in the 1920's and 1930's might obtain a "grubstake" from a few friends and relatives to sustain his summer spent with hammer in hand in the Canadian Shield or mountains of B.C. Alternatively he might finance himself by a winter spent trapping furs or working in a sawmill.

This figure has provided a romantic image for the mining industry based on the themes of rugged individualism and man against nature. These prospectors' motives were to make a great deal of money by "striking it rich". Few did. Indeed, for base metal mining, as opposed to the precious metals, the lone, untrained prospector was soon an unimportant factor of production in our period.[37] Exploration in the Canadian north became a serious concern of the industry from the 1930's onwards. Aircraft permitted first a longer summer range and later a sophistication of exploration techniques which implied a scale quite different from the activity of the lone prospector.[38] Financing of exploration efforts came to require substantial sums of money, to which syndicates of rich professionals and speculative businessmen could still aspire from the 1930's through the 1950's, but which increasingly were provided in the exploration budgets of the recognised mining companies. Airborne teams of geologists replaced the lone prospector in the summer throughout the Canadian Shield.

Proving an ore body involved diamond drilling a location where an outcrop of rock or magnetic survey techniques (or both)

Figure 4.5: Flow Chart of Non-Ferrous Base Metal Mining Process

Stage	Name	Product
1	EXPLORATION	INFORMATION
	↓	
2	PROVING	INFORMATION
	↓	
3	DEVELOPMENT	SITE FOR PRODUCTION
	↓	
4	ORE PRODUCTION	CRUSHED ORE[a]
	↓	
5	ORE DRESSING	CONCENTRATE[b]
	↓	
6	SMELTING	MATTE[c]
	↓	
7	REFINING	BASE METAL[d]

[a] Metal content typically 1% to 4% of combined recoverable metals.

[b] Metal content varied considerably around 10% of combined recoverable metals.

[c] Might vary around 95% pure recoverable metals. For some fabricating uses this was the industry's final product.

[d] Metal content exceeded 99%

Interpretive Note: Stages 1 and 2 were geographically spread, whereas Stages 3-5 were always located at the mine site. Stage 6 might be at the mine site but need not be. Stage 7 was generally centrally located.

indicated the possible existence of commercial quantities of ore. The technique used drills, tipped with diamond bits, which allowed a cylindrical core of rock to be removed from underground. Combining a drilling pattern with a sampling analysis of the core at various depths enabled geologists to guess at the extent, quality, shape and mining characteristics of any ore bodies discovered. With this information an exploration prospect either became commercially attractive (which might involve further investigation with underground mining methods) or else no further attention was paid to it. The drilling syndicate or mining concern might either abandon their legal claim or hold onto the legal rights as long as possible, paying a small annual fee, to sell the rights to more optimistic investigators. Alternatively the drilling entrepreneurs might have held only an "option" to the claim, which would revert to the title holders, according to the option's terms, if a specified time elapsed or if no development work was initiated on the prospect.[39]

As compared to one-man exploration, proving was a relatively complex activity which required financial expertise in addition to the management capability of delivering a drilling crew to a remote area and there ensuring its regular employment. Since contract drilling crews were available under the control of minor entrepreneurs a syndicate (which might include the prospector or which might simply buy from him the staked claim) would put up sufficient capital to pay for a drilling crew. Shares might even be issued at this stage ("penny stocks") for one of the many exploration ventures which received listings on Canadian stock exchanges.

Legal transfers of claims and options on claims with

different financial arrangements were legion. For example, the Hudson Bay Mining and Smelting Company's Flin Flon mine, which was discovered in 1915 by Tom Creighton, a pioneer prospector, changed option holders several times between 1915 and 1925, when a group of New York interests acquired the option and, after metallurgical testing, formed the Hudson Bay Mining and Smelting Company to establish the mine.[40]

This is a typical experience in that the road from a prospect to a producing mine was usually both long and contorted. Eventually it was normal for genuinely promising prospects, after successful drilling results, to be taken over by substantial financial interests. The capital needs for developing the ore body and transforming it into a producing mine were so great that the assumption of control by major capitalists became almost inevitable at this stage.

Located at the mine site were the activities of development, ore production and ore dressing. Development involved, if the mine was to use underground methods, the sinking of a shaft and the cutting of drifts (large tunnels) at the levels where the mining of the ore body was to be undertaken. To the economist this represents sunk capital, the initial fixed cost necessary for production to begin. Considerable finance was the pre-requisite to such development work which might take several years to complete. For example, the Lynn Lake, Manitoba, nickel mine of Sherritt Gordon Mines Ltd. had development work start in 1948 and the mine only began to produce in 1952.[41]

The removal of the ore from the earth is mining in the strict sense. Mining men differentiate themselves from smelter employees and the administrators of the corporation. Hard rock

miners operate equipment and make decisions underground in a work situation made difficult by dust, water and noise and made hazardous by blasting, by fire and by phenomena peculiar to their underground situation such as rockbursts.[42] The job is difficult and dangerous, but creates a camaraderie which extends from geologists to manual labourers. Much of the popular sentiment that mining must have benefited the Canadian economy rests on an appreciation, often implicit, of the sweat and discomfort lying behind the swelling mineral statistics.

Whatever the overall economic effects of mining, the mine workers deserve considerable respect. The story of their unionisation and their struggle to improve working conditions is being told elsewhere, and need not be touched on here.[43] However, it can be remarked that sacrifice by workers, while generally benefiting their employers, need not necessarily have benefited the economy as much as might an alternative use of their labour. Like the prospector the hard rock miner threatens to assume mythic qualities which obstruct a rational analysis of the economic value of his endeavours.

Ore dressing is also known as ore beneficiation or simply as milling. Mechanical techniques of pulverisation fractured rock into grains with varying proportions of metal to waste rock. By means of magnetic and flotation methods these grains were separated into a "concentrate" and a "tailing".[44] Different ores with special properties demanded a particular combination and modification of the basic methods of liberation and concentration. With high grade ores matte could be produced directly by smelter methods, but ore dressing (especially selective flotation) was essential for certain ores and increased the economic recovery of metals from most ores.

Ore dressing created a demand for iron products used in the mechanical part of the process (e.g. balls for ball mills, rods for rod mills) and for chemicals used as flotation agents. The method of selective flotation was adopted commercially from the 1920's onwards by the Canadian mining industry.

Smelting and refining are often associated in discussion, and indeed the D.B.S. collected statistics throughout our period for a category entitled 'non-ferrous smelting and refining'. Smelting uses heat - furnaces with or without oxygen feed - to separate metal from metal and metal from slag. The product, called smelter matte, varies around 95% pure metal. Refining of the matte was for non-ferrous metals heavily dependent on the electrolytic methods, though alternative methods, such as the leaching technique of Sherritt Gordon's Alberta refinery later became commercially viable. After refining, the metal is more than 99% pure. Both smelting and refining are activities requiring capital on a large scale.

In Canada from 1918 to 1955 the mining industry came to be dominated by a very few substantial companies - INCO, Falconbridge, COMINCO, Granby Consolidated Mining and Smelting, Noranda Mines, Hudson Bay Mining and Smelting and Sherritt Gordon Mines. The success of these companies was based on two attributes:

(1) Control over an excellent and extensive ore body or series of ore bodies.

(2) Possession of smelting capability.

If the former attribute was a matter of chance as well as the result of a sound exploration strategy, the latter was a matter of access to capital and entrepreneurial determination. Sometimes the capital was acquired largely from ploughed back

profits, as with Noranda Mines, but in other cases financial backing was the key to smelter acquisition. This relationship is investigated more fully in Chapter VI.

Evidence can be brought to indicate the oligopolistic nature of smelting and refining in Canada. In 1923 there were seven operating smelters in Canada. In British Columbia there was COMINCO's Trail smelter which dealt with lead and copper. The smelting of lead ores had started in 1899 and "copper and lead operations were carried on side by side until 1929". Zinc was first recovered from smelting procedures (more than a decade subsequent to its electrolytic recovery) in 1930. COMINCO's own ores were handled but custom smelting was also undertaken. Also operating in British Columbia in 1923 was the copper smelter of Granby Consolidated Mining, Smelting and Power at Anyox in the remote north west of the province.

In Ontario in 1923 nickel/copper ores were smelted by INCO at Copper Cliff, by the Mond Nickel Company at Coniston, and by the British North American Nickel Corporation near Sudbury. In addition small amounts of nickel oxide were obtained from cobalt ores in the smelters of the Coniagus Reduction Co. (St. Catherine's) and the Debro Smelting and Refining Co. (Debro). From 1916 lead was mined at Galetta and a lead smelter there was run by the Kingdom Mining, Smelting and Manufacturing Co. As the regional figures show (Appendix A, Tables 4 to 12) nickel and copper were the dominant base metals produced in Ontario throughout the 1920's.

Thus, as far as the major non-ferrous base metal group is concerned, there were only five major and two minor smelters at work in the entire country in 1923. In 1924 the British

government sponsored British American Nickel Corporation went into liquidation selling its assets to INCO. Then in 1928 INCO took over the Mond Nickel Company Ltd. including its Coniston smelter and Welsh refinery. For two years INCO controlled all the nickel smelting capacity (from copper/nickel ores) in Canada until in 1930 Falconbridge Nickel Mines, incorporated in 1926, blew in their Sudbury smelter.

The near monopolistic position of INCO throughout this period can only have been protected by their holding such a high proportion of the nickel smelting capacity in company ownership. Similarly, COMINCO was in a strong position in the west, being the most favourably placed smelter to handle the lead-silver ores of the East Kooteney and Boundary mining regions. Both companies prospered.

By 1933 two major companies had established new smelters in Canada, adding to the 1923 list. Noranda Mines had fired a copper/gold smelter at Rouyn and Hudson Bay Mining and Smelting were producing copper from Flin Flon, Manitoba. Within two years the Anyox smelter closed.

In this fashion was established the basic distribution of non-ferrous metal smelting in Canada. British Columbia had one smelter treating lead and zinc at Trail. Ontario had three, treating copper and nickel at Copper Cliff, Coniston and Sudbury. Quebec had the Noranda copper/gold smelter and Manitoba the Flin Flon copper smelter of Hudson Bay Mining and Smelting. Nor, until 1955, when Sherritt Gordon at Fort Saskatchewan, Alberta, introduced a nickel refining process (leaching) which by-passed smelting as an independent stage, did processing capacity start to expand.

Simultaneously Gaspe copper commenced production from a smelter in Murdochville, Quebec.

With regard to refineries, even fewer have operated in producing non-ferrous base metals. In 1923 COMINCO operated a zinc refinery at Trail. INCO owned a nickel refinery at Port Colborne and British American Nickel Corporation had a nickel/copper refinery at Deschenes, Quebec. Mond nickel was refined in Wales and some INCO nickel went to Huntingdon, U.S.A., for refining. By 1933 Noranda Mines had established a copper/gold refinery in Montreal East and INCO a copper/nickel refinery in Copper Cliff run by the Ontario Refining Company, a majority-owned subsidiary. Falconbridge did all its refining in Norway. However, at Flin Flon a zinc refinery was operated by Hudson Bay Mining and Smelting

The Trail refining capability of COMINCO had been extended to handle lead as well as zinc.

Here again the basic structure that was to exist for 20 years had been established by the early 1930's. By 1945 no new refineries had been established and even by 1955 the only addition was the Sherritt Gordon refinery (using "leaching"), already mentioned, initiated in Fort Saskatchewan, Alberta, in 1955. Of course, installations which existed in the early 1930's did expand their refining capacity over the period to 1955.

FOOTNOTES

1. Royal Ontario Nickel Commission, Report (Toronto: King's Printer, 1917).

2. Ibid., p. xxvii

3. Ibid.

4. H. V. Nelles, op. cit., pp. 359-60.

5. See my discussion on growth and development in the first pages of Chapter II.

6. The category, Canadian Metallic Minerals, consists of base metals (copper, lead, zinc, nickel, cobalt, and iron) and precious metals (gold, silver and platinum). Also included in some years, in minor amounts, are magnesium, tungsten and uranium. As this list is not exhaustive, minor amounts of other metals may also appear. See M. C. Urquhart and K. A. H. Buckley, Historical Statistics of Canada (Macmillan: Toronto, 1965), p. 410, notes N82-88. See also, for further detail, D.B.S., General Review of the Mining Industry, 1960 (26-201), p. A-46.

7. M. C. Urquhart and K. A. H. Buckley, ibid., Series N-87. See also, for price index, Appendix A, Table 13.

8. The general price level was at virtually the same level. (Appendix A, Table 13).

9. This decline is in fact the sign of a discontinuity in the series rather than an indication of recession. The value of copper and lead was reduced under a new compiling method which also affected nickel and zinc. In short, a change in statistical method tends to deflate the growth exhibited by base metals in the latter part of the 1920's. See, Urquhart and Buckely, op. cit., p. 409, and D.B.S., Mineral Production of Canada, 1928 (26/D/28) pp. 317-8.

10. Urquhart and Buckley, op. cit., Series N-83.

11. Ibid., Series N-87.

12. In 1931 the U.K. and many other nations left the Gold Standard, leading to upward market pressures on gold prices. The index of Canadian wholesale gold prices moved up from 61.0 in 1931 to a fixed wartime level of 109.0 in 1940 (1935-39 = 100) representing a 79% increase in 10 years. See D.B.S., Wholesale Price Indexes, 1913-50 (62/D/102), Table 1. It is interesting to note that the compilers of this index with a 1935-39 base gave gold a weight of 44.4% in the sub-section, Non-Ferrous Metals and their Products (including gold). This weight is excessive for all but the later 1930's. The metals "copper and products", "lead and products", "nickel", and "zinc and products" were weighted together as 43.5% in the sub-section.

This weight is too light for all but the 1930s (Appendix A, Table 3). See, for details of weights, D.B.S., ibid., Appendix I.

13. Urquhart and Buckley, op. cit., Series N-83.

14. M. C. Urquhart and K. A. H. Buckley, ibid., Series N-87.

15. The compilation of the data did not permit the allocation of values to particular metals. Compilation was "on an industry basis which represents very closely the actual return to the metal mining industry". The method involved the classification of the entire mining sector into industry groups designated according to the principal products. Statistics were published by group. Examples were Copper-Gold-Silver Mining, Silver-Lead-Zinc Mining and Nickel-Copper Mining. Questionnaires sent to all mines and smelters asked questions on the metal content of concentrates shipped, the value of concentrates shipped, number of employees and costs. See, D.B.S., General Review of the Mining Industry, 1960 (26-201), Appendix.

16. See 15 above. In 1921 D.B.S. assumed the responsibility for collection of mining statistics for the Mines Branch of the Dominion Department of Mines. "Principal Statistics" were published only in part in the Annual Report on the Mineral Production of Canada (26/D/28). From 1949 a full presentation was given in General Review of The Mining Industry (26-201). Urquhart and Buckley report their source for Series N82-88 in earlier years as the files of D.B.S. See, Urquhart and Buckley op.cit., notes to N82-88.

17. See D.B.S., General Review of the Mining Industry, 1960 (26-201, p. A-46.

18. Ibid. Also noted in a letter to author from A. J. Symonds, Head, Minerals Unit, Statistics Canada, dated May 18th, 1977.

19. See Footnote 16, above.

20. Prior to 1931 gold was valued at a constant price. Subsequently the price set in the U.S. was used.

21. Compare Urquhart and Buckley, op. cit., Series N-87 with Canadian Mineral Statistics, 1886-1956, Reference Paper No. 68 (26-501), Table 1. (Latter reproduced in Appendix A, Table 3, Column 2). That this relationship is reversed in 1946 is most likely due to postwar price decontrol.

22. Urquhart and Buckley, op. cit., p. 409

23. Ibid.
D.B.S., The Mineral Production of Canada, 1927 (26/D/28), Appendix.
D.B.S., General Review of the Mining Industry, 1960 (26-201), Appendix

24. See Footnote 18.

25. Thus, in this Chapter, Tables 4.2-4.7 and Figure 4.1 are based on Appendix A, Tables 1-12. The source for these is the D.B.S. Smelter Estimated Data series. Exclusively based on this series is D.B.S., Canadian Mineral Statistics, 1888-1956, Reference Paper No. 68 (26-501)

26. The price was U.S. $948.0 in 1920 and U.S. $987.5 in 1950. See C. J. Schmitz, World Non-Ferrous Metal Production and Prices, 1700-1976. (Frank Cass: London, 1979) pp. 287-8.

27. See Footnote 9.

28. Over the same period as concerns us the world pattern of output and prices for base metals seems to accord with the interpretation presented here for Canada. The opinion of C. J. Schmitz is as follows:
"The broad trend of prices, in terms of current values, has been one of fluctuations around a generally falling trend to the late 1930's - early 1940's, followed by fluctuations around a generally rising trend to the present day. Underlying this pattern was rapid expansion in the world's production of most primary commodities from the mid-nineteenth century to mid-twentieth, at a rate perhaps faster on the whole than the growth of demand". C. J. Schmitz, op. cit., p. 28.

29. Both these indices appear in Urquhart and Buckley, op. cit., Series J34 and J41. The underlying data, which the editors modified for continuity, are in D.B.S., Wholesale Price Indexes, 1913-50, Reference Paper No. 24 (62/D/102).
The weights of the sub-section are of interest. Excluding gold "non-ferrous metals and their products" weighed 5.66% of the composite total for the wholesale price index. Gold was 4.44% of the composite total. Thus, including gold, non-ferrous metals and their products weighed 10% of the composite index. See D.B.S., ibid., Appendix I.

30. The tenor of this assessment, albeit for all Canadian mining, is supported by John Davis, Mining and Mineral Processing in Canada (Royal Commission on Canada's Economic Prospects: 1957) pp. 12-14. See also F. B. Howard White, Nickel (Toronto: Longmans, 1963), pp. 162-4.

31. One illustration of this transmogrification is the history of zinc production in B.C. Until 1898 zinc was penalised as an impurity in the shipments of galena (lead) ores to the U.S. but thereafter the mineral assumed a value in its own right (Burley, p. 294). From 1898 The Canadian Pacific Railway Co's mining subsidiary, formed in that year, smelted copper and (from 1901) lead at Trail. Fearing exhaustion of existing supply sources for lead ores by 1909, The Consolidated Mining and Smelting Co. (COMINCO) had acquired mining rights to the Sullivan mine, some 200 miles from Trail, which contained "a complex lead-zinc-iron deposit (which) had proved difficult to treat" (C.M.J., p. 133).

At first the zinc was eliminated during concentration so that the Trail smelter could handle a concentrate high in lead (and silver). Before the war of 1914-18 and, with the encouragement of the Imperial Munitions Board, during the hostilities, research was directed to zinc recovery. The solution was found in a process of selective flotation introduced commercially in 1920, and improved over three years, which enabled the zinc to be separated from the other minerals. (A small, unprofitable zinc production had commenced in 1916 using electrolytic recovery). The large expansion in zinc production in Canada in the 1920s came in the main from the Sullivan mine (Burley, p. 262).

Noteworthy features of this example are:
(1) The deliberate corporate research effort involved.
(2) The interest and support of the Dominion and Imperial authorities for strategic reasons (Burley, pp. 295-305).
(3) The way in which a composite ore, mined initially for the one mineral (lead), encouraged research towards the economic recovery of its partner ore (zinc).

References are to:

K. H. Burley, The Development of Canada's Staples, 1867-1939 (Toronto: McClelland and Stewart, 1970)

COMINCO Staff, "The Story of COMINCO", Canadian Mining Journal, Vol. 75, No. 5 (May, 1954).

32. COMINCO Staff, ibid., p. 233. J. R. Boldt and P. Queneau, The Winning of Nickel (Longmans: Toronto, 1967).

33. "As a source of power electric energy is being used to an ever increasing extent in mining and milling operations where important economies in operation are being affected". D.B.S., Annual Report on the Mineral Production of Canada, 1933 (26/D/28), p. 131.

34. A fully equivalent series for Canadian Nickel prices is not available over the period. However, see Appendix Table 15.

35. T. W. Gibson, Mining in Ontario (Toronto: Province of Ontario, Dept. of Mines, 1933), p. 82.

36. See footnote 31 above. For a short time the British government owned a Sudbury Mine (the Murray Mine) for strategic reasons. Their operating company was the British America Nickel Corporation which was liquidated in 1924. See Gibson, ibid., p. 79, p. 92 and D.B.S., Mining Events, 1604-1956, Reference Paper No. 68 (26-501) p. 10. A later U.S. interest is evidenced by the content of Canadian North (U.S. Office of Naval Operations, April, 1956) Ref. No. OPNAV. P03-4.

37. The important Sudbury ore bodies (Creighton and Frood) and the Sullivan mine were known by the First World War. The Britannia Mine on Howe Sound had shipped copper concentrates from 1905. The Flin Flon mine, which was to be the vehicle for Hudson Bay Mining and Smelting, was discovered in 1915, closely followed by the deposits Sherritt Gordon was to acquire in the late

1920's to form the Sheridan mining community. Even The Horne Mine, from which sprang Noranda Mines, was staked in 1921 at the very start of our period. Admittedly, in this latter discovery traditional prospecting methods are to be credited. See John Davis, Mining and Mineral Processing in Canada (Royal Commission on Canada's Economic Prospects, 1957) Appendix A.

38. See, for detail on techniques, J. R. Boldt and P. Queneau, The Mining of Nickel (Toronto: Longmans, 1967), p. 19.

39. For fuller discussion see, John Davis, op. cit., Appendix B.

40. The Story of Hudson Bay Mining and Smelting Co. Ltd. (H.B.M. and S. Brochure: 1976).

41. Boldt and Queneau, op. cit., p. 86

42. Ibid., p. 123

43. Geoffrey R. Hjorleifson, "The reactions of the Canadian non-ferrous mining industry to collective bargaining at the International Nickel Co., Sudbury, Ontario" (Unpublished M.A. Thesis: Department of Economics, University of Manitoba, 1970).

44. Selective flotation is a method of separating metal-bearing ore from waste rock based on the principle "that whatever the bodily composition of a substance, it will tend to adhere to an air bubble if its surface is not wetted by water". In flotation tanks the desired minerals are made hydrophobic by the addition of suitable chemicals to a liquid ore pulp. Air is then bubbled through the tanks. Boldt and Queneau, op. cit., p. 199.

CHAPTER V

LINKS WITH THE CANADIAN ECONOMY

The Annual Special Edition of The Northern Miner in August, 1927 was a paean of praise to the booming Canadian mining industry.[1] An article described the Toronto Standard Stock and Mining Exchange as the "best market in North America for mining securities."[2] Another asked plaintively "why does Great Britain stand aloof?" - ignoring the investment potential in the mining share bonanza.

In one interesting piece, more analytical than the rest, a writer enquired rhetorically "Does Toronto realise its debt to the north?" Acknowledging first that Toronto possessed a good market for mining stocks, the existence of many Toronto fortunes based on mining was noted. According to the writer 90% of Ontario mines had Toronto head offices. The article continued to detail in non-technical terms the linkages through which Toronto benefited from the mining industry.

Toronto, it declared, obtained the bulk of the business of equipping the mining crews with food, tools, clothing and other necessary items. S. H. Logan, the General Manager of the Canadian Imperial Bank of Commerce, was quoted as follows:

"In 20 years about one billion dollars has come out of Northern Ontario. About $600,000,000 must have been spent on supplies, wages, food and machinery in Toronto and Southern Ontario."[3]

In a speech to the Toronto Board of Trade Club precision is not to be expected, but the quotation illustrates vividly that the Canadian trader and entrepreneur was by no means unaware of the commercial potential of the mining industry. The backward

linkages of hinterland mining to the Toronto metropolis were clear in 1927.

Agriculture, forestry and mining were the foundation stones of Toronto's prosperity in the 1920's.[4] Wholesalers and small manufacturers, as well as the Eaton mail order business, flourished on the basis of these primary demands. Mining and Toronto were the more closely connected because Ontario was the main mining province, and some Toronto jealousy was aroused by the holding in Montreal in 1928 of the Imperial Mining Congress. The contest of Ontario and Quebec to induce the rail link from Noranda to run to their respective metropolitan centres showed once again that the linkage benefits of mining expenditures were clearly understood by the commercial classes in the two provinces.

Later, when the grim 1930's succeeded the buoyant 1920's, gold mining in Northern Ontario and Quebec remained a bright glow in an otherwise bleak economic landscape. Base metals, though production faltered, did not collapse in the manner of the wheat economy. (See Appendix, Table I). Recovery too was faster than with the agricultural staple.

Perhaps something of the flavour of the times is transmitted in the words of R. B. Bennett printed in the depth of the Depression in the 1933 Feature Edition of the Sudbury Star, produced to celebrate 50 years of nickel mining in Sudbury. Prime Minister R. B. Bennett said:

"Sometimes when you feel depressed, as I dare say some of you do, sometimes when you feel everything is wrong in the world, there is nothing I should ask you to think of more than Canada's mining industry if you wish to revive your faith."[5]

The material presented in the last few paragraphs illustrates that base metal mining in the inter-war period in Canada was a significant source of demand. In the production of minerals, costs were incurred for goods and services, the supplying of which acted as a stimulus to Toronto and Montreal. In short these cities benefited from some of the backward linkages from mining. It was on account of these important commercial benefits, experienced to some degree throughout the economy, that mining was perceived increasingly as a sector of the economy particularly deserving of encouragement. In this sort of public policy there can be seen precedents in the approach of the Canadian state to a succession of staple products.[6] The transportation subsidies to the wheat economy are the best known example.

In this thesis dissent is expressed from the view that mining was especially beneficial to the Canadian economy. Implicitly the developmental strategy of the Canadian state towards mining is condemned. Both Dominion and Provinces seem equally liable to this judgment.

Of course, let there be no misunderstanding, benefit there was from mining to the Canadian economy. However, under private ownership the minerals industry exhibited the very same weakness as earlier Canadian staples. Concentration of public attention and governmental encouragement on mining did not promote in Canada development of an industrial base capable of existence independent of its original progenitor. Largely this was due to the linkages of mining remaining for the most part of the backward variety. There did not occur the increasing contribution of

forward linkages which is necessary for mining production to secure genuine economic development (See Chapter II above).

In the remainder of the present chapter the linkages of base metal mining are explored to establish their configuration between 1918 and 1950. The task is to illuminate for Canadian economic development the weakness of the minerals staple on the one hand while suggesting its contribution on the other. The hypothesis which guides this investigation is the one introduced at the end of Chapter II. This hypothesis is that the linkages to non-ferrous base metal mining on the basis of private enterprise were inadequate to promote the economic development warranted by the potential of the raw ore bodies. Beyond this guiding hypothesis, however, the aim is to contribute to what has been described as "the detailed historical writing needed to explore the pervasive and peculiar impact of each particular staple."[7]

At this a disclaimer is due. The treatment of linkages attempted here is by no means exhaustive. The territory has been uncharted. The available data are incomplete, and the sources are diverse, scattered and, in content, often tangential to a linkages assessment. My objective here has been to delineate the main contours with reasonable accuracy, rather than to map the terrain with precision. Thus, imports of capital equipment (an important issue) are unexplored. Indeed the balance of payments is dealt with only in an abstract setting. Foreign tariffs are examined only briefly. As throughout this thesis, gold is considered in passing, despire the joint production of gold and base metals from

many Canadian ore bodies.[8] I would assert, nonetheless, that in the end the contours loom clearly enough to sustain the main proposition of this chapter.

Backward Linkages

The Sudbury Star, the newspaper serving the mining communities of Sudbury and Copper Cliff, must itself be considered a final demand linkage of the copper-nickel mines. In the Feature Edition celebrating in 1933 the half-centenary of nickel in Sudbury, sixty pages were printed, including about one-third of advertising materials.[9] These pages serve as a window on the economic connections of the industry - and I.N.C.O. in particular - at that time.

In what can only be a rough, intuitive analysis, some of this material is presented in Table 5.1. An examination will show that backward linkages predominate among the important advertisers in this special edition. If security dealers were to be admitted as a backward linkage of the industry, the preponderance of backward linked businesses would be still greater. To include the smaller advertisers would indicate a significant role for the construction industry indigenous to Ontario, again a backward linkage. A few forward linkages to machine manufacturers in Canada (other than mining machines) are also indicated among the smaller advertisers.[10] To the extent that contemporary advertising in this medium sheds light on the industry's economic contacts, backward linkages are placed at the centre of the linkages analysis in this Chapter.

Most mines were small mines, though leading companies based on large mines dominated the industry (see Chapter VI). There were 485 operating metal mines in Canada in 1929 with just over 31,600 employees. The leading mining province, Ontario, had only 97 metal mines in that year but almost 16,000 employees in metal mining.[11] Canada had 867 metal mines by 1936 employing 46,500 in all.[12]

What were the backward linkages to the development of a small mine in Northern Ontario? Though not indicative of day-to-day operating linkages, examination of such an experience can be considered an analysis of some of the "typical" backward linkages of the industry. Relevant information is obtainable from an article entitled the "Cost of Developing a Small Mine", which appeared in the Canadian Mining Journal in 1939.[13]

The article assumes a hypothetical underground mine in Northern Ontario with a 525 feet deep shaft developed at 125 feet intervals to a total of 3000 feet. Electric power was assumed to be available and only 5 miles distant there passed a railroad. The ore warranted the erection of a small concentrator while development work was in progress.[14]

The costs of development up to the point of regular production are laid out in Table 5.2. In all, the development was presumed to take 21 months. The underground development was judged to be completed in 12 months from the commencement of shaft sinking.

