ABSTRACT

This thesis considers the behaviour of firms in the Canadian primary steel industry during the 1950-1966 period with particular attention to the influence of changes in foreign competition on their operating performance. The performance of this industry is analysed with the aid of a model based on recent developments in oligopoly theory as applied to situations where firms have been well insulated from outside competitive pressures in the past. The model predicts that increased foreign competitive pressures will force the surviving domestic steel firms to become more efficient by exerting a downward pressure on their prices and costs. The actual behaviour of the steel firms during this period has conformed to the expectations generated by the model. Insofar as increased foreign competition was connected with the improved efficiency of Canadian steel firms, this study supports the hypothesis that in some cases tariff reductions which increase foreign competitive pressures could lead to improved operating efficiency for domestic oligopolists.

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FOREIGN COMPETITION AND THE CANADIAN STEEL INDUSTRY

by

Dennis P. De Melto

THE EFFECT OF FOREIGN COMPETITION ON THE CANADIAN PRIMARY STEEL INDUSTRY : 1950-1966

by

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PREFACE

This thesis analyses how an increase in foreign competition has resulted in improvements in the operating efficiency of firms in a specific Canadian oligopoly — the Canadian primary steel industry. Originally, an attempt was made to take an econometric approach to the analysis of the question. However, measurement problems, inherent in this area, appeared to make such an approach unworkable. For example, after experimenting with a variety of import-export ratios, it became obvious that such ratios were totally inadequate as measures of the foreign competitive situation. Therefore, a more historical approach is taken. The performance of the Canadian primary steel industry during the 1950-1966 period is analysed with the aid of a model of an oligopolistic industry based on recent developments in oligopoly theory as applied to situations where domestic firms have been well insulated from outside competitive pressures in the past.

The model, which is applicable to the Canadian primary steel industry, assumes a fairly tight oligopoly situation in which firms have not been subject to very strong outside competitive pressures and are producing a range of fairly standardized products. Given this sort of situation, how will an increase in foreign competitive pressures facing these firms affect their behaviour and their operating efficiency? The model predicts that downward pressure will be exerted on the product prices of domestic firms. In order to prevent this from adversely

affecting their long run profitability, firms will attempt to lower their production costs. One important way of doing this is by introducing new techniques of production and accelerating the rate at which technological innovations are being introduced into their production processes. This has been especially important in the case of the Canadian steel oligopolists during the period under review here.

The behaviour of the Canadian steel firms is analysed in the remaining chapters of the thesis. Although the study does not "prove" that the increase in foreign competition facing Canadian steel firms was a significant factor in accounting for their greatly improved efficiency, it is argued that the conformity of their actual behaviour — under conditions of increasing foreign competitive pressures — with the expectations generated by the model, does offer significant support to the hypothesis connecting increased foreign competition with improved operating efficiency. The main conclusion of the study is that when foreign competition facing the steel firms increased during the 1950-1966 period, it did exert a downward pressure on domestic steel prices and costs. The original contribution of this thesis lies in the analysis of how increased foreign competition in the post-war period has affected the behaviour of the Canadian steel oligopolists and, in particular, in how it has affected their operating efficiency.

In the formulation and preparation of the thesis my main debt of gratitude is to Professor A. Asimakopulos for his continued assistance and encouragement. I would also like to thank Professors A. Deutsch and A. Vicas for their many helpful comments and suggestions for improvement on the drafts of this thesis.

D. P. De Melto.

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CHAPTER I

INTRODUCTION

The purpose of this thesis is to investigate the general hypothesis that foreign competition plays an important role in determining the structure and efficiency of oligopolistic industries and that a significent increase in foreign competition facing domestic oligopolists will force them to become more efficient if they are to survive. Economists in Canada have recently become interested in an analysis of the effects which the Canadian tariff is having on the structure and efficiency of the manufacturing sector of Canadian industry,[1] and the resulting discussions have more or less explicitly embodied the above hypothesis.[2] If the hypothesis is valid, it obviously has important implications for Canadian tariff policy. To the extent that tariff reductions cause foreign competition facing domestic oligopolists to increase,

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[1]Some outstanding recent examples in this area are: S. Stykolt and H.C. Eastman, "A Model for the Study of Protected Oligopolies," The Economic Journal (June, 1960), pp. 336-47; H.C. Eastman and S. Stykolt, The Tariff and Competition in Canada (Toronto: The Macmillan Co. of Canada Ltd., 1967); John H. Dales, The Protective Tariff in Canada's Development (Toronto: University of Toronto Press, 1966); P. Wonnacott, and R.J. Wonnacott, Free Trade Between the United States and Canada : The Potential Economic Effects (Cambridge, Mass., Harvard University Press, 1967).

[2]For example, Eastman and Stykolt claim that "It follows that excess costs of production are the consequence of excess tariff protection. With lower protection Canadian plants with excess costs would be obliged to lower costs in order to survive against foreign competition; they would be larger and fewer." Op. cit., The Tariff and Competition in Canada, p. 7.

a lowering of tariffs will force these firms to become more efficient. If this is the case, it means that the domestic tariff is fostering industrial inefficiency in Canada.

In order to investigate this hypothesis, a model is developed in Chapter II which attempts to predict how the oligopolistic firms in the post-war Canadian primary steel industry would react when faced with increased foreign competition. The hypothesis that increased foreign competition would force domestic steel firms to become more efficient if they are to survive is embodied in the model. Such an outcome is consistent with a model of an oligopolistic industry based on recent developments in the theory of the behaviour of firms in this type of industry. These developments in oligopoly theory are also discussed in Chapter II and are concerned with the behaviour of oligopolies in situations where strong internal competitive pressures are lacking. The behaviour of domestic steel firms during the 1950-1966 period is then analysed in order to ascertain to what extent their actions, when faced with increased foreign competition, conform to the expectations generated by the model. The increase in foreign competition facing the domestic steel firms during the period under review appears to have made a significant contribution to the greatly improved efficiency of the major steel firms which took place during this period. The main conclusion reached on the basis of this study is that the performance of the oligopolistic firms in the Canadian primary steel industry is consistent with the view that foreign com-

petition is an important restraining factor on domestic prices and costs. The results of this study do lend support to the hypothesis connecting increased foreign competition to improved industrial efficiency in the specific case of the post-war Canadian primary steel industry.

The current analyses of the effect of the domestic tariff on the structure and efficiency of Canadian manufacturing industries are directly relevant to the problem under investigation in this thesis. These discussions contain a common line of argument which is most explicitly set out by Eastman and Stykolt. The authors point out that oligopolistic firms may decide that they can best maximize their profits by charging a high price just under the maximum price allowed by their tariff protection.[3] To the extent that domestic firms do charge this high price, new firms may be established in the industry owing to the profit possibilities resulting from the setting of such a price. In order that their entry would not greatly depress the current market price,

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[3]Stykolt and Eastman explicitly recognize that the tariff is just one more factor tending to affect the height of barriers to entry into the industry. In a collusive oligopoly, price will be set to take into account potential competition from imports and from new entry. The authors point out that if oligopolists believe that profit maximization requires their continued domination of the market, price will tend to be below the limit price set by the height of the tariff and close to the minimum long run average costs of the firms of most efficient size. However, if firms believe they can best maximize profits by a policy of charging high prices up to the tariff limit, new firms may be established in the industry resulting in more firms in the market than could be accommodated at a price that just covers the minimum average costs of firms of optimum size. Stykolt and Eastman, "A Model for the Study of Protected Oligopolies," op. cit., pp. 338-42.

new firms will be encouraged to set up plants which are of less than minimum efficient size. They can successfully follow such a policy owing to the original high price policy of existing firms. The result is clear — there are now more firms in the industry producing at insufficient scales and having higher costs of production than would be the case if there were fewer firms supplying the market in larger scale plants. Over time, the original high price becomes "justified" by the resulting market structure.[4] The authors do not attempt an extensive analysis of the conditions under which such a high-price policy would actually be pursued, but they stress the fact that a protective tariff always acts as an inducement for oligopolists to follow such a policy. Therefore, they claim that insofar as the domestic tariff allows firms to charge prices above world prices and induces the entry of new firms at inefficient scales, it encourages industrial inefficiency.[5]

Most of the discussions referred to above stress the fact that in much of Canadian manufacturing industry, production is carried out in plants or firms of sub-optimal scale because of the small size of the Canadian market.[6] Eastman and Stykolt claim that although it is often argued that the foreign tariff is responsible for situations where

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[4]Ibid., p. 342.

[5]Ibid., p. 338. High domestic tariffs could also induce foreign firms to set up subsidiaries in the domestic market in order to serve this market from inside the tariff wall.

[6]Ibid., pp. 336-37; and Wonnacott and Wonnacott, op. cit., p. 213.

production is being carried out in Canadian industries by firms of less than optimal size, this argument applies only where the Canadian market, national or regional, is served by only one firm which has a scale of output below the minimum optimum scale for a firm in that industry.[7] In situations where several oligopolists are serving a given domestic market with plants of sub-optimal scale, the question which necessarily arises is ". . . why prices are not cut to eliminate some firms and to permit an increase in the size of the remaining ones."[8] The foreign tariff is only of peripheral significance to this sort of question, but a lowering or removal of the domestic tariff can bring pressures to bear on the prices and costs of such firms and cause their productivity to be raised without increasing the size of the domestic market. This is possible insofar as ". . . Such pressures may result in a reduction in the range of products supplied or in advertising or marketing costs, and it may also result in the elimination of some of the firms in markets where the net effect of tariffs has produced overcrowding."[9]

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[7]Stykolt and Eastman, "A Model for the Study of Protected Oligopolies," op. cit., p. 345.

[8]Ibid., p. 346. It would be possible to have several firms in the domestic industry, each one serving a regional market but unable to expand into other regional markets owing to high transportation costs, while at the same time being unable to expand into an adjacent foreign market owing to the foreign tariff. Even so, if more than one firm is established in a regional market, the elimination of one firm would presumably allow the remaining firms to expand to larger more efficient scales.

[9]Ibid.

This last link in the above argument embodies the hypothesis that a lowering or removal of the domestic tariff will force firms to become more efficient by increasing their exposure to foreign competitive pressures. Domestic firms will be forced to lower their prices to the level of world prices plus transportation costs to their market from foreign sources. The lower prices may drive marginally efficient firms out of the industry and leave the remaining firms with a larger share of the domestic market. This presents the remaining firms with an opportunity to reap greater economies of scale by expanding their production. It is also possible that firms may be forced to specialize in a narrower range of products in order to gain sufficient economies of scale to survive in the new environment resulting from the lowering or removal of the domestic tariff.[10]

Most of the discussions referred to above come to the conclusion that the Canadian tariff does have undesirable effects on the efficiency of Canadian manufacturing industry,[11] and that tariff reduction or

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[10]This line of argument has apparently had a strong impact on government policy advisors in Canada. For example, the Report of the Task Force on the Structure of Foreign Industry stated that "The reduction of the Canadian tariff would reduce inefficiency by increasing import competition, lessening the number of Canadian firms and rationalizing production within the remaining firms." Foreign Ownership and the Structure of Canadian Industry (Ottawa : Queen's Printer, 1968), p. 117.

[11]For example, John Dales points out that ". . . the tariff increases GNP in Canada by increasing the resources of labour and capital domiciled in Canada — which is why historians think it is a 'good thing'; at the same time it reduces GNP per capita in Canada by reducing the efficiency of the economy — which is why theorists condemn it as a 'bad thing'." John H. Dales, op. cit., p. 7.

removal should have beneficial effects on efficiency. But does this last step in the argument necessarily follow? The methodology used in the Stykolt and Eastman study is comparative statics. We are comparing a situation in which full adjustment has been made to tariff protection (presumably the present situation) with a situation in the future in which full adjustment has already been made to the absence of tariff protection. In the latter situation we assume that firms must be producing at larger scales and reaping the economies of scale they were unable to attain in the former situation.[12] Therefore, average costs of production in the tariff-free situation will be lower than in the protected situation. One disturbing element in this approach is the lack of interest in the effects of increased competition per se. The force which is expected to give rise to the changes in industrial structure implied by the above comparison is, of course, foreign competition. A great deal more analysis, both theoretical and empirical, could profitably be carried out in the area of the adjustment process which takes place when foreign competition facing different types of oligopoly situations increases.

The concept of efficiency employed by Eastman and Stykolt is influenced by their view of how the Canadian tariff affects industrial efficiency. "By 'efficient' industries is meant industries that minimize their costs by producing in plants of optimal scale and thus achieve

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[12]This approach is clearly set out by Eastman and Stykolt (see footnote 2 above).

lowest average costs, given input prices as they prevail in Canada at a particular time."[13] A comparison is being made here among short-run average cost curves (for different size plants) inside the traditional long-run average cost or envelope curve. Firms producing in plants large enough to place them at the bottom of the downward sloping portion of the long-run average cost curve are "efficient" while firms producing in plants of smaller scale are "inefficient". It is assumed that most existing Canadian firms could take fuller advantage of available economies of scale if they could plan for larger markets. The authors claim that plant size in most of Canadian manufacturing industry is not large enough to be efficient in the above sense.[14] Professor Eastman has compared the efficiency of different Canadian industries by measuring the percentage of an industry's output which is produced in plants of minimum efficient scale (as determined by engineering estimates and surveys of industry opinion) and comes to the conclusion that the size of the market is the principal determinant of the efficiency of manufacturing industries in Canada.[15]

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[13] Eastman and Stykolt, op. cit., The Tariff and Competition in Canada, p. 7.

[14] Ibid., p. 8.

[15] H. C. Eastman, "The Canadian Tariff and the Efficiency of the Canadian Economy," The American Economic Review (May, 1964), pp. 437-38 and 447. This conclusion is based on the discovery of a positive relationship between the efficiency of the Canadian industries sampled and the numbers of firms of minimum optimum size that could supply the output of those industries (pp. 443-44).

The Canadian tariff may encourage the existence of situations where a number of domestic firms are able to survive in a protected industry even though they are producing in plants of inefficient scale. However, aside from the scale argument, increased foreign competition may have beneficial effects on the efficiency of domestic oligopolies for another reason as well — one which is often overlooked in the above discussions. In traditional economic theory the long-run average cost curve is drawn for a given technology and will shift downward if a significant technological innovation comes along. Even if Canadian firms are producing in plants of minimum efficient size for the technology being employed in the industry, their costs may be above those of foreign firms employing some newer technology. For example, the long-run average cost curve for a steel plant could be defined on the basis of the open-hearth steelmaking process, and another one (lower) for the newer oxygen-vessel steelmaking process.[16] Efficiency in an industry can clearly be improved not only by firms taking fuller advantage of economies of scale offered by existing technology as employed in the industry, but also by the introduction of technological innovations. Increased foreign competition may force domestic firms to introduce technological innovations more quickly than they would in the absence of such competition. In some oligopoly situations this factor could have very significant effects on the efficiency of domestic firms.

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[16]Factors affecting the rate at which firms introduce available technological innovations are discussed at length in Chapter II.

There are sound theoretical reasons for believing that increased foreign competition will have beneficial effects on the efficiency of oligopolists in protected industries. This idea has a long tradition in the economic literature. The classical tradition tended to reach conclusions based on the analysis of a model which assumed competition was effective, and analysis centered on the industry rather than on the firm. The firm did appear as a distinct entity in the theory of monopoly. Here, foreign competition was viewed as a salutory influence over monopoly power which prevented the monopolist from charging the full monopoly price. The tariff was viewed as the "mother of monopoly" because it allowed the monopolist to extract something closer to the full monopoly price in the protected domestic market.[17]

The "infant industry" argument, although it reached different conclusions, followed in a logical manner. Tariffs could play the role of keeping the domestic price above a certain minimum (dictated by world prices) so that domestic firms (presumably high-cost producers relative to foreign firms) could have time to grow and become internationally competitive. In these terms, the approach to the tariff question taken by the Canadian economists cited above appears to be a simple inversion of the infant industry argument insofar as the policy approach is concerned -- if the tariff fosters inefficient producers then its removal will force them to become more efficient in order to survive.

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[17]Examples of this type of analysis are still quite common: "When foreign competition is reduced, industrial combinations behind the national tariff walls are encouraged." Paul H. Douglas, America in the Market Place (New York: Harcourt Brace & World, 1966), p. 19.

In the short run the influence of the tariff was thought to be primarily on the formation of price in the domestic market. In the longer run a movement toward free trade (reciprocal tariff removal) was viewed as beneficial in the classical tradition because it gave rise to economies of specialization and greater division of labor. Countries would specialize in the production of a good for which they had a comparative advantage. The infant industry argument, which was even supported by such free-traders as J.S. Mill, was simply viewed as a way of giving a domestic industry time to grow and develop a position of comparative advantage, after which the protection would presumably be removed.[18] Current discussions of the Canadian tariff view this argument as inherently unsound, because of the belief that the domestic tariff fosters an industrial structure which actually encourages inefficient production.

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[18]Murray Kemp has pointed out that a tariff may not be necessary to induce firms to set up operations, grow, and gain a comparative advantage, even in industries which have static increasing costs — the situation most favourable to the "infant industry dogma". Kemp shows that the dogma postulates a dynamic learning process and that the argument is only unambiguously correct in the extreme case where firms with static increasing costs learn only from the experience of other firms. If instead firms should learn only from their own experience, then when in the future their costs have fallen to the level of world costs, there will exist a barrier to the entry of new firms into the industry at that time, since lacking experience, their costs would be higher. This means the existing firm could make above normal profits at this time. The possibility of reaping these profits in the future may induce firms to begin to produce even without tariff protection if they estimate these profits will compensate them for losses sustained during the learning period. Murray Kemp, "The Mill-Bastable Infant-Industry Dogma", The Journal of Political Economy (February, 1960), pp. 65-67.

Arguments concerning the effect of the Canadian tariff focus on oligopolistic market structures. This is to be expected in light of the important role played by economies of scale in the above arguments. The manufacturing sector of Canadian industry is unusually concentrated relative to that of most other Western industrial countries;[19] a situation which is inevitable in much of Canadian manufacturing industry where the ratio of minimum optimum size of plant (or firm) to the size of the Canadian market is low.[20] Furthermore, the effect of foreign competition on a perfectly competitive industry is clear-cut. Supply will increase in the domestic market and, given demand conditions, the price which was formerly clearing the market will fall and marginally efficient firms will be forced out of the domestic market.

On the other hand, the effect of foreign competition on an industry made up of a few oligopolistic firms is not at all clear-cut. In broad terms, an oligopolist can be viewed as working within a certain framework of prices and attempting to sell as much as he can within that framework.[21] In this context, it is not clear whether, or how soon, or by how much, domestic

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[19]See, for example, Gideon Rosenbluth, Concentration in Canadian Manufacturing Industries (New York: National Bureau of Economic Research, 1957); and Joe S. Bain, International Differences in Industrial Structures: Eight Nations in the 1950's (New Haven: Yale University Press, 1966.)

[20]D.J. Daly, B.A. Keys, and E.J. Spence, Scale and Specialization in Canadian Manufacturing, prepared for the Economic Council of Canada, Staff Study No. 21 (Ottawa: Queen's Printer, 1968).

[21]See, for example, Joan Robinson, Exercises in Economic Analysis (London: Macmillan & Co. Ltd., 1965), p. 182; and R.C. Bellan, Principles of Economics and the Canadian Economy (Toronto: McGraw-Hill Co. of Canada, Ltd., 1967), p. 128.

oligopolists will lower their prices owing to the actual or potential entry of lower priced competitive imports into their domestic market. If domestic oligopolists are very much aware of the potential dangers of import competition they may react very quickly to an increase in foreign competition. Furthermore, the assumption is becoming more and more common in the economic literature that in oligopoly situations conspicuously lacking in effective competitive pressures, firms may neither maximize their profits nor minimize their costs. If such firms believe their profit situation is in some sense "satisfactory" they may show little inclination to even exactly calculate their actual costs.[22] Under these conditions, firms may have failed to introduce currently available technological innovations in order to protect their sunk investments in existing capital equipment. A protective tariff is a permissive condition for this sort of situation in much the same way as it is for a situation where firms are producing in plants of sub-optimal scale. There is a strong possibility that when faced with increased competition such firms will attempt to introduce technological innovations and new production techniques in order to lower their average costs of production.[23]

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[22]Extensive illustrations of arguments of this type are given in Chapter II.

[23]This possibility is mentioned in an earlier analysis of the Canadian tariff and its economic implications. "Removal of the Canadian tariff should also serve to increase the competitiveness of the manufacturing sector of our economy and a gradual reduction might act as a spur to efficiency." Clarence L. Barber, "The Canadian Tariff," The Canadian Journal of Economics and Political Science (November, 1955), p. 517.

However, it cannot simply be assumed that foreign competition will call forth a competitive response from firms in an industry which had previously been well insulated from effective competitive pressures. If domestic firms are not sensitive to the dangers of potential foreign competition they may not attempt a competitive response. If a competitive response is not forthcoming, increased foreign competition may result in the erosion of the domestic market by imports. In this case the domestic industry will suffer from low capacity utilization, lack of growth, increased unemployment, and reduced profits. The continued inflow of imports would eventually force domestic firms to lower domestic prices to the level of the landed price of the imported product. The reduction of profits and the unused capacity in the industry could impair the ability and incentive of domestic firms to introduce technological innovations. The net result of increased foreign competition might be technological retrogression and the eventual demise of the domestic industry.[24]

The main conclusion which the above discussion suggests can be summarized as follows. It is extremely important to recognize that the Canadian tariff can foster inefficient production on the part of domestic oligopolists. To the extent that the tariff has this effect, the continued existence of these firms after tariffs have been removed implies that they must have become more efficient. However, it is equally important to recognize that the force which is being relied upon to effect the

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[24]If foreign competition drives the domestic price of the product below the long run minimum average costs of producing in a technically efficient plant of minimum optimum size in the domestic market, then all domestic firms will be driven out of the domestic industry over time.

implied adjustments on the part of domestic firms is increased foreign competition. But the question of whether increased foreign competition will force oligopolists to become more efficient, fewer in number, and more specialized cannot be answered a priori. The reaction of domestic oligopolists to increased foreign competition will be influenced by a very broad variety of factors, some of which have been indicated above.[25] The really vital and basic question which requires further investigation, is how oligopolists will react when faced with increased foreign competition. It is hoped that this study will shed some light on the question by taking the specific approach outlined in the opening paragraphs of this chapter.

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[25]These factors are discussed at length in Chapter II. One common reaction to increased foreign competition which is not analytically relevant to this thesis is for domestic firms to demand greater tariff protection. To the extent firms receive greater tariff protection they will prevent foreign competitive pressures from increasing.

CHAPTER II

A MODEL OF HOW INCREASED FOREIGN COMPETITION AFFECTS THE CANADIAN PRIMARY STEEL INDUSTRY

Oligopoly Behaviour and the Reaction of Oligopolists to Increased Competition

Before constructing a model to predict the behaviour of Canadian steel firms when confronted by increased foreign competition, oligopoly theory — as it deals with the question of how oligopolists might be expected to behave when the competitive situation they are facing is changed — will be reviewed briefly. Oligopoly situations are characterized by a relatively small number of sellers dealing with a large group of buyers, so that the actions of any single firm may have substantial effects on the sales of its rivals.[1] Therefore, the demand curve facing the oligopolist is not horizontal and is in fact unknown even when consumers' tastes, incomes, etc. are given, until the reaction of its rivals to changes in its price are known.[2] Specific assumptions can be made which will have the effect of specifying the reactions of rivals, but

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[1]E.H. Chamberlin, The Theory of Monopolistic Competition : A Re-orientation of the Theory of Value (Cambridge, Mass.: Harvard Economic Studies, 1956), p. 30. Of course, in an oligopoly situation the small number of sellers may instead be dealing with only a small group of buyers, in which case there would be imperfections on both sides of the market.

[2]These general remarks are treated in depth and with historical reference in Fritz Machlup's, The Economics of Sellers' Competition (Baltimore: The Johns Hopkins Press, 1952).

these assumptions are usually quite restrictive. An early example of this approach is the "kinky" oligopoly demand curve.[3] Another approach is to assume collusive behaviour on the part of rival firms as, for example, in Fellner's analysis.[4] Price leadership is an example of collusive type behaviour designed to reduce uncertainty about the price reactions of rival firms in an oligopolistic industry. The likelihood of collusive type behaviour in an industry would appear to be greater the higher the degree of concentration in an industry.[5]

An extremely important discussion of oligopoly is contained in Professor Joe Bain's Barriers to New Competition.[6] Bain thinks the assumption of short-run profit maximization should be modified in oligopoly situations. Oligopolies may be wary of showing too great a profit for fear of attracting the entry of new firms into the industry. This will affect the pricing policies of oligopolists, but the greater the barriers to entry into their industry, the less will their pricing policies be affected. One important barrier to entry is the size of the market relative to the minimum efficient size of the firm in the industry. The

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[3] Ibid., pp. 353 and 471-74.

[4] Fellner's solution is based on the assumption that firms will display the sort of implicit accepted behaviour which will lead to something close to the maximization of joint profit in the industry by means of share-of-the-market demand curves. William Fellner, Competition Among the Few (New York: Alfred A. Knopf, 1949), pp. 24-41 and Chapter 7.

[5] An extensive discussion of collusive type behaviour is contained in Machlup, op. cit., pp. 432-48.

[6] Joe S. Bain, Barriers to New Competition (Cambridge, Mass: Harvard University Press, 1956).

greater the ratio of minimum efficient firm size to the size of the market, the higher will be the barrier.[7] This increases the likelihood that new entry at minimum efficient size will significantly lower price — a factor which discourages new entrants.[8] Finally, Professor Bain points out that a theoretical measure of entry conditions into an oligopolistic industry is ". . . the percentage by which the prices of established firms can exceed the competitive level without attracting entry."[9]

There are several aspects of this discussion which are directly relevant to the thesis problem. Since the ratio of minimum efficient firm size to market size in many Canadian industries is quite high, some industries will have rather high barriers to entry. Many Canadian industries are also highly concentrated (partly because of their high minimum-efficient-firm-size ratios), so the likelihood of some type of collusive behaviour (perhaps only implicit collusion) is great. In such situations firms may be charging a price considerably higher than Bain's "competitive level price". It is at this point that the foreign competitive situation becomes relevant. New entry could be broadly interpreted to include new competition generated by an increase in imports into the domestic market. If domestic firms are not com-

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[7] Ibid., pp. 13 and 29.

[8] Ibid., p. 33.

[9] Bain defines the "competitive level" as ". . . the minimum attainable average cost of production, distribution, and selling for the good in question, such cost being measured to include normal interest return on investment in the enterprise." See Bain, op. cit., pp. 4-6.

pletely insulated from foreign competition (they may be, if they have prohibitive tariff protection) they will take the landed price of imports into account in setting their own prices.[10] Fear of potential import erosion, like fear of new entry, will introduce an element of price restraint into an oligopoly situation and may also make oligopolies more cost-conscious than they would otherwise be.[11]

The distinction between firms which have or have not been insulated from effective competitive pressures brings up one important definitional problem. Professor Machlup has recently defined heavy, vigorous, or effective competition as ". . . forces which set up pressure within the firm to do something about its sales and profit position." When under such pressure, firms are ". . . constantly compelled to react to actual or potential losses in sales and/or reductions in profits."[12] He points out that fewness of competitors in an industry is a significant

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[10]Extensive specific examples of the effect of the Canadian tariff on the prices paid by Canadians for protected goods are given by John H. Young, Canadian Commercial Policy, a study prepared for the Royal Commission on Canada's Economic Prospects (Ottawa: November, 1957), Appendix A, pp. 163-233; and G.L. Reuber, The Objectives of Monetary Policy, a study for the Royal Commission on Banking and Finance (Ottawa: December, 1962), p. 167 ff. A very specific analysis of how Canadian steel wire and cable producers tended to price their products to the limit set by the landed price of U.S. products in the post-war period is contained in V.W. Bladen and S. Stykolt, "Combines Policy and Public Interest : An Economist's Evaluation," Anti-Trust Laws : A Comparative Symposium, W. Friedman, editor (Toronto: The Carswell Co. Ltd., 1956), pp. 45-90.

[11]This point is pursued further below, especially in the section dealing with technological innovation.

[12]Fritz Machlup, "Theories of the Firm : Marginalist, Behavioural, Managerial," The American Economic Review (March, 1967), p. 18.

factor in the specification of conditions which are likely to be lacking in competitive pressures.[13] Obviously, such a concept cannot be quantitatively measured, but the definition is still significant because it sets up criteria for judging whether or not specific events are likely to increase effective competition in the industry. Events giving rise to an actual or potential increase in imports, for example, will increase competitive pressures in an industry insofar as this gives rise to actual or potential losses in sales and/or reductions in the profits of the domestic firms.[14]

Some more recent theories of the firm have explicitly taken into account the fact that many large firms are not subject to strong competitive pressures of any sort and that this significantly affects their behaviour. These models are often characterized as organizational or behavioural and are often criticised for their lack of generality — i.e. a model built for a particular firm has often not been applicable for predicting the behaviour of any firm except the one on which the model was based.[15] Nevertheless, such studies have made useful contributions to a clearer understanding of the motivations and goals

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[13] Ibid.

[14] The specific problem of analysing situations of "increased foreign competition" is dealt with in the section below concerned with the actual construction of the model.

[15] This point has been discussed by Machlup, "Theories of the Firm : Marginalist, Behavioural, Managerial," op. cit., p. 16, and the truth of this statement can be seen by looking at some of these models which are based on intensive studies of particular firms. For example, see R.M. Cyert and J.G. March, Behavioural Theory of the Firm (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1963).

of oligopolistic firms, particularly in instances where competitive pressures have been weak. These theories have attacked the use of the profit goal as the sole explanation of the firm's behaviour. While recognizing the need for "satisfactory" profits, other goals have been put forward as the firm's motivating engine. These other goals would include the desire for growth, for security, for the "quiet life," or for a reputation for public-service mindedness, etc.[16]

One goal, other than profits itself, which has been widely accepted is the growth goal. This goal is often expressed in terms of sales (value) maximization or in terms of target market shares. One such model is Baumol's sales-maximization model which works with a profit constraint and is of interest here for two reasons.[17] First, it indicates that firms may well give top priority to growth when profits are in some sense satisfactory and may be willing to trade off some current profits in order to achieve greater sales. Second, and perhaps more important, the model suggests a method for gauging whether or not profits are "satisfactory".

> In practice, the determination of a minimum acceptable profit level will probably come down to no more than a rough attempt, again partly by rule of thumb, to provide competitively acceptable earnings to stockholders while

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[16]Fairly complete lists of these goals can be found in Machlup's "Theories of the Firm : Marginalist, Behavioural, Managerial," op. cit., pp. 12-13, and in Herbert A. Simon, "Theories of Decision-Making in Economics and Behavioural Science," The American Economic Review (June 1959), p. 262.

[17]William J. Baumol, Business Behaviour, Value, and Growth (New York: The Macmillan Co. Ltd., 1959).

> leaving enough over for investment in future output expansion at the maximum rate which management assumes to be reasonably safely marketable.[18]

If profits are satisfactory, firms may pursue goals other than short-run profit maximization.

The above theories all contribute to a better understanding of the likely behaviour of oligopolistic firms when faced with different specific competitive situations. One very realistic model, which seems general enough to take into account the different oligopoly patterns of behaviour discussed above, is contained in Mrs. Joan Robinson's Exercises in Economic Analysis.[19] This model will be used to set up a less general model from which predictions can be drawn concerning the likely behaviour of Canadian steel firms when faced with increased foreign competition. Mrs. Robinson's model introduces an oligopolistic firm that is realizing the proceeds and costs that it had estimated when it invested in its existing plant and then proceeds to analyse the reaction of the firm when it is moved away from this position.[20]

Mrs. Robinson assumes that overhead costs do not vary with output and that some elements of prime costs are lumpy and do not vary proportionately with output. At rates of output higher than those

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[18] Ibid., p. 53.

[19] Joan Robinson, Exercises in Economic Analysis (London: Macmillan & Co. Ltd., 1965), especially pp. 175-200.

[20] Ibid., p. 53.

designed for the plant, average prime costs will rise sharply as output is increased further. The total cost curve therefore takes the shape indicated in Diagram 2-1. The distance OG represents the share of overhead costs and gross profit as correctly estimated by the firm for the time period in question. GH represents that part of prime cost which is lumpy and thus must be incurred if any output is to be produced at all. Average prime cost is assumed to fall until the output for which the plant was designed is reached, and to rise thereafter. The distance ON is "normal capacity output" since average prime cost is at a minimum at this the designed capacity. NP_n would measure the normal cost for the normal output. If the firm regularly sold the output ON for the proceeds NP_n it would cover what it regards as its full cost of production and would be earning profits at what it regards as a normal rate. The slope of the price line OP_n represents the price that yields the normal proceeds and is called "subjective normal price" by Mrs. Robinson.[21]

What happens in such a model if the firm suddenly finds that at the subjective normal price it can only sell OM, so that proceeds are now MP? The firm could change price but is not sure of what the result of a price change will be. If the price line is rotated through the axis, points can be specified which will correspond to the sales

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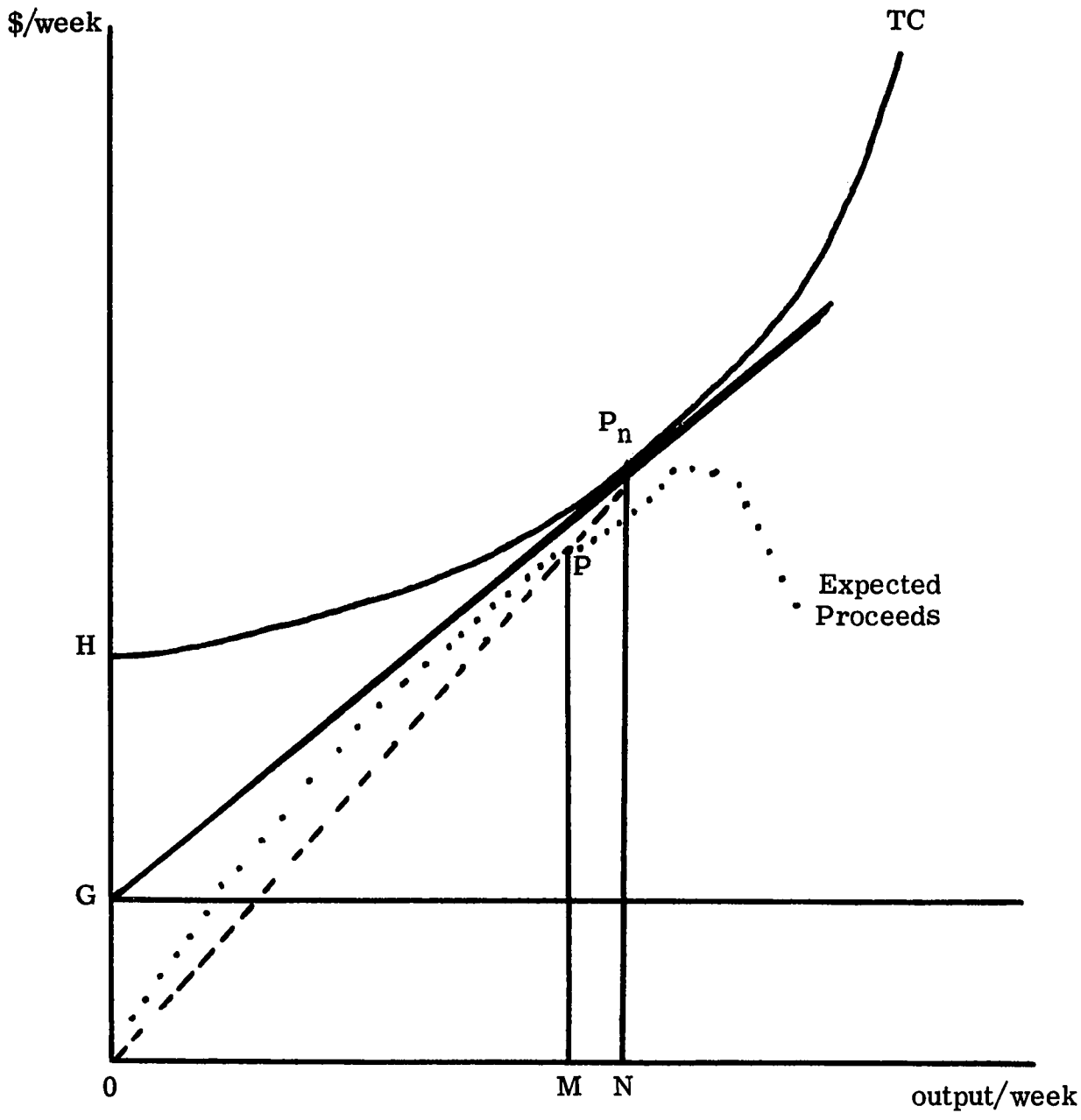
[21]This price is "subjective" because "There are elements of estimation . . ., in the calculation of total costs (including selling costs), in the view which the firm takes of the profit to be made and in the determination of the normal rate of output for the plant." Ibid., p. 187.

DIAGRAM 2-1



the firm expects to make at the different prices (assuming constant selling pressure). An "expected proceeds curve" results which indicates the different proceeds a firm estimates it will earn as only the price of the product is altered. The shape of the curve obviously depends on the firm's estimate of the elasticity of demand for its product. In general, as price falls expected sales rise and at a price higher than the current price expected sales would be below OM. This curve will rise from the origin and pass through P (the firms current position) and, if it had not already begun to fall before point P was reached, it will begin to fall at some point beyond P.

In analysing this model, Mrs. Robinson points out that when a firm is selling its normal output at subjective normal price, it may have very little incentive to change the status quo even if its expected proceeds curve indicates that charging some other price might be more profitable. In this situation other goals might begin to take precedence over the profit goal. However, when proceeds fall below normal, the firm will have to react in one way or another.[22] When this happens firms will certainly consider changing price, and the shape of the expected proceeds curve will be an important factor in this decision.[23] The firm may believe that a cut in price would increase its proceeds (demand is elastic to a fall in price) and that these proceeds would at

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[22] Ibid., p. 188.

[23] If the firm's expected proceeds curve should peak at P and decline thereafter, you would have the "kinky" demand curve situation and prices would be sticky.

least cover the increased prime costs entailed by the increased output.[24] In this way, it can reduce the gap between total costs and expected proceeds but it cannot hope to attain subjective normal proceeds (see Diagram 2-1). In such a case the firm is likely to lower price. Of course the firm may be wrong and proceeds will not rise, or will not rise to the extent expected.

However, the above reactions do not take into account another possibility — the possibility of altering the cost curves. Mrs. Robinson points out that "The ideal firm of the textbooks is always producing its output at minimum costs in any case, but in reality there is no very strong pressure to keep costs down (or even to find out what they are) so long as proceeds exceed them by a comfortable margin."[25] Now that the situation is changed, firms will try to reduce costs by genuine efficiency improvements or by reducing the quality of the product. Where the whole industry has been affected, firms may also attempt to cut the wage rate.[26] In the sort of situation discussed above, Mrs. Robinson's model reveals an a priori likelihood that a firm will consider attempting to alter the current price and cut costs.

This analysis is directly relevant to the hypothesis under investigation here. It is clear that increased competition from imports

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[24] Joan Robinson, op. cit., p. 191.

[25] Ibid., p. 190. Actual empirical examples of this are given in footnote 54 above.

[26] Ibid.

could well create the sort of situation where at subjective normal price domestic firms find they can no longer sell their normal output. Even if domestic firms viewed the market demand curve as inelastic before import competition increased, they will realize that the entry of imports into their market will make the demand curve facing them more elastic — i.e., foreign competition will affect the shape of the domestic firm's expected proceeds curve in a downward direction. In such a situation a downward adjustment in price becomes likely, but the greater the foreign competition the more likely will it appear that even a downward adjustment in price will not narrow the newly opened gap between their costs and proceeds. The possibility of lowering the cost curve can be very real in the sort of situation discussed above where it is clear that oligopolists may not have been making much of an effort to keep their costs down prior to the time when competitive pressures (in this case, foreign) increased.

The Pricing Policies and Investment Decisions of Oligopolists

A great deal of empirical work has been done in the area of the pricing policies and investment decisions of firms. Perhaps the most widely publicized view of oligopolistic pricing is the "full cost" or "target-rate of return" pricing principle.[27] Firms are assumed to

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[27]One well-known empirical study, the results of which reinforced this view of the price setting process, was undertaken by R. L. Hall and C.J. Hitch, "Price Theory and Business Behaviour," Oxford Economic Papers (No. 2, 1939). This paper is discussed critically by Machlup, Economics of Sellers' Competition, op. cit., pp. 69-71.

calculate the average cost of producing a product when the plant is producing normal capacity output and to this they add a "conventional addition for profit."[28] Firms set a price high enough to cover their unit costs at the normal output level plus an allowance which will result in a predetermined profit rate when operating at that level. This implies that price will be altered only when the cost of producing the standard output changes (owing to technological improvements or changes in input prices), and that changes in demand or cost changes which occur because of changes in operating rates will not call forth a price response.

However, the implications of this pricing principle are not nearly so straightforward as would at first appear. The findings of the Hall and Hitch study do not support the hypothesis that firm price only with reference to average costs. Machlup points out that the data in the Hall and Hitch study show that the margin above average cost varies from firm to firm, within firms from period to period, and among different products being produced by the firm.[29] Other data besides costs were obviously being consulted in making pricing decisions and these other data were usually connected with demand — such as fear of competitors or potential competitors.[30] Mrs. Robinson also attacks this principle as an explanation of price, pointing out that even if a

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[28] Machlup, Economics of Sellers' Competition, op. cit., p. 69.

[29] Ibid., pp. 69-70.

[30] Ibid.

firm could calculate the relevant total cost of producing one of its products separately, the principle still does not indicate how the allowance for profit is determined and is allocated for the various products being produced.[31] The failure to specify how the profit allowance is determined means the principle does not really explain prices.

The full cost principle can be very misleading because it implies that prices can be fixed without regard to demand. In fact, the demand element does come in precisely with regard to the question of the profit margin. Demand factors will have effects on the prices being set through their effects on the size of the firm's profit target. For example, if import competition results in a significant drop in the firm's operating rate, then the firm can be viewed as having to consider altering its price because of its views about whether its profit target is still realistic. But even so, the same considerations will apply in making this decision as applied in Mrs. Robinson's model.

Another empirical study, based on industry questionnaires, has analysed the pricing policies of 20 large U.S. corporations.[32] The pricing goals determined by this study were: "(1) pricing to achieve a target return on investment; (2) stabilization of price and margin; (3) pricing to realize a target market share; and (4) pricing to meet or prevent competition."[33] Although (1) was the most frequently

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[31] Joan Robinson, op. cit., p. 183.

[32] Robert F. Lanzillotti, "Pricing Objectives in Large Companies," The American Economic Review (December, 1958), pp. 921-40.

[33] Ibid., pp. 922-23.

mentioned goal, the author points out that the market-share goal was mentioned almost as frequently and seemed to be equally effective in governing policy.[34] Even more significant, the study found that firms which stressed a target-return goal tended to be those firms which were selling their products in protected markets and were industry leaders.[35] The results of this study lend support to the realism of Mrs. Robinson's model. When firms are not under very strong competitive pressures they will be concerned with earning a desired target return, but when competitive pressures develop and firms find they are no longer selling their normal output, then concern about their market shares and related demand conditions comes to the fore and affects the firm's pricing policy.

Mrs. Robinson links up the pricing policies of firms with their investment decisions in the following way:

> The search which firms keep up as investment goes on, for the most profitable line of advance, keeps costs and prices more or less in line with each other, for prices high relatively to costs is a signal for investment to come in and enlarge capacity. But on the whole it would be more true to say that market prices for particular commodities determine their costs of production than that costs determine prices, for the costs that it is worthwhile to undertake, for any individual producer, depend upon the prices that he expects to be able to charge.[36]

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[34] Ibid., p. 928.

[35] Ibid. Two steel companies were included in the survey. U.S. Steel (the price leader) gave an 8% target return goal with collateral goals of a 30% market share and stable prices and margins. The small National Steel indicated a market share goal (maintenance of their 5% market share with a collateral goal of increasing its share — but it indicated it was a price follower).

[36] Joan Robinson, op. cit., p. 178.

The investment decision is closely linked to demand conditions in the industry, especially to the firm's expectations about future demand. Recent empirical studies of the investment decision of firms confirm this.[37] Within a growth context accelerator models seem to be adequate for explaining investment behaviour (linking trends in capacity utilization with investment expenditures). In a context of stagnation or depression, liquidity considerations become important in determining the degree of sensitivity of investment to capacity pressures.[38] Another study, based on interview techniques, found that for steel companies the decisive influence on investment decisions was the firm's estimate of its future demand which was based on expected future industry demand and the firm's estimate of its share of the future market.[39]

Mrs. Robinson views the investment decision as basically a balancing between fear of excess capacity and fear of losing markets.[40] Again, foreign competition is relevant here since increased foreign competition can affect the firm's expectations about future demand,

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[37]J. R. Meyer and E. Kuh, The Investment Decision : An Empirical Study (Cambridge, Mass.: Harvard University Press, 1957); E. Kuh, "Theory and Institutions in the Study of Investment Behaviour," The American Economic Review, Papers and Proceedings (May 1963); and J. R. Meyer and R. R. Glauber, Investment Decisions, Economic Forecasting, and Public Policy (Boston: Harvard University Press, 1964).

[38]Meyer and Kuh, op. cit., p. 117.

[39]Robert Eisner, Determinants of Capital Expenditures: An Interview Study (Urbana: University of Illinois Press, 1956).

[40]Robinson, op. cit., p. 199.

prices, and markets and therefore can affect its investment decisions. If increased foreign competitive pressures convince firms that prices will have to be kept down in the future if they are to retain their present markets, then firms will begin to look much more critically at their cost structures when making investment decisions. In this sort of situation the vital question is whether the firm can significantly lower unit production costs by introducing new techniques of production.

The Rate of Introduction of New Techniques of Production

Professor Salter has discussed the factors influencing the rate at which technological improvements are actually introduced into an industry.[41] He points out that when plants are built they normally embody the best practice techniques which were available at the time they were planned and built. Older plants become outmoded as technology changes and as relative factor prices change.[42] This view of the capital equipment of an industry makes it clear that output per unit of variable input (say, labor) in an industry is actually a weighted average so that the building of new plant or the closing down of older plant should raise average labor productivity in the industry. Therefore, the rate at which new techniques of production are being utilized should be reflected in the industry's average labor productivity figures and should be closely related to the rate of investment. Other things being

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[41]W.E.G. Salter, Productivity and Technical Change (Cambridge: Cambridge University Press, 1956).

[42]Ibid., p. 52.

equal, rising labor productivity will lower unit production costs.