The underground development, unlike the preliminary work, would involve a minimum of sub-contracting. (Diamond drilling was

Table 5.1: The Feature Edition of the Sudbury Star

Advertiser[a]	Products[b]	Linkage Type[c]
Canadian General Electric	Generators, Transformers, Motors, Switchboards	B
Imperial Oil	Petrol, Parafin	B
Royal Trust Co.	-	FD,B
Canadian Westinghouse	Electrical Apparatus	B
Cochrane-Dunlop Hardware, Sudbury	-	FD
Canadian Atlas Steels, Welland	Hollow Steel Drill	B
Ontario Hydro Power Commission	-	B
Canadian Loco. Co., Kingston	-	F, B
Northern Electric Co.	Electric switches, Wires and Cables	B
Geo. Gordon and Co., Coche Bay (Ontario)	Lumber	B
Sudbury Brewing and Malting	-	FD
Foley Bros., New York	Construction	B
Canadian Foundries and Forgings	Crusher Balls, Mill Liners, Forged Shafts	B
Canadian Industries Ltd. (CIL)	Explosives, Paint etc.	B
General Engineering Co. Toronto	Flotation Machines	B
The Bank of Toronto	-	FD
Canadian Airways	-	B
STELCO	Steel and its products	F, B
Herber Morris Crane and Hoist	-	B
T. Eaton and Co.	-	FD

a. Full page and half page advertisements only. Security dealers excluded.
b. Selected.
c. F = Forward, B = Backward and FD = Final Demand.

Source: The Sudbury Star, Feature Edition (August, 1933).

always handled by independent contractors for the smaller mining companies). The mine's labour costs therefore represented the actual labour costs involved in the work underground. These labour costs were deemed by far the most significant expense of underground development accounting for about $4500 a month whereas "supplies", for example, were costed at $1500 a month and electric power at $700 a month. Obviously the labour cost was the most significant element of cost to the mine, but the single commodity, electric power can also be seen to be vital. Hydro-electricity provision emerges as an important backward linkage of mine development.

Particular items purchased with part of the $200,000 of development expenditures would have included an electric hoist ($9200), a compressor ($7000), a heating plant boiler ($1200), underground rock drills ($3350), 2 shaft cages and 2 buckets ($1600), electric transformers ($5000), three-quarters of a mile of electric power line ($1000, five miles of road ($5000) and several buildings ($3500). These were all potential backward linkages to the Canadian economy, from which, if the advertisers in the Sudbury Star give any guide, many Canadian based companies benefited in the 1930's.

These glimpses into the Sudbury celebration in 1933 and into the situation facing the mining entrepreneur in the late 1930s are useful as concrete illustrations of linkages in the mining industry. However, for backward linkages, at least, it is possible to use aggregative data to lend support to the picture of an industry giving, via backward linkages, diverse opportunities

Table 5.2: Development Costs for a Small Mine in the 1930's

Activity		Cost $
Preliminary Development		
Prospecting[a]		2,000
Recording and Patents		976
Surveying and Legal Costs		2,540
Temporary Buildings		1,311
Stripping and Blasting		1,360
Sampling and Assaying		274
Diamond Drilling		12,700
Building		13,505
Plant and equipment		42,070
Road Building		5,000
General Charges[b]		13,500
	SUB TOTAL	95,136
Underground Development		
Shaft Sinking		37,200
Other Development		51,800
General charges[b]		24,000
	SUB TOTAL	113,000
	OVERALL TOTAL	208,136

a. This cost item is an arbitrary estimate.

b. Managerial salaries, advertising, insurance, etc.

Source: M. D. Isbister, "Cost of Developing a Small Mine", Canadian Mining Journal, Vol. 60, No. 5 (May, 1939).

to other parts of the Canadian economy.

The breakdown of non-ferrous expenditures (including gold) presented in Table 5.3 was made available for 1935.

A brief summary of these data show purchases of machinery were 15.0% of total expenditures by the non-ferrous industries in 1935. Fuel and power accounted for nearly one quarter of expenditures, including electric power which was, alone, 11.5% of total spending. Freight absorbed over 16.0% of the industries' expenditures. Explosives and chemical flotation agents taken together accounted for 11.6% of spending.

The backward linkages to electric power, coal and oil were obviously major. So also were those to transportation. However, about half the purchases, if the "other" category is included, would seem to have been manufactured goods.

Linkages have been explained to be a potential investment inducement, not a realised output gain (Chapter II). Some of these expenditures were for imports. For example, just under half the coal was imported from the USA.[15] However, in the fields of electric power generation, transportation and construction Canadian purchases were obviously of prime importance. The evidence of the advertisers in the Sudbury Star, and their Canadian addresses, supports the view that the potential, which these backward linkages represent, was on occasion being turned into Canadian output, even though the entrepreneurial basis might be branch-plant American.

Gold mining prospered in the 1930s, but by 1935 base metal was also recovering. The linkages of an expanding industry are revealed by these data. A comparison of gold and base metal

Table 5.3 : Expenditures by Non-Ferrous Mining, Smelting and Refining Industries, 1935

Item	Expenditure ($ million)	Proportion of Total (%)
Explosives	4.77	7.2
Rock drills and parts	1.15	1.7
Pipes and plumbing	1.41	2.1
Iron and steel	1.60	2.4
Lumber	3.79	5.8
Building materials	1.30	2.0
Electrical equipment including batteries and wire	2.24	3.4
Crushing and grinding equipment	1.32	2.0
Grinding balls and rods	1.20	1.8
Mining, milling and smelting machinery excluding trucks	3.84	5.8
Miscellaneous machinery and tools	1.46	2.2
Flotation agents and chemicals	2.91	4.4
Freight - incoming	7.73	11.7
Freight - outgoing	2.86	4.3
Fuel - coal, wood etc.	5.62	8.5
Fuel - oil	1.51	3.0
Electric Power	8.15	12.4
Other	12.94	19.6
TOTAL	65.89	100.0

SOURCE: D.B.S. Special Report on the Consumption of Supplies by the Canadian Mining Industry, 1935 (Ottawa : 1936)

industries also shows some differences. Both gold and base metals are included in Table 5.3, but in Tables 5.4 and 5.5 data for each kind of metal are presented. Roughly 45% of the expenditures in Table 5.3 were made by gold mining concerns.

Electric power took the same proportion of gold and base metal spending. Transportation, in contrast, was almost one-quarter of the base industries' spending but only 6.4% of the expenditures in gold mining. The high value/weight and value/volume ratios of gold compared with base metals is likely responsible for this difference in the pattern of backward linkages. Machinery purchase amounted to one-fifth of the gold industry's spending in 1935, but only one-tenth of the base metal industries' expenditures. Undoubtedly this difference reflected the investment surge initiated in gold mining by the high prices and profits of the Depression years. Purchases of coal and wood for fuel were also significant in base metal mining, smelting and refining to an extent much greater than in the gold industry.

The import leakage is not known precisely. Thus, while these figures demonstrate linkages in the (correct) sense of potential Canadian outputs, they do not describe actually realised Canadian outputs. However, the developmental impetus of mining's demand was obvious enough at the time; the declared perception of the D.B.S. was that "the diversity and magnitude of expenditures by this great Canadian industry" had "a widespread and increasing influence on our industrial life."[16]

But if the picture is clouded in some parts by a lack of aggregative data, some important detail may also be missed from

Table 5.4 : Expenditures by the Gold Mining Industry, 1935

Item	Expenditure ($ million)	Proportion of Total (%)
Explosives	3.34	11.6
Rock drills and parts	0.80	2.8
Pipes and plumbing	0.84	2.9
Iron and steel	0.52	1.8
Lumber	1.94	6.8
Building materials	0.74	2.6
Electrical equipment including batteries and wire	1.26	4.4
Crushing and grinding equipment	0.85	3.0
Grinding balls and rods	0.89	3.1
Mining, milling and smelting machinery excluding trucks	2.33	7.8
Miscellaneous machinery and tools	0.79	2.8
Flotation agents and chemicals	1.41	4.9
Freight - incoming	1.73	6.0
Freight - outgoing	0.11	0.4
Fuel - coal, wood etc.	0.55	1.9
Fuel - oil	0.69	2.4
Electric power	3.59	12.5
Other	6.33	22.0
TOTAL	28.71	100.0

SOURCE : D.B.S., Special Report on the Consumption of Supplies by the Canadian Mining Industry, 1935 (Ottawa : 1936)

Table 5.5 : Expenditures by Non-Ferrous Mining, Smelting and Refining Industries excluding gold,1935[a]

Item	Expenditure ($ million)	Proportion of Total (%)
Explosives	1.43	3.9
Rock drills and parts	0.35	0.9
Pipes and plumbing	0.57	1.5
Iron and steel	1.08	2.9
Lumber	1.85	5.0
Building materials	0.56	1.5
Electrical equipment including batteries and wire	0.98	2.6
Crushing and grinding equipment	0.47	1.3
Grinding balls and rods	0.31	0.8
Mining, milling and smelting machinery excluding trucks	1.61	4.3
Miscellaneous machinery and tools	0.67	1.8
Flotation agents and chemicals	1.50	4.0
Freight - incoming	6.0	16.1
Freight - outgoing	2.75	7.4
Fuel - coal, wood etc.	5.07	13.6
Fuel - oil	0.82	2.2
Electric power	4.56	12.3
Other	6.61	17.8
TOTAL	37.19	100.0

a) Some gold values from composite ores are still included.

SOURCE : D.B.S., Special Report on the Consumption of Supplies by the Canadian Mining Industry, 1935 (Ottawa : 1936)

too lofty a perspective. Hidden in the expenditure totals were payments which were the life blood of new, developing industries in Canada.

Aircraft, for example, came to be relied upon for prospecting, and for mining transportation generally, in the north. In commenting upon the expansion of Canadian aviation in the late 1920s J.R.K. Main emphasised this linkage:

> "The proliferation of operators was almost entirely a product of exploration and mining development in what Canadians call, for want of a better term, the North - meaning, the country lying beyond our towns and cities. More precisely, it encompassed the Precambrian Shield which encloses Hudson Bay in a belt from 600 to 1000 miles in depth. It was by now widely known that the Shield was, potentially at least, heavily mineralised. Large ore beds carrying gold and other minerals had been discovered at Noranda, Rouyn, Chibougamou, Kirkland Lake, Red Lake and a score of other places.
>
> Red Lake, opened in 1925, was an air operator's ideal. Apart from a few tractor trains hauling goods in the winter time, it was developed and maintained entirely by air.
>
> Prospectors and mining magnates itched to discover and exploit the riches of Aladdin. No questions were asked about the means: the aeroplane was the instrument that made all this possible."[17]

Likewise for hydro-electric engineers and their suppliers, for railroad operators, for iron and steel trades and so on, a whole way of life, for some, if not all, of the men and concerns involved in Canada, depended upon the mining industry's aggregate expenditures. In fact, it was this perception of mining's importance to Canada that permeated government's thinking towards the industry.

Forward Linkages and Final Demand Linkages

Beyond non-ferrous smelting and refining what were the forward linked industries associated with base metal mining? In

Canada prime among these metal using occupations was the electrical apparatus and supply industry. Almost one half the wages and salaries in the non-ferrous metal products sector were paid to the electrical apparatus and supplies industry in 1928.[18] Likewise in the same year 40% of the cost of materials used in the non-ferrous metal products sector was incurred on account of this electrical goods industry.[19] Electric storage batteries, radio equipment, telegraph and telephone apparatus, electric motors, spark plugs and kitchen stoves were the main products fabricated.[20]

It is interesting to note the small proportion of the exports of this industry going to the U.S.A. Less than 1% of export sales in 1936 were to the U.S.A.[21] Major customers were the United Kingdom, the British Empire and South America. Typical purchases were $150,000 of ignition equipment by Australia, $182,000 of electric kitchen stoves by South Africa, $151,000 of telephone and telegraph apparatus by Brazil, $43,000 of the same equipment by Argentina and $122,000 of batteries by New Zealand. Despite the geographic proximity of the U.S.A. it seems Canadian manufacturers of electrical goods found their markets elsewhere. Indeed some were subsidiaries of U.S. firms.

Of course, other industries also used the output of non-ferrous base metal mining. Brass and Copper products along with Lead, Tin, and Zinc products required $19.8 million of materials in 1928, which was exactly one-fifth of the materials purchased by the non-ferrous metal manufacturing sector.[22] Such expenditure represents not only purchases of base metal refinery products but also spending on general supplies. Thus, forward linkages spiral

out creating demands throughout the economy.

Looked at as a whole, the non-ferrous metal manufacturing industry (including smelting and refining) was rather modest in 1928 as compared with the iron and steel industry, despite the absence of significant iron ore mining at this time in Canada.[23] Also the gross values of production of textiles, wood and paper products, and animal and vegetable products were mostly greater by a factor of 2 or 3 than the output of metal manufacturing. Minus smelting and refining the products grouped under Non-Ferrous Metal Manufactures were equal in value to the small Chemicals industry.[24] Despite the mineral richness of Sudbury, Trail and the lesser base metal communities, there had not been experienced by 1928 a major development of manufacturing based on minerals from the mill, smelter or refinery.

These obvious forward linkages to base metal mining seem to have been modest in the 1920's and 1930's. Less perceptible forward links there must also have been - to stainless steel, scientific equipment and so on. It would be wrong to underestimate the role played by a ready supply of nickel, copper, lead and zinc in easing the task of Canadian entrepreneurs in many industries. However, imports of non-ferrous base metals remained significant in the 1920's reflecting the shortage of Canadian refining capacity for copper and zinc and the inability of the refiner to provide the whole range of products required by fabricators.[25]

Remarkably, even when a wide range of Canadian refinery products became available in the 1930s the importance of Canadian metal fabrication relative to primary production did not grow,

Table 5.6: Value of Production of Non-Ferrous Metal Manufacturing, Selected Years

(1) Year	(2) Primary ($ million)	(3) Secondary ($ million)	(4) Total ($ million)	(3)/(4) (%)
1919	66.8	26.6	93.5	28.5
1926	72.9	40.9	113.7	36.0
1929	109.9	59.9	169.8	35.3
1933	100.6	27.2	127.8	21.3
1939	262.6	64.4	327.0	19.7
1946	304.7	179.9	484.6	37.1
1957	1280.1	403.2	1683.4	24.0

Source: M. C. Urquhart and K. A. H. Buckley, Historical Statistics of Canada, Series Q396-Q398.

Table 5.7: Value Added in Non-Ferrous Metal Manufacturing, Selected Years

(1) Year	(2) Primary ($ million)	(3) Secondary ($ million)	(4) Total ($ million)	(3)/(4) (%)
1919	55.0	19.2	74.3	25.8
1926	27.5	18.9	46.5	40.6
1929	62.2	25.1	87.3	28.8
1933	54.5	12.2	66.8	18.3
1939	80.1	27.3	107.3	25.4
1946	69.6	78.9	148.5	53.1
1957	450.7	152.4	603.1	25.3

Source: M. C. Urquhart and K. A. H. Buckley, Historical Statistics of Canada, Series Q396-Q398.

though naturally imports of refinery products fell away. Even after the artificial, protective stimilus of the Second World War, only 37.1% of non-ferrous metal products' sales were secondary rather than primary (Table 5.6). A decade later the proportion had fallen to one quarter, despite the rapid advance in sales of the Canadian mining industry in this period. With respect to value-added, the transitory nature of the wartime stimulus to secondary metal working is even more distinctly evident. (Table 5.7). From just over half the value added in non-ferrous metal manufacturing the importance of secondary manufacturing, or fabricating in other words, fell in 1957 to one quarter, that is to say, to pre-war levels. No clearer demonstration is required of the failure of refined nickel, copper, lead and zinc to create permanent, forward linked manufacturing activities in Canada on the scale warranted by the output of raw metals.

What reasons can be brought forward for this outcome? It is well known that the forward linkages from extractive industry are in any case limited in many circumstances.[26] For example, in as much as minerals in the twentieth century are used in high technology products, nations in the underdeveloped world may not possess the skilled manpower and technical experts to establish forward-linked industry. Yet for Canada with a fine education system and free entry to the system of the U.S.A. this explanation would seem to be inadequate.

The structure of tariffs in potential markets must have had an influence. Typically in industrialised countries such

tariffs weighed heavily on fabricated products and lightly on raw materials. Even prior to fabrication such influences might affect industrial location. The U.S. Tariff Commission noted in 1948:

"The U.S. import duty on crude nickel and nickel-alloy metal may have been a factor in determining the location of that company's plants for refining Monel matte, and producing Monel mill shapes and castings in Huntington, West Virginia, and in Bayonne, New Jersey, rather than in Canada. Monel matte is imported duty free whereas nickel metal is dutiable. The importation of nickel matte has enabled the company not only to import free of duty the nickel content of the matte but also a substantial content of copper. The Revenue Act of 1932 made the copper content of imports of copper bearing ores and concentrates subject to an import-excise tax (now temporarily suspended) of 4 cents per pound; this tax was not made applicable to the copper content of nickel matte."[27]

Great caution is required in the area of tariff policy and its effects. Often all is not quite as it seems. For instance, along with the duty mentioned in the above quotation, a scheme of bonded imports of copper existed. These U.S. imports of blister copper paid no duty if refined, or refined and fabricated, in the U.S.A. for re-export. The effect was that "in the 13-year period 1935-47 the quantity of taxed copper imported amounted to 7% of the total imports."[28]

Finally it has to be acknowledged that the U.S.A. received only about one-tenth of its imports by volume, including bonded imports, from Canada in the period 1935 to 1948, with considerable year to year fluctuations in the proportion. Less than one-fifth of Canada's output was routed to the U.S.A. in this period, most of Canada's exports going to Great Britain. The institutional arrangements of the British Empire succeeded in attracting Canadian copper at this time, whereas some nickel processing was successfully lured to the U.S.A.

There are, unfortunately, few simple statements to be made concerning the effects on Canada's processing and fabricating industries of world tariff patterns. It is safe to observe, though, that the structure of tariffs world-wide did not preclude fabrication for export in some lines. Canadian entrepreneurship, primed with Canadian capital in depth, could most probably have made further inroads to foreign markets.

This is not to deny that the failure to secure forward linkages was partly a political failure. World trade patterns are made by negotiation as well as by comparative advantage, and within the British Empire, Canada's trade position was capable of manipulation. However, as the British Empire crumbled and as American dominance of the world's economy grew from the 1930s to the 1950s, Canada's business ties swivelled increasingly towards a North-South pattern. The mining industry became more American in ownership (Chapter VI).

The pressures in this situation were to supply primary metals rather than to compete with American customers by vertical integration into secondary manufacturing. The existing non-ferrous metal products industry was heavily U.S. owned.[29] For outside capital the costs of entry to the continental industry together with the failure of an Imperial economic strategy, as attempted by the Ottawa Conference, for example, may have inhibited entrepreneurial interest.[30]

Had a mechanism existed whereby a proportion of the rents from extractive industry were funnelled into manufacturing, the situation could have been very different. As it was, private

enterprise obtained the rents and employed them within the mining sector or transferred them abroad. The failure of government policy, almost inevitable, given the ideological climate of the nation, was to abjure the collection of rents by nationalisation or taxation. Only thus could wealth created by Canada's extractive resources - the ore reserves of nickel, copper, lead and zinc - have been translated into a developed Canadian economy based on the further processing and fabricating of diverse base metal products.

In fact our explanation goes beyond the strict bounds of this thesis.[31] Our limited concern has been to indicate the absence of progressively more significant forward linkages to Canadian non-ferrous base metal mining throughout our period. As a result economic development based on forward linkages to the industry was truncated.

Despite their importance, very little can be said by way of precise analysis of the mining industry's final demand linkages.[32] In general the extent of these linkages is witnessed by the frontier penetration of mining civilisation with its social infrastructure, townsite construction and retailing services. The owners of labour services raise families and provide for them with the rewards of their labour. The diverse demands of a community are what is described by final demand linkages.

Already it has been suggested that the bill for wages and salaries was often a substantial part of mining costs in the 1920s and 1930s. By way of illustration in the nickel-copper part of mining in 1921, a labour force of 816 wage earners and

Table 5.8: Labour Earnings as a Proportion of Gross Value of Production, Canadian Metallic Industries, 1923 - 55.

Year	%	Year	%	Year	%
1923	37.1	1935	-	1947	31.1
1924	33.1	1936	33.9	1948	29.1
1925	31.6	1937	32.1	1949	31.9
1926	32.1	1938	29.8	1950	30.0
1927	37.3	1939	28.9	1951	31.1
1928	40.7	1940	27.8	1952	36.9
1929	38.6	1941	28.7	1953	39.4
1930	43.1	1942	24.0	1954	35.1
1931	34.8	1943	27.3	1955	31.5
1932	32.3	1944	28.9		
1937	31.8	1945	29.7		
1934	34.5	1946	22.7		

Source: M. C. Urquhart and K. A. H. Buckley, Historical Statistics of Canada, Series N84 and N87.

39 salaried employees were paid for some part of the year at least. Demand conditions for the industry's products were very slack. Payments to labour in the mines and mills amounted to $734,000 out of total expenditures for the year in the nickel-copper mining and milling industry of $1.4 million.[33]

On the metallurgical side of the business, there are the processes of smelting and refining nickel-copper matte. Labour, both salaried and non-salaried, earned $1.2 million in smelting these ores in 1921 and $551,000 in refining them.[34] In comparison, fuel purchases, mostly imported coal products, by the same smelters and refineries were worth only $925,000 in that year. Expenditures for labour, it can be noted, were much greater than monies spent on fuel, the most important backward linkage.

To put this in perspective over the longer period reference may be made to Table 5.8. From this, it seems that roughly one-third of the gross value of production of all the Canadian metallic industries, precious and base, was earned by the labour force. Throughout the period, metallurgy incurred proportionately less of its total cost from hiring labour than did mining and milling.

In assessment, it can be said that, as the mining industry grew an important part of its contribution to Canadian economic development arose through its employment of labour. Immigration, too, with its pervasive developmental effects was encouraged by the five-fold increase in the labour force over the period to which Table 5.8 refers. A mining labour force appeared with specialist skills.

Harold Innis compared the Klondike experience to a cyclone in its economic effects. The gold created a furious draft of demand which blew itself out with mine exhaustion, leaving the local infrastructure as a shell without a purpose. The ghost town is a hovering question mark over the developmental effects of mining's final demand linkages. Fortunately for Canada, the diversity of minerals, often in long lasting ore bodies, has mitigated this problem. At least Sudbury and Trail have stood for fifty years and more, though many communities, like Sheridon in Manitoba, have withered away with the disappearance of commercial ore.

The transitory nature of final demand linkages from particular extractive resources has always been, and remains, a fundamental problem in evaluating the developmental impact of Canadian mining. What social costs lie hidden in the derelict buildings and deserted roadways of the Canadian ghost town?

Balance of Payments Effects

The role of the Balance of Payments in economic development is complex. Not only the overall balance, but also the structure of the accounts underlying it, can have profound implications. That the shape of economic progress in hinterland economies is deeply affected by the nature of metropolitan demand is one of the major insights of staples analysis. In this sense, economic development is transmitted to the hinterland via the Balance of Payments.

Orthodox economic theory can also contribute to understanding the role of foreign exchange earnings in a developing economy. To the extent that foreign exchange earnings from base metal mining plus net private capital inflows associated with the industry are not offset by imported inputs, such as capital goods, and repatriated profits then the base metal mining industry will be a source of (net) foreign exchange earnings for Canada. In theory, this inflow would be desirable for a developing economy if utilised to import capital goods for other industrial sectors. On the other hand if the exchange rate were forced to a high level by staple exports in general, of which base metals were one, then the development of secondary industry on an export basis could be impeded.

One important observation is in order. Detailed examination of the major companies in non-ferrous base metal mining does not support the widely held belief that mining induced substantial inflows of private capital from abroad. In obtaining a dominant stake in Canadian base metal mining, U.S. concerns relied much more heavily on ploughed back profits and economic rents than on massive subventions of U.S. capital (See Chapter VI). Only from time to time, and usually at moments strategic from the viewpoint of finance and control, did large sums of U.S. dollars enter Canadian base metal mining. Of course, there were inflows of foreign capital, British as well as U.S. in origin, but compared with the internally generated growth of the industry, they were of small significance.

The needs of the Canadian economy must be reconsidered prior to further assessment of the impact of mining on Canada's economic development in the period 1918-55. To clarify this issue reference can be made to the literature of economic development, in particular to the "two gap" analysis proposed by Hollis Chenery and others in the 1960s.[35] For the present purpose this analysis serves to emphasise that foreign exchange may act as a constraint to economic development quite apart from the availability of savings. Economic growth may be impeded by an inability to obtain necessary imports from abroad, despite the existence of domestic savings.

If the base metal mining industry were a net earner of foreign exchange and if economic development required the importation of capital goods or other essential imports, it could be concluded that the industry helped Canadian economic growth independent of its own direct contribution. The reverse would be true if the industry were a net user of foreign exchange, and, to find its overall effect, a downward revision of the industry's direct contribtuion to economic growth would be in order.

The direct calculation in principle consists of adding the value of the industry's exports and capital inflows and subtracting the value of the industry's imports, of repatriated capital and of expatriated profits and rents. Unfortunately, the empirical basis for such a summation is lacking. However, it is possible to move towards an intuitive assessment of the overall position.

A set of "stylised facts" will be employed. They are a capital/output ratio of 3, a 10 year average lifetime of capital assets and an export/output ratio of 1. No empirical evidence is adduced to support these assumptions, though they are reflective of the Canadian setting of non-ferrous base metal mining.

Now it must be recognised that buildings, private transportation facilities and inventories were part of the capital stock of the industry. To these must be added public infrastructure devoted to mining to obtain the overall capital requirement of the industry. Despite these items being high in Canadian inputs the capital goods needed by the industry were such that to assume 50% of the capital stock to have been imported does not seem unreasonable.

Taken together with the "stylised facts" the assumption that 50% of the capital stock was imported would lead to the conclusion that, over a ten year period, about 30%, or one-third of mineral output values were used for investment imports. Of course, on top of this charge on foreign exchange, current supplies incorporated an import element. Nevertheless, it seems reasonable to suppose that the trade effect of the mineral industry was to secure a net foreign exchange gain. Intuitively this is explained by the high export/output ratio alongside some domestic backward, forward and final demand linkages.

With respect to the services component of the Current Account of the Balance of Payments and to the Capital Account, the picture is even less clear. I have already mentioned that

capital inflows were modest. Considerable ploughing back of returns took place of the proceeds of U.S. investment in Canadian base metal mining. Nevertheless, an outflow not only of profits but also of economic rents did occur. Whether the net effect was positive or negative is by no means obvious. Indeed as U.S. firms entered the industry, the phenomenon of transfer pricing likely grew in importance, causing still greater difficulties in assessing even the year by year situation. However, a bold speculation would be that after the 1930s, very little or no net foreign exchange was earned by the non-ferrous base metal mining industry over the combined services and capital accounts of the Balance of Payments.[36]

It will be evident that this discussion is suggestive rather than rigorous. This area is one in which much further work is required before definitive answers can emerge. The impact of the mining industry on the Canadian Balance of Payments is a thesis topic in its own right. The tentative analysis conducted above suggests, as a prelude to such research, that the mining industry may have contributed little through trade to creating a foreign exchange surplus for the Canadian economy.

Of course, this may not have mattered. Canadian economic growth may not have been impeded by a foreign exchange constraint. The relative strength of the Canadian dollar in much of the period 1918-55, may be an indication that capital inflows and export surpluses in other sectors of the economy may have rendered the mining industry's net contribution to, or use of, foreign exchange holdings quite irrelevant to an understanding

of how the industry affected Canadian economic growth and development. In other words, it was the industry's direct impact, through mineral production and its linkages, which was likely of most importance rather than the indirect effects on other sectors experienced through the Balance of Payments.

However, the fallacy of composition is to be avoided. The overall contribution of natural resource exports to the Canadian Balance of Merchandise Trade is well known. Perhaps it is best to note the similarity of the trade impact of non-ferrous base metals to this pattern, while acknowledging that the foreign exchange impact of the industry's funding arrangements are less clear, and likely to be insignificant at best. The possibility cannot be dismissed that the long run debit effect of such funding is considerable.

FOOTNOTES

1. The Northern Miner (August 25, 1927).

2. The Toronto Standard Stock and Mining Exchange dealt in mining securities from 1896 until amalgamated with the older Toronto Stock Exchange in 1934. The Toronto Stock Exchange Historic Trading Summary (TSE: 1974).