The firm's replacement rule specifies that a plant should be replaced if the operating costs of the plant exceed the total of operating plus capital costs (including provision for a normal return) of its best practice alternative. Fixed costs are ignored for existing plant in this comparison because these costs must be paid even if the plant is replaced. A plant should be scrapped if it is earning no surplus over its operating costs and this will be the case if the unit operating costs of the plant are equal to or greater than the price of the product. Competition would drive the market price for the product to the level at which it just equals the unit operating plus capital costs of the best practice plants being built and coming into operation.[43] In Professor Salter's dynamic context, this leads to a temporary equilibrium until a new technique comes along.[44] Innovations, in a competitive framework, lead to increased investment and expansion of output until price has been driven down to a new equilibrium level. While this was occurring, the falling price causes the scrapping of the older plant as the product price falls below the unit operating costs of the most outdated plants.

The current market price for the product defines the oldest (and presumably most outdated) plants which can economically remain

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[43]In this case, the replacement and scrapping decisions would occur at the same point in time.

[44]Salter, op. cit., pp. 58-59.

in operation.[45] Regardless of whether an industry is competitive or not, downward pressure on market price will lead to a faster rate of replacement and/or scrapping of the older, more outdated capital equipment. This will result in rising output per man hour in the industry. A competitive producer is forced to replace obsolete equipment as price is driven down to equality with the average costs of the efficient firms, but a monopolist may not feel any such pressure. Professor Salter comments that ". . . the rate of return on capital does not necessarily indicate whether or not a monopoly exists, for a monopolist is free to employ obsolete high-cost methods which would not be tolerated under competition."[46]

The position of the oligopolist is intermediate to that of the monopolist and the perfect competitor. If an oligopolist engages in aggressive expansion the burden of the lower prices involved in such aggressive expansion will partly fall on the surpluses currently being generated by the existing capital equipment in the industry — his own and his rivals. Professor Salter believes that especially in tight oligo-

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[45]Given the going market price, Professor Salter demonstrates that existing differences between the unit labor requirements for best practice plants and the unit labor requirements for plants using the most outdated equipment in the industry is determined by the amount of real investment per unit of output required for best practice plants, the price of such investment (amortization and normal profit) and the wage rate. This leads to the conclusion that the use of outdated equipment is not a sign of inefficiency in the sense of poor management by firms because in part ". . . the extent to which outdated equipment can survive is a reflection of factor supplies." Ibid., pp. 68 and 72.

[46]Ibid., p. 94.

poly situations, firms will tend to avoid aggression as a means of capturing a larger market share. Price leadership would be one solution which could result in this sort of situation. Nevertheless, even in the absence of internally generated competitive pressures, increased foreign competition can place downward pressure on product prices in oligopoly markets and falling prices will increase the rate at which existing capital equipment will become economically obsolete.[47]

The relevance of the above discussion to the question of foreign competition is clear. If foreign competition has increased, domestic firms will be forced to make technological improvements or at least to scrap their older most obsolete equipment. But if firms do not replace this equipment with new best practice equipment then their capacity and market shares will decline. All of the above discussions stress one point — increased competitive pressures will set up strong incentives for firms to lower their unit costs of production. Furthermore, there exists a high probability that oligopolists will have scope for lowering production costs by means of technological innovation; and the more protected the original situation the greater is the likelihood

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[47]This same connection between competition and technological change has been pointed out by Marvin Frankel, "Obsolescence and Technological Change in a Maturing Economy," The American Economic Review (June 1955), pp. 296-319, especially pp. 300-05. It has also been suggested that in many cases domestic firms may react to potential rather than actual increases in foreign competition. M.V. Posner suggests that in fact producers in foreign countries other than the country where a significant innovation is being introduced may " . . . be more alert to foreign developments than were foreigners to the possibilities of their export markets." "International Trade and Technological Change," Oxford Economic Papers (October 1961), pp. 323-41.

that the scope for making such innovations will be great.

A Summary Description of the Canadian Primary Steel Industry

The hypothesis that increased foreign competitive pressures are likely to improve the efficiency of the operations of domestic oligopolies is tested in this thesis by examining the behaviour of the Canadian Primary Steel industry during the period 1950-1966. This is an appropriate industry, it is clearly oligopolistic and is highly concentrated.[48] One reason for the high degree of concentration is the existence of significant economies of scale associated with the steelmaking process. It is an important industry in Canada and is primarily Canadian controlled so that the complications introduced by parent-subsidiary relationships are avoided.[49] Tariff protection for this industry has been moderate by Canadian standards and the tariff was certainly not prohibitive during the period under review here. The four major firms produce roughly 90 per cent of the total domestic production of primary steel products. These firms produce semi-finished steel, flat-rolled steel (sheet and plate), bars and rods, structural steel, and steel rails. They sell their products to other industries such as the construction, automotive, metal fabricating, and canning industries. The three largest firms are primarily located in Ontario, close to the largest Canadian steel markets in Ontario and Quebec. The fourth major firm had its

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[48]The documentation for most of the descriptive statements in this brief summary is contained in Chapter III. In instances where this is not the case, appropriate footnotes have been added.

[49]See Chapter III, footnote 4.

main plant in Nova Scotia during the 1950-1966 period under review in this thesis. Not all of the four produce a complete line of primary steel products so that on a product basis concentration in the industry is even higher than indicated by the over-all concentration figure. Although the firms produce fairly standardized products, there is some scope for competition with regard to product quality (e.g. exactness of size specification, etc.) and delivery and other subsidiary services such as the provision of technical information on the best way to use the product.

The firms do not appear to compete via price, and the largest (which produced almost 40 per cent of domestic steel production during the period under review) acts as a price leader a good deal of the time. The very small number of significant firms in the industry itself indicates a high probability that they will find ways of reducing internal competitive pressures by some sort of collusive action. At the beginning of the period under review, none of the major firms had reached scales of output consistent with estimates of the minimum efficient scale of output in steelmaking. However, because of the fast post-war growth in demand for steel in Canada, by the end of this period the three largest firms had grown to a size which was consistent with current estimates of minimum efficient size. The major firms (with the exception of the smallest of the four) have successfully kept abreast of the significant technological inventions which occurred in the post-war years and today they are very efficient when compared with their foreign

counterparts.[50] Since the beginning of the 1960's there is evidence that domestic steel firms are also developing small but reasonably stable export markets.

Viewed in isolation, the four major firms would appear to form a tight oligopoly, but in fact they have always been subject to some degree of foreign competition even though internal competitive pressures have not been very strong in the post-war period.[51] During the early 1950's foreign competition came primarily from U.S. steel firms but Canadian firms were apparently able to successfully replace imports with domestically produced steel during this period without showing any evidence of impairment of their profit rates. Steel prices at home were raised fairly sharply, but at a slower rate than U.S. steel prices. In the second half of the 1950-1966 period foreign competitive pressures increased from offshore steel-supply sources, especially from the European Coal and Steel Community countries and Japan.[52] In the early 1950's the high ratio of steel imports to domestic steel consumption in Canada (about 30 per cent) provided Canadian firms with a strong incentive to expand the scale of their operations and become more efficient in order to replace imports with domestically produced steel. The fact that expansion allowed domestic firms to reap greater economies of scale increased the incentive of firms to expand via import replace-

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[50]Chapter VI, pp. 157-76.

[51]Chapter V, pp. 136-37.

[52]Data on international steel prices and steel trade flows are contained in Chapter IV.

ment. The intensification of foreign competitive pressures at the end of the 1950's should have increased still further the incentive of domestic firms to be as efficient as possible in order to protect the larger market shares they had captured in the 1950's.

The idea of the necessity of constantly being prepared to meet foreign competition is no doubt firmly ingrained in the thinking of the management of the Canadian steel firms. This is reflected in the strong influence which changes in foreign steel prices (especially U.S. steel prices) apparently have on the behaviour of domestic steel prices. The attitude of Canadian firms with regard to foreign competition will be contrasted with that of the U.S. steel firms in the post-war years which were almost completely insulated from significant foreign competitive pressures up until the end of the 1950's.[53] The model constructed in the following section attempts to bring the oligopoly theory reviewed above to bear on the specific question of how increased foreign competition is likely to have affected the behaviour of the Canadian steel oligopolists during the 1950-1966 period and what effects this is likely to have had on the efficiency of these firms.

The Effects of Increased Foreign Competition on the Canadian Primary Steel Industry : A Model

The review of oligopoly theory has stressed the reaction of oligopolists to situations where competitive pressures have increased. Under such changed circumstances firms might try altering their product

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[53] Chapter VI, pp. 173 and 176.

prices and reducing their unit production costs. One important conclusion, reached above, is that firms which in the past have been well insulated from effective competitive pressures are very likely to have the scope for a significant lowering in their unit production costs. Oligopolists may feel very little pressure to introduce new cost-saving techniques and keep their production costs at a minimum so long as their revenue is covering their costs by a margin they consider comfortable.[54] In this situation, if foreign competition increases, firms may begin to use new cost-saving techniques and to introduce currently available technological innovations or to increase the rate at which such innova-

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[54]It is difficult to judge to what extent such behaviour is in fact significant in oligopolistic industries, but many examples which indicate such behaviour does occur can be found. Neil Chamberlain gives specific examples of firms which apparently begin to consider new techniques of production only when they experience adverse variations in their projected expenditures relative to their expected revenues. He also gives examples of firms which experienced increased domestic and foreign competition and reacted by increasing research expenditures and introducing new equipment only after this occurred. Neil Chamberlain, The Firm : Micro Economic Planning and Action (New York: McGraw-Hill, 1962), pp. 340-42 and 354. Oliver Williamson gives an example of a large durable goods manufacturer who admitted that direct costs were not closely scrutinized or kept near a minimum in markets where the firm had quite a bit of control over price (competition was weak). The Economics of Discretionary Behaviour (Englewood Cliffs, New Jersey : Prentice Hall Inc., 1964), p. 111. Cohen and Cyert point to Ford Motor Company as an example of a firm which found methods of significantly reducing operating costs on a given volume of output only after it incurred losses in the first three quarters of a particular year. Theory of the Firm : Resource Allocation in a Market Economy (Englewood Cliffs, New Jersey : Prentice-Hall Inc., 1965), p. 334. Finally, Adams and Dirlam claim that the U.S. steel giants refrained from introducing new cost saving innovations at the end of the 1950's, even though it would have been profitable to introduce them, because they wanted to protect their sunk investments in their existing capital equipment. "Big Steel, Invention and Innovation," The Quarterly Journal of Economics (May 1966), pp. 167-89. This last reference is discussed at length in Chapter VI.

tions are currently being introduced into their production processes. This factor plays an important part in the model developed here to predict the effect of increased foreign competition on Canadian steel firms.

This model, which is applicable to the Canadian primary steel industry in the post-war period, assumes the existence of a tight oligopoly situation. Domestic firms have been well insulated from effective competitive pressures and are producing a range of standardized products. Given this sort of situation, foreign competition is assumed to increase and the process whereby increased foreign competition may lead to an increase in the efficiency of domestic firms is traced out as follows. Foreign competition may increase owing to a decline in the landed price of steel imports, say because foreign steel firms have excess steel capacity and have attempted to increase their foreign sales by lowering their export prices. Domestic steel consumers, attracted by the lower-priced steel imports, increase their purchases of foreign-produced steel. Firms now find they cannot sell as much steel as formerly at their current prices.[55] As a result, their profits are impaired, not only because of the lower sales volume but also because the unit production costs of steel firms rise sharply when they are producing at less than designed capacity.[56]

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[55]This is clearly the sort of situation discussed above with reference to Mrs. Robinson's model. Firms may find that at their subjective normal price they can no longer sell their normal output. Mrs. Robinson refers to this as a "buyers' market". Joan Robinson, op. cit., p. 191.

[56]K.H. Wylie and M. Ezekiel, "The Cost Curve for Steel Production," The Journal of Political Economy (December, 1940), pp. 777-821. Eastman and Stykolt's study comments on the very close relationship between capacity utilization and profits in steelmaking. Eastman and Stykolt, op. cit., The Tariff and Competition in Canada, p. 362.

Faced with this specific situation, domestic firms are likely to consider lowering prices. In the Canadian steel industry prices are fairly rigid downward and there is a price leadership arrangement in the industry.[57] The market demand curve for steel has long been recognized as being inelastic (demand elasticity for steel products is considerably less than unity).[58] Given a price leadership situation, domestic firms will view their own demand curves as a reflection of the inelastic market demand curve. These factors would tend to militate against a lowering of domestic prices. However, the existence of imports in the domestic market has the effect of increasing the elasticity of demand facing the major domestic producers. If both the sales and profits of domestic firms are being eroded by import competition, it would appear to be necessary for them to lower their prices. But even if domestic prices are lowered enough to stop the inflow of imports into their market, it is unlikely that profits will be restored to their former levels since the market demand curve is inelastic. Profits may even be reduced further.

Faced with this sort of situation domestic firms will be forced to try to lower their unit production costs unless they are willing to accept a lower level of profits. The large domestic steel firms may

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[57]See Chapter III, pp. 69-70.

[58]The original study of the elasticity of demand for steel products was published by the U.S. Steel Corporation, An Analysis of Steel Prices, Volume, and Costs (1940). The study was done under the direction of T.O. Yntema and was also published by the Temporary National Economic Committee. See also Eastman and Stykolt, op. cit., The Tariff and Competition in Canada, p. 362.

attempt to force their suppliers to lower input prices and might attempt to cut wages in the steel industry. They will also look for new cost-saving techniques of production, the introduction of which would lower unit production costs and help to restore their profits. The lowering of product prices may itself force domestic firms to replace or scrap their older equipment if price falls below the unit operating costs of this equipment. It may well be that the profit maximization calculus had already decreed that this equipment be replaced even before domestic prices were forced down. But if domestic competitive pressures had not been strong in the past, firms may have decided to protect their sunk investments in existing capital equipment. As long as such firms felt that profits had been satisfactory in the past they could collectively afford themselves this luxury. If their technological response is successful then their efficiency will improve.

Of course, there are many possible variations in the chain of events set out above. Firms might react to potential rather than actual import erosion of their markets. In this case, when export steel prices in foreign markets begin to decline domestic firms might immediately lower domestic steel prices in order to prevent any increase in imports. This is a possible reaction in the Canadian steel industry where firms have been concerned about reducing the high import share of their market.[59] Even in this case however, given the inelastic demand for steel products, the profits of domestic firms will be impaired. Foreign

[59]See Chapter III, p. 74.

competitive pressures have obviously increased even though the import to consumption ratio for steel products has not risen. A longer-run reaction on the part of domestic firms, intended to reduce unit production costs, is still extremely likely.[60]

The relationship between the landed import price (the price of the imported good to the domestic consumer including an allowance for the tariff and the costs of transportation to the domestic market) and the domestic price of steel is obviously important. Even if the landed import price of steel falls below the domestic price, foreign competition may not significantly increase. Foreign firms might be unwilling to serve the domestic market for a variety of reasons.[61] Also, domestic consumers might be unwilling to purchase steel from foreign suppliers

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[60]The concept of "long run" as used here does not refer to the passage of "logical time" as used, for example, in the traditional theory of the firm where technological conditions and the supply conditions for inputs are given. The model developed here is applicable to historical time. Foreign competition is assumed to increase at a particular time in actual history and firms are free to develop new techniques and introduce technological innovations into their production processes and will in fact be encouraged to do so as a result of the changed competitive situation. See Joan Robinson, Essays in the Theory of Economic Growth (London: Macmillan & Co. Ltd., 1962), pp. 23-29.

[61]For example, foreign firms may consider our market to be too small to be worth the cost and effort of selling here and other markets may look more attractive and easier to enter because prices are even higher there than in our market. If sharply rising domestic prices have risen above the landed price of imports foreign firms might still be unwilling to sell in our market because supply was short in their own markets.

for a variety of reasons.[62] Of course, the continuing availability of lower priced imports is likely to result in rising imports as many of the non-price factors which give rise to import resistance will lessen over time. If imports have been an important element in the domestic market in the past, it is likely that a deterioration in the price competitiveness of domestic firms will result in further increases in imports.[63] If this is the case, they may not even wait for imports to increase before lowering domestic prices. In any event, in such a situation firms will become extremely unwilling to raise domestic prices any further. One strong conclusion which emerges here is that increased

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[62]For example, domestic consumers may lack information about the foreign good or they may feel the foreign market is not a reliable source of supply. Delivery times from foreign firms may be longer and less certain. A recent study has found that even in the case of standardized products, such as nonferrous metals, "Tariffs and quotas, the division of markets, the tendency to maintain customary trade channels, technical know-how, and other factors operate to varying degrees . . . to reduce the importance of price differences in trade flows." I.B. Kravis and R.E. Lipsey, Comparative Prices of Nonferrous Metals in International Trade (New York : Columbia University Press, 1966), p. 55.

[63]From the viewpoint of this thesis a recent and very relevant study in the area of measuring demand elasticities for steel imports is found in a Ph.D. thesis by Donald Barnett. Barnett finds a strong negative relationship between the proportion of domestic steel consumption imported and the price of the imported steel product relative to the average price of that good in Canada. The study concludes that relative prices are an extremely important determinant of the ratio of steel imports to steel consumption in Canada. For example, ". . . for almost all [steel] product classes a 1 per cent variation in the relative price of imports has resulted in a 3 to 11 per cent change in the opposite direction in the imports/consumption ratio, depending upon product class and source." D. Barnett, The Import Share of Rolled and Tube Steel Products in Canada (Queen's University : Ph.D. Thesis, September 1968), especially pp. 164-68.

foreign competition in the steel industry will almost certainly reduce profits in the industry unless firms can succeed in lowering their unit production costs very quickly when foreign competitive pressures begin to emerge.

Increased foreign competition can have another effect on the structure and efficiency of domestic oligopolies insofar as its impact may fall most heavily on the marginal firms in the industry (firms with higher than average unit production costs owing to, say, their small scale of output or the ownership of older more out-dated capital equipment). As domestic prices are forced down by increased foreign competition, these firms will feel the profit squeeze more acutely. If their profits are seriously impaired and the funds necessary for the introduction of new techniques of production embodied in new plant and equipment are unavailable, they could be forced out of the industry.[64] Another possibility in an industry such as primary steel is that some regions of the market may be more subject than other regions to import competition owing to the geographical arrangement of regional markets and

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[64]If price is driven below the unit operating costs of the firm's plant then the existing plant will have to be scrapped. The more outdated the firm's capital equipment the greater will be the necessary funds required for replacement. Even if the firm has the funds available for replacing its plant, it will have to decide whether the prices expected to be ruling in the future will cover its long run average costs. If price is driven below the unit operating plus capital costs of a best-practice plant in the industry, then all firms will be driven out of the industry in the long run. In this case, given the factor prices ruling in the market (and the exchange rate) the product of this industry would not enjoy a comparative advantage in trade.

the importance of transportation costs in the total costs of steel products. Firms which primarily serve such a regional market would feel the impact of foreign competition more heavily than other firms. Finally, import competition may be heavier in one line of steel products and firms specialized in this line will also feel the impact of import competition more strongly. These factors were especially important for the position of one of the four major steel firms during the 1950-1966 period.

If foreign competition does fall more heavily on certain firms relative to other domestic firms and drives them out of the industry, the remaining firms will have a larger domestic demand to supply if they are successful in significantly lowering their unit production costs and meeting the foreign competitive threat to their markets. The technological response will itself be made easier if there are economies of scale available to the remaining firms in the industry and they react by planning to expand the scale of their operations to serve the larger market resulting from the reduction in the numbers of firms in the industry. Stykolt and Eastman have stressed the importance of this possible effect of increased foreign competition in their arguments connecting tariff reductions and increased productivity for protected oligopolists.[65] Another possibility is that increased foreign competition will force domestic firms to specialize in a narrower range of products in order to gain economies of scale in the production of a specific product. The factors which would influence a firm in the direction of the rationaliza-

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[65]"Tariff reductions may also be useful instruments for increasing competition, for they force increases in the scale of such suboptimal firms as are able to face foreign competition and reduce overcrowding." S. Stykolt and H.C. Eastman, "A Model for the Study of Protected Oligopolies," op. cit., p. 347.

tion of its production processes are so varied that it is impossible to discuss them on a general level without regard to a specific industry.[66] Stykolt and Eastman simply stress the fact that the productivity of firms in an oligopoly situation can be raised without necessarily increasing the size of the market insofar as competitive pressures force domestic firms to reduce the range of products they are currently producing.[67] In the case of the Canadian steel industry, greater specialization as a result of increased foreign competition would appear to be unlikely given the technology of steel production.[68]

One further function of the model developed here is to clarify the meaning and definition of the terms "increased foreign competition" and "increased efficiency" as used above and in the following empirical study. It is clear that increased foreign competition will not necessarily take the form of an increase in the ratio of imports to domestic consumption or to sales by domestic firms. A fall in the landed price of

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[66]A good discussion of how tariff policy has affected specialization in the automobile industry is contained in R. J. Wonnacott's "Tariff Policy" in Canadian Economic Problems and Policies, edited by L.H. Officer and L.B. Smith (Toronto: McGraw-Hill Company of Canada Ltd., 1970), pp. 126-141. The objective of the Canadian-U.S. Auto Agreement was to allow for high volume specialization in a limited number of auto models by Canadian producers in an effort to bring down Canadian auto production costs.

[67]"The productivity of oligopolistic firms can be raised without increasing the size of the market, if competitive pressures can be brought to bear on their prices and costs. Such pressures may result in a reduction in the range of products supplied . . . ." S. Stykolt and H.C. Eastman, "A Model for the Study of Protected Oligopolies," op. cit., p. 346.

[68]See Chapter III, pp. 60-68 and Chapter VII, p. 188.

imports might also give rise to increased foreign competition by forcing domestic firms to lower prices (or refrain from raising them when they otherwise might) in order to prevent an erosion of their markets by imports. Competition is a "force" and it is impossible to measure it directly. Professor Machlup has pointed out that competition can be judged to have increased in terms of its effects, especially by its effects on the sales and profit variables of firms.[69] This approach can be extended to the measurement of foreign competition as well. If the ratio of steel imports to domestic steel consumption increases then foreign competition will be judged to have increased.[70] A rising inflow of imports will reduce both the sales and profits of the domestic steel firms for reasons discussed above. But even if no import erosion occurs, foreign competition may still have increased if a change in relative prices (the landed import price as compared with the domestic price) causes domestic firms to lower prices (or refrain from raising them when they otherwise would) in order to avoid a potential reduction in their shares of the domestic market. In this case domestic sales would not be adversely affected but the profits of the domestic steel firms would be impaired.[71] In the following empirical study both these possi-

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[69]See p. 19 above.

[70]Even if this ratio rises, it is possible that domestic firms may not experience an actual reduction in sales if domestic demand is increasing rapidly. But their share of the domestic market would still be declining over time and in light of the above discussion of the growth goals of firms, a competitive reaction to this sort of situation would still be expected.

[71]In general terms, foreign competition can be judged to have increased when an actual or potential increase in imports gives rise to an actual or potential reduction in the sales and/or profits of domestic firms.

bilities will have to be investigated in order to determine when foreign competition facing the domestic steel firms actually did increase during the 1950-1966 period.

Increased foreign competition can place domestic oligopolists in a position where they must become more efficient if they are to survive in the long run. Increased efficiency for oligopolists can result from an expansion in the scale of their output if this allows them to reap greater economies of scale and from the successful introduction of new techniques of production and technological innovations. Since the vehicle for introducing technological innovation and expanding capacity is the investment expenditures of firms, increased foreign competition should give rise to increasing investment expenditures in the industry. Other things being equal, these rising investment expenditures should result in an increase in the rate at which average labor productivity is rising, as new efficient capital equipment is added to the industry and older out-dated capital equipment is scrapped.[72] The efficiency of domestic oligopolies may be improved because increased foreign competition creates conditions which allow some firms to expand the scale of their output and, with existing technology, gain greater economies of scale. The efficiency of domestic oligopolies may also be improved because increased foreign competition forces domestic firms to increase the rate at which they are introducing technological innovations into their produc-

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[72]See the discussion of Professor Salter's model, pp. 32-36 above.

tion processes. In either case, increased foreign competition will have resulted in improved industrial efficiency. The latter case turns out to have been very important for the firms in the post-war primary steel industry in Canada.