3. The Northern Miner, op. cit.

4. G.P. de T. Glazebrook, The Story of Toronto (University of Toronto Press, 1971), Chapter 8.

5. The Sudbury Star, Feature Edition (August, 1933).

6. H.G. Aitken, "Defensive Expansionism - The State of Economic Growth in Canada", in W.T. Easterbrook and M.H. Watkins (eds.), Approaches to Canadian Economic History (Toronto: McClelland and Stewart, 1967).

7. Mel Watkins, "The Staple Theory Revisited", Journal of Canadian Studies, Vol. 12, No. 5, (Winter, 1977).

8. Gold was excluded for the analysis in the planning stage as part of the process of defining a manageable research topic. Gold is subject to a different type of demand from base metals, so that the cycles of gold and base metals sales tend to be quite different. Of course, not only is the production function similar for both gold and base metal mining, but also many base metal deposits contain gold. For gold mining in Canada an introduction is A. Hoffman, Free Gold: the Story of Canadian Mining (Toronto: Rinehart and Co., 1947).

9. The Sudbury Star, op. cit.

10. Of course, the evidence presented in Table I is suggestive only. Advertisements are an imperfect guide to mining industry suppliers and customers. Size of company business with the nickel industry and size of newspaper advertisement are certainly only broadly correlated. Much economic history must draw upon such evidence, tenuous in itself, to help to substantiate an historical intuition.

11. D.B.S., Annual Review of the Mineral Production of Canada (1929) Table 27.

12. Ibid., (1936), Table 20.

13. M.D. Isbister, "Cost of Developing a Small Mine", Canadian Mining Journal, Vol. 60, No. 5 (May, 1939).

14. In terms of Figure 4.5 this example deals mainly with Stage 3 but Stages 4 and 5 are in progress concurrently, though only in connection with the ore which is obtained as a by-product of Development in the Stage 3 sense.

15. D.B.S., Annual Review of the Mineral Industry in Canada, 1936.

16. D.B.S., Special Report on the Consumption of Supplies by the Canadian Mining Industry, 1935 (Ottawa: 1936) p.2.

17. J.R.K. Main, Voyageurs of the Air (Ottawa: Queen's Printer, 1967) p. 63.

18. D.B.S., Manufactures of Canada: Production, Imports and Exports, Prepared for the use of the Imperial Conference, 1930. Table V.

19. Ibid., "Electrical Apparatus and Supplies" is a sub-heading under the heading "Non-Ferrous Metal Products". Also a sub-heading is "Non-Ferrous Smelting and Refining". Thus the sector totals in this discussion include smelting and refining as well as fabricating.

20. D.B.S., Trade of Canada, 1936. Table 11, pp. 116-117.

21. Ibid.

22. D.B.S., Manufactures of Canada: Production, Imports and Exports, Table V. (See footnote 18 above).

23. The gross value of production of non-ferrous metal products was $238 million in 1928 (including smelting and refining). The equivalent value for textiles was $415 million, for wood and paper products was $683 million, for animal products was $485 million and for vegetable products was $757 million. The Canadian total gross value of production in 1928 was $2770 million for all manufacturing industries. Ibid.

24. The gross value of production of Chemicals and Allied Products was $147 million in 1928, compared with the "without smelting and refining" value of production of non-ferrous metal products of $144 million. Ibid.

25. M.C. Urquhart and K.A.H. Buckley, Historical Statistics of Canada, Series N27-49.

26. U.N.I.D.O., Non-Ferrous Metals - A Survey of their production and potential in the developing countries (New York, 1972).

27. U.S. Tariff Commission, Summaries of Tariff Information Vol.III Metals and Manufactures, Part V, "Principally Non-Ferrous Metals, Miscellaneous Metals etc." (Washington, 1948) p.120

28. Ibid., p. 53.

29. H. Marshall and K.W. Taylor, Canadian American Industry (1936). Reprinted in the Carleton Library Series (McClelland and Stewart, 1976), pp. 71-75.

30. That the attempt was a real one for Canadian mineral marketing is supported by the following. "During the Ottawa Conference, producers and users continued to discuss the regulation of the Empire markets in copper, lead and zinc. But their preliminary negotiations had already fixed the terms which were finally written into several Ottawa agreements. British firms could buy at world prices; foreign metals (i.e. non-Empire) would pay a duty, but only as long as Empire producers could supply all British demand at world prices." I.M. Drummond, Imperial Economic Policy, 1917-1939, (University of Toronto Press, 1974), pp. 202 (parenthesis added).

31. Also judged beyond the scope of the present task is the whole question of the Canadian tariff. In their investigation Marshall, Taylor and Southard concluded that almost all the non-ferrous metal products imported from the U.S.A. in 1932 could be produced competitively in Canada by U.S. branch plants. The same was true for chemicals. Tariffs on electrical apparatus and machinery were judged "average" by Marshall, Taylor and Southard. From this it can be gleaned that Marshall, Taylor and Southard believed these two manufacturing sectors were able to produce on the whole quite efficiently by world standards. There is no indication here that sales expansion of these manufactured products was inhibited by high costs. H. Marshall et al., op. cit., Chapter VII, pp. 271-277.

32. There existed no suitable data for quantitative examination until the advent of input-output methods. Even those are of limited value in the mining context. See L. Copithorne comment which concludes P.F. Nickel at al., Economic Impacts and Linkages of the Canadian Mining Industry (Centre for Resource Studies, Queen's University, 1978).

33. D.B.S., Annual Report of the Mineral Production of Canada (1921), p. 51.

34. Ibid.

35. Hollis B. Chenery and A. Strout, "Foreign Assistance and Economic Development", American Economic Review (September, 1966).

36. In the long run analysis of the balance of payments, the appropriate time horizon for our concerns, economic theorists often construct stock adjustment models giving an outcome the same as this tentative conclusion. "An inflow of capital,

although it will bring about a once-over increase in the stock of reserves, will cause a deterioration in the balance of payments in the continuing interest payments to which it gives rise:" See M. von Neumann Whitman, Policies for Internal and External Balance, Princeton Special Papers in International Economics, No. 9 (Dec., 1970), p. 24.

CHAPTER VI

FINANCE AND CONTROL

A General Perspective

The United States of America replaced Britain as the major supplier of capital to Canada in the early twentieth century. That British capital inflows into Canada tended to be portfolio in nature, while U.S. capital inflows tended to be direct investments, has become a commonplace of post-Confederation economic history. The fate of such British direct investment as did exist prior to World War I has been documented by D. C. Paterson. His conclusion is simple: "British direct investment was not ..... dynamic enough to match that of the United States."[1] Thus, the commanding presence of the U.S. in direct investment in Canada was established by 1926.

Direct investment implies control of an enterprise in the Canadian definition. Using Dominion Bureau of Statistics criteria as to what was direct, (i.e. which holdings of equity implied control of firms), almost four-fifths of the stock of foreign, direct investment in Canada was U.S. owned in 1926. The next three decades saw only a small reinforcement of this relative position, though the total stock of all foreign, direct investment rose more than fourfold.[2]

In contrast the three decades from 1926 revealed a major

Table 6.1: Ownership of Foreign Direct Investment in Mining and Smelting[a]

($ million)

	U.S.	Total Non-Resident Ownership	U.S. as % of Total Non-Resident Owned
1926	141	169	83.4
1930	191	217	88.0
1933	211	238	88.7
1939	198	228	86.8
1945	215	237	90.7
1949	331	349	94.8
1953	561	580	96.7
1955	781	811	96.3

[a]Excludes the mineral fuels

Source: Statistics Canada, Canada's International Investment Position, 1926-67 (Ottawa: 1971). Table VI, P130.

advance in the U.S. holdings of portfolio securities in Canada. The U.S. owned 43.1% of the long term portfolio investments in Canada in 1926 and 66.2% in 1955. The total stock of such portfolio investment had increased by almost one-third in that interval.[3]

It is useful to know the tempo of these economy-wide changes within the Canadian mining industry. Often this sector is perceived as having been of special interest to U.S. investors. To treat foreign direct investment in Canadian mining as primarily U.S. based is indeed legitimate. (Table 6.1). This pattern had been established by 1926 and was reinforced thereafter. Despite a modest increase in the U.S. share, portfolio investment does not show a similar overwhelming dependence on U.S. owned funds (Table 6.2).

It may be concluded that mining remained a sector characterised by U.S. direct investment rather than portfolio investment.[4] For Canada the Portfolio/Direct ratio for U.S. Long Term Investment in Mining and smelting rose from 17 cents on the dollar (1926) to 27 cents on the dollar (1939) and varied little thereafter.[5] Such a finding at the aggregate level gives some reassurance of the relevance of the analysis to follow, which looks mainly at the equity changes in non-ferrous, base metal mining firms.

In the above discussion attention has focused on foreign investment and its analysis in terms of direct/portfolio and U.S./other foreign categories. A further question of interest is what proportion of the mining and smelting industry was controlled by U.S. residents? Consistently U.S. control exceeded the proportion of capital owned in the U.S. (Table 6.3). The explanation for

Table 6.2: Ownership of Foreign Portfolio Investment in Mining and Smelting[a]

($ million)

	U.S.	Total Non-Resident Ownership	U.S. as % of Total Non-Resident Owned
1926	24	50	48
1930	43	94	45.7
1933	50	101	49.5
1939	53	101	52.5
1945	62	119	52.1
1949	85	145	58.6
1953	164	243	67.5
1955	220	379	58.1

[a]Excludes the mineral fuels

Source: Statistics Canada, Canada's International Investment Position 1926-67 (Ottawa: 1971). Table X, P136.

Table 6.3: Ownership and Control of Capital in Mining and Smelting

	U.S. Owned Investment (%)	U.S. Controlled Investment (%)	Total Capital Employed[a] ($ million)
1926	28.0	32.0	600.0
1930	34.0	42.0	800.0
1939	31.0	38.0	800.0
1948	32.0	37.0	1100.0
1953	52.0	55.0	2500.0
1955	48.0	55.0	2100.0

[a]Book value of capital owned by Canadian residents and foreign residents.

Source: Statistics Canada, Canada's International Investment Position, 1926-67. (Ottawa: 1971) Tables XVIIand XVIII.

for this phenomenon lies in the emphasis placed by the U.S. on direct investment. The U.S. controlled share of the industry rose from 32.0% in 1926 to 55.0% in 1955. Considering the mining and smelting of non-ferrous native ores (a much narrower category available only from 1955) data show that of a total estimated investment stock of $785 million in 1955 about 42.0% was owned in the U.S. However, that was sufficient for U.S. residents to control 68.0% of the capital employed in the industry.[6]

In common with many other Canadian industries non-ferrous base metal mining seems to have been controlled to an ever increasing extent by U.S. residents as the twentieth century advanced. The conclusion of Mel Watkins applies:

"The historic tendency for staple production to take place under the aegis of foreign capital has persisted, indeed accelerated."[7]

(In this chapter I am concerned to examine this phenomenon in the specific industry context of non-ferrous base metals).

Financing the Leading Firms

The first half of the twentieth century certainly saw the U.S. ownership pattern firmly established in the Canadian mining industry. The question is, why? Was there a commensurate inflow of U.S. capital, a drawing on the pool of foreign savings to develop Canadian natural resources? This explanation is favoured by the industry itself. For example, a recent industry sponsored book offers the following explanation:

"It is obvious that the proper development of the mining industry, and all the resource industries, requires capital. Like it or not, the internal sources of money are just not sufficient. Some foreign investment is absolutely necessary. In our reaction to the extent of American investment in our country, we tend to lose sight of the fact that this foreign capital is essential to us."[8]

Moving into the academic world, this position quite

properly loses its hard edges. Emphasis is placed on the "package deal" which foreign direct investment in Canadian resources may represent; with the capital, it is suggested, came entrepreneurial talent and the latest U.S. technology. In American Capital and Canadian Resources these dynamic aspects of foreign investment are highlighted by Hugh Aitken. He asserts.

"American capital, entrepreneurship and technology have not merely exploited opportunities; they have also created them. Their function has been not merely to facilitate the doing of things that would have been done anyway, but also to get things done that might not have been done at all."[9]

If this version were entirely true little weight would attach to an analysis of economic rent and linkages which suggested a sub-optimal outcome to the development of Canadian mineral resources by foreign private capital. If foreign investment created rents, which would never have been realised otherwise, then the transfer of these rents outside of Canada, though perhaps unfortunate, would represent no loss. Likewise if foreign investment created some linkages, which would otherwise have never appeared, then the identification of lost linkages is an antiquarian task. It is because this orthodox view is overstated that an analysis of rents and linkages can contribute much to our understanding. In what follows in this section flesh will be found to fill out this base assertion.

In Canada the mining industry came to be dominated by a very few substantial firms.[10] For example the mining, smelting and refining of nickel-copper was conducted in 1954 by only six firms, of which the dominant firm was the U.S. controlled International Nickel Company of Canada (INCO). Other major producers were

Falconbridge Nickel Mines and Sheritt

Gordon Mines Ltd. which developed as Canadian firms but which were later bought by U.S. owners.

For lead-zinc mining, smelting and refining the concentration was such that the six largest firms contributed 86% of the net value added. In this case a Canadian firm, a Canadian Pacific Railway subsidiary, was dominant. The firm was the Consolidated Mining and Smelting Company of Canada, at the heart of whose prosperity was the Sullivan lead-zinc mine in south-eastern British Columbia.

For copper-gold mining, smelting and refining the concentration was similarly pronounced. About 88% of the net value added was created by the largest six firms. In this case the two firms at the head of the 'big six' were respectively U.S. controlled and Canadian controlled. The Hudson Bay Mining and Smelting Company in Manitoba had developed under U.S. patronage whereas Noranda Mines Ltd. in Quebec had become thoroughly Canadian.

At once some awkward facts emerge. It appears that Canadian capital, entrepreneurship and technology were eminently successful in establishing COMINCO as a major international mining company. Likewise Noranda flourished even when wrenched adrift from the maternal grasp of New York finance. Falconbridge flourished under the wing of an American Entrepreneur primed with Canadian risk capital.

Each of the dominant concerns seems to owe its success to two factors. First, each had control over ore bodies which proved to be both rich and lasting - or else, as in the case of Sheritt Gordon Mines and Falconbridge,implemented a successful exploration effort within the region first exploited. Second,

each possessed a smelting capability. (Again in the period prior to 1955 Sheritt Gordon was an exception to this rule). If the former factor was a matter very largely of chance, the latter was a matter of capital access and entrepreneurial determination.

Some insight results from examining the development of these leading companies.

(1) The International Nickel Company (INCO)

The International Nickel Company has long been known as INCO despite occasional, minor changes to the name under which the company is incorporated. INCO is the best researched of all the mining companies in Canada.[11]

One reason for this has been INCO's dominant position in the world market for nickel. By the late 1920's roughly 90.0% of the nickel entering into world markets was mined in INCO's Sudbury mines.[12] Certainly this aspect of the company interested O. W. Main in his use of INCO as a case study in industrial organisation.

A more subliminal reason may be that INCO seems almost archetypal of American investment in Canadian resources. The company was formed in 1902 by the fusion of the American-led Canadian Copper Company, which owned valuable Sudbury nickel-copper deposits, and the Orford Company, which possessed refining works in the U.S. and which had tailored a suitable technology for separating the nickel and copper content. The new company was incorporated in New Jersey.

The U.S. was an important customer for nickel for both military and peace-time uses, but the growing military demand from Europe became of overwhelming importance as the first decade of the twentieth century drew to a close. American entrepreneurship,

American technology and, to a lesser extent, American markets all contributed to the company's growth from 1902.

What of finance? INCO was formed during the international manoeuvers of capital which came before the later and more bloody manoeuvers on the Western Front. Nickel had come to be recognised as a strategic material of great importance to naval warfare due to the hardness of nickel-steel alloys. Armour plated battleships meant high profits for the supplier of nickel-steel alloys, as long as their supply of nickel was secure. In the U.S.A., J. P. Morgan backed the U.S. Steel Corporation, and using monopsony pressures, masterminded the merger of The Canadian Copper Company and The Orford Company.

O. W. Main estimates that the total purchase price for the Canadian Copper Company, with its Sudbury deposits, was $4.25 million on a deal which, including the Orford Company and a few other moribund concerns, totalled no more than $10 million. From 1910 (when dividends began) to 1916 INCO paid $30.9 million in dividends on the common stock almost all from earnings based on Sudbury ores.[13] All but a handful of the preferred and common shares were held by U.S. residents in 1916.[14]

The newly formed INCO was capitalised in 1902 at $27.2 million (issued), of which $8.9 million was common stock. Also part of the issued capital was $8.9 million of 6% preferred stock. The balance (of $27.2 million) was 5% mortgage bonds.[15] Main's assessment of the capital structure was that "Morgan and Co. was thus able to retain control without being required to invest anything in the new company".[16]

The consolidated assets of the company in 1916 had risen to $61.0 million, of which the by then wholly owned

subsidiary, the Canadian Copper Co., recorded assets of $10.9 million in Ontario.[17]

The considerable financial and market powers of the Morgan interests were now devoted to preventing entry by other interests into the nickel business. Their success may well have deterred some inflows of capital into Canada.[18] Only after 1918, when the military demand for nickel collapsed, and when the Morgan star waned, did INCO face Canadian entrants to the nickel industry.

In the half-century to 1955 two important changes took place in the equity structure of this concern. The International Nickel Copany of Canada was established in 1916 as a wholly-owned operating subsidiary with a Dominion charter. The authorised capital was $5 million in common shares of $100 par value. Two years later the authorised capital was increased to $50 million of $100 par value common shares.

These moves represented the culmination of a long political struggle to have nickel refined in Canada. INCO had resisted this to the last, but the imminent Report of the Royal Ontario Nickel Commission and a scandal over Sudbury nickel reaching the German war machine, had broken the company's resistence at last. The 1916 financing was for the Port Colborne refinery and was "all provided out of the treasury of the American company."[19] Of course that treasury had had fourteen years of Sudbury derived profits, so whether any true capital inflow as involved remains uncertain.[20] The 1918 equity operation involved the new Canadian Company in taking over the Canadian assets of the American company. Such a transfer likely resulted in little inflow of new capital.

Given the profitable nature of the business from 1902 it seems unlikely that much capital entered Canada as a result of

INCO's operations to 1918. Ploughed back profits could facilitate expansion. Of course, the Canadian Copper Company had been financed by Ohio capital in 1886; the capitalisation was $2 million, later increased to $2.5 million.

In the 1920's, after a few lean years, the peace-time demand for nickel in automobiles and speciality steels began to grow. H. Marshall and F. Southard in their 1936 volume, Canadian-American Industry, state of INCO as follows:

"In 1926 the company undertook a program of expansion, largely in Canada, which cost $52 million before its completion in 1933. Seventy-one per cent of the capital was provided by the sale of securities and the rest out of earnings and reserves." 21

This conclusion of Marshall and Southard is misleading. The major part of the expansion related to the takeover of the Mond Nickel Company. Initially this involved the Canadian subsidiary of INCO in share exchanges with the New Jersey corporation so that The International Nickel Company of Canada became parent company. Then to absorb Mond a share exchange was arranged accompanied by much insider speculation in the stocks of the two companies. By 1934, by which time the dust had settled, Canadians owned 21% of the shares, British residents owned 33% and U.S. residents owned 42%. Assets in Canada and abroad were valued at $200 million.[22]

Marshall and Southard, bemused no doubt by the financial juggling, leave a false impression of heavy capital inflows in this period attendant upon the American ownership. As they tend to envision this sort of inflow as a major benefit of the growing American presence, it is worthwhile to correct that impression.

In W. Y. Elliott et al., International Control in the Non-Ferrous Metals, Alex Skelton includes details of INCO's cash

earnings and capital expansion from 1920 to 1934 (inclusive).[23] Over these 15 years of expansion Asset Growth before Common Dividends amounted to $152.7 million. Of this amount Dividends were paid to the sum of $48.7 million. The balance of $104.0 million represented $40.0 million of new money invested and $64.0 million of re-invested earnings. Thus, even before closer examination, almost two-thirds of the company's expansion was due to ploughed back profits and economic rents.

Fixed capital expenditures were financed from earnings and from new money invested in the company. In every year from 1920 to 1934 profits were ploughed back into fixed capital formation, but only in two years was new finance introduced to the corporation.

(1) Bonds were issued in 1925 to finance the takeover of the defunct Anglo-Canadian Mining and Refining Co. through an INCO subsidiary. The bankrupt company held sizable deposits of ore in the Sudbury basin.

(2) The second occasion saw the acquisition of the Mond Nickel Company in 1929, when $37.2 million is recorded as "new money invested". As the preferred stock increase authorised by INCO in 1929 was designed to be exchanged with Mond shares as part of the takeover, it seems unlikely that a substantial capital inflow occurred at this time. Skelton notes that the $37.2 million of "new money invested" in 1929 "includes proceeds from sale of Mond stock".

All in all of the $40.0 million of new money invested in fixed capital in this period, it seems that a substantial proportion involved the acquisition of rights to ore and existing capital assets. Moreover, on the second occasion, company equity

was definitely issued to acquire the assets of Mond. Here there is to be found neither new real capital formation (i.e., construction of buildings or purchase of machinery) nor "dynamic capital inflows. In short over this fifteen year period there appears to be very little capital inflow from abroad, or at least an amount insignificant in relation to the expansion of the firm. INCO represents a model of internally generated growth rather than a company dependent on heavy infusions of U.S. capital.

INCO had become a multinational corporation by 1934, based on profits and economic rents earned with Sudbury ores. From 1930 to 1955 there were no further equity issues by INCO of Canada. The Company's head office remained in New York over these years.

(2) The Consolidated Mining and Smelting Company of Canada, Ltd. (COMINCO)

The Canadian Pacific Railway Company built the southerly Crows Nest Pass route through the Rockies in 1898 to Kootenay Lake, from where, by steamer and by rail, shipments could be transferred north to the C.P.R. main line.[24] Engaged in a battle for the traffic of South-Eastern British Columbia, with American promoters of railroads and steamship lines, the C.P.R. purchased in 1898 the recently completed smelter at Trail, the owner of which had grand ambitions for railway developments of his own. To ensure a steady supply of ore to the smelter the C.P.R. was drawn gradually into the business of mining.

The Consolidated Mining and Smelting Company of Canada Ltd., was incorporated under Dominion Charter in 1906. The Trail metallurgical works now included, in addition to the original

copper/gold smelter, a blast furnace to produce smelter lead and a small, electrolytic lead refining plant. Cominco's operations extended, beyond the Trail complex, to mines in nearby Rossland and along the tracks to Moyie in East Kootenay.

The company acquired in 1910 the Sullivan Mine in East Kootenay, which contained a rich lead/zinc ore so complex that nobody could then economically separate it. A Canadian research effort located in Trail solved that metallurgical problem, first by subsidised electrolytic methods in 1916, then with increasing commercial success by a process of selective flotation started in 1920 and improved thereafter. On the richness of the Sullivan Mine the company grew over three decades into a multinational corporation involved in mining, metallurgical operations and, via by-products of the Sullivan ore, in fertilizer and chemicals manufacturing.

The capital structure of the firm was straightforward. The words of T. W. Bingay, a former Vice-President of Finance for the company, writing in 1936 support this assessment:

"The capital structure of the company has always been very simple. Though bonds were issued in 1918 to the extent of $3 million (later increased to $4 million) they were retired in 1925 by a voluntary exchange for stock on a basis very advantageous to the bondholders, and the capital was returned to its original simplicity.

Mine development and expansion of reduction plants have been financed to some extent through moderate capital stock issues, but more largely through the re-investment of profits. (Emphasis added). The original capital was $4,698,888; thirty years later it is only $16,292,250. During this period the great Sullivan mine was developed and equipped with a 6000 ton concentrator and the Trail plant was expanded from a small copper smelting and lead smelting and refining operation to the present impressive aggregation of smelting refining and fertilizer plants."25

An interesting feature of the post-World War I period was that, unusual for a mining company, COMINCO had a large bank

overdraft with the Bank of Montreal. The security for this facility was inventory built up in expectation of sales to the Imperial Munitions Board. The credit amounted to just over $2 million in 1917 at a point where the issued capital stood at almost $10.5 million. Over the next three years the amount of this bank accommodation increased. Including a "bridging loan" in anticipation of funding, the amount of bank borrowing peaked at over $5 million in 1920. Not until 1925 was this element of COMINCO's financing eliminated.

Bank borrowing again occurred in 1930, increasing to a total of almost $3.9 million in 1932. The purpose of the borrowing was to finance increased inventories and to establish the fertilizer operation which was to make use of sulphur from the Sullivan ore. Most likely the prestige of the C.P.R. and its close links with the Montreal financial community aided it in securing substantial sums of capital at critical periods in the company's development in a form most unusual for a mining company.

The pattern of ownership is only just discernible, though the fact of C.P.R. control is never in doubt. A report in the mining press in 1928 suggested that the C.P.R. owned 46% of the stock "and continues to turn a deaf ear to proposals from various banking groups which have sought to buy control".[26] In the Financial Times in 1940 it was reported that the C.P.R. held just over 51% of the equity.[27] The Sun Life Insurance Company held shares in Cominco according to the 1928 press report quoted above.

As far as sources of capital are concerned COMINCO gives the impression, as does INCO, of a firm which has grown primarily on the basis of ploughed back profits and economic rents. Financing was available from Canadian sources when needed. Of course,

since the C.P.R. was a stock widely owned in Britain (though control of the company rested in Canada), a fair percentage of the Cominco stock and bond financing may have involved an inflow of British portfolio capital.[28] No bonds were issued between 1936-55 nor was any new finance raised by stock issues during these years.

(3) Noranda Mines

A legal quirk caused Noranda Mines Ltd. to become incorporated in Ontario. An American syndicate, headed by Samuel Thomson and Humphrey Chadborne, had been formed in New York in 1922 with a view to buying and developing promising mineral properties. Soon after its formation the syndicate took an option on the Tremoy Lake (now Lake Osisko) property in Quebec staked by Ed. Horne, and owned by the Tremoy syndicate of which he was part.[29] (See Chapter IV above).

A Canadian lawyer representing the Thomson and Chadborne syndicate noticed that under Ontario law the members of the syndicate were personally liable for the mining interests they held in Ontario. To remove this potential embarrassment, small mining ventures being somewhat failure prone, Noranda Mines Ltd. was incorporated in Ontario in 1922.

The sharp eyed lawyer, James Murdoch, became interim president of what was still a small concern. However, he stayed on as Noranda built its smelter by the Home property and remained as president after the locus of control shifted to Canada in 1927. He retired in 1952, having been intimately involved in the pace and direction of the company's expansion to multinational status.

Three features of the case seem to explain the naturalisation of Noranda. First, Murdoch was something of a nationalist.

The Northern Miner reported in 1927 that as much equipment as possible was bought by Murdoch in Canada as Noranda built the Rouyn smelter. As a result Canadian suppliers received 73% of the money disbursed in this construction and tooling-up operation.[30]

Staffing of the enterprise is of further interest. Ernest Hibbert was hired as general manager to see to mine development including the erection of the Rouyn smelter, a task complicated by the need to ship in all materials by winter roads. Hibbert employed as assistants two men who had worked with him in the defunct British American Nickel venture at Sudbury. (Hibbert was British born). These men, H. L. Roscoe and R. V. Porritt,were responsible for the underground development of the new mine. The former was American and the latter Canadian; both had gained expertise within Canada though British American Nickel had been a British supported concern. R. V. Porritt, a McGill University graduate in mining engineering, rose through the company to become president in 1964. H. L. Roscoe became senior vice-president in 1956. Also involved in the Noranda mine site and smelter construction was J. R. Bradfield, another McGill University graduate, who, having worked in the U.S., joined the New York designers in 1926 with a view to becoming "on site" civil engineer at Rouyn. He became company president in 1956 and chairman of the board in 1964. For an engineer of ambition Rouyn proved a fine spot to be in the mid-1920's.

This episode is an important counter-case to those who argue that a lack of entrepreneurial or technical skill explains the U.S. presence in Canadian mining. At Rouyn there was no such lack as Noranda grew from exploration company, to integrated mining concern and, as early as 1937, to be a Canadian multinational

with a gold property in Nicaragua. Given different circumstances elsewhere in Canada might not this Noranda story have been been widely duplicated? For two other features of the case are needed to understand the success of Noranda as a Canadian mining corporation.

The most dramatic of these special circumstances affecting Noranda was good luck, but luck delayed sufficiently to allow for the 1927 ownership shuffle. The Lower H ore body found only in 1929 proved to be the lode, rich in copper and gold, on which Noranda's prosperity in the 1930's depended. The original development had taken place on the basis of a supply of ore assured for only three years. Yet in the late 1920's Noranda Mines stock soared in price in trading on the mining stock market that had flowered in the boom years. The New York interests decided to unload Noranda at a substantial premium of up to 2000% on their original investment. In the Annual Report for 1927 it was noted that "since the last Annual Report changes have taken place in the list of shareholdings resulting in a majority of the issued shares being registered in the names of shareholders resident in Canada".[31] The New York Office was reported closed, a new office having opened in Toronto. Two years were to pass before the discovery of the Lower H ore body turned a small and speculative enterprise into a rich and burgeoning corporation based on Canadian enterprise, technical skills and capital.

The other circumstance that explains Noranda is the availability of Canadian capital. A factor here was the coincident occurrence of gold and copper in the Noranda ore body. Gold mining had built up pools of capital in Porcupine and Kirkland Lake since before the First World War. Tending towards the business that was familiar, some of these reserve funds were put

to work financing Noranda. The choice between gold rich ores and copper rich ores, both of which existed within the Noranda Property, also gave a valuable flexibility to the company's output mix.

The involvement of Hollinger Mines, and Noah Timmins, in the expansion of Noranda was one conduit by which Canadian capital reached Noranda. Noah Timmins joined the board of Noranda in 1925. A $3 million issue of 7% First Mortgage Sinking Fund Gold Bonds was subscribed by Hollinger in its entirety in 1927. For Hollinger a bonus of 30,000 Noranda shares accompanied the ideal. Two years later all of this 1927 Noranda bond issue was repaid out of an equity issue. Hollinger remained a major stockholder in Noranda as a result of the bonus shares, and shares obtained earlier by Noah Timmins in exchange for claims held beside the Horne property. Of course, the other source of Canadian capital for Noranda was the equity market. Many Noranda shares were held in the Porcupine and Kirkland Lake gold mining areas.

The Noranda funding requirements grew from its inception in 1923 until 1928 when the firm first began to enjoy a revenue stream. Smelter production began in December, 1927. The original 5,000 shares of $100 par value had grown by end 1928 to a total of 2,168,556 shares outstanding of an authorised 2,250,000 shares of no par value. What this amounted to in money raised is difficult to evaluate since some shares were exchanged for land claims and options in the Rouyn locale and various management bonuses came into play in these years. Equally there is no way of telling how much came from the American syndicate and other U.S. residents. Generally the rights issue was the way in which shares were released from the company's treasury, such rights issues occurring in 1925, 1926, 1927 and 1929.

The Annual Reports noted Capital Expenditures, which included land acquisition costs as well as some administrative expenses, as rising from $267,000 in 1923, to about $3.2 million in 1926. The latter expense was related to smelter construction. At this point the Hollinger bond purchase brought in the $3.0 million in 1927, which was paid off two years later by the proceeds of the last issue of company shares that was to occur for 25 years. We have the comment in the 1927 Annual Report, already noted, that the majority of the issued shares were then held in Canada. As the 1929 issue was of the rights sort it can be presumed that mostly it represented Canadian capital.

From 1930 Noranda grew, without outside finance, on the basis of the stream of profits and economic rents accruing to the enterprise. The refinery built for Noranda in Montreal in 1931 was owned by Canadian Copper Refiners, a joint venture. Nichols Copper, an American concern linked with Phelps Dodge, and British Metals, a marketing organisation, joined with Noranda as senior participant in subscribing to the new company's shares. Thereby both refinery technology and market outlets were obtained at a stroke. Noranda guaranteed a $2.5 million bond issue of Canadian Copper Refiners to ensure adequate finances beyond the equity funding for the refinery's construction.

From whence, in summary, came Noranda's capital? In the long view it has come mainly from Noranda's successful exploitation of its Quebec deposits. The crucial early financing came from the United States, but a combination of the booming market in Noranda shares and the backing of gold earned funds in the coffers of Hollinger Mines, together with the late discovery of the richer ore lodes, enabled Canadian entrepreneurs to assume

The Quebec government subsidised the rail link from the C.N. main line which was completed in 1926. A year later despite Quebec government opposition in the courts, a second rail link to North Bay (and so Toronto) was established via the Ontario-owned Temiskaming and Northern Ontario Railway.

(4) Falconbridge Nickel Mines Ltd.

Throughout the years to 1957, Falconbridge Nickel Mines was more than a successful mining company; it was the flagship corporation for an eventually ramshackle corporate empire dedicated to financing and developing new mines in Canada and abroad.[32] Thayer Lindsley, an American engineer, built the empire with complex inter-connections in order to receive ever more finance, while retaining effective control of the constituent companies in his own hands. With age, the balancing act became impossible for Lindsley. He lost control in 1957 and the assets came under American control in 1967. At its inception, Sherritt-Gordon Mines was a Lindsley company, but one which went its own way in 1947, albeit following a route of its own directly into American ownership. Falconbridge Nickel and Sherritt-Gordon were both Canadian companies until the post-war era, financed largely by Canadian capital in their early years and with Lindsley a Canadian resident. Eventually they were bought over as going concerns by U. S. companies.

Falconbridge Nickel Mines was a small and speculative concern when established in 1928, but, by acquiring a nickel refinery in Norway to which smelter matter was shipped, the company was rendered independent of INCO with respect to marketing a distinctive final product. A smelter was completed near the minesite in the Sudbury basin as a matter of priority in 1930.

It is something of a puzzle why INCO allowed the new company to survive, since experience had shown that competitors were usually given short shrift. Only Mond had survived over the years, and Mond was absorbed in 1928. In this event, the key to the puzzle most probably lies. The INCO monopoly of nickel production and sales had become very conspicuous and perhaps liable to regulation by both the Canadian and U.S. governments. Falconbridge created an illusion of serious competition, though initially its output was sold in Europe away from INCO's major market in the U.S.[33] Indeed, Nazi Germany, with growing nickel requirements was likely an important customer in the 1930's.[34] However, it was not until after the Second World War that Falconbridge moved from gnat status to become a serious competitor of INCO. Again the threat of war was important to the growing company as the U.S. government feverishly stockpiled strategic raw materials, of which nickel was one.

Falconbridge Nickel Mines was incorporated in 1928 with an Ontario charter.[35] The property to be mined belonged to Minneapolis interests when it was bought for $2.5 million by Ventures Ltd. and Sudbury Basin Mines Ltd. in 1928. Presumably the sum reflects a considerable element of capitalised economic rent. Never before had so much been paid for a Sudbury property. It seems likely that the realisation of anticipated resource rent in this instance caused an outflow across the capital account of the Canadian balance of payments. Where the anticipated rent is capitalised and paid as a lump sum, in this example $500,000 in cash immediately, to be followed by $2,000,000 in cash within a few months, the translation of rent to foreign parts is at its most obvious.[36] (The usual case sees these surpluses transferred in the form of dividends).

Both Ventures Ltd. and Sudbury Basin Mines Ltd., the purchasers, were Lindsley creations. Sudbury Basin Mines came first, being formed to develop a large area staked by Lindsley and a colleague in the Sudbury Basin. Shares were issued which sold well on news of promising drill results.[37] In the end the funds raised were used to float other companies, including Falconbridge Nickel Mines. In rapid succession, small groups of investors were formed under Lindsley's leadership to found Sherritt-Gordon Mines (1927), and in the following year Ventures Ltd., the main holding company.

The property acquired for $2,500,000 was turned over to the new Falconbridge Nickel Mines, along with $250,000 from Ventures in cash, in exchange for Falconbridge shares. Falconbridge's First Annual Report shows that of 5 million authorised shares, a total of 3,213,305 were "issued or to be issued". Ventures Ltd. held 1,536,170 and Sudbury Basin Mines Ltd. owned 1,250,000.[38] The public held 377,135 shares which had been released for cash or in exchange for additional properties.[39]

The question of what was the source of Falconbridge's development finance reduces, it seems, to the source of Ventures and Sudbury Basin Mines funds. As unknown proportion of these monies came from the Canadian equity market. With shares issued having risen only to 3,321,759, the distribution of Falconbridge shares was almost entirely in Canada in 1935.(Residents of Canada held 97% in 1935) However, Ventures and Sudbury Basin Mines still held over 2 million shares.[40] The resident status of these two companies own shares is not known, though Lindsley himself was said to own 30% of Ventures stock. Where Lindsley obtained his financing is then relevant, since his next egg from a previous

mining speculation had not exceeded $30,000 when he arrived in Canada.[41] With respect to the rather nebulous structure of the Lindsley empire, there have always been more questions than answers.

Falconbridge next needed development capital in 1936. Having weathered the early years of the Depression, the sales of nickel became brisk in the mid-1930s. An extensive construction programme was initiated in 1936 to improve the Falconbridge mine and smelter, and to upgrade the Norwegian refinery.

An unusual aspect of the financing at this time was the mobilisation of capital gains on equities. Total expenditures for the construction was $2.1 million. Excess cash reserves had been invested from 1932 in bonds and, most shrewdly, in several Canadian gold mining stocks. When the reserves were liquidated in the amount of $1.6 million, a capital gain of almost $0.5 million was realized.[42] Of course, the reserve fund itself (the cost of securities at purchase) represented undistributed profits and economic rents.

By the late 1930s, Falconbridge was a thriving but still comparatively small producer of nickel and copper. Dividend payments had begun in 1933. Net profits, after taxes and depreciation charges, exceeded $2 million for the first time in 1939. Assets, including $3.4 million in cash, exceeded $12.0 million in 1939. Over $1 million was set aside for depreciation in 1939, typical of a policy of ploughing back a high proportion of gross profits into the network of companies.

The troops of Adolf Hitler entered Norway in April 1940, severing the link between Falconbridge's smelter matte and their final product of refined nickel. Falconbridge had been considering building a Canadian refinery should the Norwegian one fall into German hands. However, INCO agreed to provide spare refining

capacity to Falconbridge on a toll basis, heading off the necessity for a new Canadian refinery.[43]

Only after the Second World War, still a Canadian company in the Lindsley empire, did Falconbridge Nickel start to challenge INCO. New ore bodies were discovered in Sudbury due to an energetic exploration effort. The annual meeting of shareholders was told in 1948 that "the company will seek re-entry into the U.S. market and will set aside 40% of the estimated 1948 nickel production for this outlet".[44] Their plans were assisted by the stock piling policies for strategic raw materials adopted by the U.S. government in the Cold War atmosphere of the late 1940's and 1950's.

Anxious to increase nickel production and to build sources of supply separate from INCO, the U.S. government sponsored, among others, Falconbridge Nickel Mines and Sherritt-Gordon Mines. In each case, the chain of events leading to American takeover can be traced to the strain placed on the financial capabilities of the firms by striving to increase sales dramatically to the U.S. government in the late 1940's and early 1950's. (No U.S. premeditation is suggested). Despite what amounts to capital injections from "bonused" U.S. government contracts, the cash flow for expansion and independent survival proved inadequate.

First in 1948 Falconbridge signed a five year contract with the U.S. government for nickel.During the Korean conflict in 1951 the U.S. Defense Materials Procurement Agency agreed to a ten year contract at market prices for each year along with a $6 million advance. Then the U.S. government, in the biggest order of the three, contracted to buy large quantities of refined nickel over 9 years at market prices plus a premium of 40c a pound on

100 million pounds. At that time (1953) the market price for nickel was about 60c a pound. Here was a production bonus of $40 million. By the end of the contract in 1972 it accounted for all but an insignificant portion of Falconbridge's annual sales of nickel to the U.S.[45]

With these contracts Falconbridge grew to become the second largest producer of nickel in the world. Latterly Ventures and Falconbridge had been viewed with suspicion by the investment community; for instance, a Falconbridge rights issue in 1952 was only half subscribed. Aware of the forthcoming contract Ventures Ltd., the major shareholder, exercised its rights to the full. After the contract was announced, Ventures Ltd. was able to float $30 million of corporate bonds. Apparently Ventures realised some of the capital gain in the period after the last and biggest contract came into force. Thus the Canadian equity market and bond market were both involved in this financing. Of course, U.S. residents could trade in Falconbridge shares and buy Ventures bonds; to what extent they did so remains undetermined. Once again by 1957 Falconbridge and Ventures were short of cash. Robert Anderson, who had been U.S. Deputy Secretary of Defence, had been appointed Ventures' President in 1955, Lindsley moving to the position of Board Chairman. Later Anderson left to become Secretary to the Treasury in the Eisenhower Administration. Close links with the U.S. were being cultivated.

As a major customer the U.S. government may have been concerned that Lindsley had again over-extended his financial capacity. The U.S. government was very closely involved in monitoring the nickel supply situation in these years as is attested by evidence presented to a U.S. Congressional Sub-

Committee in 1959. A witness who had been closely involved in the procurement of nickel for the U.S. stock pile commented as follows:

"Furthermore, in the interests of national defence, we desired to develop a nickel capacity in other regions than Canada and particularly in Cuba with its nickeliferous ore deposits and its location. Another factor in this determination was our desire to not increase the monopolistic position of INCO and as a corollary its control over nickel prices (emphasis added)"46

A document submitted to the same hearings mentioned that INCO's share of the free-world "nickel supply" had fallen from 90% in 1951 to 68% in 1955.[47] In the climate of the times it would have been quite consistent for the U.S. to take a close interest in Falconbridge's internal affairs. Certainly Anderson it was who, to bring in fresh capital, sold a controlling block of Ventures shares to McIntyre Porcupine in 1957. Thus, Falconbridge Mines remained Canadian until 1967 when McIntyre Porcupine was taken over by the Superior Oil Company, a U.S. corporation.[48]

A study of Falconbridge yields rather less hard information on financing than do the previous sketches of corporate growth. Still it is clear that ploughed back profits and economic rents were of importance. Shareholders even complained at times about the small proportion of profits distributed as dividends. An injection of American funds there certainly was both in the initial floating of the company and later in the 1950's in the form of American government bonuses. Finally the Canadian equity and bond markets were involved in providing funds at various stages. My tentative view is that the latter was the most important source of outside finance until the 1950's, when closer contact with the U.S. administration would tend to encourage U.S. private participation in financing in addition to the infusions of funds

received from the U.S. government. Not then in its pioneer stage, but rather in its expansion to multinational status, Falconbridge nickel was assisted in its growth by U.S. capital.

The career of one man with Falconbridge is noteworthy. Saskatchewan born Horace Fraser graduated from the University of Manitoba in 1924 with a B.Sc. in chemistry. After taking a Harvard Ph.D. in geology, he worked briefly for INCO before taking a faculty position in California. During the Second World War he worked in Washington D.C. "in charge of ferro-alloys in the U.S. government's foreign economics administration."[49] His duties included "matters pertaining to the purchase abroad of nickel, manganese, chromium and iron."[50] Sought out by Lindsley, Fraser joined Falconbridge after the war rising to become president and managing director in 1957.

Fraser was important in obtaining the U.S. government contracts which meant so much to the company's success in the 1950's. His entrepreneurial skills are widely esteemed.[51] Again it does not seem proper to explain foreign ownship by an absence of Canadian entrepreneurs.

(5) Sherritt-Gordon Mines

Incorporated under an Ontario charter in 1927 as part of the Lindsley group of companies, the focus of Sherritt-Gordon was on the Sherridon deposits of copper, zinc, gold and silver in Northern Manitoba. (See Chapter IV above). Of the original authorised capital of 6,000,000 shares, 4,000,000 were issued in 1927 for cash and in exchange for the Sherridon property rights. Through to 1932 a further 1,741,357 shares were sold for cash by means of rights offerings. The mine closed due to low metal prices from 1932 to

1936, with production beginning again in August, 1937. A small rights offering of 133,075 shares was made in 1937 to finance the start-up costs. The acquisition of many claims at Lynn Lake required the issue of 70,000 shares in 1946.[52]

Most of Sherritt-Gordon's financing until 1946 can be seen to have taken place in the boom stock market conditions of the late 1920's. The mine's capital stock took the form of shaft and development work at Sherridon along with associated installations of mining machinery and surface construction. This capital stock remained unused, but underwent little deterioration during the 1930's shutdown. Unusual for such a remote mine site neither power facilities nor smelter facilities had to be financed. Halstead Lindsley, brother to Thayer and president of Sherritt-Gordon, noted this benefit in the First Annual Report:

> "In view of the location of its property your Company has been extremely fortunate in having been able to arrange with the Hudson Bay Mining and Smelting Co. for the smelting of its copper concentrates and for the supply of electric energy, without having to provide the capital that would otherwise have been necessary for hydro electric development, whilst it will enjoy lower rates than it could have achieved by developing its own units."[53]

A 42 mile railway feeder line was supplied by Canadian National in 1929 with financial assistance from the Dominion government.[54]

The 1931 Annual Report noted that the cost of bringing the mine to production in 1931 was about $4 million, an outcome within the budget established in 1928. About $300,000 of the above represented an investment in the townsite of Sherridon justified on the grounds of "attracting and holding a better class of employees".

The company operated in the Lindsley fold until 1947 with

Halstead Lindsley as President and Thayer Lindsley as Vice-President. Both resigned in that year. The only clue as to the reason for this disengagement is Lindsley's cryptic response when questioned, "What's the sense in owning a horse if you can't ride him?"[55]

Sherridon's exhaustion was intimately tied to the eventual American takeover of Sherritt-Gordon. Lynn Lake was established as an alternative mine site in the years 1945-53. In moving, the company became a nickel producer primarily, where previously copper had been its staple; to smelt and refine the nickel new capacity had to be built, severing for technical reasons the comfortable arrangement with Hudson Bay Mining and Smelting. The Fort Saskatchewan leaching plant in Alberta was the response to this changed circumstance. A power site had to be developed on the Churchill River in Saskatchewan. As a result of these financing needs Sherritt Gordon over-extended the capacity (or willingness) of the existing shareholders to supply capital. The takeover by Newmont Mining Corporation was the result. The published existence of a five year contract with the U.S. government, from 1950, and of other contracts with American steel producers, proved inadequate to promote financing in Canada. In casting adrift from Ventures the company seemed to sail directly into American ownership.

The details are as follows. The authorised capital stock was increased to 12,000,000 common shares in 1951. A rights issue of 1,188,886 shares was only 90% subscribed leaving Newmont Mines, an established U.S. mining corporation, to buy 1,000,000 shares as pre-arranged plus the 122,196 shares surplus from the rights issue.

In addition, as the following passage reveals, Newmont had acquired an even stronger position. Eldon Brown, the "post Lindsley" President and Managing Director, announced in March,

1952 as follows:

"The two stage financing plan, outlined at the last annual meeting, under which we proposed borrowing $4,000,000 in 1951 and the balance of the $19,000,000 total amount in 1952, proved to be impracticable. The commitment of the Newmont Mining Company to purchase $4,000,000 principal amount of debentures, non-interest bearing to June 1, 1956 and convertible prior to that date into Sherritt-Gordon shares at $2.50 per share, in addition to the similarly convertible $2,000,000 committed to initially, became effective when the two stage financing plan was dropped. Negotiations were then started with a view to borrowing the entire amount of $19,000,000 in 1952.

In the course of these negotiations the lenders required (emphasis added) our making provision for an additional $4,000,000, of which $1,000,000 principal amount of debentures, convertible into Sherritt-Gordon shares at $2.50 per share, and in conjunction with the lenders, to purchase one half of the additional $3,000,000 of first mortgage bonds if required to complete the construction programme."[56]

The lenders who purchased the First Mortgage Bonds included, in addition to Newmont, once again, J. P. Morgan and Co., The Metropolitan Life Co., Sun Life and 9 other banks and insurance companies.[57] The Lynn Lake financing arrangements are described in Table 6.4.

More difficulties were to follow. The Fort Saskatchewan leaching plant was late in completion, and the 1953 estimate of $46.8 million for its construction represented a 33.6% cost overrun on the 1951 reported estimate. Despite contingency reserves additional financing was required to the extent of $8 million. Further pressure related to the withholding by the lenders of the $3 million of the First Mortgage Bonds finance which was discretionary, "pending completion of arrangements for the additional financing".[58]

A rights equity issue was considered but rejected on the following grounds:

Table 6.4: Proposed Method of Financing Lynn Lake Project

($ million)

Method	Funds
Retained earnings from Sherridon operations	10.8
Proceeds from sale of 2,188,886 shares	4.3
Convertible debentures	7.0
First Mortgage Bonds	19.0
Optional First Mortgage Bonds	3.0
TOTAL	44.2

Source: Sherritt-Gordon Mines Ltd., Annual Report for 1951.

"Due to the large number of shareholders resident in the United States, it was apparent that such an offering could not be limited to Canadian shareholders. However, to make an offering to all shareholders it would first be necessary to complete a registration with the U.S. Securities and Exchange Commission. Such registration would cause a delay of about 6 months, which we simply could not afford."[59]

In the event the necessary $8 million came from two sources:

(1) An advance of up to $5 million was obtained from the U.S. government against nickel stockpiled in 1954 at Fort Saskatchewan.[60]

(2) Newmont Mining Corporation and "the Lenders" agreed to buy $3 million of "Series C Mortgage Bonds". An interesting feature of Series C bonds was that, in addition to the 5% p.a. coupon interest rate, a "deferred interest rate" of 3% p.a. was payable when the bonds were redeemed. It was stipulated that the deferred interest could be converted into common shares of Sherritt-Gordon at 75% of the ruling market price.

That the company was becoming ever more closely tied to Newmont is evident. The Annual Report for 1955 mentioned that the $8,000,000 of Convertible Debentures had already been converted into 3,200,000 shares of the company. Newmont now was in complete control of the subsidiary, Sherritt-Gordon Mines.

What caused the American takeover in this case? In an immediate sense the financial strain imposed by the development of Lynn Lake and the Alberta leaching plant were obviously responsible. However, one should ask why Sherritt-Gordon's internal resources were insufficient to this task and why Canadian capital did not materialise when required? Bearing on both these issues is the operation of wartime price controls in Canada.

Like all Lindsley companies, Sherritt-Gordon ploughed back a high proportion of gross profits into exploration. Lynn Lake

represents the fruit of this policy. However, as was shown in the Annual Report for 1951, the bulk of the firm's Sherridon ore was mined under conditions when its full value could not be realised.

The company in 1939, along with other copper producers in the British Empire, agreed to supply the British government "at a fair price".[61] About three quarters of the output of Sherritt-Gordon was earmarked in this way, with the balance being sold in Canada. Domestic prices were controlled from 1942-1947. Thus, being closed down during the Depression and being unable like American companies to profit from the war, the company's reserves were inadequate to provide for the postwar removal and expansion. Considering that exhaustion loomed it is remarkable that over two thirds of the company's profits from exploiting the Sherridan deposits came in the period from 1947 to 1951. (Table 6.5). Bad luck in not having ore free to mine at periods of high metal prices explains a large part of the company's financial short-comings.

Much more speculative is the point with respect to the failure of Canadian risk capital to materialise for Sherritt-Gordon's development. McIntyre-Porcupine had capital to inject into Falconbridge at this time, but McIntyre-Porcupine had gold won profits and economic rents from the 1930's. Could it be, one speculates, that Canadian business, emerging from the Depression, soon went into the price controls and heavier taxation of the Second World War, whereas American business on the whole thrived during the hostilities? In other words, might Canada's contribution to the war effort explain the relative absence of risk capital in Canada in the late 1940's and early 1950's? This matter, however, is one beyond the scope of this thesis.

Table 6.5: The Sheridon Operations of Sheritt-Gordon Mines

Period	Ore Milled		Value of Production		Net Profit[a]		Net Profit as Proportion of Value of Production
	Millions of Tons	% of Total	$ million	% of Total	$ million	% of Total	%
1931-46	6.7	78	36.7	62	2.5	23	6.9
1947-51	1.9	22	22.1	38	8.3	77	37.8
1931-51	8.5	100	58.7	100	10.9	100	18.5

Source: Sherritt Gordon Mines Ltd., Annual Report for 1951.

[a]Before depreciation.

What is clear is that American financing was necessary for Sherritt-Gordon to complete its ambitious expansion programme. As with Falconbridge, a major factor in the expansion decision was the prospect of sales to the American government. It is somewhat ironic that Canada in standing shoulder to shoulder with the U.S. during the Cold War era contributed, at least in this instance, to another erosion of the East/West axis on which Confederation and the National Policy were based. The leverage provided by the essentially military demand for nickel in the 1950's accentuated the Americanisation of the base metal mining industry in Canada.

(6) Hudson Bay Mining and Smelting

The Dominion charter of Hudson Bay Mining and Smelting was granted in 1927. A technology having been found to separate the Flin Flon copper/zinc ores by on site experimentation, the Whitney group of New York exercised an option on the property and launched what was then a massive investment in the north of Manitoba. Obviously American entrepreneurship, capital and technology were indeed dynamic in this episode.[62]

Perhaps what stands out is the willingness of an entrepreneurial group to experiment and innovate with the flotation method which, in the 1920's, was coming into widespread commercial use. It was the successful application of this method which made the deposits, known since 1915, a commercial proposition to mine and smelt. Refining was carried out in the Noranda-backed refinery of Canadian Copper Refiners in Montreal.

Previous interest in the property there had been. Earlier options had been taken, but dropped after the recalcitrant nature of the ore become apparent. As a result Canadian interests owned the

property when the Whitney group, embodying considerable metallurgical experience, purchased their option in 1925. The Mining Corporation of Canada was the main shareholder in the property up to 1928. Cobalt had been the source of that corporation's investable surplus.

Initial funding for Hudson Bay Mining and Smelting was by the sale of shares. The company's initial authorized capital was 2,500,000 shares of no par value.[63] A company called Flin Flon Mines, set up in 1927 as part of the deal, was awarded 1,000,000 shares of Hudson Bay Mining and Smelting, along with an (unknown) amount of cash, in exchange for the property to be mined. Of this "vendor stock" the Whitney group controlled 500,000 shares. The rest belonged to the Newmont Mining Corporation (350,000) and to the Mining Corporation of Canada (150,000).[64]

The Canadian investing public appeared eager to support the venture at this stage. The Northern Miner reported in January, 1928, that few shares of Hudson Bay Mining and Smelting were available to the Canadian public, since the New York interests were keeping nearly all their stock.[65] Despite an enthusiastic "over the counter" demand in Toronto, no shares were available. Only shareholders of the Mining Corporation of Canada were able to subscribe to the new company under a rights arrangement. For each group of 10 shares held in the Mining Corporation of Canada, one share in Hudson Bay Mining and Smelting might be acquired. The purchase price was $15 per share.

The share listing on the Toronto Standard stock mining exchange was promised but not yet accomplished at this point. The financing was expected to raise $15 million to $20 million in cash to bring the enterprise into commercial operation. The company was selling 1,500,000 shares at prices of either $10 or $15 per share. The

New York share distribution was private - but reportedly widespread.[66] Nonetheless at his death in 1930 Harry Payne Whitney owned 30% of the common stock then valued at $3.7 million. He likewise held 30% of the $5 million of bonds issued by the company in 1930.[67]

The comment may be made that, though the greater part of the capital to launch this enterprise was obtained in New York, this outcome seemed to be due to rationing, at least in part. There was no shortage of Canadian funds eager to purchase equity, but unable to do so under the conditions of the initial launching of the company. Moreover, the Mining Corporation of Canada was reported to have purchased a large amount of the 1,500,000 shares sold for initial financing.[68] Even in this case, which might seem at first glance to be clear-cut, shortage of risk capital does not explain the American ownership of a major new deposit. Instead, in this instance, a successful application of the science of flotation has centre stage. Innovation, in short, was successfully accomplished by the American financiers.

Apart from the bond issue of 1930, the financing of Hudson Bay Mining and Smelting depended after its launching entirely on ploughed back profits and economic rents. The $5 million bond issue took the form of convertible debentures all of which were retired by July, 1935, by purchase or conversion into capital stock. Of the authorised capital of 3,000,000 shares in 1935, 2,757,973 had been issued.[69] Total assets were valued at $4.6 million at the end of 1934. Control remained in U.S. hands throughout the period to 1955; subsequently in the 1960's the company was sold to South African interests.

Table 6.6: Total Assets of Leading Companies in Canadian Non-Ferrous, Base Metal Mining, 1935 and 1955.

($ million)

	1935	1955
INCO	210.6	519.6
COMINCO	49.9	200.8
NORANDA	34.0	113.6
HUDSON BAY M AND S	34.6	74.1
FALCONBRIDGE	9.6	68.8
SHERRITT-GORDON	8.6	58.2

Source: Financial Post Survey of Mines, 1936 and 1957.

Conclusion

In conclusion some perspective can be obtained by a comparison of the total assets of these companies. (Table 6.6). First the relative importance of INCO is apparent in both 1935 and 1955; the rich Sudbury deposits and the world monopoly position achieved by the 1920's rendered INCO a unique phenomenon in Canadian mining history. As noted above very little infusion of U.S. capital seems to have been necessary for INCO's success.