In summary, the model developed here indicates that increased foreign competition facing a domestic oligopoly does give rise to pressures that can cause domestic firms to react in a way which will result in improved efficiency for the industry as a whole. The more insulated domestic firms have been from effective competition in the past, the greater the likelihood that their scope for improving their efficiency and lowering their costs will be significant. The main conclusion which this model suggests is that increased foreign competition will place downward pressure on domestic prices and costs and result in increased efficiency in the industry.[73] The following empirical study does not prove a cause and effect relationship between increased foreign competition and increased efficiency, but it does indicate that the behaviour of the domestic steel firms, when foreign competition increased, has been consistent with the expectations generated by the model. Therefore,

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[73] At the same time it is recognized that very severe foreign competition could drive the domestic price down below the minimum long run average costs of a firm producing with the latest technology. In this case firms would not be able to earn even normal profits and the result would be the disappearance of the domestic industry. Whether such a result is desirable, is beyond the scope of this thesis. Of course, to the extent that changes in foreign competition are resulting from changes in the domestic tariff, the degree of increase in foreign competition may be a policy variable.

the thesis does lend support to the hypothesis that increased foreign competition can give rise to increased efficiency — at least in the case of the post-war Canadian primary steel industry.

CHAPTER III

THE CANADIAN PRIMARY STEEL INDUSTRY

The Structure of the Primary Steel Industry in Canada

There are four large integrated producers of primary steel products in Canada which account for roughly 90 per cent of total production in the industry. They produce pig iron in blast furnaces, steel ingots in steel furnaces, and rolled steel products in rolling mills. An integrated producer produces pig iron as well as steel ingots and rolled steel products.[1] There are roughly 38 other small producers included in the official statistics for this industry.[2] Aside from the four major producers, six other domestic firms produce products which are competitive with those of the major firms to a very limited degree. They produce steel ingots in small electric furnaces and rolled steel products in rolling mills. The electric furnace uses steel scrap as its main input as opposed to the open-hearth steel furnaces of the large integrated steel firms which use pig iron and steel scrap in variable proportions.

[1]The major steel firms also own and operate, or have interests in, iron ore mines. Mining statistics are completely separated from the steel-making statistics for these firms, and are not discussed in this thesis. The vertical integration of these firms also extends in the other direction to include more highly fabricated products, such as wire, pipe, and tubes. Data including these operations are also excluded unless otherwise indicated.

[2]Dominion Bureau of Statistics, Iron and Steel Mills, 1966, annual, catalogue number 41-203. Aside from the four major firms there is one other small firm in the industry that is "integrated".

A few of the other small firms produce specialty steels, but the majority produce steel castings for special purposes. Most of the smaller firms producing primary steel products have relatively low overhead costs and are built close to the market they serve.[3] The geographical features of the Canadian economy and the high transportation costs involved in the shipment of steel, have assisted in the development and continued existence of these smaller firms, but they can compete only in a few specialty products.

All four of the large integrated steel firms are located in Eastern Canada, three in Ontario and one in Nova Scotia. The three Ontario producers serve the national domestic market, that is to a greater or less degree they sell their products from coast to coast. The Nova Scotia producer's main domestic markets are in the Maritimes, Ontario, and Quebec. It also ships a small amount of steel products to British Columbia by water. The largest firm is The Steel Company of Canada, Limited (Stelco), which has its main plant in Hamilton, Ontario. Stelco offers a fairly complete line of steel products with the exception of rails and some heavier structural steel and

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[3] A listing of the firms in the industry and their principal equipment and products is given in Primary Iron and Steel, Mineral Resources Division, Department of Energy, Mines and Resources (Ottawa: Queen's Printer). Of the six firms producing primary steel products other than the major producers, two are in Ontario, one in British Columbia (with a plant in Manitoba), one in Newfoundland, one in Nova Scotia, and one in Saskatchewan. The largest of these, the small integrated producer, had a steel ingot capacity of only 190 thousand tons in 1966 as compared with that of the smallest major firm which had a steel ingot capacity of 1.3 million tons.

also sells more highly fabricated steel products, e.g. pipe. The second largest firm is The Algoma Steel Corporation Limited, located in Sault-Ste-Marie, Ontario. Algoma offers a fairly complete line of primary steel products, but not quite so broad a line as Stelco. Dominion Foundries and Steel, Limited (Dofasco) is located in Hamilton and is specialized in flat-rolled steel products which today account for over 50 per cent of primary steel products produced in Canada. Finally, Dominion Steel and Coal Corporation, Limited (Dosco), the smallest of the four producers, was located in Sydney, Nova Scotia during the period under review. Dosco was also specialized, but in shaped rather than flat-rolled products. It was the only one of the four major firms that has been foreign controlled.[4]

The following table compares the structure of the industry in 1956 and 1966 in terms of the share of the major firms in the total steel-ingot capacity of the industry.

[4]The British group, Hawker-Siddeley, gained control of this firm in 1959. Dosco has been especially subject to foreign competitive pressures in the post-war period and in 1967 it announced it planned to close down its main steel-producing plant at Sydney in 1968. Foreign competition was cited as an important contributing factor in the formulation of this decision. The plant was subsequently purchased and is being operated by the Government of Nova Scotia. A little less than 25 per cent of Algoma's outstanding stock is owned by a West German firm (Mannesman International Corporation Ltd.) but this does not give that firm control of Algoma. One small steel firm producing highly specialized steel products (Atlas Steel) is U.S. owned. (Financial Post Corporation Service). The percentage of total assets (for firms with assets of over $100 million) in the steel industry in Canada that are foreign controlled is only 13 per cent which is very low compared with most other Canadian industries. On the other hand, concentration in this industry is high relative to other Canadian industries. See G. Rosenbluth, "The Relation between Foreign Control and Concentration in Canada," The Canadian Journal of Economics (February, 1970), pp. 24-28. See also J. Singer, Trade Liberalization and The Canadian Steel Industry (Toronto: University of Toronto Press, 1969), Pp. 8-9.

TABLE 3-1

INDUSTRY CAPACITY IN PRIMARY STEEL* - SHARES OF MAJOR CANADIAN FIRMS

	Steel Ingot* - tons (000's) and Percents 1956		1966	
	Annual Capacity	% of Total	Annual Capacity	% of Total
Stelco	2,350	43.0	4,378	37.2
Algoma	1,120	20.5	2,600	22.1
Dofasco	707	12.9	2,151	18.3
Dosco	783	14.3	1,256	10.7
Sub-Total	(4,960)	(90.7)	(10,385)	(88.2)
Other Firms	510	9.3	1,396	11.8
Total	5,470	100.0	11,780	100.0

*Steel ingot capacity as at December 31st in short-tons. Dominion Bureau of Statistics capacity estimates. Estimates are based on the assumption that equipment is working at normal efficiency, 24 hours per day, with allowance for shut-downs for necessary repairs and overhaul.

Source: D.B.S., Iron and Steel Mills, 1966 (Catalogue No. 41-203, annual, and prior to 1962, No. 41-001).

The degree of concentration in the industry is obviously quite high. It is higher in the Canadian primary steel industry than in counterpart steel industries in the United States, United Kingdom, and Common Market Countries. For example, the four largest primary steel producers in the United States account for 67 per cent of the output of the U.S. industry while in the United Kingdom nine

firms account for about 80 per cent of crude steel output.[5] Table 3-2 gives a good idea of the size and concentration of primary steel plants for a selection of countries in 1965. Although none of the Canadian firms is in the largest size category specified in the table, three of the major firms have plants in the upper middle range of plant sizes (above 2 million ingot tons annual capacity in 1965). But these three plants account for 77.7 per cent of total Canadian steel ingot capacity. In the United States 30 plants are in the over 2 million tons capacity range and they account for 68 per cent of total U.S. capacity. The ECSC countries had 13 plants in this range and Japan had 7. These plants accounted for 34 and 55 per cent respectively of the steel ingot capacity of these countries' steel industries. This indicates that at least three of the large Canadian firms have plants whose size is competitive with that of the main steel plants in other steel-producing countries. The comparative data in the table also indicate that, given the relative size of the Canadian market,[6] the high degree of concentra-

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[5]Gideon Rosenbluth, Concentration in Canadian Manufacturing Industries (New York: National Bureau of Economic Research, 1957). This study compares Canadian and U.S. data on industrial concentration. A recent study of the British steel industry discusses the situation there: C. Pratten and R.M. Dean, The Economies of Large Scale Production in British Industry (Cambridge: Cambridge University Press, 1965). Finally a good general discussion of concentration and steel pricing policies in North America, Britain, and the Common Market countries is found in a P.E.P. Study: Steel Pricing Policies (London: Political and Economic Planning, 1964).

[6]For example, apparent consumption of total steel rolling-mill products in 1965 in Canada was 8.4 million tons. The Algoma Steel Corporation, Ltd., Submission to the Royal Commission on Taxation, Statistical Supplement (August 1967), Table 10-1.

TABLE 3-2

SIZE AND CONCENTRATION OF

PRIMARY STEEL PLANTS IN SELECTED COUNTRIES, 1965

	Over 4	4 to 3	3 to 2	2 to 1	1 to .5	Below .5	Total
	(based on steel ingot capacity in millions of tons a year)						
A. Number of Plants							
Canada	-	1	2	-	1	12	16
U.S.A.	7	7	16	17	15	32	94
Britain	-	1	2	9	9	20	41
E.C.S.C.	1	1	11	16	31	46	106
Japan	2	3	2	7	4	31	49
Total	10	13	33	49	60	141	306
B. Share of National Capacity (%)							
Canada	-	35.5	42.2	-	9.8	12.5	100
U.S.A.	29.1	13.9	25.0	16.4	7.2	8.4	100
Britain	-	9.6	13.4	36.3	19.7	21.0	100
E.C.S.C.	4.8	3.2	26.4	21.3	21.2	23.1	100
Japan	21.4	22.9	10.7	23.8	6.5	14.7	100
Total (a)	16.8	12.2	22.8	20.4	12.6	15.2	100
C. Steel Ingot Production (millions of tons) (b)							
Canada	-	3.59	4.26	-	0.99	1.26	10.10
U.S.A.	38.27	18.28	32.88	21.57	9.47	11.05	131.52
Britain	-	2.90	4.05	10.96	5.95	6.34	30.20
E.C.S.C.	4.54	3.03	25.00	20.17	20.08	21.88	94.70
Japan	9.72	10.04	4.86	10.81	2.95	6.67	45.41
Total	52.53	38.20	71.05	63.51	39.44	47.20	311.93
Average Size in Group	5.25	3.22	2.15	1.30	0.66	0.33	1.02

Source: Robert E. Elver, Competition in the Canadian Primary Steel Industry, 1945-1966, Pennsylvania State University, Ph.D. Thesis, September 1967, p. 9.

tion is necessary if Canadian firms are to have scales of production consonant with those of the average-sized foreign firms.

An analysis of the degree of concentration in the Canadian primary steel market is further complicated by the existence of regional markets.[7] For example, Stelco and Dofasco have their main plants in Hamilton, and are best situated for serving the main regional market for primary steel which is in the industrial area of South-Eastern Ontario. Dosco's main plant in the Maritimes market gives it an advantage in that small market, but places it at a disadvantage in all the other regional markets. Stelco and Dofasco have an advantage vis-à-vis the other two producers in the Toronto and in the Montreal markets. Algoma's position gives it a slight advantage in the Western Canadian market except in British Columbia where all three of the Ontario major producers are on equal footing owing to the freight-rate arrangements in Canada. It should be pointed out that all of the major producers except Dofasco have small steel-making facilities at sites other than at their main plants — Stelco and Algoma in the Prairies, and Dosco in Quebec. In order to place this discussion more sharply in focus, the following table gives a picture of the relative size and importance of the regional markets in Canada. The importance of the Ontario market is clearly indicated.

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[7]The trade balance and foreign markets are discussed in Chapter IV. The Canadian industry has been developing an export sector over the 1950-1966 period. In the 1964-66 period imports as a per cent of sales by domestic producers averaged 22 per cent, while exports averaged 16 per cent. Over the period as a whole, the import ratio was declining while the export ratio was increasing (See Chapter 4).

TABLE 3-3

APPARENT REGIONAL CONSUMPTION OF

STEEL ROLLING MILL PRODUCTS

Region	Percent of Canadian Consumption* Average for 1961 - 1965
Atlantic	3.1
Quebec	21.2
Ontario	61.4
Prairies	8.9
British Columbia	5.4

*measured by net tons of steel consumed.

Source: The Algoma Steel Corporation, Limited, Statistical Supplement, Submission to the Royal Commission on Taxation (1966), August 1967, Table 13.1.

The fact that the primary steel industry produces a variety of products introduces a further complication. Concentration may also be greater than indicated by the overall figures if only one or two firms produce certain types of products. This question is discussed in the following section which describes the production process in steel-making and the types of products produced in the industry.

The Production Process in Steelmaking

The production process for the four major steel firms is complicated and highly capital intensive.[8] The first step consists of the

[8]A more elaborate description of the processes involved in steelmaking is found in "Process Analysis of the U.S. Iron and Steel Industry," by Tibor Fabian, in Studies in Process Analysis, edited by A.S. Manne and H.M. Markowitz (New York: John Wiley & Sons, Inc., 1963).

production of pig iron from iron ore. Coke, which is made from bituminous coal in coking ovens, is taken from the ovens and melted together with iron ore and limestone in the large blast furnaces of the plant. The result is molten pig iron which is poured into moulds to form shapes (called pigs). The pig iron is used, along with scrap steel, to make molten steel in the steel furnaces. In North America the open-hearth steel furnace has been the predominant type of steel furnace, although in the last ten years the oxygen vessel has been replacing the open-hearth furnace.[9]

In the open-hearth furnace, hot metal, cold pig iron, and steel scrap are fed into the baths of the open hearth. Limestone and high grade iron ore are added in order to remove carbon from the molten iron. Oxygen may also be added to the bath for purposes of decreasing cycle time and for carbon removal. Cycle times run from 8 to 16 hours and the capacity of the furnace for one cycle is usually between 100 and

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[9]The use of the oxygen vessel is discussed at great length in Chapter VI and in Appendix A-1. This process converts molten pig iron into steel in a pear shaped vessel by jetting oxygen vertically downward into the molten bath of pig iron. More pig iron and less scrap is used in this process than in the open-hearth process. Steel is made in small batches (50 tons of steel per cycle) but the cycle is much shorter, 30 cycles per 24 hours as compared with $2\frac{1}{2}$ for open hearth furnaces. The investment costs are much smaller and the quality of the steel is as good as open-hearth steel. Both these methods are contrasted with the electric steel furnace which basically just melts steel scrap and is only used to produce specialty steels in small amounts, or small amounts of steel ingots and castings. In Europe the Thomas converter (a basic Bessemer process) method of steelmaking is still in use, but not in North America. This is the oldest type of steel furnace and the steel is not of such a high quality as open-hearth steel. Its continued use in Europe is owing to the high phosphorous content of much of the European ore for which the process is especially suited.

250 tons of steel, though some of the newer furnaces in North America have capacities up to 500 tons per cycle. There is a great deal of variability in the proportions of pig iron and scrap which may be used. The molten steel from the furnace is then poured into ingot moulds. The steel ingot, which weighs several tons, is the basic output of the steel furnace, although a very small amount is poured directly into steel castings for final sale. The steel ingots are then processed further in rolling mills where their size and shapes are altered by rolling into two basic forms called blooms and slabs. The mill where the steel ingots are rolled is called the blooming or primary rolling mill.[10]

The steelmaking process, to the end of the blooming mill stage, is accomplished at one site in the four integrated Canadian firms. The following stages, carried out in finishing mills, are sometimes done at separate sites.[11] The blooms are rolled into billets, structural shapes, rails, and forgings and the billets are further rolled into bars and rods and skelp. These products (excepting skelp) are referred to as shaped

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[10]The continuous casting process, another recent innovation, consists of pouring steel directly from the steel furnace into moulds which form blooms, billets, and slabs, thus eliminating the blooming stage. This is also discussed at greater length in Chapter VI and Appendix A-1.

[11]The advantage of integrating these different stages of production at the same site is that the rolling of the different forms at different stages of the process can be undertaken before the forms have completely cooled. This avoids the necessity of reheating. Also gasses arising as a by-product at one stage can be used for heating in the following stage. For example, gasses formed in the blast furnace can be injected into the open-hearth furnace.

products as opposed to flat-rolled products which are rolled from the slabs. The rolling of the slabs results in different types of sheet and plate. The products may be further processed by cold reduction (the rolling of bars and flat-rolled products in a completely cooled state). Cold reduced flat-rolled products may be coated with tin to make tin-plate or with zinc to make galvanized sheet.

The specific products resulting from the above operations comprise the products of the primary steel industry. These products may be classified as follows: pig iron and semi-finished steel (ingots, blooms, billets, and slabs), only a small proportion of which is actually sold, the greater part being retained by the major firms for further processing; bars and rods (wire rods, concrete reinforcing bars, hot-rolled, cold rolled, and cold-drawn bars); flat-rolled products (hot and cold-rolled sheet and strip, skelp, and plate); structural shapes (beams, angles, tees, zees, etc.) and sheet piling; and rails and railway track material (rail joints including splice bars and fish plates, and tie bars).

Some of the four large firms also produce more highly fabricated products in competition with smaller steel fabricators not included in the industry. Examples are wire and wire products (drawn from steel rods) and pipe and tube (made from skelp). These products are included in the fabricated steel industry. Recently there has been a tendency for the large integrated firms to obtain interests in fabricated steel producers, resulting in "captive markets" for the output of the primary products of the integrated firms. For example, in 1964 Stelco

obtained control of Page-Hersey Tubes, Limited, the largest manufacturer of pipe in Canada. This assures Stelco of a large and fairly stable market for its output of skelp.

Since not all of the four major firms produce a complete line of the products listed above, the degree of concentration in the industry is even higher on a product-by-product basis. The fact that during the period under review here, Dosco was specialized in shaped and Dofasco in flat-rolled products means that at most only three of the major firms would be offering any one product. Flat-rolled products have been growing in importance and since 1959 have represented over 50 per cent of the total sales of primary steel products by domestic producers. Furthermore, only Stelco offers cold-rolled bars[12] and has only done so since 1962. Only Dosco and Algoma produce rails and only Algoma produces the heaviest structurals. Algoma also produces the widest hot-rolled sheet (up to 96 inches) and again has done so only in the 1960's. Among the major firms only Dofasco and Stelco produce tin plate and galvanized sheet and strip. Dosco mainly produced bars, rods, and rails during the 1950-1966 period, but in 1966 they began to produce flat-rolled products in Quebec. It is only since the beginning of the 1960's that Canadian firms were offering a complete line of primary steel products. Prior to that time many products were imported.

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[12] Although some of the smaller firms in the industry also offer cold-rolled bars.

The products of the primary steel industry are fairly standardized and leave little scope for any significant degree of product differentiation on the part of the four large integrated producers. But the firms can compete with regard to services accompanying the product such as delivery time and exactness of product specification. The relatively small size of the Canadian market for primary steel products, coupled with the economies of scale associated with steel production, make a high level of concentration in the Canadian industry inevitable.

Economies of Scale in Steelmaking

In his well known work on barriers to the entry of new firms into industries, Professor J.S. Bain studied the availability of economies of scale in a variety of U.S. industries, including the primary steel industry. His estimates, based on questionnaire data, indicated that a fully integrated steel mill in the United States should have an annual capacity of between 1 and 2.5 million ingot tons.[13] This would mean that between one and two and one half per cent of the industry's capacity would be contained in a plant of minimum efficient scale. At an annual capacity of 0.5 million ingot tons his estimates indicated that costs might be up as much as 5 per cent. He points out that the major firms in the United States, most of them being multi-plant firms, have the bulk of their steel capacity in plants above the 1 million ton line.[14]

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[13] Joe S. Bain, op. cit., p. 72.

[14] Ibid., p. 237.

A more recent study of economies of scale in the steel industry was done in the United Kingdom. The conclusion reached there, based on engineering studies as well as industry sampling, broadly reinforced but up-dated Bain's conclusion.

> We have been convinced by our study of the industry that, in general, economies over the range taken by Bain are now greater than this [i.e. greater than Bain's estimates given above], and that for some types of works economies of scale continue beyond $2\frac{1}{2}$ million tons. This increase in the optimum size of works has been caused by technological advances which have involved, inter alia, an increase in the size of units of plant.[15]

In the light of this, an estimate of minimum efficient scale placed at 2 million ingot tons annually would appear to be justified.

Looking at the Canadian situation, the three largest steelmakers have only recently reached the above 2 million ingot ton capacity level at their main steel plants.[16] In 1961 the ingot capacity of Stelco's steel furnaces was 3.1 million ton per year, while the next largest firm, Algoma, had an ingot ton capacity of only 1.6 million. However, by 1966 three of the four major firms had capacity levels at their main plants of over 2 million ingot tons per year. Stelco's capacity was 4.2 million ingot tons while Algoma and Dofasco had capacities of 2.6 and 2.1 million tons respectively. Dosco's capacity, at its Sydney plant,

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[15] C. Pratten and R.M. Dean, The Economies of Large Scale Production in British Industry, op. cit., p. 81. Parentheses were added to the quote.

[16] There do not appear to be any significant economies arising from multiplant operations in steelmaking. Bain found that economies of multi-plant operation in the U.S. were not significant, op. cit., p. 254. In Canada, the major firms each have only one main steel-ingot producing plant.

was only 1.1 million tons.[17] Total annual steel ingot capacity of all the steel firms in the primary steel industry at the end of 1966 was close to 12 million tons. Given the fact that Stelco accounts for close to 40 per cent of the total primary steel production in Canada, the total capacity of the steel industry in 1966 indicates that there would be little, if any, room for another major integrated producer in Canada today if the new firm was to produce at levels near those indicated above as representing minimum efficient scale. In 1965 total steel ingot and castings capacity in the Canadian industry was 11.8 million tons.[18] Thus it is only quite recently that three of the four major producers have reached levels of production consonant with estimates of minimum optimum scale.

The study of the tariff and competition in Canada by Professors Eastman and Stykolt contains a section on the primary steel industry.[19] Their conclusions regarding economies of scale are similar to those reached above: "Thus a plant achieving lowest costs and producing, on the one hand, bars, rails, and structurals for which blooms are the intermediate product and, on the other hand, plates, sheet and strip, for which slabs are necessary, must have two primary mills of smallest

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[17]Dominion Bureau of Statistics, Iron and Steel Mills, 1966 (Catalogue No. 41-203), and prior issues.

[18]Canada Mineral Resources Division. Department of Energy, Mines and Resources, Iron and Steel, No. 24 (June 1966).

[19]Eastman and Stykolt, op. cit., The Tariff and Competition in Canada, pp. 337-63.

efficient size of over one million ingot tons each, or a total capacity of at least 2 million tons a year."[20] They found that only Stelco was efficient when judged by the criterion of actual steel-making capacity relative to estimated minimum efficient capacity in 1956. The steel ingot capacity of the major firms in 1956 was given in Table 3-1. Professors Eastman and Stykolt surveyed the blast furnace, steel furnace and rolling mill operations of the Canadian industry. The conclusion they drew was that in 1956 the steel industry had no capacity of minimum efficient size.[21] Since 1956 the growth of the market in Canada for steel products and the growth of the steel firms, has altered this situation. Three of the four large integrated steel producers now have plants above the minimum-optimum-size scale of output. A more recent study of the Canadian industry comes to the conclusion that 3 of Canada's 4 main producers are now of an efficient size. "They are not too small to realize most potential returns to increasing scale. They are not too large to result in potential diseconomies of scale."[22]

The Pricing Policy of Canadian Primary Steel Firms

A clear understanding of the pricing policy of the steel oligopolists is vitally important to the study. Professor Machlup has indicated

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[20] Ibid., p. 350.

[21] Ibid., p. 62, Table 1.

[22] Robert E. Elver, Competition in the Canadian Primary Steel Industry, 1945-1966, Pennsylvania State University, Ph.D. Thesis, September 1967, p. 10.

that fewness of competitors in an industry is the most significant single factor in situations where oligopolies are likely to be insulated from internal competitive pressures. This is so not only because potential competition from new entry will be unlikely in this case, but also because the few firms are likely to have discovered that aggressive price competition geared to netting a firm a larger market share may do such firms more harm than good.[23] Given the high degree of concentration in the Canadian primary steel industry, it would actually be surprising to find that the four major firms had not found some sort of collusive solution to the problem of pricing their products.[24]

Although the mechanics of price setting in the Canadian primary steel industry are complicated, Stelco, the largest steel firm in the Canadian market, has been identified as the principal price leader.[25] A recent history of Stelco, which appears to reflect the actual policy thinking of this firm, has explicitly stated that Stelco's prices ". . . set the pattern for Canadian steel prices."[26] The important role of

[23]Machlup, "Theories of the Firm: Marginalist, Behavioural, Managerial," op. cit., p. 18.

[24]Aside from the high ratio of minimum optimum size of firm to size of the market for Canadian steel production the only other significant barrier to entry is the high capital cost of constructing an efficient plant. Eastman and Stykolt set this cost at $300 million for a plant producing either shaped or flat-rolled products. Ownership of resources is also a slight barrier to entry since some of the existing firms own or have interests in iron ore mines. But some major Canadian firms do purchase their iron ore requirements almost exclusively on the open market. Eastman and Stykolt, op. cit., The Tariff and Competition in Canada, pp. 354-58.

[25]Barnett, op. cit., p. 41.

[26]William Kilbourn, The Elements Combined : A History of the Steel Company of Canada (Toronto: Clarke, Irwin & Co. Ltd., 1960), p. 225. The writing of this history was suggested by Stelco and officials at Stelco cooperated with the author and retained the right to delete certain details regarding the company's operations (see the Preface, p. x).

Stelco in the price setting process for Canadian steel firms has also been explicitly recognized by the Canadian government.[27] One important point which is often stressed in this regard is that although most Canadian firms in most markets usually follow price changes made by Stelco, all Canadian steel firms are international price-takers.[28] The effect of international steel prices, especially U.S. steel prices, is discussed further below.

In order to present a clearer picture of the pricing system in the Canadian primary steel industry, a further discussion of the mechanics of steel pricing is required. In the post-war period Canadian steel prices have been quoted on an f.o.b. mill basis and each mill is a base for the products produced by the mill. Under a single or multiple basing — point system the number of basing points tends to be considerably smaller than the number of mills.[29] In this situation "phantom freight" can exist — a situation where the supplying mill will charge a customer a delivered price equal to the base price at the nearest base plus transportation costs from that base even though the

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[27]"The Government has already had some successful experience in restraining price increases. In September 1966, Stelco rescinded a proposed steel price increase after being publicly asked by Mr. Sharp to do so." The Financial Times (October 9, 1967).

[28]See Elver, op. cit., p. 115.

[29]The U.S. steel industry used a basing-point system until 1949 when it was banned because the Federal Trade Commission felt it encouraged identical pricing in any given area. Thereafter, U.S. firms also quoted prices f.o.b. works. Duncan Burn, The Steel Industry, 1939-1959 (Cambridge: University Press, 1961), pp. 478-79.

supplying mill is in fact closer to the customer than is the base. This cannot occur under the Canadian system, since all the mills are bases for the products produced at the mill. However, quoting a f.o.b. mill price does not necessarily avoid a system where identical prices are charged to consumers in any given market area.[30] In the Canadian system, firms tend to charge customers in a given market area identical prices by practising "freight absorption" when necessary — i.e. charging a delivered price below its mill price plus transportation to the market in question in situations where the mill of another firm is closer to that market. This tendency to absorb freight in order to charge a price identical to the prices of other firms in a given market preserves the essence of the basing-point pricing system.[31]

Eastman and Stykolt have characterized the Canadian system as a "modified" basing-point system because of the importance of the Hamilton base (the base closest to the main regional steel market in

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[30]For example, even under the f.o.b. system the U.S. Federal Trade Commission upholds the right of firms to discriminate in price in order to "meet competition" in a given area. Duncan Burn points out that it is difficult to distinguish between the discrimination which the identical delivered price under the old basing-point system implies and the discrimination which firms undertake to meet a competitor's price. Duncan Burn, op. cit., p. 505.

[31]Fritz Machlup points out that the essence of the basing-point pricing system lies in the fact that it is a technique of pricing which "... makes it possible for any number of sellers, no matter where they are located and without any communication with each other, to quote identical delivered prices for any quantity of the product in standardized qualities and specifications, ..." Fritz Machlup, The Basing-Point System (Philadelphia: The Blakiston Company, 1949), p. 7.

Canada).[32] "The base prices at the mill were usually the same but, effectively, it was the Hamilton base price that determined prices in Ontario."[33] The reason for the tendency toward identical prices in given market areas was that firms practised freight absorption in order to meet the delivered prices of firms closer to the market area in question. As Barnett points out: ". . . some of the other producers are further from the main market than Stelco and transportation costs being important, the latter producers may give special discounts on transport ('roll backs') to bring their delivered price in line with Stelco's. Thus although f.o.b. prices may be quoted, the domestic producers attempt to keep their delivered prices to a specific consuming area in line."[34] The Canadian primary steel pricing system described here is formally referred to as a "plenary basing-point system".[35]

Domestic steel firms also practised freight absorption vis-à-vis their western Canadian markets and absorbed increasing amounts of freight charges when competition from abroad was especially strong.[36] Since the major firms serve each other's natural market areas, cross-freighting does exist in the Canadian steel market although it is not possible to gauge how much. In the Prairie provinces primary steel

[32]Eastman and Stykolt, op. cit., The Tariff and Competition in Canada, p. 359.

[33]Ibid.

[34]D. Barnett, op. cit., p. 41.

[35]See Fritz Machlup, op. cit., The Basing-Point System, pp. 15-17.

[36]Eastman and Stykolt, op. cit., The Tariff and Competition in Canada, p. 359.

prices appear to reflect fairly accurately the Eastern mill prices plus freight from these mills (Hamilton and Sault Ste. Marie). But for the Hamilton mills to meet the going price in the Prairies they have to absorb freight since the Algoma mill is located further west than the Hamilton mills. Meeting competition in the Prairies would involve a great deal of freight absorption for Dosco and Dosco does not compete in this market. Delivered primary steel prices in British Columbia are much more variable and reflect the more competitive situation there owing to the heavy foreign competition to which this market is subject, especially from U.S. and Japanese steel firms. The Ontario mills absorb freight to B.C., but are apparently not willing to charge prices there that are lower than the mill prices at their Eastern mill.[37] When capacity utilization in the industry is high the Eastern mills are not so anxious to serve this market since the freight absorption involved reduces the profit margins on such sales.

Another very important factor in Canadian steel pricing decisions is the international price of steel products. This has already been referred to above in connection with the question of freight absorption in the western Canadian steel market. In fact, U.S. steel prices seem

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[37] It is not clear whether selling at different prices in different parts of Canada would be in contravention of the Combines Investigation Act. The Act forbids selling articles in Canada at prices lower than those exacted by the seller in other parts of Canada, but only if this has the effect of ". . . substantially lessening competition or eliminating a competitor . . . ." (Section 33 (A) of the Act). For this reason, steel firms in Canada have refrained from charging delivered steel prices in the West which were actually lower than their Eastern mill prices.

to have a very strong influence on Canadian steel prices. This relationship is discussed at length in Chapter IV where the behaviour of U.S. and Canadian steel prices during the 1950-1966 period is analyzed. The important influence of U.S. steel prices on Canadian steel prices during this period has been confirmed by an official of Stelco who pointed out that in his opinion ". . . the overriding influence on prices during this period (1957-64) was an effort on the part of leading Canadian producers to achieve price stability in order that our steel prices would fall below those of American mills."[38]

In the United States, as in Canada, the largest steel firm in the industry, U.S. Steel Corporation, acts as a price leader and this corporation based its pricing policy on a target-rate-of-return calculus during the 1950's.[39] Canadian steel firms follow a general policy of refraining from commenting on their internal pricing policies. The only revealing statement on this subject is found in Stelco's official history, written in 1960, which states: "During the postwar period, prices of the Company's products, which set the pattern for Canadian steel prices, were at last tied as specifically as possible to the cost of each item sold."[40] Such a statement is difficult to interpret, but

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[38]Correspondence between myself and Stelco, November 1968. It was pointed out that this objective was realized in 1961.

[39]This was discussed in Chapter II. An excellent discussion of U.S. steel pricing policies is contained in Gardiner C. Means' Pricing Power and the Public Interest: A Study Based on Steel (New York: Harper & Bros., 1962), especially pp. 30-33.

[40]Kilbourn, op. cit., p. 225.

it seems to mean the firm felt it had gained enough discretion over the price of its products that, given unit costs, it was able to insure the capturing of some pre-determined profit margin. However, as Eastman and Stykolt point out, the pricing policy of Canadian steel firms was very sensible insofar as it was successful in blocking the entry of new firms while still allowing for a favourable profit performance.[41] During the 1948-60 period the average rate of profit in the industry was 19.1 per cent as compared with an average 18.6 per cent for all manufacturing industries in Canada.[42] Their policy of relatively low prices "... made entry possible only at a large scale, and the small size of the market relative to the scale of efficient plants made the entry of new efficient firms unprofitable."[43] This analysis led Eastman and Stykolt to comment that the pricing policy of the steel oligopolies in Canada "... was typical of highly interdependent firms that sought to maximize profits in the long run because their equipment was durable."[44] It should be pointed out here that this assessment is reinforced by the above discussion of the effect of U.S. steel prices on Canadian pricing policy. The long-run concern of the domestic firms was not only with new entry but also with actual and potential import competition, and their pricing policy was apparently adjusted accordingly. This subject is taken up again in the following two chapters.

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[41] Eastman and Stykolt, op. cit., The Tariff and Competition in Canada, p. 362.

[42] Ibid., pp. 362 and 364.

[43] Ibid., p. 362.

[44] Ibid.

CHAPTER IV

INTERNATIONAL PRICE COMPETITIVENESS AND THE BALANCE OF TRADE IN THE CANADIAN PRIMARY STEEL INDUSTRY

The international trade data for the Canadian primary steel industry indicate that the overall international competitive position of Canadian primary steel products has improved over the 1950-1966 period. Steel imports have been declining and exports increasing as a per cent of the domestic industry's sales of primary steel.

TABLE 4-1

PRIMARY STEEL EXPORTS AND IMPORTS AS A PER CENT OF PRIMARY STEEL SALES BY CANADIAN FIRMS*

3-YEAR AVERAGES
(percents)

	Imports/Sales	Exports/Sales
1950-52	42.4	9.5
1957-59	28.9	12.3
1964-66	21.9	16.3

*Based on dollar data.
Source: Table A-10

However, the fact that steel imports have declined in importance in the domestic steel market during this period does not necessarily mean that foreign competitive pressures facing domestic steel firms have been weak. It is perfectly possible that foreign competition increased during

this period and forced domestic firms to reduce their prices and costs and become more competitive in order to avoid an erosion of their markets by imported steel.

For purposes of this study, increased foreign competition has been defined as any actual or potential increase in imports which gives rise to an actual or potential reduction in market shares and/or profits of domestic firms. The greater the unwillingness of domestic firms to lower prices when foreign competitive pressures increase, the greater the likelihood that domestic firms will experience an erosion of their markets by imports. A change in relative prices (foreign steel export prices relative to domestic steel prices) will improve the ability of foreign steel producers to supply the domestic market relative to Canadian producers, and is likely to give rise to such an actual or potential increase in imports.[1] The present chapter simply examines the behaviour of these relative prices and the resulting steel trade flows between the Canadian and foreign steel markets as a preliminary step in judging whether foreign competition facing domestic steel firms did increase during the 1950-66 period. It is only a preliminary step because changes in relative steel prices and steel trade flows may be understating the increase in foreign competition to the extent that domestic firms reacted to the

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[1]The most relevant comparison would be between domestic steel prices and the landed price of imports for primary steel products. However, data on foreign steel prices and transportation costs for steel products are not available in sufficient detail to calculate landed import prices with a very high degree of precision and consistency. Therefore, price comparisons are between domestic steel prices and foreign steel prices (usually foreign steel export prices) unless otherwise indicated.

foreign competitive pressures by following a more restrained pricing policy than they would have in the absence of the increase in foreign competition.[2] Before proceeding to examine the behaviour of Canadian steel prices relative to foreign steel prices the behaviour of the domestic tariff and exchange rate is examined separately in the following section because changes in these variables have significant effects on the competitive position of Canadian and foreign supplied steel products in the domestic market.

The Canadian Tariff and Exchange Rate

The height of the Canadian tariff is very important in determining how successful foreign-produced steel will be in competing with domestically produced steel in Canada. Canadian tariff rates are moderate when compared with the general Canadian tariff structure for manufactured products.[3] Rates on crude steel are very low (free to 5 per cent), while rates on more highly fabricated primary steel products are in the 5-10 or 5-15 per cent range.[4] The position of the Canadian tariff structure for primary steel is intermediate between the lower U.S. tariff structure and the higher tariff structure for the ECSC countries.

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[2]The question of to what extent increased foreign competition affected the behaviour of domestic prices and domestic profits is discussed in Chapter V.

[3]For a general discussion of the Canadian tariff structure see John H. Young, Canadian Commercial Policy, a study for the Royal Commission on Canada's Economic Prospects (Ottawa: November 1957); and J.R. Melvin and B.W. Wilkinson, Effective Protection in the Canadian Economy, Economic Council of Canada, Special Study No. 9 (Ottawa: Queen's Printer, 1968).

[4]See Table A-1.

Britain's steel tariffs are generally higher than those of the ECSC countries and Japan's are higher still.[5]

The Canadian tariff rates tend to be lower than U.S. rates (and rates of other countries) on less fabricated steel products. The Japanese and U.K. steel tariff rates tend to be high throughout the range of primary steel products, while the tariff rates of the ECSC countries also tend to be lower on less fabricated steel products. The U.K. receives preferential tariff treatment from Canada, the British Preferential portion of the Canadian steel tariff schedule being lower than the other schedules in Table 4-2. All the other countries listed are subject to the MFN schedule. The Canadian tariff on primary steel products is obviously not prohibitive as is evident from data on primary steel imports into Canada (see, for example, Table 4-4).[6]

In 1957 the Canadian Tariff Board reported on the tariff situation in the industry and recommended that the tariff schedule for primary steel be made more consistent and that many of the end-use provisions in the schedule (provisions allowing for steel for certain specified uses in Canada to enter either duty-free or at lower levels than generally

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[5]See Table 4-2. Comparisons of tariff structures for steel, based on import weights, are not too satisfactory because they give prohibitive tariffs a zero weight, etc., but existing studies of this sort do reinforce the above statements. See, for example, American Iron and Steel Institute, Steel and the GATT Tariff Negotiations (New York: AISI, 1964), p. 6.

[6]Even when effective tariffs are computed for Canadian industries, the average level of protection in the steel industry is moderate relative to other Canadian industries. The nominal tariff on Canadian primary steel products averaged 6.7% as compared with an effective tariff rate of 8.6%. See J.R. Melvin and B.W. Wilkinson, op. cit., p. 24.

TABLE 4-2

TARIFF RATES* ON SELECTED PRIMARY IRON AND STEEL PRODUCTS

(Per cent)

Product	Benelux	West Germany	France	Italy	U.K.	Japan	U.S.	Canada	
								B.P.	M.F.N.
Pig Iron	5	5	5	5	10	10	-	3	5
Ingots	7	7	7	7	10	12.5	8.5 - 10.5	free	4
Semis	8	8	8	8	10	12.5	8.5 - 10.5	free	5
Wire Rod	10	8-10	10	10	10	15	2.5 - 6.3	free	3
Bars and Rods	9	8-9	9	9	10	15	7 - 10.5	5	10
Shapes and Sections	9	9	9	9	10	15	2	5	10
Plates	5	9	9	9	10	15	8	5	10
Sheet (h.r.)	5-6	9-10	9-10	9-10	10	15	8	5	10
Sheet (c.r.)	9-10	9-10	9-10	9-10	10	15	10	5	15
Tinplate	6	10	10	10	10	15	8	10	15
Strip (h.r.)	10	10	10	10	10	15	6 - 9.5	5	10
Strip (c.r.)	10	10	10	10	10	15	6 - 9.5	5	15
Rails	10	10	10	10	10	15	1	5	10

h.r. = hot rolled; c.r. = cold rolled.

Note: *Rates listed are those applying prior to the Kennedy Round agreements of 1967 and after the raising of the ECSC tariffs on primary steel in 1964.

Source: Organization for Economic Co-operation and Development (unpublished study paper on steel), and the Canadian Tariff Schedule.

applied) be eliminated.[7] The Board saw no reason to significantly alter existing steel tariff rate levels despite the fact that a submission to the Board from a group of the larger steel firms was requesting increased tariff protection.[8] The net effect of the steel tariff revisions which did come into effect in mid-1958 was to very slightly raise the general level of tariff rates for primary steel. As pointed out in a recent study: "The 1958 tariff revision was the only major change in the 1945-1966 period. The increase in protection was moderate . . . . Also, the increase was not by design but rather the net result of the revision process."[9]

Changes in the Canadian exchange rate have been a more important factor influencing the price competitiveness of Canadian steel in the domestic market than has been the one moderate change in the Canadian primary steel tariff. Between October 1950 and May 1962 Canada had a floating exchange rate.[10] The most significant changes in the Canadian exchange rate occurred between 1950 and 1952 when the rate appreciated by almost 10 per cent and between 1960 and 1962 when it depreciated by 10 per cent.[11] Over the longer 1959-1963 period the depreciation is even more marked, amounting to slightly over 12 per

[7]Canada. Tariff Board Report. Basic Iron and Steel (Ottawa, 1957), p. 93.

[8]Ibid., p. 4.

[9]Elver, op. cit., p. 40.

[10]A good analytic history of Canada's experience with a floating exchange rate is contained in L. B. Yeager's International Monetary Relations (New York: Harper and Row, 1966), Chapter 24, pp. 423-40.

[11]See Table A-2.

cent. During the rest of the 1950-1966 period the rate remained fairly stable, although it did appreciate on balance during the 1956-1959 period. In 1962 the exchange rate was fixed, its official par value being set at 92.5¢ U.S. = $1.00 Canadian. Given this background on the Canadian tariff and exchange rate, the following sections analyse the behaviour of Canadian steel product prices relative to foreign prices and the effects of these movements on steel trade flows. This is done separately for the United States and then for Canada's other main competitors.

Steel Prices and the Trade Balance in Primary Steel Products Between Canada and the United States

The competitive position of Canadian primary steel products in the domestic market has improved very markedly relative to U.S. steel products during the 1950-1966 period. The position of U.S. steel products is especially important because the United States is Canada's main source for imported steel and is also her main export market. One reason for this is the propinquity of the Canadian and U.S. markets for primary steel products.[12] Therefore, U.S. steel prices would be expected to have an especially strong influence on Canadian steel prices. Prior to the mid-1950's, Canadian steel firms kept their prices slightly

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[12]Another reason may be that Canadian branch plants tend to purchase their steel requirements from the same steel suppliers as their U.S. parents, although there is no empirical evidence available on this question. This possibility is discussed by A.E. Safarian, Foreign Ownership of Canadian Industry (Toronto: McGraw-Hill Co. of Canada, 1966), especially Chapter V, "The Imports of Subsidiary Companies," pp. 147-67.

below the landed price of U.S. steel imports in Canada, but this practice was discontinued around 1956.[13] Since that time, Canadian prices have fallen below that limit price, and since 1961 Canadian steel base prices have actually fallen considerably below U.S. base prices for primary steel products, when both sets of prices are expressed in Canadian dollars.[14]

The close relationship between U.S. and Canadian prices for primary steel products can be illustrated by comparing the behaviour of the U.S. and Canadian price indexes for primary steel products.[15] During the 1950-1958 period Canadian steel prices moved in the same direction as U.S. steel prices (upward) in every year except 1953-54. However, during this period Canadian steel prices were rising at a slower annual average rate than were U.S. steel prices (roughly 5 per cent for Canada as compared with 7.5 per cent for U.S. steel prices). Steel prices in both countries abruptly ceased their upward trend and levelled off in the second half of the 1950-1966 period — Canadian steel prices in 1958 and U.S. steel prices in 1959. Thereafter, prices in both countries were held virtually stable until 1965 and 1966 when they rose slightly, this time at a slightly faster rate in Canada than in the United States. These price movements reinforce the discussion in Chapter III which claimed that Canadian steel prices are strongly influenced

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[13]Canada. Tariff Board Report, op. cit., p. 93.

[14]See Table A-4.

[15]See Table A-3.

by U.S. steel prices and that Canadian firms were attempting to bring their steel prices down below U.S. steel prices after the middle of the 1950's.

The price competitiveness of Canadian steel products relative to U.S. steel products improved fairly consistently during the 1950-1966 period. In the early 1960's this improvement was reinforced by the depreciation of the Canadian dollar between 1959 and 1962. The following table presents the Canadian base prices for a representative selection of primary steel products as a per cent of the U.S. base prices for those same products.[16] Since all prices were expressed in Canadian dollars, the comparison takes into account the effect of the depreciating Canadian exchange rate. The improving trend in the price competitiveness of Canadian steel products is interrupted in 1965-66, but even so, Canadian steel prices were still considerably below U.S. steel prices in 1966.

Taking into account the Canadian tariff and the slight geographical protection of the Canadian market, Canadian steel prices began falling below the landed price of U.S. steel imports in the mid-1950's.[17] This conclusion is supported by some calculations in a recent study by Jacques Singer.[18] He found that for five primary steel product groups ". . .

[16]Table 4-3.

[17]It should be pointed out, however, that it was not until the early 1960's that Canadian steel firms were able to produce a full line of primary steel products, so these relative price movements do not rule out the possibility of continued steel imports from the United States after the mid-1950's.

[18]Jacques Singer, Trade Liberalization and the Canadian Steel Industry, Private Planning Association of Canada (Toronto: University of Toronto Press, 1969).

TABLE 4-3

CANADIAN BASE PRICES OF PRIMARY STEEL PRODUCTS AS A PER CENT OF U.S. BASE PRICES*

Year	(Per cents)
1954	113.0
1955	109.1
1956	106.0
1957	107.7
1958	106.0
1959	103.3
1960	101.3
1961	97.6
1962	92.5
1963	91.6
1964	88.1
1965	88.8
1966	91.1

*Price comparisons were made in Canadian dollars for Januarys. Canadian base = Hamilton, U.S. base = Pittsburg.

Source: Table A-4.

Canadian base prices were between 4 and 19 per cent above U.S. base prices in January, 1955; by comparison, they were in a range between 6 and 13 per cent lower in January, 1968.[19] At the same time, Singer points out that the Canadian tariff raises the price of U.S. steel imports in Canada by a further 10 to 15 per cent for most highly fabricated steel products. Thus the tariff alone would bring Canadian steel prices below the landed import price of many U.S. steel products after the middle of the 1950's.