COMINCO and Noranda both grew faster than INCO from 1935 to 1955, in each case primarily using Canadian capital. Over this period Falconbridge and Sherritt-Gordon grew from gnat status to become multinationals in their own right. The former relied throughout mainly on Canadian capital, while not until the early 1950's was Sherritt-Gordon bought out by American funds. Hudson Bay Mining and Smelting did employ American capital to become established in the late 1920's, but not apparently from any lack of Canadian investment interest.[70] In short any notion that base metal mining in Canada has foreign owned firms heavily involved due to a shortage of Canadian capital in their development stages is false - if the leading firms examined here provide a true picture of the situation.

FOOTNOTES

1. D. G. Paterson, British Direct Investment in Canada, 1890-1914 (University of Toronto Press, 1976).

2. Statistics Canada, Canada's International Investment Position, 1926-67 (Ottawa: 1971).

3. Ibid.

4. The mining industry was seen in the 1930's as better suited to equity financing than bond financing. However, bond financing for base metals development did occur. See J. Graeme Watson, "Mining Finance in Canada", in J. F. Parkinson (Ed.)., Canadian Investment and Foreign Exchange Problems (University of Toronto Press, 1940).

5. It should be noted that the D.B.S. category of "portfolio investment" includes not only bonds but equity holdings judged not to be part of controlling interests. To quote directly from the source: "Direct investment is that investment in a business enterprise which is sufficiently concentrated to constitute control ..... Portfolio investments on the other hand are typically scattered minority holdings of marketable securities which do not carry with them control of the enterprises in which the investment occur." Statistics Canada, op. cit. p. 26.

   Portfolio investment in Canada is listed as stocks, bonds of various levels of government and corporations and various other claims on corporations. Ibid. p. 44.

6. Ibid. Table XX, p. 153.

7. Mel Watkins, "The Staple Theory Revisited", Journal of Canadian Studies, Vol. 12, No. 5 (Winter, 1977).

8. R. M. Longo (Ed.)., Historical Highlights of Canadian Mining (Pitt Publishing Co: Toronto, 1973) p. 164.

9. Hugh Aitken, American Capital and Canadian Resources (Harvard University Press, 1961).

10. I. Brecher and S. Reisman, Canada-U.S. Economic Relations (Royal Commission on Canada's Economic Prospects, 1957) Appendix B.

11. See, for examples, O. W. Main, The Canadian Nickel Industry (University of Toronto Press, 1955); T. W. Gibson, Mining in Ontario (Province of Ontario Department of Mines, 1937); J. F. Thomson and Norman Beasley, For the Years to Come (Toronto: 1960); J. Swift, The Big Nickel (Kitchener, Ontario: Between the Lines, 1977); Royal Ontario Nickel Commission, Report (1917); D.M. Le Bourdais, The Sudbury Basin, (Toronto: Ryerson Press, 1953).

12. J. Swift, op. cit.

13. Royal Ontario Nickel Commission, op. cit. p. 74.

14. Ibid. p.73.

15. R. M. Longo, op. cit, p. 56.

16. O. W. Main, op. cit., p. 45.

17. Royal Ontario Nickel Commission, op. cit., p. 74.

18. O. W. Main, op. cit. p. 128.

19. H. Marshall and F. Southard, Canadian-American Industry, First edition, 1936 (McClelland and Stewart, 1976), p. 98.

20. The bald figures given by the Report of the Royal Ontario Nickel Commission suggest that INCO of New Jersey, the parent company, made profits totalling $39.9 million from 1903 to 1916, of which no less than $11.7 million were earned in 1916. Attention is drawn to a reserve "to cover account of foreign constituent companies and for depreciation of their properties" which renders the above figures rather less than that reported in the company's Annual Reports as "net profits". The estimated cost of the Port Colborne refinery was $4.0 million in early 1917. Royal Ontario Nickel Commission, op. cit., pp. 74 - 78.

21. H. Marshall and F. Southard, op.cit., p. 98.

22. O. W. Main, op. cit., p. 105.

23. "Asset growth" is used by Skelton as a concept, ignoring depreciation, which adds the annual expenditures on fixed capital, changes (+ve or -ve) in working capital and changes (+ve or -ve) in company holdings of financial assets. See Alex Skelton, "Nickel", in W. Y. Elliott et al. (Ed.), International Control in the Non-Ferrous Metals (New York: MacMillan, 1937).

24. The information on COMINCO comes mainly from news items, the company's Annual Reports (See especially the 50th Annual Report, 1955) and the following article: Canadian Mining Journal Staff (Eds.), "The Story of COMINCO," Canadian Mining Journal, Vol. 75, No. 5 (May, 1954), pp. 151-393.

25. T. W. Bingay, "A Brief History of the Consolidated M. and S. Co., The Miner, Vol. 9 (October, 1936), pp. 49-51.

26. The Canadian Mining Gazette, October 29, 1928.

27. The Financial Times, May 24, 1940.

28. Bonds issued by the subsidiary, The West Kootenay Power and Light Co., were guaranteed by COMINCO. (eg., 1923). At other times (e.g.,1925) COMINCO bought its subsidiary's stock,

transferring reserves in this manner to secure additional power plant capacity.

29. Information on Noranda Mines comes from the Financial Post Corporation Service, Company Annual Reports and the following, Leslie Roberts, Noranda (Toronto: Clarke, Irwin and Co., 1956); "Noranda's Fiftieth Anniversary", The Northern Miner Magazine Supplement, July 6, 1972; R. M. Longo (Ed.), op. cit. pp. 41-46.

30. The Northern Miner, March 14, 1927.

31. Noranda's Annual Report, 1927.

32. Information on Falconbridge Nickel Mines comes mainly from the following, D. M. LeBourdais, Sudbury Basin: The Story of Nickel, (Toronto: The Ryerson Press, 1953); John Deverell, Falconbridge (Toronto: James Lorimer and Co., 1975); F. S. Moore, American Influence in Canadian Mining (University of Toronto Press, 1941); R. M. Longo, op. cit.; D. M. LeBoudais, "Lindsley and His Ventures", Saturday Night, Vol. 77, No. 4, (Feb. 17, 1962). Further information was obtained from Annual Reports and news items in The Northern Miner.

33. See O. W. Main, op. cit.

34. John Deverell, op. cit. p. 42.

35. An earlier company called Falconbridge Nickel Mines had been incorporated under Dominion charter in 1918. From this legal entity, maintained from 1921 to 1928, the property to be mined was acquired from the Minneapolis owners.

36. D. M. LeBourdais, Sudbury Basin: The Story of Nickel, p.138.

37. See, for example, The Northern Miner, "Sudbury Basin" (Jan. 19, 1928); "Conditions same as Treadwells" (March 1, 1928), no title (March 8, 1928).

38. An unidentified Investment Company held 50,000 shares. Most likely this was Toronto Mines Finance Ltd., a Lindsley creation.

39. The regulations for obtaining a listing on the Standard Stock and Mining Exchange of Toronto required that 10% of the issued shares be in public hands, and not owned by officers, directors, and agents of the company. See The Northern Miner (March 24, 1927).

40. E. S. Moore, op. cit., p. 35.

41. D. M. LeBourdais, "Lindsley and His Ventures" op. cit.

42. Falconbridge Nickel Mines Annual Report, 1936.

43. See The Northern Miner, "Cut Falconbridge Production", (April 25, 1940) and "Halt Falconbridge Shipments" (April 11, 1940).

44. "U.S. Outlet Aim of Falconbridge", The Toronto Globe and Mail (March 12, 1948).

45. John Deverell, op. cit. p. 46, p. 50.

46. U.S. House of Representatives, Subcommittee of the Committee on Government Operations, Hearings on Nickel-Cobalt Contract Obligations of the U.S. Government, 86th Congress, 1st Session, May 11 and 12, 1959, p. 83.

47. Ibid, p. 63.

48. This conclusion is based on a reading of all the sources mentioned in Footnote 32, relying especially on J. Deverell's account. However, a contradictory judgement was made by I. Brecher and S. Reisman in their background study for the Royal Commission on Canada's Economic Prospects. They indicated, with 1954 in mind, that they considered Falconbridge to have been under U.S. control. No evidence or references were provided to substantiate this judgement other than the remark that, in the selection of leading non-resident enterprises, sources other than D.B.S. had been used. Their judgement may have been based on a knowledge of how the stock in Ventures Ltd. was held. In any event, the takeover by McIntyre Porcupine in 1957 ushered in a period of unambiguously Canadian ownership. See I. Brecher and S. Reisman, Canada-U.S. Economic Relations, Royal Commission on Canada's Economic Prospects (1957) Appendix B.

49. R. M. Longo, op. cit., p. 237.

50. D. M. LeBourdais, The Sudbury Basin, p. 180.

51. D. M. LeBourdais "Thayer Lindsley and his Ventures", Saturday Night, Vol. 77, No. 4, (Feb. 17, 1962).

52. The information on Sherritt-Gordon Mines depends mainly on Annual Reports and the Financial Post Corporation (Yellow Card) Service.

53. Sherritt-Gordon Mines, First Annual Report (1928-29).

54. See for details of railway expansion into Northern Manitoba, H.A. Innis, "The Hudson Bay Railway", The Geographical Review, Vol. XX, No. 1 (Jan., 1930), and Canada, Debates of the House of Commons, 82nd Session, 17th Parliament (21-22, George V, 1931) May 21., 1931, pp. 1858-60.

55. Quoted in John Deverell op. cit. p. 42.

56. Sherritt-Gordon Mines, Annual Report for 1952.

57. Financial Post Corporation (Yellow Card) Service, Sherritt-Gordon Mines.

58. Sherritt-Gordon Mines, Annual Report for 1953.

59. Ibid.

60. Only $4.2 million of this facility was utilised. Financial Post Corporation (Yellow Card) Service, op. cit.

61. Sherritt-Gordon Mines, Annual Report for 1939.

62. E. S. Moore, op. cit., pp. 64-65.
H. Marshall, F. Southard and K. W. Taylor, op. cit., pp. 91-93.

63. The authorised capital was increased to 3,000,000 shares in 1930. Financial Post Corporation (Yellow Card) Service, Hudson Bay Mining and Smelting.

64. E. S. Moore, op. cit.

65. The Northern Miner, January 19, 1928.

66. Information in this paragraph from "Flin Flon Deal Outlines," The Northern Miner, January 26, 1928.

67. The New York Times, July 20, 1934. Cited in H. Marshall et. al., op.cit., p. 91. Footnote 123.

68. "Flin Flon Deal Outlines", op. cit.

69. The Canadian Mines Handbook. (The Northern Miner Press, 1936).

70. In British Columbia a number of companies dependent on U.S. capital did flourish. The most important of these was Granby Consolidated Mining and Smelting. First incorporated with a B.C. charter in 1901 the initial capital came from Quebec and the U.S.A. Almost bankrupt in 1936 due to low copper prices the company survived to enjoy further prosperity, selling to the U.S. government in the 1950's. See, E. S. Moore, op. cit. and the Financial Post Corporation (Yellow Card) Service, Granby Mining Corporation.

CHAPTER VII

PUBLIC POLICY: TAXES

An initial distinction sets the stage for investigating the collection of rent in Canada from non-ferrous base metal mining from 1918 to 1955. Alfred Marshall remarked:

> "..... The rent of a mine is calculated on a different principle from that of a farm. The farmer contracts to give back the land as rich as he found it: a mining company cannot do this; and while the farmer's rent is reckoned by the year, mining rent consists chiefly of 'royalties' which are levied in proportion to the stores that are taken out of nature's store-house."[1]

A royalty then is a charge for using up a scarce, depletable resource. Such a royalty is both a payment of rent and, at the same time, a payment for "capital" consumption.

The evolution of the language of economics has led to widespread use of "royalty" in a slightly different, though obviously derivative, sense. For example, Glenn P Jenkins writes thus in 1974:

> "Royalties are usually levied as a fixed percentage of the gross value or physical amount of mineral production. In certain situations, such as in the Middle East oil producing countries, while 'de facto' royalties are collected, they are called income taxes because they are applied to a previously fixed amount of profits per barrel. In this discussion, any tax levied or negotiated as a fixed amount per unit of output prior to production is treated as a royalty".[2]

The defining characteristic of a "royalty" used in this way is that it is an exaction levied on the amount (in physical units) or gross value of the mineral extracted.

A royalty in Marshall's sense of the term can be collected by means of a royalty in Jenkin's usage, as the volume and gross value bases do crudely relate to depletion rates, but Marshall's royalty may also be collected by fixed charges, such as licence fees, or by income taxes. While the principle of rent collection from extractive industry is always as Marshall described it, the method of rent collection need not involve Jenkin's royalties, which are in an alternative vocabulary sometimes called severance taxes. In this text "taxation" and "taxes" are terms used to refer only to the instrument of collection, though, in principle, it is an impost's bearing on Marshall's royalty which is under discussion.

Fortunately our history is straightforward here. The Dominion levied no royalties, in the sense of severance taxes, on base metal mining between 1918 and 1955. In B.C. the Mineral Output Tax of 1898, a charge levied on output in physical units, was incorporated in the Taxation Act of 1911. In

Quebec an impost similar to B.C.'s was applied until 1925 when a profits tax, similar to Ontario's mining tax, was substituted. Otherwise, looking at the legislation in retrospect, the only instruments used by governments of any level, which might have borne on economic rent, were fixed charges of various sorts and income taxes or profit taxes.

A sound "a priori" case for the existence in mining of Ricardian economic rent occurs, if various qualities of ore body are commercially exploited. (See Chapter III.) In Canada this was the case. (The renown of Sudbury and the Sullivan mine was based on such a differential.) If market prices for a metal justify exploitation of marginal ores, then the richer, less intractable or better situated ore bodies earn a surplus. This Ricardian economic rent is not required as an incentive for private capital to work these ore bodies. If it can be acquired skilfully by the state, no economic inefficiency will result from its collection, even in a private enterprise economy.

The mining industry in Canada long campaigned against paying taxes. The campaign proved successful enough to ensure over the years a light taxation load for mining, and an absence of effective economic rent collection by governments.

The Quebec Mining Association was formed in 1891 with the particular objective of opposing the proposed 3% tax on Quebec mining.[3] A few years later, what was to become the Canadian Mining Association coalesced around the infant provincial associations. Lobbying for tax concessions and for tariff concessions on imported mining equipment became a central concern of the national body.

No Dominion taxes were placed on mining until the First World War, and even then the climate of opinion which saw mining as a special case permeated the tax laws, embossing them with many concessions. Frontier industry merited support, or so it was felt.[4]

The property tax on which local finances in Ontario then depended had been reviewed by the Ontario Assessment Commission chaired by James Maclellan in 1902. The words of a later Commission, reviewing similar problems after 65 years, describe succinctly the situation for mines:

"Since 1869 mineral lands had enjoyed preferential assessment at values equivalent to agricultural lands. The Maclennan Commission felt that investors in mineral lands no longer required such encouragement and proposed that the privilege be withdrawn. Their views were overridden and the provision was retained in the Act of 1904". [5]

By and large each mineral producing province was similarly inclined to allow mining concerns to stay off the tax rolls of the municipalities in which they operated. (B.C. was an exception). Thus, mining companies came to play a paternalistic role in their local communities, providing municipal services when the company felt it worthwhile. If, as with INCO at Copper Cliff, company funds were spent on the township then a credit might be allowed against taxes owed to the province. [6] (An analogy being made with the rebate to which municipal taxes would have entitled the company, if it had been paying any).

Such concessions abound, for the industry was deemed to deserve them. When Hudson Bay Mining and Smelting came to Northern Manitoba, for instance, the province undertook not to levy royalties for 20 years ahead. Under the C.P.R. umbrella COMINCO was lodged in a special group under the Workmen's Compensation legislation of B.C. such that, as a self contained "insuring group", no payments to a general fund were required. Claims for which the company was responsible were adjudicated by the Workmen's Compensation Board but paid directly [7]

To explain this background of public policy towards the industry is a task separate from my own. (For the earlier period Nelles has provided one explanation for Ontario). [8] My more limited objective is to show that scarcely any economic rent was mobilized by taxation of the base metal mining industry, and to note that, when for a short time higher taxes likely cut into resource rent, the surplus was directed to pay for the

Second World War.

Little more was collected from mining in these years, in all probability, than was required to pay for the public services mining used, for example, geological surveys, maps, rail links, roads and educated manpower.[9] In short no attempt was made to command the surplus from mining by taxation for use in diversifying the economy and encouraging a broadly based economic development. To the extent that policy makers did address this issue they saw frontier mining as actually being "development".

Encouraging mining was the economic development policy in vogue. Such an approach relies on the natural linkages from mining, and provision of the maximum of incentives for their creation, to the exclusion of re-directing the surplus of that industry to develop others. In a staple economy, as Harold Innis made clear, such a strategy is risky. If domestic linkages are insufficient and economic rent escapes the economy the development potential of an extractive resource may be frittered away. Did this happen to Canadian non-ferrous base metals?

In what follows I examine first the legislative environment of mining taxation up to 1955. Next I consider one company, INCO, and compare the taxes paid to profits and dividends. I conclude the chapter by taking some aggregative statistics to elucidate how taxes bore upon the mining firms.

The Legislative Environment

The Dominion

An important restriction in the British North America

Act reserved all but direct taxation powers to the Dominion. Thus taxation of the mining industry was a matter of direct imposts as far as the Provinces and Municipalities were concerned. "Direct" was interpreted to mean, after the definition of John Stuart Mill, any tax "which by its nature tends to be borne by the person on whom it is imposed and is not passed on to another".[10] The Dominion government was free to levy any sort of tax. However, the Dominion did not choose to levy any distinctive imposts or royalties (in Jenkins' sense) on the mining industry.

To follow the minutiae of Federal and Provincial tax changes and squabbles as they relate to mining would be tedious, and tangential to my present purpose.[11] It is enough to indicate that the Dominion government, and all the Provinces but B.C., based their taxation of mining principally upon profits.

Profits are a residual under the accounting conventions accepted by revenue collectors. As such it is always necessary to have some concept such as "taxable income" which specifies the income base to which tax rates are to be applied. The striking feature of the taxing of mining in Canada was the extent to which this tax base was diminished by application of various depreciation and depletion allowances, and tax exempt periods for new investments. These allowances, rather than the tax rates, explain the light taxation burden borne by mining companies in Canada. Of course, the policy was deliberate, since "development" was deemed to require these discriminatory incentives to Canadian mining.

Corporate taxation by the Dominion was introduced in the Business Profits War Tax of 1916, a measure justified by the extraordinary circumstances of war at its inception.

The provisions of this legislation were augmented by the Income War Tax Act of 1917, in which Dominion personal income taxes were first introduced. Again during the Second World War taxation of corporations increased under the Excess Profits Tax Act of 1940. Eventually after the hostilities ended taxation reverted to a lower level with the Revised Income Tax Act of 1949. These were the legislative instruments under which mines paid direct taxes to the Dominion, and the generous treatment of mining income was authorised in them.

Three Dominion concessions to mining, each serving to reduce taxable incomes, were of particular significance. (1) Percentage depletion allowances allowed taxable income to be reduced each year by a specified percentage, to compensate the owners of mineral rights for the exhaustion of their property. Since the Income Tax Act of 1917 these depletion allowances had been granted to mining corporations in Canada. The initial rate of depletion allowed was 25% for base mines, rising to 33-1/2% in 1929, at which level it remained until the 1960s.[12] Shareholders too were eligible for such an allowance against qualifying dividends, though the applicable rate was reduced from 33-1/2% to 20% in 1935.

As the allowance was not limited by any declared value of the property (it was an annual % reduction in taxable income) the total income excluded from taxation over the years might exceed, not only the purchase price of the property rights, but also the actual appreciated value of the property in later years as markets expanded and mineral prices rose. The concept of depletion allowances runs quite contrary to the principle that the state is entitled to collect natural resource rents.

(2) The Three Year Exemption for metal mines under Dominion tax laws was introduced in 1936.[13] As the term suggests, income derived from a mine in the first three years of its productive life was tax free under this provision. This tax holiday is an invitation to "high-grade" and, thus, to earn economic rent tax free. Again the design of the tax system was such as not to collect the asset value of the nation's extractive resources.

(3) Eventually Canadian legislation allowed exploration and development costs to be written off against income. As such search and pre-production expenses are in the nature of capital expenditures, this concession amounted at its most generous to immediate 100% depreciation allowances for part of the mining industry's capital expenditures. The rationale was the risky nature of exploration as an investment in information along with the desirable results attributed to mine finding.[14]

Introduced during World War II under a rule of the Income War Tax Act the initial concession gave 100% write-offs of the cost of exploration on properties contiguous to existing mines and 26-2/3% write-offs on other, outside exploration and development in Canada.[15] Base metals and strategic minerals were eligible for the deduction. Reporting in 1944 the Royal Ontario Mining Commission recommended that "all annual expenditures made by mining companies on outside exploration in any part of Canada, excepting costs of options or purchase of property, be allowed as a deduction from earnings before assessment for Dominion Income or Excess Profits Tax".[16] Whether influenced by this Report or not, the government extended this concession by various ad hoc measures and made it more valuable until it was incorporated into Section 83A of the Income Tax

Act by amendment in 1950.[17] In the opinion of Timbrell the result was that:

> "A continual broadening of the provisions of Section 83A (of the Income Tax Act) has taken place since its introduction and as a result of many annual changes it has become extremely complicated to interpret."[18]

After the Second World War, in reaction to the high taxes levied to finance the war effort, tax concessions for corporations multiplied. Schemes such as the fast write-off of capital investment were introduced. Mining benefited even more than most industries in this climate of opinion by having the normal depreciation regulations rendered more favourable and by having provincial mining taxes allowed as a deduction from income taxable by the Federal Government.[19]

The taxes paid by mining had increased dramatically in the war. Direct taxes as a proportion of gross profits doubled from just under 15% to just over 30% in the war years (Table 7.2). Tax room in mining there was in plenty. At the same time the major part of base metal output was sold at controlled wartime prices. Of course, other industries also experienced a greater tax burden during the hostilities. Yet it seems particularly inappropriate that, after the war, during the most significant price boom in Canada's mining history, the Canadian government turned away from the mining industry as a source of revenue.

Again it can be seen that government policy, with a vision of frontier development in mind, deliberately abstained from the implementation of taxes (or royalties) on economic rents. Only during the Second World War were taxes such that some rents were collected, and spent to finance the waging of the war.

Table 7.1: The Burden of All Taxes 1926-46

Year	Taxes as % of GNP[a]	
	%	Index No. (1935 = 100)
1926	13.2	77
1927	13.0	76
1928	12.4	75
1929	13.0	76
1930	12.8	74
1931	14.7	85
1932	17.0	99
1933	18.3	106
1934	17.3	101
1935	17.2	100
1936	18.1	105
1937	17.3	101
1938	17.2	100
1939	16.6	97
1940	19.5	113
1941	22.5	131
1942	21.7	126
1943	23.4	136
1944	23.0	134
1945	22.1	128
1946	24.1	140
1947	23.5	137
1948	21.4	124
1949	20.7	120
1950	20.8	121
1951	23.4	136
1952	23.6	137
1953	23.0	134

[a] All taxes of all levels of government.

Source: J. Harvey Perry, Taxes, Tariffs and Subsidies, Vol. I (University of Toronto Press: 1955) p. 275.

Table 7.2: Direct Taxes paid by Extractive Industries as a Proportion of Profits

Year	%	Index No. (1935 = 100)
1926	7.7.	50
1927	7.8	51
1928	8.0	52
1929	7.5	49
1930	10.5	68
1931	10.7	69
1932	19.8	129
1933	14.1	92
1934	13.4	87
1935	15.4	100
1936	15.3	99
1937	14.7	95
1938	16.5	107
1939	14.2	92
1940	28.2	183
1941	28.7	186
1942	31.6	205
1943	30.2	196
1944	31.6	205
1945	32.5	211
1946	30.4	197

Source: D.B.S., Selected Corporation Financial Statistics, 1926-46, Working Document. (August, 1958).

The Provinces

Limited to direct taxation but with growing responsibilities for urbanisation, education, transportation and social services, the Provinces had entered the field of corporate taxation even prior to World War I. In addition mineral royalties (in Jenkins' sense) had been levied in Nova Scotia since 1869, in Quebec since 1880 and in Ontario since 1891. There are even precedents of taxes on personal incomes before Confederation in the colonies of British North America.

In short the provincial right to place direct taxes on income was well established by 1900. A Mining Profits Tax was first enacted in Ontario in 1907. A Mining Tax Act, separate from the Corporation Tax Act, was passed in 1914, and it is under this legislation that the greater part of Ontario's revenues from mining was to come.[20] In contrast B.C. retained the Mineral Output Tax of 1898, a tax levied not on profits but on output in physical units, including its provisions in the Taxation Act of 1911. Mines were soon also subject to income taxes in B.C. despite exemptions when first corporate taxation was introduced in 1901. In Quebec the royalty principle (in Jenkins' sense) was applied until 1925 when a tax on profits, similar to Ontario's mining tax, was substituted.

Until the transfer of natural resources to the Prairie provinces in 1930 no special taxes were levied by the Dominion under whose jurisdiction they lay. Normal Dominion tax provisions applied. Though collecting some revenues through corporate taxation Manitoba and Saskatchewan did not pass their

respective Mining Royalty and Tax Act and Mineral Taxation Act until 1948. Both were profit based taxation measures.[21]

This sequence of Dominion and provincial tax bills adopted for the most part a profit based approach to the taxation of mining income, and introduced provisions reflective of a development policy sympathetic to frontier mining. The state has long involved itself in industry sponsorship in Canada, particularly the encouragement of natural resource industries. With the wheat staple the existence of western Canada is some evidence of the policy's success. For extractive industry the equivalent testament would have to be the marginal towns clinging to the Canadian shield in northern Manitoba, northern Ontario and northern Quebec. (Sudbury would surely have flourished without government support as would Trail and Kimberley. Yet even these strong examples of mining development do not exude an air of permanence). It is in this context of transitory and geographically mobile economic activity that the favourable tax treatment accorded to mining from 1918 to 1955 must be judged.

Municipalities were of small quantitative significance in the taxing of mining enterprise.[22] In Ontario, a proportion of the provincially collected mining levies were transferred to mining municipalities rather than have direct municipal property taxes bear on the mining companies.[23] Throughout Canada mines were the creators of company towns which did not always incorporate. In either situation towns represented the local infrastructure essential to the successful operation of the mining enterprise. Sums spent on municipal facilities in the barren Shield or rugged Cordillero were an obvious production cost of mineral ores for which even the mining industry, individualistic as it was,

acknowledged some responsibility. Thus, the Report of the Royal Ontario Nickel Commission contains comments from leading mining men admitting the system then in force to be "fair".[24] In practice that system, under The Mining Tax Act (1914), excused mines from municipal taxes but returned one third of the provincial mining tax (3% of annual profits) to the municipality with which a mining producer was associated.

In summary the legislative environment described was one in which the Provinces' early role in taxing extractive industry was usurped after World War I by the growth of the Dominion's corporate and income taxation. Despite continued Provincial taxation it was the Dominion's take which grew to be the largest, despite generous special treatment of mining (and oil) in the Dominion statutes. The municipalities, as always the creatures of their province, played little part. At no level was the tax well designed to collect economic rent effectively. Many of the provisions of the Dominion laws seemed designed to give rent away to the industry as a form of development incentive. The question was visualised entirely in geographic, employment and demand terms. Linkages to mining were relied upon to supply a return to the revenues foregone in taxing the extractive industries more lightly than other Canadian industrial activities.

Taxes and the Surplus

The contention that in Canada economic rent from extractive industry was privately appropriated accords with the design of the tax legislation. The state's share of the surplus was not collected, but rather sacrificed to the goal of frontier development.

An examination of the evidence shows the lightness of the burden placed on mining enterprise.

From the dividends paid by mining companies a sense can be obtained of how few were the important producers. Many concerns operated mines, but only one or two flourished immensely. It is these concerns which were replete with economic rent.

The main outline of the dividend record for mining is depicted in Table 7.3 and Table 7.4. All values are in current dollars. Note that "metal mines" include gold producers as well as base metal properties.

The main points revealed are as follows:

(1) Metal mines in Canada paid just more than $1,000 million in dividends up to 1939. In the next 16 years a further $1,600 million in dividends were declared.

(2) More than one half of the dividends paid by metal mines in Canada up to 1955 was paid by Ontario producers.

(3) More than one half of the dividends declared in Ontario up to 1955 was declared by INCO.

(4) Even greater concentration of surplus is evident in B.C. Almost three-quarters of the dividends declared by metal mines in that province up to 1955 was declared by COMINCO.

(5) Some six-tenths of all the dividends paid by metal mines in Canada up to 1955 was declared by the six corporations examined in Chapter VI.

Dividends represented only part of the rent accruing in production. Reserve funds and new investment were also derived from self-generated funds. Yet these dividend figures show once again the importance of Ontario and of the major producers in the mining

Table 7.3: Dividends paid by Metal Mines, in Canada by Region[a]

($ million)

Province[b]	To End - 1939	To End - 1955
B.C.	203.3	550.4
Manitoba	22.4	183.2
Ontario	720.7	1,585.2
Quebec	66.8	356.6
Canada - Total	1,013.2	2,687.7

[a] "Metal Mines" should be understood to be metal mining companies

[b] Nova Scotia is insignificant and Saskatchewan is not credited with any dividends in the source, presumably being included with Manitoba.