Furthermore, U.S. producers also have a slight transportation disadvantage in most regions of the Canadian market. Both the Singer and the Eastman and Stykolt studies comment on the transportation advantage of the eastern Canadian mills over the relevant U.S. mills.[20] Singer concludes that the eastern mills have a distinct freight advantage in serving the major domestic Canadian market in the east with the single exception of southwestern Ontario where the Detroit steel mills have a slight advantage over the Hamilton and Sault Ste. Marie mills.[21] In the far western Canadian market the western steel mills in the United States (Utah and California) do have a very slight freight cost advantage in Vancouver, but it is not large because of special freight rate arrange-

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[19] Ibid., p. 35.

[20] Singer, op. cit., pp. 36-44; and Eastman and Stykolt, op. cit., The Tariff and Competition in Canada, pp. 343-45.

[21] Singer estimates that the advantage of the Hamilton mills over the nearest U.S. mills in serving the Toronto steel market amounts to about 5% of the Canadian base price for most steel products. Op. cit., p. 37.

ments offered by the Canadian railways for shipping steel to the west coast in Canada. In any event, it is now clear that U.S. steel producers lost their laid-down price advantage in the Canadian market after the mid-1950's and that since that time the price competitiveness of Canadian steel products has improved almost continuously.

Given the significant improvement in the price competitiveness of Canadian primary steel relative to U.S. steel in the Canadian market, it is likely that the importance of U.S. steel imports into Canada would decline during the 1950-1966 period. In fact, U.S. steel imports as a per cent of total steel imports in Canada fell from around 80 to 85 per cent in the early 1950's to 50 per cent or less in the mid-1960's.[22] This occurred at a time when total steel imports into Canada as a per cent of domestic steel consumption were also declining.[23] Furthermore, as the export sales of domestic steel firms were rising during the 1950-1966 period, an increasing proportion of these exports were going to the U.S. market.[24] Therefore, the improving price competitiveness of Canadian primary steel products in the 1950-1966 period was accompanied by a decrease in U.S. steel imports into Canada and an increase in Canadian steel exports to the U.S. steel market. The following section examines the competitive position of Canadian steel products vis-à-vis the steel products of Canada's main offshore steel competitors.

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[22]See Table 4-5. Import data are being measured in dollar values.

[23]See Table 4-7.

[24]See Table 4-6.

Steel Prices and the Balance of Trade Between Canada and Offshore Steel-Producing Countries

Canada's main offshore steel competition in the 1950-1966 period has come from the ECSC countries,[25] Japan and the United Kingdom. Since reliable information of ocean freight rates is not available, the behaviour of laid-down prices for steel from these countries in the Canadian market is difficult to assess. Furthermore, export prices in the ECSC countries and Japan tend to fluctuate around their home prices, rising above home prices when domestic demand is strong relative to supply and falling below home prices in the opposite situation.[26] Nevertheless, sufficient price data is available to isolate the trend of offshore steel export prices relative to Canadian steel prices during the period under review.

The National Bureau of Economic Research has recently sponsored some studies analysing the price competitiveness of U.S. steel products relative to foreign steel products.[27] The purpose of these studies was to

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[25] References to the European Coal and Steel Community (ECSC) countries and the European Economic Community (Common Market) countries refer to the same group of countries, namely: France, West Germany, Italy, Netherlands, and Belgium-Luxembourg.

[26] Numerous examples of this can be found in the annual reports on the steel industry by the Organization for Economic Cooperation and Development. For example, see The Iron and Steel Industry in 1965 and Trends in 1966 (Paris: OECD, 1966), "Statistical Annex." The fact that the export prices are below the home prices of these countries does not necessarily imply dumping (see pp. 96-7 above).

[27] I.B. Kravis, R.E. Lipsey, and P.J. Bourque, Measuring International Price Competitiveness, N.B.E.R. Occ. Paper 94 (New York: Columbia University Press, 1965); and I.B. Kravis and R.E. Lipsey, "New Measures of Price Competitiveness, 1953-64," in Toward Improved Social and Economic Measurement, Annual Report of the National Bureau of Economic Research (New York: N.B.E.R., 1968), pp. 21-28.

construct indexes of price competitiveness that would best explain the flow of trade in conjunction with other relevant variables.[28] The index of price competitiveness which was developed in these studies for the steel sector consisted of the steel product prices of the U.K., ECSC countries, and Japan, expressed as a per cent of domestic U.S. steel prices.[29] The study concludes that the price competitiveness of U.S. steel products declined significantly during the 1953-64 period and accounts for the erosion of the domestic U.S. market by steel imports which occurred during this period.[30]

The Canadian-U.S. index of price competitiveness (Table 4-3) has been added to the original NBER index and exhibits the Canadian base prices for primary steel as a per cent of U.S. base prices. Canadian firms do not report separate export prices as they normally charge their base price plus transportation and tariff allowances for the foreign market in question. U.S. firms do report export prices but these are normally f.o.b. Atlantic port and consist of packaging costs, transportation costs to the port, and loading costs, so that in fact their export prices are simply port-delivered base prices.[31] Although the

[28]Kravis, Lipsey, and Bourque, op. cit., p. 18.

[29]See Table A-5. The prices collected for the study were f.a.s. port of export, and exclude tariff and transportation charges because of the difficulty of estimating international freight charges.

[30]Kravis and Lipsey, op. cit., p. 23.

[31]Singer, op. cit., p. 102. Singer points out that there is a consistent spread between the port delivered prices and the base prices of U.S. firms so no price flexibility is allowed for by the separate quotations for export prices — unlike in the ECSC countries and Japan.

Canadian-U.S. index added to the NBER table does not have the same commodity weights as the other indexes, it does give a good indication of Canada's relative international position since it accurately reflects the relative position of Canadian and U.S. steel prices.

In order to relate movements in foreign export prices more directly to movements in Canadian steel prices, the Canadian index was set equal to 100 and the other indexes adjusted accordingly in the following table. A decline in the index for other countries indicates foreign steel export prices are falling relative to Canadian steel prices and thus the competitiveness of this country's steel is improving relative to Canadian steel.

TABLE 4-4

PRICE LEVEL INDEXES FOR PRIMARY STEEL PRODUCTS

INDEXES OF PRICE COMPETITIVENESS

CANADA FOR EACH YEAR = 100*

(per cents of Canadian steel prices)

	1957	1961	1962	1963	1964
Canada	100	100	100	100	100
U.S.	93	102	108	109	114
U.K.	81	82	85	84	92
ECSC	83	80	82	80	91
Japan	na	81	77	78	82

*The indexes represent foreign steel prices as a per cent of Canadian steel prices and take into account changes in exchange rates.

Source: Table A-5.

Price comparisons between Canada and her main offshore steel competitors is not of much interest prior to 1957 because until that time these countries were still in the process of post-war reconstruction and steel was in short supply on their domestic markets. However, around 1957-58 the situation changed and conditions of excess steel capacity developed in Europe and on the free-world steel market.[32] The indexes of price competitiveness in Table 4-4 indicate a decline in the price competitiveness of U.S. and U.K. steel during the 1957-64 period. However, the price competitiveness of ECSC and Japanese steel improved relative to Canadian steel through to 1963 although their price competitiveness deteriorated in 1964. The improvement in the price competitiveness of ECSC and Japanese steel between 1957 and 1963 occurred despite the fact that the Canadian exchange rate depreciated sharply in the 1960-62 period. However, 1964 is a poor terminal year for such comparisons since the export prices of the ECSC countries and Japan rose sharply at the end of 1964, but resumed their downward trend again in the middle of 1965 — so the improved price competitiveness of Canadian steel in 1964 was in fact short-lived.[33]

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[32]The reports of the OECD have expressed concern about these excess capacity conditions which developed in 1958 and continued into the 1960's. The gap between world production capacity and world crude steel production became apparent in 1958 and 1959 and was especially serious in the 1961-63 period. After closing somewhat in 1964 it increased again in 1965. OECD, The Iron and Steel Industry in 1964 and Trends in 1965 (Paris: OECD, 1965), p. 68.

[33]Unfortunately, the NBER indexes cannot be up-dated because they were not based on published steel price data, but were collected especially for the studies.

The behaviour of the export prices of offshore steel producers, being very volatile, should be examined more closely in the post 1956 period. The behaviour of U.K. steel prices has been more consistent with that of North American steel price experience.[34] But steel prices in the U.K. have had a consistent upward trend in the 1960's and hence the price competitiveness of U.K. steel relative to Canadian steel products has tended to deteriorate fairly consistently.[35]

In sharp contrast to U.K. and U.S. steel products, the price competitiveness of ECSC and Japanese steel products has tended to improve relative to Canadian steel products during the 1957-1966 period. The export prices of the continental European steel producers show a clear downward trend over the 1957-1966 period as a whole. This can be clearly seen in the following chart. This same downward trend is also evident in the export prices of the ECSC producers alone.[36]

[34]Singer points out that U.K. export prices tend to be slightly below home prices but that both quotations tend to be rigid and show little indication of price flexibility. Singer, op. cit., p. 102.

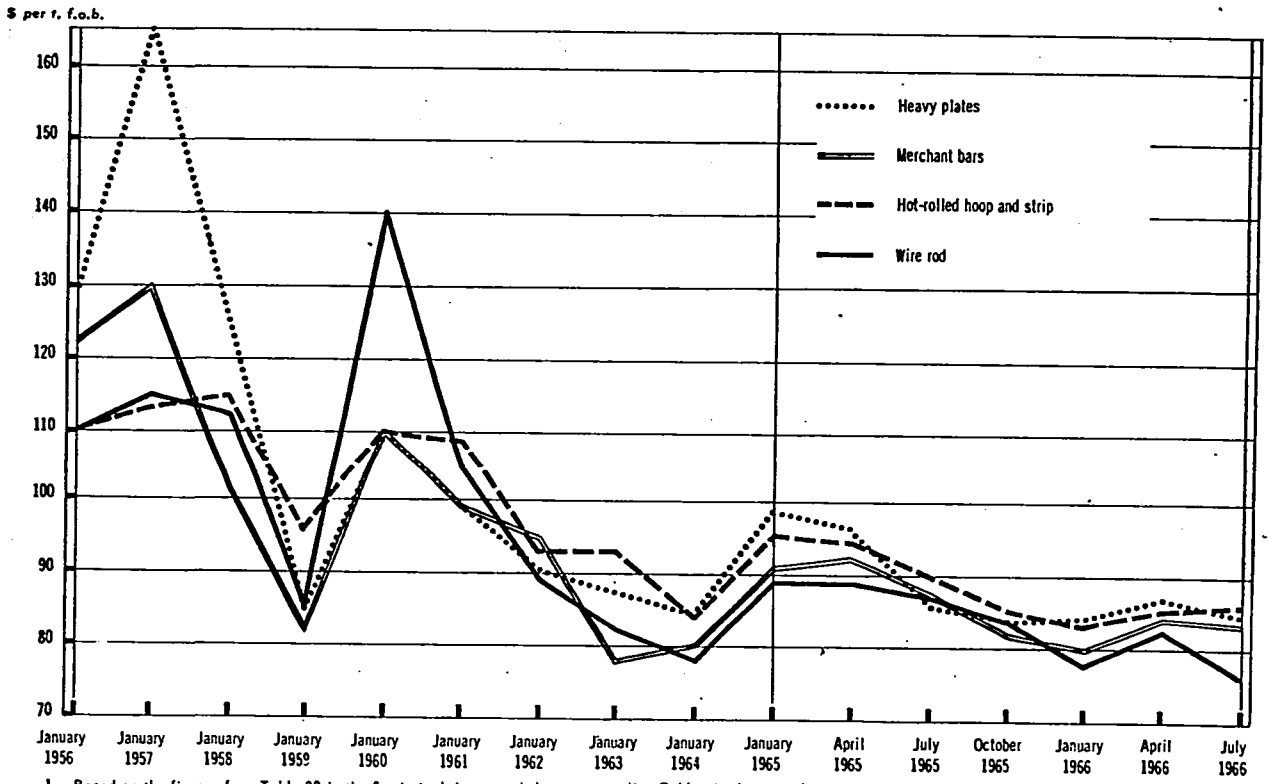
[35]See Table A-9. The upward trend of U.K. steel prices in the 1960's is in contrast with the stable Canadian steel prices in the 1960's. Furthermore, the depreciation of the Canadian exchange rate in the early 1960's contributed to the deterioration of U.K. price competitiveness relative to Canadian steel products (see Table 4-4).

[36]See Tables A-6 and A-7. All the export prices are expressed in terms of U.S. dollars and thus take into account changes in the exchange rates of these countries. Since 1950 the Netherlands and West Germany appreciated their currencies by 5 per cent in 1961 and the French franc was depreciated by about 40 per cent between 1956 and 1958. The British pound was depreciated by 17 per cent in 1967. International Financial Statistics, International Monetary Fund, January 1968.

CHART 4-2

Figure 7[1]

CONTINENTAL PRODUCERS' EXPORT PRICES FOR CERTAIN IRON AND STEEL PRODUCTS*



1. Based on the figures from Table 39 in the Statistical Annex and the corresponding Tables in the preceding reports.

*Continental producers refer to the Continental European members of the OECD and include, therefore, the ECSC countries.

Source: Organization for Economic Cooperation and Development, Iron and Steel 1965 and Trends in 1966 (Paris: OECD, 1967).

Although the downward trend in these export prices was interrupted briefly in 1964, it was resumed again in 1965 and 1966 at a time when Canadian prices were beginning to rise again after seven years of virtual stability. The downward trend in the export prices of these countries was strong enough to offset the effect of the depreciating Canadian exchange rate in improving the price competitiveness of Canadian steel.[37] The price competitiveness of Japanese steel relative to Canadian steel followed a very similar pattern to that of the price competitiveness of ECSC steel, improving very markedly during the 1960's.[38]

Whether the post 1957 decline in Japanese and ECSC export prices relative to Canadian steel prices will give rise to an increase in imports from these countries into Canada depends on whether these price movements have brought the landed price of imported steel from these countries down to the level of domestic steel prices. Singer points out that because data on ocean freight rates actually paid by foreign steel exporters cannot be obtained, only estimates can be made of the laid down prices of offshore steel in the Canadian and U.S. markets. For ECSC steel destined for the North American market Singer estimates that the tariff would add between $8 and $9 (U.S.) per metric ton to ECSC export prices in recent years and that transportation costs to the North American market from either Europe or Japan would add a further $15 to $20 U.S. per metric ton if formal published rates are

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[37] See Table 4-4.

[38] See Table 4-4 and compare Table A-8 (Japanese export prices) with Table A-3 (Canadian steel base prices).

used or (more realistically) $5 to $20 per metric ton if tramp or charter rates are used.[39] This would require a total spread (to cover the tariff and transportation cost) of between $15 and $25 (U.S.) per metric ton of steel between ECSC export prices and North American base prices before ECSC steel could be price competitive in the North American market.[40]

On the basis of these estimates, Singer's study concludes that the relative price movements studied above "theoretically" explained the rising penetration of European steel into the U.S. market but that "In the Canadian-ECSC comparisons the possibility is less clear-cut, though on the basis of figures for January, 1966 the $35 per-ton differential [between ECSC export prices and Canadian prices] is theoretically large enough."[41] For Japanese products the same situation holds but price-competitive Japanese steel exports into the Vancouver market are judged to have been clearly possible. On the basis of these estimates Singer concludes:

> Since we have not developed a full weighting scheme summarizing all trade in rolling mill products for the Canadian data, our observations for Canada rest on facts developed on a product-by-product basis. The figures for the selected products shown . . . support the view that the sharp declines of recent years in ECSC and Japanese export prices have widened the difference between offshore export prices and Canadian prices suffici-

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[39] Singer, op. cit., p. 101.

[40] Ibid.

[41] Ibid.

> ently to theoretically permit flows of ECSC steel to Eastern Canadian markets and Japanese steel into Vancouver.[42]

The conclusion that price competitive steel imports to Canada from the ECSC and Japanese steel industries in the 1960's is likely to have been a serious threat is further reinforced when the possibility is considered that these foreign competitors may absorb freight in exporting to North America. In fact, these offshore competitors did absorb freight in delivering steel to the North American markets.[43] The further possibility that offshore steel suppliers were in fact dumping steel in the Canadian and U.S. markets in the 1960's is also considered by Singer. Strictly speaking, "dumping" refers to sales in a foreign market at delivered prices which are less than the price in the home market.[44] Therefore, freight absorption in international sales does not itself imply dumping nor does quoting an export price which is lower than the home price. Officials of some of the large steel firms have

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[42] Ibid., p. 105.

[43] For example, in the early 1960's European steel exporters argued that although in some cases they were charging prices in the North American market that were below their home prices for steel (dumping), they had to do this in order to meet Japanese steel prices in the U.S. market. It was established in the case of wire rods that the Japanese were charging the same price in their home market as in the North American market and could not be convicted of dumping though they were obviously absorbing all freight charges. See W. Adams and J.B. Dirlam, "Steel Imports and Vertical Oligopoly Power," The American Economic Review (September, 1964), pp. 648-49.

[44] An arithmetic dumping violation occurs when the f.o.b. price in the exporter's home market is higher than his export price minus transportation costs, customs duties, etc.

indicated in private, though not in public, that the increase in offshore steel imports to Canada in the 1960's did represent actual dumping in many cases.[45] Singer points out that in "a rare published statement", one steel official in the United States said that much of the imported steel in the U.S. market was being sold for less than it was sold at home.[46] Singer concludes that the sharp declines in ECSC and Japanese export prices have increased the possibilities for dumping in the North American steel market and have placed the Canadian market within the reach of price competitive imports.[47]

On the basis of the above analysis of the improving price competitiveness of ECSC and Japanese steel, an increase in imports from these countries would be expected. By 1962 the ECSC countries were supplying 20 per cent of total Canadian steel imports as compared with only 6 per cent in 1955, and by 1965 their share had risen to 30 per

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[45]Elver's study of steel base prices did make some estimates of laid down import prices from the ECSC countries, but lack of refined data made it impossible to establish dumping precisely. "With refined data on actual transaction, dumping as defined may or may not be established, and the extent would be a few dollars either way. When discriminatory ocean freight rates, tax rebates on exports, and other commercial differentials are considered, it may be concluded that an element of dumping exists." Elver, op. cit., p. 85.

[46]Singer, op. cit., p. 107. Furthermore, the PEP study points out that the ECSC countries themselves avoided taking anti-dumping measures in the 1960's when steel prices began to fall sharply in their own markets because ". . . in the event of any general recourse to anti-dumping measures they themselves would be the chief losers." Political and Economic Planning, op. cit., p. 346.

[47]Singer, op. cit., pp. 106-107.

cent although it fell back again to 24 per cent in 1966.[48] Japan's share of total Canadian steel imports was only 3 per cent in 1962, but by 1966 it had risen to 10 per cent. The U.K.'s share of Canadian steel imports declined during the 1960's — to 7 per cent in 1966, while the United States' share of Canadian steel imports declined from 85 per cent in 1955 to 48 per cent in 1965 and 52 per cent in 1966. As the price competitiveness of ECSC and Japanese steel improved, their share of the primary steel import market in Canada increased sharply in the 1960's, obviously at the expense of the United States and to a lesser extent the United Kingdom. Furthermore, the proportion of steel exports from Canada going to the United States rose sharply while the proportion going to the ECSC countries declined in the 1960's.[49]

The final question which needs to be examined here is what effect these relative price movements and steel trade flows have had on the overall trade balance for Canadian primary steel products. The steel trade balance data for Canada show primary steel trade deficits over the 1950-1961 period, but in 1962-63 the steel trade balance moved into surplus.[50] After 1963 the trade balance moved back into deficit, but the deficits were smaller than in the 1950's. Two indicators of the primary steel trade balance for Canada have been computed in

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[48]Table 4-5.

[49]Table 4-6. Canadian steel exports to Japan have always been negligible.

[50]Table A-10. Export and import data for primary steel are measured in dollar values.

TABLE 4-5

SOURCES OF CANADIAN IMPORTS OF PRIMARY STEEL PRODUCTS: IMPORTS BY COUNTRY AS PER CENTS OF TOTAL STEEL IMPORTS
(per cents)

	United States	United Kingdom	Common Market	Japan	Scandinavia
1950					
Pig Iron & Semis	80.4	6.7	12.6	*	*
Bars & Rods	79.0	14.0	6.0	*	*
Flat-Rolled Products	80.0	14.6	2.2	*	3.2
Structural Steel	81.0	9.7	9.2	*	*
Rails & Track Material	15.5	59.2	2.5	*	*
Total	78.6	14.6	5.2	*	2.2
1955					
Pig Iron & Semis	90.9	5.4	*	*	*
Bars & Rods	83.8	8.7	6.6	*	*
Flat-Rolled Products	89.2	6.6	1.6	1.6	*
Structural Steel	79.0	2.6	15.5	2.5	*
Rails & Track Material	26.1	47.0	3.5	*	*
Total	84.6	6.4	6.2	1.6	0.6
1957					
Pig Iron & Semis	97.3	1.1	*	*	*
Bars & Rods	76.4	12.5	10.0	*	*
Flat-Rolled Products	80.6	6.5	2.6	*	*
Structural Steel	65.3	6.3	26.7	*	*
Rails & Track Material	17.4	46.8	3.9	*	*
Total	73.4	7.8	12.0	0.9	0.3
1962					
Pig Iron & Semis	63.4	6.8	0.7	*	20.1
Bars & Rods	22.2	9.3	55.6	6.2	1.8
Flat-Rolled Products	81.7	8.7	2.9	2.6	2.0
Structural Steel	60.1	12.4	25.1	0.8	*
Rails & Track Material	62.6	20.9	16.5	*	*
Total	62.7	9.8	20.1	2.9	1.9
1965					
Pig Iron & Semis	47.3	1.5	17.6	*	9.5
Bars & Rods	22.3	6.1	60.0	5.9	1.3
Flat-Rolled Products	59.2	10.8	14.9	10.5	3.0
Structural Steel	45.4	9.9	36.8	7.3	*
Rails & Track Material	75.0	1.5	22.0	*	*
Total	47.9	9.3	29.8	8.5	2.1
1966					
Pig Iron & Semis	45.6	1.9	21.9	*	10.2
Bars & Rods	23.8	8.2	41.5	9.3	3.2
Flat-Rolled Products	66.7	4.8	18.5	10.5	2.9
Structural Steel	40.1	11.1	37.4	8.7	0.5
Rails & Track Material	67.5	1.2	17.6	9.9	*
Total	51.6	6.7	23.9	9.6	2.7

Source: Dominion Bureau of Statistics. Trade of Canada, Imports by Commodities (monthly) No. 65-007, December, 1966 and prior issues.

TABLE 4-6

EXPORTS OF PRIMARY STEEL TO A SELECTION OF COUNTRIES AS A PER CENT OF TOTAL CANADIAN STEEL EXPORTS

Products	1950	United States	U.K.	E.C.S.C.	South America*
Pig Iron & Semis	1	45.3	-	-	0.1
Bars & Rods	2	39.2	2.6	23.4	9.4
Flat-Rolled Products	3	51.0	-	7.3	0.4
Structural Steel	4	20.7	3.4	8.2	-
Rails & Track Material	5	66.8	-	-	-
	Total	43.8	0.3	3.1	1.0
	1955				
Pig Iron & Semis	1	72.1	18.6	7.6	0.3
Bars & Rods	2	10.1	32.6	12.9	11.3
Flat-Rolled Products	3	49.1	20.0	7.4	1.3
Structural Steel	4	37.7	0.4	-	41.3
Rails & Track Material	5	0.2	-	-	59.0
	Total	50.9	16.7	6.7	11.7
	1960				
Pig Iron & Semis	1	42.3	33.0	20.4	2.3
Bars & Rods	2	32.5	16.9	1.8	3.2
Flat-Rolled Products	3	35.7	12.7	9.0	14.3
Structural Steel	4	84.5	-	-	3.3
Rails & Track Material	5	4.4	-	-	69.0
	Total	37.3	20.7	12.3	10.6
	1966				
Pig Iron & Semis	1	89.0	2.9	2.4	-
Bars & Rods	2	68.1	5.3	4.6	4.4
Flat-Rolled Products	3	57.3	6.0	2.5	25.1
Structural Steel	4	72.6	0.6	6.9	7.1
Rails & Track Material	5	13.5	-	-	86.4
	Total	67.3	4.2	2.7	17.5

*Including Caribbean countries and Mexico.

Source: Dominion Bureau of Statistics, Trade of Canada, Exports by Commodities, (monthly), No. 65-004, December 1966 and prior issues.

Table 4-7. One indicator is the primary steel trade balance (exports - imports) as a per cent of the sales of primary steel by domestic firms.[51] This ratio registered an improving trend for the competitiveness of Canadian primary steel during the 1953-63 period, but thereafter, in the 1963-66 period, the ratio registered a deterioration in the competitiveness of Canadian steel products. In this same table, the ratio of steel imports to domestic consumption of steel shows a fairly consistent tendency to decline during the 1953-1960 period, but after 1960 the ratio levelled off and then rose to higher levels again in the 1964-66 period.

The main conclusions which can be drawn from the above analysis of relative steel price movements at steel trade flows are the following. During the 1950's the competitive position of Canadian primary steel products improved fairly consistently, primarily because the price competitiveness of U. S. steel products was declining during this period as well as into the 1960's. However, after 1957 the foreign export prices of ECSC and Japanese steel producers began to decline relative to domestic steel prices and by the beginning of the 1960's these price trends were resulting in the entry of ECSC and Japanese steel imports into the Canadian market. After 1960 the ratio of the steel trade balance to

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[51]It is common practice to use trade ratios as measures of the international competitiveness of a product. For example, Bela Balassa claims that ". . . since the commodity pattern of trade will reflect relative costs as well as the influence of non-price factors such as good will, quality, and availability of repair facilities, etc., the revealed comparative advantage of countries can be indicated by the trade performance in respect to individual industries." Trade Liberalization Among Industrial Countries (Toronto: McGraw-Hill, 1967), p. 86.

TABLE 4-

CANADA

EXPORTS MINUS IMPORTS AS A

BY DOMESTIC FIRMS - PRIMA

(Per cent

	1950	1951	1952	1953	1954	1955	1956	1957
Pig Iron & Semis	27.6	3.7	15.4	43.1	44.6	51.7	30.5	51.0
Bars & Rods	-9.3	-18.8	-9.1	-11.2	-9.1	-8.0	-11.0	-7.0
Flat-Rolled Products	-65.1	-76.1	-52.7	-44.3	-34.9	-32.3	-43.9	-39.9
Structural Steel	-120.1	-163.6	-146.1	-98.4	-161.1	-139.6	-216.4	-188.4
Rails & Track Material	-5.1	-5.3	-5.2	-5.1	-6.8	25.9	9.6	12.7
Total	-25.1	-43.4	-28.5	-22.4	-24.1	-16.6	-33.3	-25.6

Source: Table A-10.

TABLE 4-7

CANADA

)RTS AS A PER CENT OF SALES

- PRIMARY STEEL PRODUCTS

(Per cents)

)	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
)	51.0	39.3	34.7	44.8	48.8	41.0	51.1	59.3	41.2	37.6
)	-7.0	-16.3	-5.7	-0.3	-4.8	-9.0	-6.4	-11.3	-18.7	-9.7
)	-39.9	-29.7	-5.9	-2.6	-4.7	-2.6	-4.0	-8.9	-12.8	-6.5
1	-188.4	-125.0	-144.2	-182.7	-88.9	-43.2	-37.9	-61.9	-81.9	-49.8
3	12.7	29.2	-3.9	15.0	24.8	34.7	35.4	49.2	29.8	23.5
3	-25.6	-18.4	-7.7	-1.5	-0.5	1.2	1.9	-2.8	-10.4	-2.8

(Cont'd)

TABLE 4

CAN

PRIMARY STEEL IMPORTS A

CONSUMPTION* OF PRI

(Per c

	1950	1951	1952	1953	1954	1955	1956	195
Pig Iron & Semis	7.2	14.5	17.4	11.7	9.3	6.4	7.1	10.
Bars & Rods	11.9	22.0	19.2	14.6	10.6	10.9	14.0	11.
Flat-rolled Products	41.5	44.9	36.5	35.4	27.4	27.7	32.8	31.
Structural Steel	55.8	63.3	62.1	51.8	62.0	59.2	70.5	67.
Rails & Track Material	8.0	5.0	5.4	5.3	6.6	11.0	12.1	12.
Total	28.3	32.5	30.8	28.4	25.3	25.2	31.3	30.

*Domestic Consumption is defined as Sales by Domestic Producers p

Source: Table A-10.

3LE 4-7 (Cont'd)

CANADA

RTS AS A PER CENT OF DOMESTIC

' PRIMARY STEEL PRODUCTS

Per cents)

1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
10.2	8.6	6.3	7.7	3.1	3.7	4.6	6.9	6.6	6.9
11.1	16.5	10.1	9.2	11.3	13.1	11.9	15.6	21.0	14.9
31.8	25.2	15.8	17.8	13.7	16.3	16.1	20.0	22.8	17.8
67.2	61.3	62.5	67.1	49.4	33.7	33.3	41.2	47.7	39.7
12.0	7.2	13.6	6.5	5.1	3.5	5.3	7.3	6.6	6.1
30.7	24.9	18.7	15.8	15.8	15.8	15.6	20.3	23.6	18.0

:ers plus Imports minus Exports.

primary steel sales by domestic firms continued to show improvement until 1964 because the rising steel imports from competitive offshore steel suppliers were being offset by rising Canadian exports to the U.S. steel market. However, after 1960 the ability of Canadian steel firms to continue to replace imports with domestically produced steel came to an end, and after 1963 the ratio of steel imports to domestic steel consumption began to rise. Therefore, by 1960 competition from offshore steel suppliers had helped to bring to an end the ability of Canadian steel firms collectively to continue to gain a larger share of the domestic steel market, and in the 1964-66 period competition from these offshore steel suppliers was resulting in a loss of position in the domestic market for Canadian steel firms. The high ratio of capacity utilization in the domestic steel industry, especially in the 1963-65 period also contributed to this effect, as discussed in the next chapter. In any event, it appears that foreign competition facing domestic steel firms had increased by 1960 and that these foreign competitive pressures increased still further during the 1960-1966 period. Before concluding this chapter two more areas need to be investigated — first, the possibility that foreign competition fell more heavily on certain steel product categories and second, that foreign competition fell more heavily on certain regions of the domestic market.

Foreign Competition for Canadian Primary Steel on a Product and Regional Basis

Sales of flat rolled steel products by domestic steel firms have become increasingly important over the 1950-1966 period and by the

mid-1960's represented over 50 per cent of total sales by domestic firms.[52] This reflects the strong demand for such products in Canada and the improved ability of domestic firms to produce a full range of flat-rolled products. At the same time, the relative importance of crude steel sales has been declining for domestic firms. The importance of steel bars and rods for domestic firms declined only slightly accounting for about 24 per cent of sales in 1966. Changes in the relative importance of steel exports for Canadian firms has generally reflected these movements in total sales. Exports of flat-rolled products as a proportion of total exports rose sharply while crude steel exports declined sharply in relative importance.[53] Exports of bars and rods remained around 10 per cent of total exports during the entire period while structural steel exports have always been negligible. The important import items in the 1950-66 period have been flat-rolled steel, structural steel, and bars and rods.[54]

The most significant changes in the structure of Canadian steel product exports and imports has been the shift toward ECSC and Japanese imports of bars and rods and flat-rolled steel (at the expense of U.S. imports) and the increased exports of flat-rolled steel products to the United States.[55] Although imports from the United States still represent

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[52]See Table A-12.

[53]Ibid.

[54]Ibid.

[55]See Tables 4-5 and 4-6.

product categories for which Canadian producers cannot produce a full line (e.g. heavy structurals and highly finished flat-rolled products such as alloy and stainless steel plate and stainless steel sheet), this does not appear to be the case with many ECSC and Japanese imports in the bars and rods category and in the flat-rolled steel category.[56] For example, West Germany has been exporting large amounts of the more standard carbon steel sheet and plate to Canada in the 1960's.

Another important consideration regarding import competition is the question of to what extent import competition in recent years has had a regional impact. This is a strong possibility in the primary steel industry where transportation costs are such an important element in the total cost of steel products. In the Canadian market import competition appears to have fallen especially heavily on the eastern and western extremes of the Canadian market. This can be seen in Table 4-8.

British Columbia, on the western extreme of the Canadian market, as would be expected, has taken the highest proportion of its steel consumption in the form of imports (38 per cent during the 1961-66 period).[57]

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[56]Singer apparently agrees with this in general. "However, recent years' import patterns, examined on a product-by-product basis, signal the beginning of a new trend. Heretofore, Canadian steel imports reflected largely shortages in capacity or gaps in the Canadian steel product structure; . . . . By contrast, some of the imports appearing in recent years were directly in competition with domestic production sources." J. Singer, op. cit., p. 15.

[57]Most of these imports have been from offshore steel producers (especially Japan), not from the U.S. during this period. See Singer, op. cit., p. 44.

TABLE 4-8

CANADIAN REGIONAL IMPORTS OF ROLLING MILL PRODUCTS AS A PER CENT OF APPARENT REGIONAL CONSUMPTION,* 1961-66 AVERAGE

(Per cents)

	Semi-Finished Shapes	Heavy Structurals	Rails & Track Material	Bars	Wire Rod	Flat H-R Products	Flat C-R Products	Total Rolling Mill Products
Atlantic Region	-	47.5	3.8	14.7	1.8	14.7	2.8	18.2
Quebec	12.7	47.8	3.6	34.1	31.6	20.8	6.1	26.6
Ontario	3.2	3.9	5.1	14.5	9.4	14.1	6.1	12.8
Prairies	-	27.0	0.3	7.8	5.2	13.4	3.7	8.7
British Columbia	-	59.8	8.8	28.6	90.2	39.4	20.4	38.2
All Regions	3.4	42.9	3.6	19.2	19.8	16.8	6.3	16.9

*Based on tonnage figures.

Source: The Algoma Steel Corporation, Limited, op. cit., Table 18.

Transportation costs for the eastern mills are high and the market is very exposed to offshore steel competition, especially from Japan in the 1960's. Quebec also imported a large proportion of the steel it consumed in the 1960's (26.6 per cent). These high ratios of imports to regional consumption in the 1960's compare with 18.2 per cent for the Atlantic provinces, 12.8 per cent for Ontario, and 8.7 per cent for the Prairies. Since the opening of the St. Lawrence Seaway in 1959 Quebec has been more exposed to foreign competition than formerly. Although U.S. steel firms are closer to the Ontario market than to Quebec, Quebec is more exposed to competition from offshore steel suppliers and Quebec has no large integrated steel-making facilities. On a product basis, shaped steel products (heavy structurals and bars and rods) have been important import items in Quebec, the Atlantic Provinces and British Columbia and flat-rolled steel imports have been important in Quebec and British Columbia. In the Ontario market flat-rolled steel products were the most important import items, but even in this category the market seems well protected. The insulation of the Ontario market from heavy imports in the 1960's indicates that the Ontario mills were capable of producing a fairly complete line of steel products for that market.[58]

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[58]The Ontario mills do, however, still face the problem that the Canadian market is not large enough to allow these firms to produce long enough runs of some highly fabricated steel products with very exact product specifications at costs which are competitive with costs in larger mills abroad. They may be able to produce and sell such highly specialized products in the Ontario market at competitive prices but not in the other less geographically protected regions of their domestic market.

This background on the regional impact of import competition has had serious consequences for one firm — The Dominion Steel and Coal Corporation. The three largest steel firms more or less serve a national market and are all located in Ontario. Dosco, the smallest of the big four, primarily served the Atlantic and Quebec markets and only acted as a residual supplier to other markets at times when domestic supply was short.[59] Dosco's natural market area is the Atlantic region, but demand in this area is not sufficient to support even one fully integrated efficient producer.[60] Even in serving its Quebec market Dosco has a freight disadvantage vis-à-vis the Hamilton mills.[61]

This situation is especially disadvantageous for Dosco since Quebec, and to a lesser degree the Atlantic region, have been subject to a greater degree of import competition than has been the central Canadian market in Ontario. Furthermore, Dosco is specialized in shaped steel products and import competition in Dosco's main regional markets has been especially heavy in these product lines. Dosco has also been an exporter of rails traditionally, but heavy world competition in the steel rails category

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[59]Voluntary Planning Board of the Province of Nova Scotia, Sydney Steelmaking Study (Halifax: Queen's Printer, February, 1968), p. 14. This is true of all Dosco's products except rails.

[60]For example, apparent consumption of steel rolling mill products in the Atlantic region averaged only 194,000 tons per year in 1961-66. Algoma Steel Corporation, op. cit., Table 13-2.

[61]Voluntary Planning Board, Province of Nova Scotia, op. cit., p. 8. It is also pointed out in this study that in Canada it is estimated that 70 per cent of steel sales from the two Hamilton steel mills are sold within a 200 mile radius of Hamilton but only 10 per cent or less of the Sydney mill's sales are within a 200 mile radius of Sydney.

in recent years has made this an unreliable export market.[62] Therefore, it appears that foreign competition has fallen especially heavily on this firm in the post-war period owing to its geographical location and the location of its main regional markets as well as to its particular product mix.[63] Because of these factors, it is likely that the effect of foreign competition on the behaviour of Dosco will be significantly different than for the other Canadian steel oligopolies. This hypothesis is analysed in the following chapter.

Summary and Conclusions

Movements in relative steel prices (foreign steel prices relative to domestic steel prices) have apparently had a significant influence on steel trade flows between Canada and foreign markets in the post-war period. The above analysis of the behaviour of these relative prices and trade flows indicates that foreign competition increased in the second half of the 1950-1966 period, and was especially strong in the 1960's. The increase in foreign competition was the net result of the following

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[62]Large international sales of steel rails have tended to be to the smaller less-developed countries in recent years where railway systems were still being expanded. Hence many of these sales tend to be once-and-for-all deals and competition for these contracts on the world market has been very keen — the contract going to the lowest bid for the many firms bidding.

[63]Speaking of recent import competition in the Canadian steel industry, the study initiated by the Voluntary Planning Board of Nova Scotia commented: The effect of this import competition has borne much more heavily on Dosco than on the other steel producers because the imports are concentrated upon products and in regions where Dosco seeks its main volume of business. Op. cit., p. 17.

trends. U.S. steel prices rose relative to Canadian steel prices during most of the period under review here and steel imports from the United States declined. Taken in isolation, this factor tended to lessen the foreign competitive pressures facing domestic steel firms. However, in 1958 the steel export prices of offshore steel producers (ECSC countries and Japan) began to decline in absolute terms and relative to Canadian steel prices, and these countries began to gain an increasing share of Canadian steel imports in the 1960's. This factor tended to increase the competitive pressures facing domestic steel firms. These divergent trends no doubt contributed to the fact that after 1960 domestic steel firms were no longer able to continue replacing imports with domestically produced steel. By 1966 the continuing decline in offshore steel export prices relative to Canadian steel prices had contributed to the decline in the share of the domestic steel firms in the Canadian steel market which occurred during the 1964-1966 period.

The above movements in relative prices and import shares did not result in an overall erosion of the domestic steel market by imports, although the ratio of steel imports to domestic consumption did rise slightly in the 1964-66 period relative to the early 1960's. Several factors prevented a significant rise in the import to consumption ratio for primary steel products in the 1960's. The increasing competitive pressures from offshore steel suppliers were being traded off in the Canadian market against the declining competitiveness of U.S. steel products with the result that increasing offshore steel imports were to

a large extent replacing U.S. steel imports into Canada in the 1960's. The depreciation of the Canadian exchange rate in the early 1960's also helped to insulate the Canadian market from an increase in steel imports. Finally, the very rapid growth of domestic consumption of primary steel discussed in the following chapter, helped to prevent the rising offshore steel imports from causing a significant increase in the steel import to consumption ratio in Canada. In any event, it is obvious that import competition during the 1950-1966 period will not have given rise to a reduction in domestic steel production.

However, the changes in relative steel prices and steel trade flows analysed above, may well be understating the increase in foreign competition actually experienced by domestic steel firms during this period. This is because domestic steel prices would probably have been higher in the absence of the foreign competitive pressures discussed here. In other words, domestic firms may have reacted to a potential increase in imports by lowering their domestic prices or refusing to raise them in order to prevent a reduction in their share of the domestic market. To the extent domestic firms reacted in this way they may maintain their market shares but suffer a reduction in their profits.[64] It is argued in the following chapter that the price paid by domestic firms for the avoid-

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[64]Of course, if increased foreign competition does cause domestic firms to lower their prices this does not necessarily imply a reduction in domestic profits if firms can succeed in lowering their costs at the same time. This is discussed in Chapter VI concerned with the longer-run effects of increased foreign competition on the domestic steel oligopolists.

ance of a serious import erosion of their domestic markets in the 1960's was the long period of domestic price stability between 1958 and 1965. The following chapter attempts to investigate this question by analysing the effects the foreign competitive pressures discussed above had on the domestic steel oligopolists, especially in terms of their pricing behaviour and their profit positions.

CHAPTER V

FOREIGN COMPETITION AND THE BEHAVIOUR OF THE MAJOR CANADIAN PRIMARY STEEL FIRMS: 1950-1966

Increased foreign competition will affect the sales and/or prices charged by domestic steel firms. If competitive pressures facing steel firms intensify, the profits of the firms are likely to fall, at least in the short-run.[1] The analysis in Chapter IV has indicated that steel imports into Canada have not been great enough to cause a reduction in steel sales by domestic firms. This chapter attempts to judge whether increased foreign competition from offshore steel suppliers has had significant effects on the behaviour of domestic steel prices. There is a very marked difference in the behaviour of Canadian steel prices between the first and second halves of the 1950-1966 period. It is argued here that in fact the long period of virtual price stability for Canadian primary steel products after 1958 is best explained by the developments in the international steel market discussed in the preceding chapter.

The Behaviour of Canadian Primary Steel-Product Prices, 1950-1966

This section simply sets out the actual behaviour of primary steel product prices in Canada during the 1950-1966 period, while the following

[1] Of course, if firms react to potential competition and are able to lower their unit production costs significantly, it might be possible for these firms to avoid any reduction in their profits, though their profits would have been higher with the new technology and without the increased foreign competition.

two sections analyse the domestic demand and supply situation in the industry in order to ascertain whether demand and supply factors can provide a reasonable explanation of the behaviour of domestic steel prices. During the first half of the 1950-1966 period Canadian steel prices rose in every year except 1954 and steel prices were rising much more sharply than were other prices in Canada.[2] For example, the annual average price increase for primary steel products was 5.0 per cent between 1950 and 1958 as compared with 1.0 per cent for the general wholesale price index.[3] However, beginning in 1958 there was an abrupt change in the behaviour of domestic steel prices. After 1958, steel prices were virtually stable and actually declined very slightly between 1958 and 1964 although this was more than offset by a rise in steel prices in 1965 and 1966. Between 1958 and 1966 the annual average rate of increase for primary steel prices was only 0.3 per cent as compared with 1.7 per cent for the general wholesale price index and almost 2.0 per cent for the consumer price index.

During the 1950-58 period domestic steel prices fell in only one year — 1954. The industrial production index for primary steel was

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[2]See Table 5-1. The indexes for Canadian steel prices used in this thesis are based on price data collected by the Dominion Bureau of Statistics directly from Canadian firms. They are much more realistic than data based on the published list prices for Canadian steel firms which are only very occasionally altered. The price indexes reveal a much higher degree of flexibility than the published prices.

[3]Table 5-1.

TABLE 5-1

SELECTED PRICE INDEXES — CANADA

	Rolled Iron and Steel Products	Wholesale Price Indexes		Consumer Prices Index
		General	Raw and Partly Manufactured	
	1956 = 100	1935-39 = 100	1935-39 = 100	1949 = 100
		(per cents)		
1950	76.7	211.2	212.8	102.9
1951	86.4	240.2	237.9	113.7
1952	91.7	226.0	218.7	116.5
1953	94.1	220.7	207.0	115.5
1954	92.6	217.0	204.8	116.2
1955	94.0	218.9	209.7	116.4
1956	100.0	225.6	215.8	118.1
1957	106.4	227.4	209.4	121.9
1958	107.4	227.8	209.3	125.1
1959	107.2	230.6	210.9	126.5
1960	107.6	230.9	209.6	128.0
1961	107.0	233.3	212.6	129.2
1962	106.6	240.0	223.8	130.7
1963	106.4	244.6	226.9	133.0
1964	106.1	245.4	225.7	135.4
1965	108.8	250.4	231.2	138.7
1966	110.2	259.6	242.7	143.9
Per cent Changes				
1950-58	38.7	7.7	-1.6	18.5
1958-66	2.6	14.0	16.0	15.0

Source: Dominion Bureau of Statistics, Prices and Price Indexes Section.

also down sharply in that year.[4] In the post 1958 period steel prices fell very slightly in 1959 and during the 1961-64 period, although the industrial production index for primary steel products declined only once during this period — in 1960. The failure of Canadian and U.S. steel prices to decline very sharply at any time during the post-war period is often contrasted with the very volatile behaviour of continental European steel prices.[5] A recent study has attributed this difference to the fact that the North American steel industries are much more highly concentrated than their continental European counterparts.[6]

Table 5-2 exhibits the primary steel price indexes on a product group basis for the 1956-1966 period in Canada. These sub-indexes show a strong tendency to move in the same direction at the same time.[7] The large increases in steel prices between 1956 and 1957 is reflected in all the sub-indexes for primary steel products. The same is true of the smaller price increases which occurred in 1965. Although there are a few exceptions to the general rule that the sub-indexes move together, it is evident that steel firms make their pricing decisions for all their

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[4]See Table A-13, Appendix II.

[5]No data on home prices of continental European steel firms has been presented, but the more volatile behaviour of these prices is shown in J. Singer's study and in the OECD reports cited above. See, for example, J. Singer, op. cit., pp. 92-100.

[6]Political and Economic Planning, op. cit., pp. 361-62.

[7]Table 5-2. The exception to this is the index for the steel ingots and castings group which continued to rise. Imports to Canada in this category have always been negligible.