Source: Financial Post Survey of Mines, 1940-41 and 1957.

Table 7.4: Dividends paid by Metal Mines, by Major Base Metal Firms[a]

($ million)

Firm	Start	To End - 1939	To End - 1955
INCO[b]	1894	289.6	830.8
COMINCO	1906	86.3	406.6
NORANDA	1930	53.4	189.4
HUDSON BAY	1935	19.3	168.9
FALCONBRIDGE	1933	6.7	25.9
SHERRITT GORDON	1940	-	2.8
GRANBY	1903	25.3[c]	29.8

[a] "Metal Mines" should be understood to be metal mining companies.
[b] Including Canadian Copper Co. dividends.

[c] Including a distribution of capital.

Source: Financial Post, Survey of Mines, 1940-41 and 1957

industry. Questions of surplus collection by the state are more pointed if this regional and industrial structure are borne in mind.

The case of Sudbury is of special interest, since these copper-nickel deposits explain both the regional dominance of Ontario and the importance of INCO in the industry. What did Ontario, the premier mining province, collect from Sudbury ores in the way of rents over the years?

The Royal Ontario Nickel Commission reported that, under the Mining Tax Act (1907), the tax collected for the province from the nickel-copper mines had been $264,000 to October 1916.[25] The Canadian Copper Co. (which is to say INCO) had paid $245,000 of this amount.[26] Common stock dividends paid by the company from 1907 to 1915 inclusive (the appropriate comparison) were $18 million.[27] Incredibly the conservative Report considered this to be adequate taxation and recommended that if an extra tax had to be levied it should not exceed 5% of net profits.[28] For a short time the nickel copper producers were taxed at this higher rate which then lapsed in 1920 to 3% once again.[29] The Commission had expressed the opinion that a 20% to 25% after-tax rate of return was fair for mining enterprise.[30]

The Mond Nickel Co., giving evidence before the Royal Ontario Nickel Commission, declared that up to April, 1914, the company's total profits were $6.5 million.[31] (Only one half of the physical capital stock of $14 million was invested in Canada). Only some $18,000 of tax had been paid by Mond under the Mining Tax Act (1907) by 1915.[32] A Mond spokesman addressed this paucity of taxes directly as follows:

"It may be held that the above amount of Provincial tax is very small. To this possible objection we wish to reply that this is due to the current condition of the company and to the wording of the Mining Tax Act. The Mond Nickel Company has been for some years a very rapidly expanding company, and has spent annually very large sums on development and other charges, which, in accordance with the Act, must be taken from the value of the ore at the pit's mouth, for the year in which the expenditure is incurred. Naturally this has caused heavy deductions from assessable ore value, that with the company become deferred charges. This, of course, will react in the opposite direction later on."[33]

Little doubt can exist that Ontario's mining tax collected no economic rents from nickel/copper before the First World War. The political climate of the times did not favour direction taxation and no distinction was made which might have protected the people's collective rights to the rent surplus from extractive industry. As a tailpiece it may be noted that the profitable Mond concern had paid in total only $234,000 under the two successive Ontario Mining Tax Acts when INCO absorbed the company.[34] The main vehicle for direct taxation of mining by the province made only a puny impact on the surplus enjoyed by Mond Nickel from the Sudbury ores.

Taking the whole sweep of our period it is evident that Ontario's collection of Sudbury rent remained miniscule. INCO declared dividends to the end of 1952 amounting to $693.8 million, all based on the extraction and processing of Sudbury ores.[35] Ontario's revenues from INCO under the successive Mining Tax Acts totalled only $29.5 million by the end of 1952. Similarly Falconbridge declared dividends to the end of 1952 of $18.0 million, but had paid from 1933 (when dividends started) only $0.68 million to the Ontario government under the Act's profit taxation provisions.[36] No economic rent and little return on capital can have been captured under Ontario's mining tax legislation.[37]

The view that mining enjoyed a light tax load compared with other industries is traditionally difficult to support from an economy wide perspective. Dominion tax returns are still not open to the public. Yet there is evidence which shows corporations as having increased tax loads as decade succeeded decade in the twentieth century, but mining less so.[38] Only during the Second World War did the government of Canada, desperately trying to finance the war without inflation, move into the revenue field available in the surplus of extractive industry.

The Depression in Canada was a traumatic experience. Agriculture suffered especially. In the mining industry the economic crisis was cushioned by the prosperity of the gold producers and by the brevity of the adverse demand conditions faced by the base metal corporations. A period of high returns set in for base metal mining after 1935, and demand recovered steadily as stockpiles of war materials grew.

The Dominion's direct taxation of mining had exhibited a concessionary aspect from its inception. As one of the few dynamic sectors of the economy, mining attracted further dispensations in the decade of the "dirty thirties". Something of a macroeconomic motive, additional to the frontier development goal, can be discerned in the introduction of the three year exemption on new mines into the Dominion's corporate tax legislation in 1936.

This concession was especially agreeable in that, with cessation of expansion in the early 1930's, the tax load on the industry had jumped (Table 7.2). Without expansion, depreciation deductions clawed down less and less of gross profits. For this reason direct taxes to all governments as a proportion of gross

Table 7.5: Profits of Extractive Industry, 1926-46

Year	Gross Profits as % of Assets	Net Profits as[a] % of Assets
1926	6.7	6.1
1927	6.3	5.8
1928	5.9	5.4
1929	6.5	6.0
1930	4.5	4.0
1931	3.3	2.9
1932	2.3	1.9
1933	5.0	4.3
1934	7.6	6.6
1935	9.7	8.2
1936	11.7	9.9
1937	13.4	11.5
1938	11.1	9.2
1939	12.2	10.5
1940	13.2	9.4
1941	13.0	9.2
1942	12.0	8.2
1943	10.0	7.0
1944	7.2	4.9
1945	7.1	4.8
1946	7.2	5.0

[a] Net Profits equals Gross Profits minus direct taxes levied by all levels of government.

Source: Canada, D.B.S., Selected Corporation Financial Statistics 1926-46, Working Document (August, 1958).

profits in extractive industry reached a peak of almost 20% in 1932. Simultaneously profits net of taxes as a return on assets plummeted to under 2% (Table 7.5). The equivalent return to assets in 1937 was a healthy 11.5% with only 15% of gross profits being paid as direct taxes.

Dominion and provincial taxation of extractive industry shows no attempt up to 1939 to collect economic rent. When commodity prices are low the tax burden rises and vice versa. (Table 7.2). This pattern is the exact contrary to what one would expect if resource rents were being collected through taxation.

During the Second World War the nation's tax take from extractive industry improved as a result of the Excess Profits Tax. This impost was a blunt instrument and did not incorporate incentives, simply taxing (on a sliding scale) profits earned above a norm established by the profits of a company in the four pre-war years. As has been noted price control at home and patriotic long term contracts with Britain moderated the war profits of the extractive industries. Thus manufacturing, for instance, earning higher wartime returns, had from 1940 to 1946 about one-half of gross profits taxed under the combined corporate income tax and excess profits tax. For extractive industry the equivalent proportion was one third. It can be concluded that, though the wartime tax system probably collected some resource rent, this outcome was quite coincidental to the wartime tax legislation.

In the postwar era the relaxation of wartime tax impositions on mining can be discerned to have had some effect. With respect to metal mining for which statistics now become available, the combined take of the income and excess profits tax fell from 45% of taxable

income in 1946 to roughly one third in 1948.[39] In the meantime taxable income had become even more divorced from true profits by the application of the exploration and development deductions mentioned earlier in this chapter.

A variety of direct charges (exploration licences, fees to register claims, acreage taxes on undeveloped claims, etc.) fall under the category called public domain revenues. Sometimes the disincentive effect of these charges gave cause for concern.[40] However, decade by decade the importance of these charges to the provinces has declined. Economic rent captured by them prior to the First World War, though likely significant then, declined as increasingly the income based system of mining taxation was emphasised.

Over these years, 1918-55, economic rent collection was abdicated by all Canadian arms of the crown, except briefly and partially during the Second World War. Thus private individuals, the owners of the major mining firms, received the economic rent. Some mansions in Montreal and Toronto attest to the resting place of part of this surplus. However, as foreign private ownership replaced Canadian private ownership of base metal mining companies it seems likely that less and less of the rent stayed within the Canadian economy.

FOOTNOTES

1. Alfred Marshall, Principles of Economics, Variorum Edition, ed. C.W. Guillebaud (The Royal Economic Society: 1961) Vol. 1, p.167.

2. Glenn P. Jenkins, "Comment", in M. Crommelin and A.R. Thompson (eds.), Mineral Leasing as an Instrument of Public Policy (Vancouver: University of British Columbia Press, 1977).

3. William Schabas, "B.T.A. Bell - The Mining Industry's Frist Spokesman", Canadian Mining Journal Vol. 99, No. 6 (July, 1978).

4. For a selection of such views see, Royal Ontario Nickel Commission, Report (Toronto: Kings Printer, 1917) Appendix, Section N, pp. 158-203. The same attitudes are evident in Royal Ontario Mining Commission, Report (Toronto: King's Printer, 1944) Part III.

5. Ontario Commission on Taxation, Report, Vol. 2 (Toronto: Queen's Printer, 1967) p.41.

6. Royal Ontario Nickel Commission, op. cit., p.525 and Appendix, p.200.

7. See The Canadian Mines Handbook (1946), Hudson Bay Mining and Smelting Co. Ltd. See, for Cominco, letter in Author's possession dated July 13, 1978, from Board Counsel, Workmen's Compensation Board of B.C.

8. H.V. Nelles, The Politics of Development (Toronto: Macmillan, 1974) Paper edition (1975) pp. 429-443. Nelles details the close links between Ontario mining interests and successive Ontario provincial governments, seeing the province as assuming the role of the miner's friend in Dominion affairs, especially with respect to the Rowell-Sirois Report on the constitution. In a confidential memo T. Gibson, The Deputy Minister of Mines, "informed his Minister that Ontario mining taxes were amongst the lowest in the world" (ibid. p.435). The 1930 memo was classified as "confidential, not to be printed".

9. Nelles cites Premier Mitch Hepburn of Ontario (in 1935), trying to persuade the Dominion government to give up mining taxes in favour of the province, and mentioning in support that over 25 years Ontario had spent $100 million in the mining districts and had collected only $12.2 million in mining taxes. (Nelles, op. cit., p.440) The Report of the Royal Ontario Mining Commission (1944), op. cit. gives evidence (p.5) suggesting the Dominion/Ontario tax take was divided 3/1 on average (1907-42). Now the Dominion government had mining related

expenditures of its own! If Hepburn's estimate was remotely close to the truth the entire Dominion and provincial tax taken from mining in Ontario did not even cover Ontario's own expenditures in providing services such as roads, rail links, etc. to the mining industry.

10. D.Y. Timbrell, Taxation of the Mining Industry in Canada (Royal Commission on Taxation, Study No. 9, 1964) p.67.

11. Much factual information is found in the following: J. Harvey Perry, Taxes, Tariffs and Subsidies, Vols. I and II (University of Toronto Press: 1955); John Davis, Mining and Mineral Processing in Canada (Royal Commission on Canada's Economic Prospects, 1957) Appendix C.

12. These rates apply to base metals, precious metals received higher allowances. See, J.H. Perry, op. cit., p.601, and D.Y. Timbrell, op. cit., pp. 121-136. (Note: Timbrell suggests that from 1917 the amount of depletion allowance was entirely at the discretion of the Member of Finance. Only after 1946 did the rates become a matter of legal right rather than falling under ministerial prerogative).

13. J.H. Perry, op. cit., p.605; M.W. Bucovetsy, The Taxation of Mineral Extraction (Royal Commission on Taxation, Study No. 8, 1946), p.11; D.Y. Timbrell, op. cit., pp. 115-121.

14. Royal Ontario Mining Commission, op. cit., Part III, p.7.

15. Ibid.

16. Ibid.

17. D.Y. Timbrell, op. cit., p.104.

18. Ibid.

19. Ibid., p.141.

20. J.H. Perry, op. cit., Vol. II, Appendix C, Table 16, pp. 648-50.

21. These Acts were passed to allow the continued provincial taxation of mining, despite tax rental agreements for income taxes signed by the Provinces with the Federal government. See, J.H. Perry, op. cit., Vol. 2, p. 473

22. Royal Ontario Mining Commission, op. cit., p.5.

23. See, Royal Ontario Nickel Commission, op. cit., p.523; The Ontario Commission on Taxation, Vol. 2, op. cit., pp.45-6, 172.

24. Royal Ontario Nickel Commission, op. cit., Appendix, Section N.

25. The Royal Ontario Nickel Commission, op. cit., p.525.

26. Ontario Department of Mines, Annual Report (1916).

27. The Royal Ontario Nickel Commission, op. cit., p.72.

28. Ibid., p.527.

29. Ontario, Department of Mines, Annual Report (various years).

30. The Royal Ontario Nickel Commission, op. cit., p.526.

31. Ibid., Appendix, p.195.

32. Ontario. Department of Mines, Annual Report (1916).

33. The Royal Ontario Nickel Commission, op. cit., appendix p.194.

34. Ontario. Department of Mines, Annual Report (various years).

35. Financial Post, Survey of Mines (1954).

36. Tax yield data are from Ontario. Department of Mines, Annual Report (various years).

37. For tax provisions which do capture economic rent see R.D. Cairns, Canadian Tax Journal (Sept./Oct., 1977).

38. Due to a special project of the Dominion Bureau of Statistics this overview is possible for 1926 to 1946 only. An aggregative picture was constructed by D.B.S. for a range of industrial sectors by combining a sampling technique with information taken from Dominion corporate tax returns. Extractive industry, including mining, quarrying and oil wells, was one such group. It seemed to escape lightly in the payment of taxes. As mining was the most important part of extractive industy up to 1946 it seems fair to mention this as relevant to the experience of mining. The reference is as follows: Canada. Dominion Bureau of Statistics, Selected Corporation Financial Statistics, 1926-46, Working Document (August, 1958).

39. Canada. Department of National Revenue, Taxation Statistics (1948 and 1950).

40. Royal Ontario Nickel Commission, op. cit., Appendix p.159.

CHAPTER VIII

THE CONCLUSION

To investigate Canadian extractive industry and its development impact has been to mount an historical expedition into near virgin territory. Initially the questions put were limited to non-ferrous base metals to direct the exploration along a logical and practicable course. The clarification of the original questions has been laborious, and of necessity not exhaustive given the wide area to be traversed and the primary materials on which the research depended.

However, there has been presented a description of a Canadian staple industry experiencing vigorous expansion and an analysis of the nature of the contribution to Canadian economic development made by that industry. The concepts of economic rent and linkages, allied to the wider perspectives of the staple theory, have been relied upon in making this analysis. As a result a clearer understanding is at hand of how mining in Canada has shaped Canada's economic development.

In this final chapter the conclusions of the research are considered together, and these findings are related to some wider themes in Canadian economic history. Very briefly some directions for further research are suggested in the last section.

The Guiding Hypotheses

The elucidation of the basic notions of linkages and economic rent served to show the aptness of these concepts to analysis of the Canadian mining industry. (Chapter II and Chapter III) From them emerged two propositions.

1. That the realised linkages of non-ferrous base metal mining on the basis of private enterprise were inadequate to promote Canadian economic development to the extent warranted by the potential of the raw ore bodies.

2. That the part of the return to non-ferrous base metal mining in Canada which was Ricardian economic rent was privately appropriated for the most part and that this rent came to be garnered to an increasing extent by foreign owners of the Canadian industry. In this way the value of real Canadian assets, in the form of ore bodies, was partially lost to Canada.

Much of the content of this thesis has been devoted to substantiating these hypotheses.

It has been indicated that backward linkages predominated, along with final demand linkages, in the industry's expansion. (Chapter V) Yet economic development in the sense of a permanent, rounded economy is not well served by this pattern of linkages. It is from the establishment of an independent, manufacturing economy utilising the raw materials of smelter and refinery that major benefits to Canadian economic development from mining should have come. That these benefits were limited can be explained by the siting in the U.S. of the epicentre of North American capitalism in our period.

Only by short-circuiting in some way the tendencies of mature capitalism (based on oligopoly corporations) to centralise production for the final market could this outcome have been avoided. That state planning of any sort would have been unthinkable demonstrates how

dependency, and the extraction of economic surplus, can be facilitated by ideological and cultural borrowing from metropolitan centres. Alternatives to state intervention there may have been, but, if there were such, they remained undeveloped by Canadian intellectuals and the bureaucracies they trained and staffed.

In his work on mining at least Innis may be mentioned in this regard. He emphasised the overall developmental impact of mining while noting its cyclonic nature. He did not establish the conditions under which extractive industry would most benefit Canada, or any other economy fortunate enough to be endowed with mineral wealth. In seeking to comprehend the form of development initiated by the mining staple under capitalism, Innis abjured consideration of modified or alternative economic systems. He was not concerned with such policy directions.

Without such intellectual leadership Canada was bound to follow in the ideological wake of the U.S.A. For the extractive industries, including base metal mining, the result was exploitation of raw materials with on the whole rather modest further processing. The sudden reversal of the trend to ever less secondary metal manufacturing during the Second World War indicates strongly the scope that existed for development of an independent Canadian manufacturing capacity. (Table 5.6)

With respect to the second proposition it has been demonstrated that virtually no economic rent was collected from non-ferrous base metal mining in this period. (Chapter VII) The taxation methods were not designed to collect such rent because politicians, holding to a dream of frontier development, believed that as much surplus as possible should be left with the mining firms to encourage exploration and the expansion of production. Implicitly they saw the industry's

backward and final demand linkages as justifying such treatment.

Thus the astonishing fact appears that I.N.C.O., the giant of the Canadian mining industry, based in our period entirely on Sudbury ores, had paid only $29.2 million to Ontario in taxes by the end of 1952. If dividends of $693.8 million paid by INCO to the end of 1952 represented one-half of true profits (a very high estimate), the taxes collected by Ontario from INCO amounted to only 2% of that profit. Given provincial expenditures on mining, such as that on the Department of Mines and on geological surveys, the Ontario taxpayer may hardly have benefited at all in a direct fashion from the exploitation of INCO's Sudbury deposits.

Even within a capitalist milieu this is remarkable. Not only was no economic rent collected here, but hardly any return on capital was taxed away. Indeed it is not inconceivable that the province of Ontario was giving INCO a net subsidy in these years, a calculation that would be based on direct taxes offset by direct expenditures on the industry (ignoring the taxation of factor incomes and the provision of normal social infrastructure such as schools and roads). Of course, in a very similar vein this was the opinion of Mitch Hepburn in 1935, not that he intended to increase provincial taxation in any other way than by taking over Dominion tax room. (Chapter VII, Footnote 9)

The conclusion is quite clear, whether Dominion or provincial taxes are adduced, that Ricardian economic rent was not collected by the state in Canadian base metal mining, but remained in the private hands of the mining corporations. There this surplus was either put to mining industry expansion or was paid to the owners of the corporations as dividends.

From the point of view of the Canadian economy two observations are

relevant at this point. First the tax structure was such that enthusiatic exploration and development of minerals reduced taxes payable. In this way capital which might have flowed to other parts of the Canadian economy was trapped in mining. The most orthodox neo-classical analysis condemns this as an inefficient use of capital.

The second observation relates to the destination of the economic rent left in private hands. Recalling that the concept represents the flow of value from Canadian assets (ore bodies), it would have been reasonable for the nation to seek to retain this rent or to exchange it for real commodities from other nations. A reasonable postulate can be introduced that as foreign ownership becomes more prevalent more dividends will flow abroad. If these dividends contain an element of economic rent then it too will tend to leave the economy with increasing foreign ownership of the extractive industry. It has been seen that dividends in the Canadian mining industry were made up of profits and economic rents, as none of the latter was removed by taxation.

The hypothesis introduced requires some qualification at this point. While it is true that by the mid-1950's Hudson Bay Mining and Smelting and Sherritt-Gordon Mines had joined INCO as major foreign owned mining corporations, the domestic companies, COMINCO and NORANDA, had also expanded substantially. (Falconbridge too remained Canadian throughout the 1950's.) In short, it is by no means obvious up to the end of the Second World War that foreign ownership of the non-ferrous base metal mining industry increased. (Table 6.2) It was the late 1940's and the 1950's which saw first Sherritt-Gordon and then Falconbridge become vulnerable to foreign takeover.

However, from the very start of the investigation, in 1918, a large

proportion of non-ferrous base metal mining was undertaken by foreign owned concerns. In Sudbury INCO, MOND and British American were foreign corporations paying dividends abroad to foreign owners. The expansion of INCO alone involved from 1935 to 1955 an increase of $310 million in assets as compared to an increase of $74 million in those of Hudson Bay Mining and Smelting over the same period. (Table 6.6) Thus it is to the expansion of the industry with a pre-existing high foreign ownership content, rather than to the pattern of entrants to the industry, that the increased exodus of rent is to be attributed between the wars. Only subsequent to the Second World War did major firms become foreign owned where previously they were Canadian.

To recapitulate on these conclusions may be valuable. This thesis asserts that, beyond any doubt, economic rent was left in private coffers as a result of the exploitation of Canadian non-ferrous base metals from 1918 to 1955. Yet in these years the Canadian establishment was moulded in the direct tradition of British liberalism. As a system of values liberalism rejects the right of private capitalists to retain economic rent, unless some pragmatic benefit to the commonweal is apparent (Chapter III). In the Canadian setting "development" can be the only goal justifying this largesse within the liberal canons. If this were the rationale, as at one level I believe it was, the development policy of the Canadian state failed.[1] The linkages of the mining industry seemed inadequate, and of the wrong type, to promote industrial diversification within the Canadian economy.

Thus private capital collected the economic rent from non-ferrous base metal mining in this period. This thesis demonstrates that it is very likely that a large proportion of these rents accrued to foreign

owners of Canadian mining operations. However, not until the 1950's can a trend be detected towards an increasing proportion of the total rent accruing abroad. This modification does not alter the conclusion, firmly established, that under an alternative taxation regime designed to collect economic rents or under a property regime involving public management of extractive industry substantial surpluses would have collected, which might have been chanelled into the Canadian economy to produce a diversified economic development of a permanent sort. Once again the staple trap, the mesmerising effect of concentrating on an economy's most easily encashable assets, inhibited the achievement of the staple's own potential. If the time comes, as it most likely will, when Canada has no new staple in strong demand to which to direct the nation's energies, Canadians then may criticise with feeling the decisions of the politicians and business men which frittered away so much of the nation's extractive wealth.

Bearing on wider themes in Canadian Political Economy

The political economy of the minerals staple has yet to be fully articulated in Canada. The conclusions of this thesis bear upon some important themes which should be part of any authoritative statement. These implications are now considered.

Canadian economic development in the twentieth century is now subject to two distinct interpretations, in both of which natural resources are important. What may be termed the orthodox position considers the exploitation of Canada's renewable and extractive resources in the twentieth century as a success story in which foreign capital has been married to Canadian materials to the benefit of all. Certainly within the Canadian mining industry, as part of its self-image, this view dominates. In one recent "industry" book on Canadian mining, there is found the following:

> "It is obvious that the proper development of the mining industry, and all the resource industries, requires capital. Like it or not, the internal sources of money are just not sufficient. Some foreign investment is absolutely necessary. In our reaction to the extent of American investment in our country, we tend to lose sight of the fact that this foreign capital is essential to us."[3]

Moving into the academic world the orthodox position quite properly loses its hard edges. The complexity is recognised in the concept of a socially optimal rate of natural resource exploitation. Emphasis is placed on the "package deal" which foreign direct investment in Canadian resources may represent; with the capital, it is suggested, came entrepreneurial talent and the latest U.S. technology. Hugh Aitken emphasised such a dynamic interpretation of foreign investment. He asserted in American Capital and Canadian Resources:

> "American capital, entrepreneurship and technology have not merely exploited opportunities; they have also created them. Their function has been not merely to facilitate the doing of things that would have been done anyway, but also to get things done that might not have been done at all."[4]

In summary the orthodox position, in popular and academic publications, recognises that substantial foreign participation has occurred in Canada's extractive industries (to be specific) and views it positively. Seen as a corollary to a necessary drawing on the pool of foreign savings (particularly U.S.), foreign ownership also brought human capital from the U.S.A. and an entrepreneurial thrust otherwise unavailable to Canadian mining. In addition to the need for capital the orthodoxy supposes that U.S. ownership was promoted by the development of the technology of mining and mineral processing in the U.S. A. and by the greater part of the mineral industry's markets being south of the 49th parallel. Only some writers note, as for example does Hugh Aitken, the importance of re-invested earnings to the growth of foreign ownership.[5] The orthodox explanation of the need for foreign capital is not deemed to be weakened by this qualification.

Over the last decade a more questioning eye has been cast on the overall benefits of foreign investment to the Canadian economy. Within economic history the most forceful voices proposing a revised vision emanate from a group, which can be identified as Canadian Left Nationalist. One characteristic of this school has been its roots in political economy. The revisionist economic history is found not only in the writings of economists but also in the publications of political scientists, sociologists and historians.[6]

With respect to Canadian extractive resources, the revisionist position has been that foreign ownership reflects the expansion of the

of the U.S.A.
economic power/ Britain's decline as Imperial lodestar is mirrored by the growing stock of U.S. investment in Canada. Canada it is argued moved rapidly from colonial dependency on Britain to a kind of informal dependency on the United States based on economic, cultural and psychological considerations.

The interpretations of the Canadian Left Nationalists draw upon the staples tradition for vigorous insights into Canadian economic history, though in many respects theirsis as yet a disparate vision. Different political and regional orientations cause some differencesof opinion. Their political economy always appeals to reality, being anti-metaphysical and explicitly subjective. To distil their ideas and to compare them without hostility to the facts of Canadian history is to assist in the refinement, and perhaps the strengthening, of a vital intellectual force. In this spirit two important strands can be identified in their published work, and assessed, as currently important aspects of Left Nationalist thought. Both themes represent re-surfacing hypotheses in Canadian economic history.

Theme 1:

The National Policy, it is argued, created an east-west commercial axis on which Canada was successfully established. The decline of the British Empire followed by the emerging hegemony of the United States has been destructive of this notion of Canada. In the words of Cy Gonick:

> "The 1920's saw the rise of new staple industries that basically altered Canadian development and created a permanent north-south trading nexus. Hydroelectricity, pulp and paper and new mineral industries increased

> in importance. Provincial governments, strangled by the narrow fiscal base awarded to them by the British North American Act, found a new autonomy in the tax revenues from the resource industries which had been placed under their jurisdiction. They began to replace the federal government as the level of government closest to business."[7]

Though more precise in its assertions, this view is a modern echo of Innis. He said in 1937:

> "The extension of the American empire, the decline of its natural resources, and the emergence of metropolitan areas, supported capitalist expansion in Canada and reinforced the trend of regionalism. The pull to the north and south has tended to become stronger in contrast with the pull east and west."[8]

Thus, the Left Nationalist view asserts increasing provincial autonomy and regionalism and explains this tendency as due to prosperity, and to the accompanying taxes, based on natural resource industries. The experience of base metal mining confirms part, but only part, of this view. It is factually correct that regional diversification of base metal mining happened in the inter-war period. Quebec in the 1920's and Manitoba in the 1930's became significant base metal producers. (Moreover one new company in Manitoba, Hudson Bay Mining and Smelting, was an American corporation.) Yet the taxation regimes were such that little in the way of provincial revenues were collected by the new mining provinces, and indeed, the substantial profit flows did not begin for their new mining ventures until quite some time after their initial production began.

Provincial taxation on mining was profit based for the most part, as noted in Chapter VII. Dividends may be used as an index of profit over the years. Noranda Mines in Quebec, which commenced dividend payments in 1930, had paid only $53.4 million in dividends by the end of 1939, but by the end of 1955 had paid $189.4 million. Likewise in Manitoba, Hudson Bay Mining and Smelting, which began

paying dividends in 1935, had disbursed $19.3 million by the end of 1939 and $168.9 million by the end of 1955. (Table 7.4) In the case of Manitoba, and even of Quebec, it was after the Second War that the profits of non-ferrous base metal mining accelerated strongly in the price-led boom of these years. Soon nickel in Thompson, Manitoba, and, of course, oil and gas in Alberta and, later, potash and uranium in Saskatchewan were to add to this natural resource based profits flow. However, timing is important, and this particular explanation for regionalism and provincial power should be recognised as a postwar, not an interwar, phenomenon. In similar vein it is not possible to identify the initial regional diversification as leading directly to greater U.S. ownership and control, at least in the case of non-ferrous, base metal mining. The example of Hudson Bay Mining and Smelting is counter-balanced by that of Noranda Mines, a thoroughly Canadian corporation from 1927.

Theme 2:

Reinterpreting the vision of a commercial Empire of the St. Lawrence, R. T. Naylor presented a proposition in 1972 which suggested that a dominant part of the Canadian capitalist class exhibited a merchant or financial character. In simplified form, the necessary fate of even the most complex of ideas, this notion has it that Canada's indigenous capitalist class has been based to an unusual degree on commercial functions, rather than on manufacturing or any industrial activity requiring a long term investment in fixed capital.[9]

The proposition made by Naylor proved to be contentious. Even ignoring the disagreement as to whether or not the National Policy was biased towards commercial interests, Naylor was criticised vigorously

for overstating the dichotomy.[10] Later Naylor is said to have acknowledged the lack of qualifications in his article, but he did not withdraw the essentials of his contention. In his two volume History of Canadian Business the tenor of the discussion suggests that Naylor perceived continued utility in using his original analytic division.[11] In any event the proposition was a strongly stated version of the "St. Lawrence" interpretation which has enjoyed wide currency in Canadian intellectual circles over many years.[12]

Implicitly the allusion is to an absence of interest by those controlling the great pools of Canadian savings in investments in manufacturing as opposed to trades, transportation or financial institutions. Naylor's two volume book carries this theme to the First World War. What happened thereafter? The question is complicated in that the twentieth century staples of Canada, such as mining, are most definitely industries. Fixed capital is required in large absolute amounts and employed in a setting of high capital/labour ratios.

Yet something like the Naylor thesis is applied by Left Nationalists to explain the high foreign ownership of Canada's extractive industries in the twentieth century.[13] Thus the revitalised "St. Lawrence" vision is being applied to explain an important aspect of Canada's recent political economy.

Drawing these threads together a corollary of both orthodox and revisionist positions appears to be that Canadian industries in the twentieth century were starved of Canadian capital. In the orthodox cosmos an absolute shortage is perceived. Alternatively in the revisionist universe, a mis-direction of capital away from industries towards the sphere of circulation is suggested. Moreover one influential work in the

Left Nationalist stream explained foreign ownership of Canadian industry as partly due to an absence of entrepreneurial talents among Canadians[14] (Naylor disagrees). Surprisingly both orthodox and at least some revisionist economic historians seem to believe that, acting as a hindrance to Canada's development, has been the inability of Canadian industries to obtain, for investment purposes, access to adequate sums from the pool of Canadian savings and of Canadians to acquire the skills and to display the risk taking acumen on which industrial capitalism depends.

What were the facts in Canadian non-ferrous base metal mining, part of the "new industrialism" of the twentieth century? No capital shortage in this industry appears to have existed between the wars (Chap.VI). Indeed, it has been my contention that the tax structure was such, favouring the extractive industries, that too much capital was likely ploughed back into base metal mining at the expense of Canadian manufacturing industry (Chapter VII). Neither orthodox nor revisionist positions are supported with respect to their views on capital availability by the analysis of non-ferrous base metal mining conducted in this thesis.[15]

Indeed with respect to the Left Nationalist view attention is drawn to the history of COMINCO (Chapter VI). Twice, at crucial points in the company's development, injections of capital were received from the sphere of commerce. Of course, owned as it was by Canadian Pacific, COMINCO's connections with Canadian commercial capital were of the best. Yet bank lending was available in these instances for essentially long term purposes - the launching of the selective flotation technique of seperation in 1920 and the establishment of fertiliser operations from waste sulphur in 1930. Is this simply an aberration? In certain circumstances it seems rather as if Canadian commercial and financial

capital could enter into the production sphere. This observation invites an explanation of what exactly these circumstances might be. May there be other examples in other industrial sectors?

After the Second World War the suggestions of capital shortage obtain some, limited credibility in non-ferrous base metal mining. Sherritt-Gordon Mines certainly gravitated into U.S. ownership at this time as a result of financing needs which were not satisfied in Canada. A thorough examination of the effect of the Second World War on the Canadian economy might support a tentative hypothesis that profits and rents diverted to the war effort left those Canadian businesses in need of financing peculiarly vulnerable to foreign takeover after the war. Pending such work, however, this is a speculative hypothesis.

However, between the wars / the conclusion must be that base metal mining throve on reinvested surpluses generated within the major concerns. From the original gold mines of Ontario too a certain surplus which had accumulated was attracted to investments in the related industry of copper-gold mining in Quebec. For the mass of speculative small concerns, which accounted for but a small part of output, the Toronto Standard Stock and Mining Exchange provided a channel to mining for Canadian risk capital up to its absorption in 1934 by the Toronto Stock Exchange, which continued the tradition.

That there was American investment in Canadian Mining is not surprising given the opportunities for attractive speculation, but that this investment by its size propelled the Canadian mining industry is not true. Canadian economic rents, rather than American capital, are to be seen as the motive force of the industry from 1918-39. Only in the 1950's did "bonused" contracts and capital injections create a situation

where there might be some truth in Hugh Aitken's aphorism that American capital got things done that might not have been done at all.

However, it seems likely that American policies supporting high base metal prices may have been more significant than direct capital injections even in the decade of the 1950's. Only Falconbridge and Sheritt-Gordon Mines, of the majors, received the latter, from bonusing in each case and from financing in the case of Sherritt-Gordon. At the same time INCO , which received no bonuses, but whose revenues benefited from the high nickel prices, accumulated the capital to establish the Thompson nickel mining venture in northern Manitoba. The dynamic even after the Second World War seems to have been that of a manipulated market rather than vigorous inflows of U.S. capital.

Finally, the views that Canada could not develop necessary technologies but required American "packages" including technical expertise, entrepreneurship and capital is not borne out in non-ferrous base metal mining. Sometimes indeed this was the reality, as at Flin-Flon where the Whitney group of financial interests possessed the expertise to devise in Denver, Colorado a commercial production technique on which Hudson Bay Mining and Smelting flourished. In contrast at Trail a Canadian research effort supported by Canadian financial backing solved the problem of seperating the Sullivan ore in a commercial process. In Quebec, Noranda Mines employed in the entrepreneurial positions Canadians who flourished mightily. Market access was solved in that case by establishing bilateral links with American and British concerns in the joint financing of the Montreal refinery.

In conclusion the case can be dismissed that a U.S. monopoly of technological expertise hindered Canadian mining development; with open

access to U.S. educational institutions for Canadians and a free labor market this supposition would seem to be "a priori" doubtful, even neglecting the COMINCO evidence. The case must also be judged "not proven" with respect to entrepreneurship given the success of Noranda.

One would not wish to end this work on a negative note, though Innis at least might have approved the qualifications of simple explanations which seems to be indicated by the detailed picture. The history of Canadian non-ferrous base metal mining has been eventful and intriguing. There must be much more to an understanding of its political economy than is attempted here. Furthermore, of the new industrial staples nickel, copper, lead and zinc are simply examples, though for Canada they are important examples. Much further work is called for if the theoretical strength of Canadian economic history, based on the staple theory, is not to wither for want of empirical support. To some brief suggestions for such further academic research this conclusion now turns.

Scope for Further Research

To the economic historian the area of extractive industry in Canada, and metal mining in particular, is full of interesting questions not yet considered in an academic way. A tradition exists in Canada of concentrating on the implications or effects of a particular production mode on the wider economy. The influence of the staple thesis is noticeable in this tendency even upon its critics. Elsewhere than Canada economic historians ask a different set of questions relating to what brings natural resources into production at particular times and places.[16] As consumers of natural resource products this emphasis is quite explicable. Once again this difference of approach demonstrates the need for Canada, and for any country outside the centre, to create a particular history based upon questions of domestic importance. It is for this reason, I believe, the work of Innis and his successors provides a valuable starting point for any research into the economic history of extractive industry in Canada. They ask the most fundamental question of concern to the nation. How has Canada been shaped by dependence upon natural resources exported in a relatively raw state? What has been the particular impact of each natural resource? How has class formation, technology and scale economies formulated a unique economic structure for each important staple?

The staples approach is based on the notion of metropolitan demand. For metal mining a fascinating study would be to detail the changes in demand which accompany the development of mining in the twentieth century. The Dominion of Canada in the 1920's and 1930's was still prone to Imperialist sentiment, the Empire being that of Britain. In the structure of Imperial Preference, as negotiated at the Ottawa Conference, an attempt

was made to direct Canadian minerals to serve an Imperial demand. The attempt failed. Yet less than a decade later Canadian output of minerals was channelled unselfishly towards the Allied war effort. After the war the U.S. stockpiling programme arose, some of the effects of which have been touched on in this thesis. To investigate the tempo and significance of these demand changes would be a most illuminating task.

Already in the body of this thesis the Balance of Payments effects of mining have been considered in a theoretical way. (Chapter 5). A research project devoted to an empirical investigation of these effects would be useful. However, this task would be one requiring considerable ingenuity and a substantial research effort.

A more particular research effort could be focused on the person of George McCullagh and his effect, as editor of the Globe and Mail, on the climate of opinion in which mining in Ontario operated. Mining, it seems, has been an arena of parvenu wealth in Canada. The formation of the Globe and Mail can likely be investigated within the struggle for recognition and influence of that fragment of the capitalist class which obtained its wealth from extractive industry in Ontario.[17]

In British Columbia the COMINCO experience would make an interesting case study of Canadian entrepreneurship. The relationship between the state in B.C. and the mining companies would also sustain a valuable investigation. Did the province support mining interests against the Dominion as was the case in Ontario?[18]

In concluding that some of Canada's extractive wealth has been dissipated I have applied the political standards, and economic understanding, of the 1970's to a previous era. In itself this is unexceptional.

However, Canadians of differing perspectives have disagreed over minerals policy on a variety of grounds throughout the twentieth century. To trace these intellectual currents on left and right, which delineated the political options on minerals policy, would be a valuable research task for the political historian.

Finally, the question I have posed in this thesis with respect to non-ferrous base metal mining could be directed to other extractive resources. What has been the developmental impact on Canada in the twentieth century of precious metals, non-metallic minerals (e.g. asbestos),

oil and gas? Only with such work completed will the true impact of extractive industry on the Canadian economy be fully appreciated. It is my hope that this thesis has made some contribution towards this goal.

FOOTNOTES

1. At another level the social friendships of politicians and mining men probably render redundant the notion of public interest in the face of class interest and, perhaps, private gain. See H.V. Nelles, The Politics of Development (Toronto: Macmillan, 1974) pp. 438-443. Politicians in Ontario had also to consider the mining sympathies of the influential Globe and Mail, which was created by merger under the auspices of William Wright, a mining magnate, in 1936. He commented as follows:

   "My object in purchasing the Globe was not to make money out of it - at least that was not my main object. I thought I could do something for the country by making our mining industries better known. Anything that is of advantage to mining is of advantage to the country as a whole".

   For this quotation, and a discussion of the gold-enriched editor, C. George McCullagh, see Brian J. Young, "C. George McCullagh and the Leadership League" in H. J. Schultz et al., Politics of Discontent (University of Toronto Press, 1967).

2. A hostile commentator might seek to object that economic rent formed no part, or but a small part, of the profits declared by mining companies. For "a priori" reasons this argument seems untenable (Chapter III).

3. R. M. Longo (ed.), Historical Highlights of Canadian Mining (Toronto: Pitt Publishing Co., 1973) p.164.

4. Hugh Aitken, American Capital and Canadian Resources (Harvard University Press, 1961).

5. Ibid.

6. Examples include the following:

   Tom Naylor, The History of Canadian Business (Toronto: J. Lorimer, 1975).
   Wallace Clement, Continental Corporate Power (Toronto: McClelland and Stewart, 1977).
   _____, The Canadian Corporate Elite (Toronto: McClelland and Stewart, 1975)

Daniel Drache, "Rediscovering Canadian Political Economy", Journal of Canadian Studies (August, 1976)
Cy Gonick, Inflation or Depression (Toronto: J. Lorimer, 1975)
Paul Phillips, "National Policy, Continental Economics and National Disintegration" in D. J. Bercuson(ed.), Canada and the Burden of Unity (Toronto: Macmillan, 1977)

7. Cy Gonick, op. cit. p. 82.

8. Quoted in the introduction to the commemorative issue, "Harold Innis 1894-1952: Twenty Five Years On", Journal of Canadian Studies, Vol.12, No. 5 (Winter, 1977).

9. R. T. Naylor, "The Rise and Fall of the Third Commerial Empire of the St. Lawrence", in G. Teeple (ed.), Capitalism and the National Question in Canada (University of Toronto Press, 1973).

10. L. R. MacDonald, "Merchants against Industry: An idea and its origins", Canadian Historical Review Vol. 56 (Sept., 1975) pp. 263-281.
Clare Pentland, "Marx and the Canadian Question", Canadian Forum (Jan., 1974) pp. 26-28.

11. R. T. Naylor, The History of Canadian Business (Toronto: J. Lorimer, 1975).
For some reviews see G. Teeple, "Canadian Business History", Queen's Quarterly, Vol. 83 (Winter, 1976) pp. 641-45;
D. G. Paterson,Review, Canadian Journal of Economics, Vol. 10 (Aug. 1977) pp. 512-16;
Paul Phillips, "Canadian Barons", Canadian Dimension, Vol. 12, No. 2 (April, 1977).
For a demonstration of the subjective basis of historical research see M. Bliss,Review, Social History, Vol. IX, No. 18 (Nov., 1976) pp. 446-449;
R. T. Naylor, "The History of Canadian Business: a Reply", Social History, Vol. X, No. 19 (May, 1977) pp. 152-159;
M. Bliss, "The History of Canadian Business: Reviewer's Response", Social History, Vol. X, No. 19 (May, 1977) pp. 160-163.

12. The original formulation was D. Creighton, The Commercial Empire of the St. Lawrence, 1760-1850 (Toronto: Ryerson Press, 1937).

13. See, for example, G. Teeple, "The Limits of Nationalism in Canada", Canadian Dimension, Vol. 12, No. 6, pp. 27-37.

14. K. Levitt, Silent Surrender: The Multinational Corporation in Canada (Toronto: Macmillan, 1970).

15. I should point out that this finding is not a direct criticism of Naylor's own work which reaches in detail only the First War.

16. For an illustration see the session on Natural Resources and Economic Development in the published papers of the Seventh Congress of the International Economic History Association, Edinburgh (August, 1978).

17. Brian J. Young, "C. George McCullagh and the Leadership League", in H. J. Schultz et al., Politics of Discontent (University of Toronto Press, 1967).

18. H. V. Nelles, op. cit.

APPENDIX A:

Statistical Tables

TABLE 1

PRODUCTION OF MAJOR NON-FERROUS METALS IN CANADA (PHYSICAL UNITS), 1900-55

(Weight in Millions of Pounds)

YEAR	COPPER	LEAD	ZINC[a]	NICKEL
1900	18.9	63.2		7.0
1901	37.8	51.9		9.2
1902	38.8	23.0		10.7
1903	42.7	18.1		12.5
1904	41.4	37.5		10.5
1905	48.1	56.9		18.9
1906	55.6	54.6		21.5
1907	57.0	47.7		21.2
1908	63.7	43.2		19.1
1909	52.5	45.9		26.3
1910	55.7	33.0		37.2
1911	55.6	23.8		34.1
1912	77.8	35.8		44.8
1913	77.0	37.7		49.7
1914	75.7	36.3		45.5
1915	100.8	46.3		68.3
1916	117.2	41.5	23.4	83.0
1917	109.2	32.6	29.7	84.3
1918	118.8	51.4	35.1	92.5
1919	75.1	43.8	32.2	44.5
1920	81.6	36.0	39.9	61.3
1921	47.6	66.7	53.1	19.3
1922	42.9	93.3	56.3	17.6
1923	86.9	111.2	60.4	62.5
1924	104.5	175.5	98.9	69.5
1925	111.5	253.6	109.3	73.9
1926	133.1	283.8	149.9	65.7
1927	140.1	311.4	165.5	66.8
1928	202.7	337.9	184.6	96.8
1929	248.1	326.5	197.3	110.3
1930	303.5	332.9	267.6	103.8
1931	292.3	267.3	237.2	65.7
1932	247.7	255.9	172.3	30.3
1933	300.0	266.5	199.1	83.3
1934	364.8	346.3	298.6	128.7
1935	419.0	339.1	320.6	138.5
1936	421.0	383.2	333.2	169.7
1937	530.0	412.0	370.4	224.9
1938	571.2	418.9	381.5	210.6
1939	608.8	388.6	394.6	226.1
1940	655.6	471.9	424.0	245.6
1941	643.3	460.2	512.4	282.3
1942	603.7	512.1	580.3	285.2
1943	575.2	444.1	610.8	288.0
1944	547.1	304.6	550.8	274.6
1945	474.9	347.0	517.2	245.1
1946	367.9	354.0	470.6	192.1
1947	451.7	323.3	415.7	237.3
1948	481.5	334.5	468.3	263.5
1949	526.9	319.5	576.5	257.4
1950	528.4	331.4	626.5	247.3
1951	539.9	316.5	682.2	275.8
1952	516.1	337.7	743.6	281.1
1953	506.5	387.4	803.5	287.4
1954	605.5	437.0	753.0	322.6
1955	652.0	405.5	866.7	349.9

a Data from pre-1916 compiled on a different basis

SOURCE: D.B.S., Canadian Mineral Statistics, 1886-1956, Reference Paper No.68 (Ottawa: 1957).

TABLE 2

PRODUCTION OF MAJOR NON-FERROUS BASE METALS IN CANADA (NOMINAL VALUES), 1914-55

($ MILLIONS)

(1) YEAR	(2) COPPER	(3) LEAD	(4) ZINC[a]	(5) NICKEL	(6) TOTAL	(7) ALL METALLIC[b]
1914	10.3	1.6		13.7		59.4
1915	17.4	2.6		20.5		75.8
1916	31.9	3.5	3.0	29.0	67.4	106.3
1917	29.7	3.6	2.6	33.7	69.6	106.5
1918	29.3	4.8	2.9	37.0	74.0	114.5
1919	14.0	3.1	2.4	17.8	37.3	73.3
1920	14.2	3.2	3.1	24.5	45.0	77.9
1921	6.0	3.8	2.5	6.8	19.1	49.3
1922	5.7	5.8	3.2	6.2	20.9	61.8
1923	12.5	8.0	4.0	18.3	42.8	83.8
1924	13.6	14.2	6.3	19.5	53.6	102.1
1925	15.6	23.1	8.3	15.9	62.9	117.0
1926	17.5	19.2	11.1	14.4	62.2	115.1
1927	17.2	16.5	10.3	15.3	59.3	113.3
1928	28.6	15.5	10.1	22.3	76.5	131.8
1929	43.4	16.5	10.6	27.1	97.6	154.3
1930	37.9	13.1	9.6	24.5	85.1	142.6
1931	24.1	7.3	6.1	15.3	52.8	120.8
1932	15.3	5.4	4.1	7.2	32.0	111.9
1933	21.6	6.4	6.4	20.1	54.5	147.2
1934	26.7	8.4	9.1	32.1	76.3	194.2
1935	32.3	10.6	9.9	35.3	88.1	222.1
1936	39.5	15.0	11.0	43.9	109.4	260.0
1937	68.9	21.1	18.2	59.5	167.7	335.0
1938	56.6	14.0	11.7	53.9	136.2	324.1
1939	60.9	12.3	12.1	50.9	136.2	343.5
1940	65.8	15.9	14.5	59.8	156.0	382.4
1941	64.4	15.5	17.5	68.7	166.1	395.2
1942	60.4	17.2	19.8	70.0	167.4	391.5
1943	67.2	16.7	24.4	71.7	180.0	356.6
1944	65.3	13.7	23.7	69.2	171.9	308.1
1945	59.3	17.3	33.3	62.0	171.9	317.0
1946	46.6	23.9	36.8	45.4	152.7	290.4
1947	91.5	44.2	46.7	70.7	253.1	395.1
1948	107.2	60.3	65.2	86.9	319.6	488.3
1949	104.7	50.4	76.4	99.2	330.7	539.0
1950	123.2	47.8	98.0	112.1	381.1	617.2
1951	149.0	58.2	135.8	151.3	494.3	745.9
1952	146.7	54.6	129.8	151.3	482.4	728.5
1953	151.0	50.1	96.1	160.4	457.6	709.9
1954	175.7	58.3	90.2	180.2	504.4	802.4
1955	239.8	58.3	118.3	215.9	632.3	1007.8

a Data from pre-1916 compiled on a different basis
b Data provided by D.B.S. in source

SOURCE: D.B.S., Canadian Mineral Statistics, 1886-1956, Reference Paper No.68

(26-501)

TABLE 3

SHARE OF MAJOR NON-FERROUS BASE METALS AND GOLD IN METALLIC MINERALS PRODUCTION, 1916-55

($ MILLIONS)

(1) YEAR	(2) MAJOR BASE METALS	(2)/(4) %	(3) GOLD	(3)/(4) %	(4) ALL METALLIC MINERALS
1916	67.4	63.4	19.2	18.1	106.3
1917	69.6	65.4	15.3	14.4	106.5
1918	74.0	64.6	14.5	12.7	114.5
1919	37.3	50.9	15.9	21.7	73.3
1920	45.0	57.8	15.8	20.3	77.9
1921	19.1	38.7	19.1	38.7	49.3
1922	20.9	33.8	26.1	42.2	61.8
1923	42.8	51.1	25.5	30.4	83.8
1924	53.6	52.5	31.5	30.9	102.1
1925	62.9	53.8	35.9	30.7	117.0
1926	62.2	54.0	36.3	31.5	115.1
1927	59.3	52.3	38.3	33.8	113.3
1928	76.5	58.0	39.1	29.7	131.8
1929	97.6	63.3	39.9	25.9	154.3
1930	85.1	60.1	43.5	30.5	142.6
1931	52.8	43.7	58.1	48.1	120.8
1932	32.0	28.6	71.5	63.9	111.9
1933	54.5	37.0	84.4	57.3	147.2
1934	76.3	39.3	102.5	52.8	194.2
1935	88.1	39.7	115.6	52.1	222.1
1936	109.4	42.1	131.3	50.5	260.0
1937	167.7	50.0	143.3	42.8	335.0
1938	136.2	42.0	166.2	51.3	324.1
1939	136.2	39.7	184.1	53.6	343.5
1940	156.0	40.8	204.5	53.5	382.4
1941	166.1	42.0	205.8	52.1	395.2
1942	167.4	42.8	186.4	47.6	391.5
1943	180.0	50.5	140.6	39.4	356.6
1944	171.9	55.8	112.5	36.5	308.1
1945	171.9	54.2	103.8	32.7	317.0
1946	152.7	52.6	104.1	35.9	290.4
1947	253.1	64.1	107.5	27.2	395.1
1948	319.6	65.5	123.5	25.3	488.3
1949	330.7	61.9	148.4	27.5	539.0
1950	381.1	61.8	169.0	27.4	617.2
1951	494.3	66.3	161.9	21.7	745.9
1952	482.4	66.2	153.2	21.0	728.5
1953	457.6	64.5	139.6	19.7	709.9
1954	504.4	62.9	148.8	18.5	802.4
1955	632.3	62.7	156.8	15.6	1,007.8

SOURCE: D.B.S. Canadian Mineral Statistics, Reference Paper No.68 (26-501)

TABLE 4

REGIONAL PRODUCTION OF COPPER IN CANADA BY VOLUME (1918-55)

(POUNDS MILLION)

YEAR	QUEBEC	ONTARIO	MANITOBA	SASKATCHEWAN	BRITISH COLUMBIA	OTHER CANADA[a]	TOTAL
1918	5.9	47.1	2.3		62.9	0.6	118.8
1919	2.7	24.3	3.3		44.5	0.2	75.0
1920	0.7	32.1	3.1		45.3	0.3	81.7
1921	0.4	12.8			34.4		47.6
1922		10.9			31.9		42.8
1923		31.7			55.2		86.9
1924	1.9	37.1			65.5		104.5
1925	2.5	39.7			69.2		111.4
1926	2.7	41.3			89.1		133.1
1927	3.1	45.3			91.7		140.1
1928	33.7	66.6			102.3	0.1	202.6
1929	55.3	88.9			103.9		248.1
1930	80.3	127.7	2.1		93.3		303.4
1931	68.4	112.9	45.8		65.2		292.3
1932	67.3	77.1	52.7		50.6		247.7
1933	69.9	145.5	38.2	3.2	43.1		299.9
1934	74.0	205.1	30.9	6.6	48.2		364.8
1935	79.0	252.0	38.0	11.4	38.5		418.9
1936	66.3	287.9	29.9	15.0	21.2	0.8	421.1
1937	94.7	322.0	44.9	22.4	45.8	0.2	530.0
1938	112.6	309.0	65.6	18.2	65.8		571.2
1939	117.2	328.4	70.5	18.1	73.3	1.3	608.8
1940	134.2	347.9	75.3	20.5	77.7		655.6
1941	143.8	333.8	67.0	32.3	66.3		643.2
1942	140.9	308.3	47.6	56.8	50.0		603.6
1943	131.2	277.8	38.0	85.9	42.2		575.1
1944	108.1	285.3	43.9	73.5	36.3		547.1
1945	102.7	239.5	41.1	65.9	25.8		475.0
1946	69.8	179.4	38.5	62.7	17.5		367.9
1947	85.1	227.9	30.6	66.3	41.8		451.7
1948	97.6	240.8	37.9	62.1	43.0		481.4
1949	135.6	226.1	33.9	69.9	54.1		319.6
1950	145.8	234.4	41.6	58.0	42.2		522.0
1951	137.7	257.6	31.7	63.3	43.9		534.2
1952	137.7	250.7	18.7	60.7	41.6	0.8	510.2
1953	109.8	261.2	18.8	61.2	48.3	1.6	500.9
1954	167.9	281.6	24.5	72.4	50.2	2.0	598.6
1955	202.0	292.8	38.8	65.9	44.3	2.1	645.1

a To 1928 all production is from the Yukon. From 1936 all production is from Nova Scotia. Negligible output from the North West Territories is ignored.

SOURCE: D.B.S., Canadian Mineral Statistics, 1886-1956, Reference Paper No.68 pp.67-120

TABLE 5

REGIONAL PRODUCTION OF COPPER IN CANADA BY VALUE (1918-55)

($ MILLION)

YEAR	QUEBEC	ONTARIO	MANITOBA	SASKATCHEWAN	BRITISH COLUMBIA	OTHER CANADA[a]	TOTAL
1918	1.4	11.6	0.6		15.5	0.2	29.3
1919	0.5	4.6	0.6		8.3		14.0
1920	0.2	5.6	0.5		7.9		14.2
1921		1.6			4.3		5.9
1922		1.5			4.3		5.8
1923		4.6			8.0		12.6
1924	0.2	4.8			8.5		13.5
1925	0.4	5.6			9.7		15.7
1926	0.4	4.8			12.3		17.5
1927	0.4	4.9			11.8		17.1
1928	4.9	8.7			14.9		28.5
1929	10.0	14.6			18.8		43.4
1930	10.4	15.2	0.2		12.1		37.9
1931	5.7	9.0	3.8		5.5		24.0
1932	4.3	4.4	3.4		3.2		15.3
1933	5.2	10.1	2.8	0.2	3.2		21.5
1934	5.5	14.8	2.3	0.5	3.6		26.7
1935	6.2	19.3	3.0	0.9	3.0		32.4
1936	6.3	26.9	2.8	1.4	2.0	0.1	39.5
1937	12.4	41.7	5.9	2.9	6.0		68.9
1938	11.2	30.4	6.5	1.8	6.6		56.5
1939	11.8	32.6	7.1	1.8	7.4	0.1	59.9
1940	13.5	34.7	7.6	2.1	7.8		65.7
1941	14.5	33.2	6.8	3.3	6.7		64.5
1942	14.2	30.6	4.8	5.7	5.0		60.3
1943	15.4	32.2	4.5	10.1	5.0		67.2
1944	13.0	33.8	5.3	8.8	4.4		65.3
1945	12.9	29.8	5.2	8.3	3.2		59.4
1946	8.9	22.5	4.9	8.0	2.3		46.6
1947	17.4	46.0	6.2	13.5	8.4		91.5
1948	21.8	53.4	8.5	13.9	9.6		107.2
1949	27.1	44.7	6.8	14.0	10.8		103.4
1950	34.1	54.4	9.8	13.6	9.8		121.7
1951	38.2	70.9	8.8	17.5	12.1		147.5
1952	39.3	80.0	5.4	17.3	11.8	0.2	154.0
1953	32.9	77.6	5.6	18.3	14.4	0.5	149.3
1954	48.9	81.3	7.2	21.1	14.5	0.6	173.6
1955	74.5	107.2	14.4	24.3	26.3	0.8	237.5

a To 1928 all production is from the Yukon. From 1936 all production is from Nova Scotia. Negligible output from the North West Territories is ignored.

SOURCE: D.B.S., Canadian Mineral Statistics, 1886-1956, Reference Paper No.68 pp.67-120

TABLE 6

REGIONAL PRODUCTION OF LEAD IN CANADA BY VOLUME, 1918-55[a]

(POUNDS MILLION)

YEAR	QUEBEC	ONTARIO	BRITISH COLUMBIA	YUKON	OTHER CANADA[b]	TOTAL
1918	2.1	1.7	47.6			51.4
1919	2.3	1.5	40.1			43.9
1920	0.9	2.3	32.8			36.0
1921	0.6	3.3	60.3	2.5		66.7
1922		2.9	87.1	3.3		93.3
1923	0.5	4.4	99.5	6.8		111.2
1924	1.1	5.1	168.5	0.9		175.6
1925	2.1	7.2	242.5	1.9		253.7
1926	3.7	7.4	266.8	5.9		283.8
1927	6.5	8.0	292.8	4.2		311.5
1928	6.2	6.8	317.7	7.2		337.9
1929	5.4	4.8	308.0	8.4		326.6
1930		2.2	321.8	8.9		332.9
1931		1.0	261.9	4.5		267.4
1932		0.1	252.0	3.9		256.0
1933			263.3	3.1		266.4
1934			344.5	1.8		346.3
1935	2.0		336.8	0.2		339.0
1936	2.0		376.6	2.6	1.9	383.1
1937	1.5		403.6	6.4	0.4	411.9
1938			413.7	5.2		418.9
1939			378.4	7.5	2.5	388.4
1940		0.3	466.8	4.7		471.8
1941		1.6	456.8	1.7		460.1
1942	0.4	3.2	507.2	1.3		512.1
1943	2.4	2.3	439.2	0.2		444.1
1944	10.5	1.1	292.9	0.1		304.6
1945	9.2	0.7	337.0	0.1		347.0
1946	7.4	0.7	345.9	0.1		354.1
1947	8.2	0.3	313.7	1.1		323.3
1948	9.5	0.3	320.0	4.6		334.4
1949	11.6		265.4	5.4		282.4
1950	15.4		267.3	12.9		295.6
1951	15.5		255.5	12.5		283.5
1952	21.0	1.8	258.8	18.4	1.6	301.6
1953	18.5	0.7	297.6	31.6	3.7	352.1
1954	15.6	2.8	343.5	33.8	4.2	399.9
1955	11.2	3.9	323.0	26.2	4.0	368.3

a Less than 50,000 lbs. p.a. not recorded.
Since all figures are rounded, decimal changes of production at low levels may give distorted impression of actual changes.

b Excludes Newfoundland, which has had a substantial lead production, and ignores negligible production from the North West Territories. Nova Scotia supplied all the "Other Canada" production in this Table.

SOURCE: op. cit.

TABLE 7

REGIONAL PRODUCTION OF LEAD IN CANADA BY VALUE, 1918-55[a]

($ MILLION)

YEAR	QUEBEC	ONTARIO	BRITISH COLUMBIA	YUKON	OTHER CANADA[b]	TOTAL
1918	0.2	0.2	4.4			4.8
1919	0.2	0.1	2.8			3.1
1920	0.1	0.2	2.9			3.2
1921		0.2	3.5	0.1		3.8
1922		0.2	5.4	0.2		5.8
1923		0.3	7.1	0.5		7.9
1924	0.1	0.4	13.7	0.1		14.3
1925	0.2	0.7	22.1	0.2		23.2
1926	0.3	0.6	18.0	0.4		19.3
1927	0.3	0.5	15.4	0.2		16.4
1928	0.3	0.4	14.5	0.3		15.5
1929	0.3	0.3	15.6	0.4		16.6
1930		0.1	12.6	0.3		13.0
1931			7.1	0.1		7.2
1932			5.3	0.1		5.4
1933			6.3	0.1		6.4
1934			8.4			8.4
1935	0.1		10.6			10.7
1936	0.1		14.7	0.1	0.1	15.0
1937	0.1		20.6	0.3		21.0
1938			13.8	0.2		14.0
1939			12.0	0.2	0.1	12.3
1940			15.7	0.1		15.8
1941		0.1	15.4	0.1		15.6
1942		0.1	17.1			17.2
1943	0.1	0.1	16.5			16.7
1944	0.5		13.2			13.7
1945	0.5		16.8			17.3
1946	0.5		23.3			23.8
1947	1.1		42.9	0.2		44.2
1948	1.7	0.1	57.7	0.8		60.3
1949	1.8		41.9	0.8		44.5
1950	2.2		38.6	1.9		42.7
1951	2.9		47.0	2.3		52.2
1952	3.4	0.3	41.9	3.0	0.3	48.9
1953	2.4	0.1	38.5	4.1	0.5	45.6
1954	2.0	0.4	45.8	4.5	0.6	53.3
1955	1.6	0.6	46.4	3.8	0.6	53.0

a Less than $50,000 not recorded. Since all figures are rounded, decimal changes of production at low levels may give distorted impression of actual changes.

b Excludes Newfoundland, which has had a substantial lead production, and ignores negligible production from the North West Territories. Nova Scotia supplied all the "Other Canada" production in this Table.

SOURCE: op. cit.

TABLE 8

REGIONAL PRODUCTION OF ZINC IN CANADA BY VOLUME, 1918-55[a]

(POUNDS MILLION)

YEAR	QUEBEC	ONTARIO	MANITOBA	SASKATCHEWAN	BRITISH COLUMBIA	OTHER CANADA[b]	TOTAL
1918	2.8				32.3		35.1
1919	1.8	0.2			30.3		32.3
1920	1.1				38.7		39.8
1921					53.1		53.1
1922					56.3		56.3
1923	0.4				60.1		60.5
1924	2.9				96.0		98.9
1925	9.9	0.2			99.2		109.3
1926	12.9				137.0		149.9
1927	17.2				148.3		165.5
1928	21.1	0.1			163.5		184.7
1929	19.7	5.5			172.1		197.3
1930	9.8	3.5	3.9		250.5		267.7
1931			35.2		202.1		237.3
1932			41.7		130.5		172.2
1933			43.5	2.8	152.8		199.1
1934			47.3	2.2	249.2		298.7
1935	5.3		51.1	9.0	255.2		320.6
1936	6.9		36.7	27.7	255.7	6.2	333.2
1937	8.6	0.1	36.2	32.8	281.2	5.5	364.9
1938	5.3		46.9	30.0	299.4		381.6
1939	28.8		40.3	37.3	279.0	9.2	394.6
1940	27.7		35.1	44.5	312.0	4.8	424.1
1941	46.4	1.1	34.9	62.1	367.9		512.4
1942	73.9	4.7	29.9	84.5	387.2		580.2
1943	128.2	3.3	46.8	96.4	336.2		610.9
1944	137.4	2.4	45.8	87.1	278.1		550.8
1945	111.9	0.2	34.9	75.4	294.8		517.2
1946	89.7		35.6	71.1	274.3		470.7
1947	69.5		27.8	65.5	253.0		415.8
1948	95.8		41.3	60.9	270.3		468.3
1949	125.3		34.1	64.3	288.2	0.8	512.7
1950	171.6		42.9	55.0	290.3	5.5	565.3
1951	172.7		30.2	79.1	337.5	5.7	625.2
1952	189.8	0.7	30.2	93.4	348.6	19.9	682.6
1953	200.9	0.2	31.5	99.9	382.3	32.7	747.4
1954	214.0	1.4	32.5	101.3	303.1	40.6	692.9
1955	202.9	3.1	35.9	97.9	431.8	37.9	809.5

a Less than 50,000 lbs. not recorded. Since all figures are rounded decimal changes of production at low levels may give distorted impression of actual changes.

b Excludes Newfoundland, which has had a substantial zinc production. In 1930's all "Other Canada" zinc production was from Nova Scotia whereas later figures combine output from Nova Scotia and the Yukon.

SOURCE: op. cit.

TABLE 9

REGIONAL PRODUCTION OF ZINC IN CANADA BY VALUE, 1918-55[a]

($ MILLION)

YEAR	QUEBEC	ONTARIO	MANITOBA	SASKATCHEWAN	BRITISH COLUMBIA	OTHER CANADA[b]	TOTAL
1918	0.2				2.8		2.8
1919	0.1				2.2		2.3
1920	0.1				3.0		3.1
1921					2.5		2.5
1922					3.2		3.2
1923					4.0		4.0
1924	0.2				6.1		6.3
1925	0.8				7.6		8.4
1926	1.0				10.2		11.2
1927	1.1				9.2		10.3
1928	1.2				9.0		10.2
1929	1.2	0.3			9.3		10.8
1930	0.4	0.1	0.1		9.0		9.6
1931			0.9		5.2		6.1
1932			1.0		3.1		4.1
1933			1.4	0.1	4.9		6.3
1934			1.4	0.1	7.6		9.1
1935	0.2		1.6	0.3	7.9		10.0
1936	0.2		1.2	0.9	8.5	0.2	11.0
1937	0.4		1.8	1.6	14.1	0.3	18.2
1938	0.2		1.4	0.9	9.2		11.7
1939	0.9		1.2	1.1	8.6	0.3	12.1
1940	0.9		1.2	1.5	10.6	0.2	14.4
1941	1.6		1.2	2.1	12.5		17.4
1942	2.5	0.2	1.0	2.9	13.2		19.8
1943	5.1	0.1	1.9	3.9	13.4		24.4
1944	5.9	0.1	2.0	3.7	12.0		23.7
1945	7.2		2.2	4.9	19.0		33.3
1946	7.0		2.8	5.6	21.4		36.8
1947	7.8		3.1	7.4	28.4		46.7
1948	13.3		5.8	8.5	37.7		65.3
1949	16.6		4.5	8.5	38.2	0.1	67.9
1950	26.9		6.7	8.6	45.4	0.9	88.5
1951	34.4		6.0	15.8	67.2	1.1	124.5
1952	33.1	0.1	5.3	16.3	60.9	3.5	119.2
1953	24.0		3.8	12.0	45.7	3.9	89.4
1954	25.6	0.2	3.9	12.1	36.3	4.9	83.0
1955	27.7	0.4	4.9	13.4	58.9	5.2	110.5

a Less than $50,000 not recorded. Since all figures are rounded, decimal changes of production at low levels may give distorted impression of actual changes.

b Excludes Newfoundland, which has had a substantial zinc production. In 1930's all "Other Canada" zinc production was from Nova Scotia whereas later figures combine output from Nova Scotia and the Yukon.

SOURCE: op. cit.

TABLE 10

REGIONAL PRODUCTION OF NICKEL IN CANADA BY VOLUME AND VALUE, 1918-55

YEAR	ONTARIO/CANADA[a]		YEAR	ONTARIO/CANADA[a]	
	VOLUME (POUNDS MILLION)	VALUE ($ MILLION)		VOLUME (POUNDS MILLION)	VALUE ($ MILLION)
1918	92.5	37.0	1937	224.8	59.5
1919	44.5	17.8	1938	210.6	53.9
1920	61.3	24.5	1939	226.1	50.9
1921	19.3	6.8	1940	245.6	59.8
1922	17.6	6.2	1941	282.3	68.7
1923	62.5	18.3	1942	285.2	70.0
1924	69.5	19.5	1943	288.0	71.7
1925	73.9	15.9	1944	274.6	69.2
1926	65.7	14.4	1945	245.1	62.0
1927	66.8	15.3	1946	192.1	45.4
1928	96.8	22.3	1947	237.3	70.7
1929	110.3	27.1	1948	263.5	86.9
1930	103.8	24.5	1949	257.4	99.2
1931	65.7	15.3	1950	247.3	112.1
1932	30.3	7.2	1951	275.8	151.3
1933	83.3	20.1	1952	281.1	151.3
1934	128.7	32.1	1953	287.4	160.4
1935	138.5	35.3	1954	316.0	176.6
1936	169.7	43.9	1955	322.3	198.5

a Until the Manitoba nickel deposits were brought into production in 1954 Ontario was the only Canadian province producing nickel. Production in Manitoba was valued at $3.6 million in 1954 and $17.4 million in 1955.

SOURCE: op. cit.

TABLE 11

REGIONAL PRODUCTION OF MAJOR BASE METALS IN CANADA BY VOLUME, 1918-55

(POUNDS MILLION)

YEAR	QUEBEC	ONTARIO	MANITOBA[c]	SASKATCHEWAN	BRITISH COLUMBIA	OTHER CANADA[a]	TOTAL
1918	10.8	141.3	2.3		142.8	0.6	297.8
1919	6.8	71.5	3.3		114.9	0.2	196.7
1920	2.9	93.7	3.1		116.8	0.3	218.8
1921	1.0	35.4			147.8	2.5	186.7
1922	0.0	31.4			175.3	3.3	210.0
1923	0.9	98.6			214.8	6.8	321.1
1924	5.9	111.7			330.0	0.9	448.5
1925	14.5	121.0			410.9	1.9	548.3
1926	19.3	114.4			492.9	5.9	637.5
1927	26.8	.120.1			532.8	4.2	683.9
1928	61.0	170.3			583.5	7.3	822.1
1929	80.4	209.5			584.0	8.4	882.3
1930	90.1	237.2	6.0		665.6	8.9	1007.8
1931	68.4	179.6	81.0		529.2	4.5	862.7
1932	67.3	107.5	94.4		433.1	3.9	706.2
1933	69.9	228.8	81.7	6.0	459.2	3.1	848.7
1934	74.0	333.8	78.2	8.8	641.9	1.8	1138.5
1935	86.3	390.5	89.1	20.4	630.5	0.2	1217.0
1936	75.2	457.6	66.6	42.7	653.5	11.5	1307.1
1937	104.8	546.9	81.1	55.2	736.6	12.5	1537.1
1938	117.9	519.6	112.5	48.2	778.9	5.2	1582.3
1939	146.0	554.5	110.8	55.4	730.7	20.5	1617.9
1940	161.9	593.8	110.4	65.0	856.5	9.5	1797.1
1941	190.2	618.8	101.9	94.4	891.0	1.7	1898.0
1942	215.1	601.4	77.5	141.3	944.4	1.3	1981.0
1943	261.8	571.4	84.8	182.3	817.6	0.2	1918.1
1944	256.0	563.4	89.7	160.6	607.3	0.1	1677.1
1945	223.8	485.5	76.0	141.3	657.6	0.1	1584.3
1946	166.9	372.2	74.1	133.8	637.7	0.1	1384.8
1947	162.8	465.5	58.4	131.8	608.5	1.1	1428.1
1948	202.9	504.6	79.2	123.0	633.3	4.6	1547.6
1949	272.5	483.5	68.0	134.2	607.7	6.2	1572.1
1950	332.8	481.7	84.5	113.0	599.8	18.4	1630.2
1951	325.9	533.4	61.9	142.4	636.9	18.2	1718.7
1952	348.5	534.3	48.9	154.1	649.0	40.7	1775.5
1953	329.2	549.5	50.3	161.1	728.2	69.6	1887.9
1954	397.5	601.8	63.5[b]	173.7	696.8	80.6	2013.9
1955	416.1	622.1	102.2[b]	163.8	799.1	70.2	2173.5

a Excludes Newfoundland. Included are data from Nova Scotia and the Yukon.

b Includes new nickel production from Lynn Lake. Sherritt-Gordon Mines commenced shipments in 1953 to Fort Saskatchewan in Alberta where their new nickel refinery was located.

c In 1930, zinc and copper began to be produced at Flin Flon by Hudson Bay Mining and Smelting Company. In 1931, Sherritt-Gordon's mill began regular production, only to be suspended in 1932, until 1937.

SOURCE: op. cit.

TABLE 12

REGIONAL PRODUCTION OF MAJOR BASE METALS IN CANADA BY VALUE, 1918-55

($ MILLION)

YEAR	QUEBEC	ONTARIO	MANITOBA[c]	SASKATCHEWAN	BRITISH COLUMBIA	OTHER CANADA[a]	TOTAL
1918	1.8	48.8	0.6		22.5	0.2	73.9
1919	0.8	22.5	0.6		13.3		37.2
1920	2.9	30.3	0.5		13.8		45.0
1921	0.0	8.6			10.3	0.1	19.0
1922	0.0	7.9			12.9	0.2	21.0
1923	0.0	23.2			19.1	0.5	42.8
1924	0.5	24.7			28.3	0.1	53.6
1925	1.3	22.2			39.4	0.2	63.1
1926	1.7	19.8			40.5	0.4	62.4
1927	1.8	20.7			36.4	0.2	59.1
1928	6.4	31.4			38.4	0.3	76.5
1929	11.5	42.3			43.7	0.4	97.9
1930	10.8	39.9	0.3		33.7	0.3	85.0
1931	5.7	24.3	4.7		17.8	0.1	52.6
1932	4.3	11.6	4.4		11.6	0.1	32.0
1933	5.2	30.2	4.2	0.3	14.4	0.1	54.4
1934	5.5	46.9	3.7	0.6	19.6		76.3
1935	6.5	54.5	4.6	1.2	21.5		88.3
1936	6.6	70.8	4.0	2.3	25.2	0.5	109.4
1937	12.9	101.2	7.7	4.5	40.7	0.6	167.6
1938	11.4	84.3	7.9	2.7	29.6	0.2	136.1
1939	12.7	83.5	8.3	2.9	28.0	0.7	136.1
1940	14.4	94.5	8.8	3.6	34.1	0.3	291.8
1941	16.1	102.0	8.0	5.4	34.6	0.1	166.2
1942	16.7	100.9	5.8	8.6	35.3		167.3
1943	20.6	104.1	6.4	14.0	34.9		180.0
1944	19.4	103.1	7.3	12.5	29.6		171.9
1945	20.6	91.8	7.4	13.2	39.0		172.0
1946	16.4	67.9	7.7	13.6	47.0		152.6
1947	26.3	116.7	9.3	20.9	79.7	0.2	253.1
1948	36.8	140.4	14.3	22.4	105.0	0.8	319.7
1949	45.5	143.9	11.3	22.5	90.9	0.9	315.0
1950	63.2	166.5	16.5	22.2	93.8	2.8	365.0
1951	75.5	222.2	14.8	33.3	126.3	3.4	475.5
1952	75.8	231.7	10.7	33.6	114.6	7.0	473.4
1953	59.3	238.1	9.4	30.3	98.6	9.0	444.7
1954	76.5	258.5	14.7[b]	33.2	96.6	10.6	490.1
1955	103.8	306.7	36.7[b]	37.7	121.6	10.4	616.9

a Excludes Newfoundland. Included are data from Nova Scotia and the Yukon

b Includes new nickel production from Lynn Lake. Sherritt-Gordon Mines commenced shipments in 1953 to Fort Saskatchewan in Alberta where their new nickel refinery was located.

c In 1930, zinc and copper began to be produced at Flin Flon by Hudson Bay Mining and Smelting Company. In 1931, Sherritt-Gordon's mill began regular production, only to be suspended in 1932, until 1937.

SOURCE: op. cit.

TABLE 13

PRICE INDICES FOR THE PERIOD, 1914-55

(1935-39 = 100)

YEAR	NON-FERROUS METALS AND THEIR PRODUCTS[a]	GENERAL WHOLESALE PRICE INDEX[b]	YEAR	NON-FERROUS METALS AND THEIR PRODUCTS[a]	GENERAL WHOLESALE PRICE INDEX[b]
1914	128.8	85.4	1935	92.5	94.1
1915	145.4	91.8	1936	96.3	96.7
1916	183.8	109.8	1937	114.6	108.4
1917	195.7	148.9	1938	98.3	101.9
1918	193.0	166.0	1939	98.1	99.0
1919	181.6	174.7	1940	105.2	107.8
1920	184.3	203.2	1941	105.7	116.2
1921	132.0	143.4	1942	105.8	122.8
1922	132.4	126.8	1943	106.8	127.8
1923	129.6	127.7	1944	106.8	130.5
1924	129.0	129.5	1945	106.4	132.0
1925	141.3	133.8	1946	111.1	139.2
1926	136.0	130.3	1947	155.1	165.8
1927	124.4	127.3	1948	185.1	197.2
1928	125.1	125.6	1949	179.9	201.7
1929	134.9	124.6	1950	200.8	215.4
1930	109.7	112.9	1951	241.6	246.3
1931	87.9	94.0	1952	233.5	232.0
1932	80.2	86.9	1953	225.3	226.3
1933	87.5	87.4	1954	224.1	222.7
1934	87.5	93.4	1955	259.3	226.0

a Excludes gold

b Excludes gold. This general index has non-ferrous metals and their products as one component.

SOURCE: M.C. URQUHART & K.A.H. BUCKLEY, Historical Statistics of Canada p. 293, Series J41 and J34.

TABLE 14

PRICE INDICES FOR SELECTED NON-FERROUS BASE METALS AND THEIR PRODUCTS, 1914-55

(1935-39 = 100)

YEAR	COPPER & PRODUCTS[a]	LEAD & PRODUCTS[b]	ZINC & PRODUCTS[c]	YEAR	COPPER & PRODUCTS[a]	LEAD & PRODUCTS[b]	ZINC & PRODUCTS[c]
1914	109.4	93.8	121.9	1935	79.9	86.2	91.7
1915	148.0	119.9	347.5	1936	92.9	101.7	95.3
1916	241.6	176.8	340.8	1937	126.7	127.3	128.3
1917	255.5	236.4	236.3	1938	98.7	91.8	90.1
1918	220.7	192.3	211.2	1939	101.9	93.0	94.6
1919	174.9	140.3	195.7	1940	109.2	109.6	122.2
1920	179.5	188.0	231.4	1941	111.1	109.6	126.1
1921	130.5	124.6	158.0	1942	111.4	109.6	126.6
1922	127.5	133.6	167.7	1943	111.4	109.6	127.0
1923	137.1	153.0	190.5	1944	111.5	109.6	126.9
1924	124.6	171.8	181.9	1945	111.5	109.6	126.1
1925	131.7	193.5	207.9	1946	111.8	109.6	126.2
1926	130.2	176.1	202.8	1947	180.8	261.9	221.8
1927	122.4	145.4	177.3	1948	210.2	356.6	296.4
1928	136.1	130.6	164.1	1949	191.2	324.5	284.5
1929	165.8	143.3	157.8	1950	222.0	299.6	334.9
1930	125.4	118.7	117.0	1951	261.6	381.5	429.6
1931	86.0	90.7	91.3	1952	270.2	336.4	375.0
1932	66.7	77.1	85.6	1953	283.1	269.3	258.9
1933	76.0	81.3	103.2	1954	277.0	278.7	260.6

a Electrolytic copper, copper sheet, wire bars, solid bare wire, brass sheet and brass values.

b Domestic lead and lead pipe.

c Domestic zinc and zinc sheets.

SOURCE: D.B.S., Wholesale Price Indexes, 1913-50, Reference Paper No. 24 (62/D/102)
D.B.S., Prices and Price Indexes (62/002), Vols. 30-34

TABLE 15

CONTRACT PRICES FOR REFINED NICKEL QUOTED BY INCO TO U.S. BUYERS, 1929-57

Year	Price[1] (U.S. Cents per lb.)	Price Index (1935-39=100)	Year	Price[1] (U.S. Cents per lb.)	Price Index (1935-39=100)
1929	32	100	1946	31-1/2	98.4
1930	32	100	1947	35	109.4
1931	32	100	1948	33-3/4	105.5
1932	32	100	1949	40	125.0
1933	32	100	1950	48	150.0
1934	32	100	1951	56-1/2	176.6
1935	32	100	1952	56-1/2	176.6
1936	32	100	1953	60	187.5
1937	32	100	1954	60	187.5
1938	32	100	1955	64-1/2	201.6
1939	31-1/2[2]	98.4	1956	64-1/2	201.6
1940	31-1/2	98.4	1957	74[3]	231.3
1941	31-1/2	98.4			
1942	31-1/2	98.4			
1943	31-1/2	98.4			
1944	31-1/2	98.4			
1945	31-1/2	98.4			

[1]Price Ruling for Greater Part of year.

[2]Price reduction due to decrease in import duty.

[3]To May, 1957.

SOURCE: U.S. House of Representatives, Subcommittee of the Committee on Government Operations, Hearings on Nickel-Cobalt Contract Obligations of the U.S. Government, 86th Congress, 1st. Session, May 11 and 12, 1959, P. 62.

Bibliographic Notes

These notes are intended to guide anyone seeking to make use of the Bibliography in pursuing research on mining in Canada. In addition, certain materials of an archival nature, discovered in the course of research but not used extensively in this thesis, are noted here. Government libraries, which are usually quite separate from archives, exist in amazing variety in Ottawa and in the provincial capitals. For the history of mining, some of these contain valuable sources. These are included in these notes.

Some bibliographies are published which touch on, to a greater or lesser extent, mining in Canada. Foremost among these is W. George Richardson, A Survey of Canadian Mining History, The Canadian Institute of Mining and Metallurgy, Special Volume 14 (1974). This annotated bibliography, though not comprehensive, is the most extensive available. It is organised by region and by each part of the mining industry in Canada.

A more specialised work is Richard C. Jones, An Annotated Bibliography of the Sudbury Area (Sudbury Public Library, 1972). For a study of nickel and copper in Sudbury this publication is very useful.

Various government publications of a bibliographic sort are in print. A general guide to Canadian government publications is Dorothy E. Ryder, Canadian Reference Sources (Canadian Library

Association, 1973). Invaluable for the historical use of Dominion Bureau of Statistics material is D.B.S., Historical Catalogue of D.B.S. Publications, 1918-60 (Ottawa, 1966).

Specifically concerned with publications on extractive resources is The Government of Canada, Department of Energy, Mines and Resources, Mines Branch and Mineral Resources Division, Energy, Mines and Resources (Ottawa, 1967). As well as publications of the Mineral Resources Division there is included a summary history of the Mines Branch. Reports on technical mining matters provide most of the references in The Ontario Department of Mines, List of Publications, Vol.1, 1891-1965 (Toronto, 1966). Supplements bring this work up-to-date. Likewise technical in its references, but a quite separate publication, is The Ontario Department of Mines, General Index, Vols. I-VII, 1891-1966 (Toronto, various years). Remarkably little reference to mining in British Columbia appears in Marjorie C. Holmes, Publications of the Government of B.C. (1871-1947), but the occasional reference such as on p.181 to a "Summary of Acts relating to Mining (1943)" is helpful. There is an Index to the Annual Reports of the B.C. Department of Mines, 1874-1936 (Victoria, 1938).

A very valuable collection for research on Canadian mining history is found in the Library of the Department of Energy, Mines and Resources in Ottawa. Extensive holdings of Dominion and provincial government reports on mining are the library's strength. A complete set of The Annual Report of the Minerals Production of Canada is available from 1918. (See Bibliography).

The annual reports of the various provincial departments of mines are held for varying years.

Administered separately, but located contiguous to the E.M.R. Library on Booth Street, Ottawa, is the Records Section of the Department of Energy, Mines and Resources. The Records Section holds the annual reports of mining companies back to the first decade of this century, the only (near) comprehensive source for this material in Canada. Holdings include the annual reports of companies now bankrupt or merged. A file of selected newspaper clippings is also held by the Records Section, but the material selected leans heavily towards technical aspects of mine development.

The Ontario Department of Natural Resources, Mines Library, is a small, departmental library. As well as a complete set of the Annual Report of the Ontario Department of Mines, it holds a complete, bound set of the Bulletins of the Ontario Department of Mines (Bulletin No. 83 issued in 1932 is entitled "Twenty Five Years of Ontario's Mining History").

In the Ontario Provincial Archives are Records of the Provincial Department of Mines. These are accompanied by a useful finding aid, the Preliminary Inventory of Records of the Department of Mines (Coded R.G.13). Considerable information is available from these files on Ontario's mining history.

The B.C. Provincial Archives have at least one series of interest. The Cominco Papers (1884-1965) command over 10 feet of shelf space. A preliminary inventory of this material has been

made available in the Archives.

In the University of Toronto's Archives, housed in the Rare Book building of the Robarts Library, are held several B.A. (Commerce) Honours papers written on mining under the direction of Harold Innis in the 1930s. Some are useful. The references appear in the bibliography of Harold Innis, Settlement and the Mining Frontier (Toronto: MacMillan, 1936). Microfilm copies of these papers can be purchased from the University of Toronto's Archives.

In its Manuscripts Division the Public Archives of Canada contains no papers of anyone prominent in non-ferrous, base metal mining. Of course, acquisitions continue. The Public Records Division of the Public Archives does contain material of some interest. For example, the Records of Trade and Commerce (Coded R.G.20) likely contain only a few relevant files, but the series has a simple, key word index system which makes finding relatively easy. Archival advice suggests examination could reveal financial details of companies and other information relevant to Canadian mining. Also suggested for detailed information on mining contracts during the Second World War are the Records of the Department of Munitions and Supply (Coded R.G.28).

No shortage of source materials explains the small research effort expended on the economic history of Canadian mining up to this time. This author hopes that these sources will prove fruitful in further research, and that academic granting agencies will appreciate in the context of Canadian Studies

the need for fundamental research on such specific aspects of Canada's economic history.

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