TABLE 5-2

CANADIAN PRIMARY IRON AND STEEL PRICE INDEXES 1956-1966

Index 1956 = 100

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Steel Ingots and Castings	100.0	108.6	108.9	115.7	119.6	121.1	120.0	119.8	120.3	122.2	122.4
Sheet Cold Rolled	100.0	110.8	113.8	113.5	113.5	113.4	113.4	113.1	109.8	111.5	113.0
Sheet Hot Rolled	100.0	108.4	106.4	102.3	100.7	110.5	100.6	100.4	97.9	99.9	101.9
Structural Steel Shapes - H.R. Light	100.0	106.9	109.0	109.0	109.0	109.0	109.0	109.0	109.0	111.4	111.6
Structural Steel Shapes - H.R. Heavy	100.0	107.1	109.4	110.3	110.3	110.3	110.3	110.3	110.3	115.0	116.5
Bars - Hot Rolled	100.0	106.1	107.6	107.6	106.5	104.4	102.6	102.6	103.2	105.2	106.4
Bars - Cold Rolled	100.0	108.4	109.0	108.0	108.0	108.5	108.7	108.7	108.7	111.3	111.7
Rails	100.0	104.6	107.6	109.1	108.2	108.2	108.2	108.2	108.2	111.5	113.1
Railway Track Material	100.0	108.4	110.4	110.4	110.4	110.4	110.4	110.4	110.4	113.8	114.8

Source: Dominion Bureau of Statistics, Prices and Price Indexes Division.

products together in most cases.[8]

Canadian Primary Steel Production and Capacity Utilization in the Primary Steel Industry

Production of primary steel in Canada increased very sharply during the 1950-1966 period. Between 1950 and 1958 the index of industrial production for the primary steel industry rose at a rate which was roughly in line with the rate of increase in the general index of industrial production and the index of the durable manufacturing section of Canadian industry.[9] However, in the second half of the 1950-1966 period steel production increased at a much faster rate than in the first half of the period. During the 1958-1966 period real output was expanding much faster in the primary iron and steel industry than in Canadian manufacturing industry in general. The steel production index increased by 167 per cent between 1958 and 1966 as compared with 78 per cent for the general index of industrial production.

The high overall growth rate in the industry reflects the strong post-war demand for primary steel products in Canada and, to a lesser degree, import replacement effected by the domestic industry. The growth

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[8]This supports the view that steel firms have certain key product prices and will not alter their other product prices unless these key prices are altered. Adams and Dirlam attribute this to vertical integration in the steel industry and claim that this helps to explain the downward rigidity of U.S. steel prices in the 1950's. Adams and Dirlam, "Steel Imports and Vertical Oligopoly Power," The American Economic Review (September, 1964), pp. 621-55.

[9]See Table A-13. The decline in the index for primary steel in 1958 is mainly a result of a 3-month strike at Stelco.

in sales of primary steel products has been heavily supported by the strong post-war demand for flat-rolled steel products.[10] Sales of structural steel have also increased rapidly but started from a low base in 1950 owing to heavy structural steel imports. Sales of bars and rods have grown at a slower pace and sales of rails and railway track material have hardly grown at all. The strong growth in the steel market has contributed to the production of more highly specialized steel products (wider sheet and plate and heavy structurals) since the enlarged market has made it possible for firms to produce these products.

In most cases, changes in the product composition of domestic firms' sales have paralleled changes in the product composition of domestic steel consumption in Canada. This is illustrated in the table below.

TABLE 5-3

PRODUCT COMPOSITION OF STEEL CONSUMPTION IN CANADA AND STEEL SALES BY DOMESTIC FIRMS : 1950 and 1965
(percents of totals)

	Consumption		Sales by Domestic Firms	
	1950	1965	1950	1965
Pig Iron and Semis	13.7	7.0	23.7	13.1
Bars and Rods	23.0	24.9	26.4	23.2
Flat-rolled Products	46.3	55.2	35.1	54.1
Structural Steel	8.6	11.0	4.9	6.7
Rails and Track Material	18.4	1.9	9.9	3.0
TOTAL	100.0	100.0	100.0	100.0

Source: Table A-10, data based on dollar values. Consumption equals sales minus exports plus imports.

[10] See Table A-12.

The fact that the consumption pattern is closer to the sales pattern in 1965 than it was in 1950 indicates the increased ability of domestic firms to offer a complete line of primary steel products by the mid-1960's.

The very strong demand for steel products in Canada can be traced to the main primary-steel-consuming industries. These include the construction industry, machinery and tool industry, the metal fabricating industry, the automotive industry, and the container industry.[11] The automotive industry took 8 per cent of total steel shipments of domestic producers in 1950 and 9 per cent in 1965 while the container industry took 10 per cent in 1950 and 7 per cent in 1965. The construction industry has taken a markedly larger share of domestic primary steel shipments (from 14 per cent in 1950 to about 21 per cent in 1965). At the same time, the share of domestic shipments going to the machinery and tool industry declined from 23 to 15 per cent, while the metal fabricating industry increased its share very sharply (from 7 to 22 per cent). The railway equipment industry has also been receiving a declining share of steel shipments (19 per cent in 1950 as compared with only 5 per cent in 1965). Finally warehouses and wholesalers took an increasing share of total steel shipments, — 12 per cent in 1950 as compared with 16 per cent in 1965. This reflects the fact that steel producers and steel consumers have both found this method of marketing

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[11]Data on shipments of primary steel to consuming industries are derived from the Statistical Review, Dominion Bureau of Statistics (Monthly No. 11-003).

some types of steel (especially more standardized types) more convenient and attractive than direct mill purchases which normally have delivery dates of up to 6 weeks. Because the construction industry purchases a large (but unknown) proportion of this steel, the importance of the construction industry as a steel consumer is even greater than indicated above.

These changes in the relative importance of the steel consuming industries as customers of the steel firms, help to explain the changes in the product composition of domestic firms' steel sales. The especially large increase in sales to the construction and metal fabricating industries (including the steel pipe and tube industry) explains the growing importance of flat-rolled products and structural steel. The failure of rails and railway track material to maintain its share in the product composition of domestic consumption reflects the fact that the rails industry is no longer expanding so that demand for rails are only for replacement. Export sales rose in importance around 1958, and these sales abroad were also supported by sales of flat-rolled products, as discussed in Chapter IV. The overall rapid growth of primary steel output and sales generally reflects the post-war growth of secondary manufacturing industry in Canada. This was accompanied by an increase in primary steel consumption on a per capita basis.[12]

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[12]Per capita consumption of raw steel in Canada increased from 715 pounds in 1953 to 1,141 pounds in 1965. Per capita consumption in the United States, at 1,282 pounds in 1965, has shown little tendency to increase over the 1953-1965 period. The Algoma Steel Corporation, Ltd., Statistical Supplement, Submission to the Royal Commission on Taxation (1967).

Within this overall growth context it is notable that primary steel production and sales accelerated very sharply in the second half of the 1950-1966 period. This acceleration reflects the very strong demand for primary steel in the Canadian market after 1958. The import to consumption ratio for primary steel in Canada did not decline any further after 1960. In assessing the strength of pressures created by rising demand, capacity utilization ratios for the Canadian steel industry are important. The following table indicates the capacity of domestic steel firms and the capacity utilization ratios, showing steel output (measured in net tons of steel ingots) as a per cent of the steel ingot capacity of the industry (measured in the same units).

The absolute value of the capacity utilization ratio has little meaning by itself, because of the many difficulties in measuring this ratio. Data on steelmaking capacity are influenced by such factors as the relationship between steel-finishing and steelmaking facilities and also by the degree to which some steelmaking equipment is merely stand-by equipment geared to meeting cyclical peaks in demand.[13] A further problem in interpreting these utilization ratios is the question of timing. The ratios compare production data for a particular year with a capacity estimate for the beginning of that year. However, a portion of the industry's capacity may come into operation at some time during the

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[13]Correspondence between myself and Stelco has indicated that stand-by equipment capacity is not common among the four major producers in the industry. In this same letter an official of Stelco indicated that a minimum acceptable rate of capacity utilization over prolonged periods of time would be of the order of 85 per cent.

TABLE 5-4

CANADIAN CAPACITY AND CAPACITY UTILIZATION IN THE PRIMARY STEEL INDUSTRY

Year	Capacity* (As at January 1) (net tons, 000's)	Capacity Utilization* (per cent)
1950	3,691	91.7
1951	3,631	98.3
1952	3,678	100.7
1953	4,472	90.0
1954	4,657	66.9
1955	4,883	91.1
1956	5,197	99.7
1957	5,470	90.2
1958	5,913	72.1
1959	6,314	91.8
1960	6,617	86.3
1961	7,078	90.1
1962	7,884	89.4
1963	8,076	99.9
1964	8,986	99.8
1965	10,345	95.4
1966	11,255	87.2

*Capacity data refer only to capacity for production of steel ingots. Capacity is measured by the production which the given equipment will turn out in one year, working at normal efficiency, 24 hours per day, although allowing for such shutdowns as may be necessary for repairs and overhauling and rebuilding. Steel output for a given year (in ingot-tons) is compared to steel capacity for January 1st of that year to get the capacity utilization ratio.

Source: Algoma Steel Corporation, Limited, op. cit., Table 2, and Canada, Department of Energy, Mines, and Resources, Metal Resources Division, Primary Iron and Steel (Ottawa: Queen's Printer, 1968), and previous issues.

year. This is the typical sort of problem that arises when stock and flow data are compared. If production data were compared with a capacity estimate for the end of each year, rather than the beginning, a much lower capacity utilization ratio would emerge if capacity were expanding rapidly, as it was in the 1960's.

However, even though these ratios are ambiguous as to their absolute values, the changes occurring in the ratios over time are significant. As the ratio rises, the ability of firms in the industry to meet demand at going prices is weakened and eventually firms will be faced with the choice of either raising prices or rationing their steel supplies as the ratio reaches some critical value. The four major firms normally have higher capacity utilization ratios than the industry taken as a whole because they are more diversified, have access to export markets, and do not have stand-by equipment as do some of the smaller firms which act as residual suppliers at times of peak demand in the industry.[14]

Given the method of measuring capacity utilization used above, the indications are that very high capacity utilization was a problem in 1956 and in 1963-1965. Capacity utilization in the post 1958 period was well above what an official of one of the large steel firms had estimated to be a minimum acceptable level, except in 1960 when the ratio was

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[14]The method of dating the capacity data used in Table 5-4 gives an upward bias to the ratios, but this method was used because the ratios for the four major firms tend to be higher than the overall industry ratios. Furthermore, domestic firms in general have greater steel-making than steel-finishing capacity so when steel-making capacity utilization is high, the situation with regard to supplying finished steel products is even tighter than indicated by the ratios in the Table.

only 86 per cent. The data do indicate that during the 1963-1965 period domestic firms were apparently finding it difficult to expand their capacity fast enough to meet the growing demand for their products. In 1956 and in 1963-1965, when the ratio was especially high, the ratio of steel imports to consumption in Canada also rose markedly.[15] In the short run, high capacity utilization in the steel industry has apparently led to a rise in imports as domestic firms refused orders or, more likely, found they had to lengthen delivery dates considerably.

What conclusions can be drawn from the above survey of the behaviour of domestic steel prices, production, and capacity utilization? The declines in production and sales of domestic steel which did occur in the 1950's have not given rise to any significant declines in domestic prices although they may have moderated the strong upward trend in steel prices during this period. The 1960's, on the other hand, were characterized by an accelerated rate of expansion of domestic demand and production and no declines in production occurred after 1960. Nevertheless, steel prices remained stabilized after 1958 until 1965 and even in 1965-66 the rise in steel prices which did take place were not of the order of magnitude of the steel price increases which occurred in most years during the 1950-58 period. Other things being equal, it is likely that in an oligopolistic industry which is fairly well insulated from competitive pressures, an accelerated rate of increase in domestic demand would result in rising product prices. However, steel prices did not rise during the post 1958 period. As is evident from the above review

[15]See Table 4-4.

of prices, steel prices in real terms actually declined as a result of their stability in money terms in conjunction with an increasing general price level. Yet firms in the Canadian steel industry appear to have been fairly well insulated from internal competitive pressures during the 1950-1966 period.[16] There were only four major firms in the industry, barriers to entry into the industry were high, and in fact no new firms of significant size did enter the industry during the period under review. The behaviour of domestic demand and capacity utilization in the Canadian steel industry does not seem, by itself, to offer any explanation of the striking difference in the behaviour of steel prices between the first and second halves of the 1950-1966 period.

Production Costs and Profits in the Canadian Primary Steel Industry

Although steel product prices were very stable after 1958 and actually declined a little between 1958 and 1964, the prices of inputs into the production process rose fairly steadily in the primary steel industry. The following table indicates the relative importance of the different components of total manufacturing costs in the Canadian primary steel industry.

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[16]One possibility in this regard is that competition from substitute materials for steel could be responsible for the post-1958 price restraint. But domestic firms do not seem concerned about such competition and so it is unlikely that it would affect their pricing policy. For example, correspondence with Stelco revealed that competition from substitute materials played a very minor role in Stelco's pricing policy in the 1957-1966 period. It was pointed out that new products competing with steel often became complements to original and modified steel products. Examples given were steel reinforced concrete spans and plastic-coated steel sheets.

TABLE 5-5

THE COMPOSITION OF MANUFACTURING COSTS IN THE CANADIAN PRIMARY STEEL INDUSTRY* : 1964

(per cent of total manufacturing price)

Wages	27.0
Iron ore, pellets, and sinter	16.7
Scrap	9.2
Coal and Coke	8.8
Refractories	3.1
Fluxes	1.5
Non-ferrous metals and ores	6.2
Other Materials and Supplies	22.0
Fuels and Electricity	5.5
Manufacturing Cost	100.0

*Based on 1964 Census Data for the primary steel industry. Depreciation, financial charges, and selling and distribution costs are not included.

Source: Sydney Steelmaking Study, Voluntary Planning Board of the Province of Nova Scotia (February 1968), p. 4.

Wages are the single most important manufacturing cost for Canadian steelmakers.[17] The costs of iron ore and coal together are not as important an item. This helps to explain why the steel industry is

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[17]Of course, if Canadian steel firms were all using the most modern equipment available the proportions in Table 5-5 would be a little different. For example, recent innovations in steelmaking would tend to save on wage costs (see Chapter VI).

not as resource-oriented as it once was.[18] Scrap costs have become increasingly more important and are at present a more important item than coal and coke costs.

The average hourly earnings of hourly rated wage earners in the Canadian primary steel industry are significantly above the average of such earnings for Canadian manufacturing industries as a whole.[19] The rate of increase in steel wages was noticeably faster in the 1950-1958 period than in the post 1958 period (wage rates increased by about 77 per cent between 1950 and 1958 as compared with only about 31 per cent between 1958 and 1966). But the upward trend in steel wages is quite marked over the entire period, and wage rates rose in every year. Still, it is apparent that the Canadian steel firms were becoming less willing to raise wages as freely in the post 1958 period as they apparently had been in the pre-1958 period.

There is no general price index for inputs into the Canadian primary steel industry, but data are available on the behaviour of the prices of the main inputs into the steelmaking process in Canada.[20] A generally upward trend in the prices of raw materials used in steelmaking is evident over the 1950-1966 period. Scrap prices are very volatile and no distinct trend can be isolated for this series. In general,

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[18] An example of this is the Japanese steel industry which is very efficient and competitive but must import almost all its raw materials.

[19] See Table A-14.

[20] Table A-15. Wages, discussed above, are not included in this table.

raw materials prices tended to rise rather sharply around 1961-62 and then level off at these higher levels. But the rise in raw material prices has not been so consistent or strong as the rise in wage rates during the post-war period. Aggregate production costs are also available for the 1957-1966 period for the primary steel industry in Canada. Total costs rose by between 71 and 76 per cent over the period but were fairly constant when expressed as a per cent of the value of shipments in the steel industry.[21] The stability of these operating costs, as a per cent of revenue from sales indicates that the profit/sales ratio in the Canadian industry has held up during the 1958-1966 period. The implication of this is that the effect which rising input prices, in conjunction with stable product prices, would have had on the profits earned in the industry was being offset to some extent by rising productivity.[22]

The profit performance of Canadian steel firms is compared with that of other steel firms in foreign countries in the following table. These comparisons show that Canadian steel firms are highly profitable relative to counterpart foreign firms.[23]

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[21]Table A-16.

[22]This is discussed at length in Chapter VI which deals with technological innovation in the steel industry.

[23]Extensive financial comparisons among the 100 largest steel firms in the free world may also be found in the International Metalworkers' Federation's papers, The Largest Steel Companies in the Free World, conference in Duisburg, Germany (May 1962); and The Steel Industry Throughout the World , conference in Luxembourg (June-July, 1965).

TABLE 5-6

PROFITABILITY RATIOS FOR SELECTED COUNTRIES

1962-1965 (arithmetic averages)

	Per cents			Profits after taxes per short ton of crude steel*
	Profits after taxes to total assets	Profits after taxes to shareholders' equity	Profits after taxes to total revenue	
Canada	7.2	11.1	8.9	11.45
Netherlands	5.6	7.1	11.6	13.32
United States	4.5	6.7	5.3	7.27
Italy	3.1	8.5	7.2	9.83
Luxembourg	2.4	3.4	3.0	2.32
Japan	2.2	7.0	3.8	3.95
United Kingdom	2.0	3.6	2.2	4.50
West Germany	1.9	4.5	1.7	3.48
Belgium	1.9	3.7	2.0	2.85
France	0.8	2.2	1.0	1.47

*U.S. $/short ton.

Source: J. Singer, op. cit., p. 51.

The ratio of net profit plus depreciation to steel sales for the four major steel firms in Canada is given in Table 5-7 for the 1954-1966 period. The ability of Canadian steel firms to maintain high levels of profitability even when capacity utilization in the industry has fallen off is mentioned in several places in the International Metalworkers' Federation's studies. "In none of the five years from 1955 to 1960 did depreciation and net profit as a percentage of sales of the two largest Canadian steel companies fall below 13.5 per cent, a rate which can be obtained in many other countries only if trade is good."[24] This

[24]International Metalworkers' Federation, op. cit., The Largest Steel Companies in the Free World, p. 98.

TABLE 5-7

NET PROFIT PLUS DEPRECIATION
AS A PER CENT OF SALES : 1954-1966
(per cents)

	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Stelco	15.8	15.8	14.3	14.9	15.0	16.1	13.8	16.1	15.9	16.5	14.6	13.7	14.3
Algoma	14.1	14.2	15.4	15.3	17.2	17.5	16.5	17.9	18.4	19.1	18.7	18.9	17.5
Dofasco	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	17.7	18.3	16.5	17.8	16.5	14.9	15.5
Dosco	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	6.3	6.4	6.5	6.2	4.5	2.4

Source: Annual Reports of the Companies Listed.

situation has continued into the 1960's for the three largest steel firms in Canada, but not for Dosco (see Table 5-7).

The profit rates of the major steel firms in Canada, representing the rate of return on capital, have been calculated in a recent study and are given in Table 5-8. The capital is made up of ". . . the sum of long term debt, capital stock, surplus, and deferred taxes," while the return consists of " . . . net profits, i.e. revenue less operating costs, depreciation and depletion and other income, and current and deferred taxes."[25] Interest paid on debt is included in the return calculation. The ratios give a good general picture of the relative profit rates among firms and of changes in the profit rates being earned by the different firms over the 1950-1966 period.

The profit performance of Stelco was noticeably better than that of her three main competitors during the 1950-1958 period. The rate of return earned by Stelco was between 10 and 13.8 per cent in every year except 1954 and 1958, the latter being the year of the 3-month strike at Stelco. The other major firms did not in general attain nearly as high a rate of return as did Stelco in the 1950's. Algoma's rates of return were closest to those of Stelco while Dosco's profit rates were lowest of the four major firms. Dofasco's profit rates were relatively low during the 1950's but this reflects, in great part, its rapid rate of expansion in the 1950's and the resulting lower rate of return on its fast-growing capital.

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[25]Elver, op. cit., p. 92.

TABLE 5-8

PROFIT RATES FOR THE MAJOR FIRMS IN THE CANADIAN STEEL INDUSTRY, 1950-1966*

	(per cent)				
	Algoma	Dofasco	Dosco	Stelco	Weighted Average
1950	10.41	9.11	6.31	13.57	9.87
1951	14.13	5.63	6.72	10.98	9.18
1952	6.83	6.08	5.67	10.30	7.85
1953	9.36	6.36	5.46	10.50	7.89
1954	6.91	6.30	4.71	9.53	7.27
1955	11.76	9.04	3.59	13.85	10.01
1956	14.35	9.40	6.57	11.41	10.53
1957	11.94	8.96	6.18	10.03	9.35
1958	8.22	10.21	2.22	7.49	7.07
1959	11.36	9.75	2.68	13.08	9.96
1960	8.34	8.99	2.95	8.09	7.39
1961	10.87	9.74	1.20	8.54	8.14
1962	10.76	9.80	2.04	8.81	8.48
1963	11.26	10.55	2.72	9.82	9.35
1964	10.65	9.85	2.93	9.10	8.81
1965	10.76	8.91	1.60	7.79	7.91
1966	8.12	7.50	loss	7.43	-

* The profit rate is defined above in the text.

Source: Elver, op. cit., p. 92; compiled from the annual statements of the companies listed.

However, in the 1960's the situation in the Canadian steel industry appears to have changed markedly. Stelco did not earn a rate of return of 10 per cent or more in any year during the 1960-1966 period. The rate of return on capital for the four major firms taken together did not decline as sharply, although it only exceeded 9 per cent in one year during the 1960-1966 period while it exceeded 9 per cent in six of the ten years prior to 1960. The rates of return earned by the three largest steel firms came much closer together in the 1960's. Elver expresses the opinion that the profit rates earned by the major Canadian steel firms in the 1960's especially, were not high when compared with rates of return on other instruments in Canada, such as mortgages, if the higher risk involved in steelmaking is taken into account. He concludes:

> . . . the return on investment is probably down close to the tolerable minimum to provide a financially healthy industry with a minimum of profits above an adequate rate of return.[26]

The rates of return on capital earned by the major steel firms in Canada did not hold up so well as the profit to sales ratios for these firms owing to the extremely rapid capital expansion which the steel firms undertook in the 1960's in order to keep up to the rapidly expanding demand for primary steel products. The sharp post-1958 expansion in investment by the domestic steel firms is discussed at length in Chapter VI.

The above analysis of the Canadian primary steel industry does not offer any obvious explanation for the marked difference in the behaviour of domestic steel prices between the first and second halves

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[26]Elver, op. cit., p. 95.

of the 1950-1966 period. During the 1950-58 period steel demand and production expanded fairly consistently and domestic steel firms raised prices and wage rates sharply in almost every year. Profits in the industry generally seemed quite satisfactory.[27] Barriers into the industry were judged to be moderately high and no significant new entry occurred during the 1950-1966 period. However, in the second half of the period, although the expansion of demand and production accelerated and at times Canadian firms appeared to find it difficult to keep production expanding at a fast enough rate to meet current demand at current market prices, domestic steel prices stopped rising after 1958 and declined very slightly through to 1965. At the same time, other prices, including the prices of inputs into the steelmaking process, were rising. Steel firms continued to raise wages, but at a much slower rate than in the first half of the period. Rates of return on capital for the major steel firms were generally lower in the 1960's than in the 1950's.

All of the above indications point to the fact that domestic steel firms were behaving as if they were experiencing increased competitive pressures and as a result were practising a good deal of price restraint after 1958. However, internal competitive pressures do not seem capable of explaining this price restraint. Eastman and Stykolt came to the conclusion that the pricing behaviour of the domestic steel firms in the

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[27]During this period as well as during the later period, Canadian steel firms financed over 80 per cent of their rapid capacity expansion from internally generated funds. The ratio of debt to equity capital employed in the Canadian steel industry in 1964 was only 16 per cent as compared with over 100 per cent in Japan and some of the steel industries of the Common Market countries. See J. Singer, op. cit., p. 51.

1950's, was typical of highly interdependent oligopolists who wanted to maximize profits in the long run owing to the fact that their capital was durable.[28] If profit rates had been increasing in the 1960's the post-1958 price restraint could be interpreted in this context, but in fact profit rates were declining (to what one source has characterized as a tolerable minimum). If demand had been growing very slowly in the 1960's a similar conclusion might apply, but in fact domestic firms were having difficulty in expanding capacity fast enough to meet domestic demand. Domestic firms were behaving as if the market demand curve for primary steel had become much more elastic in the post-1958 period. If internal competitive forces cannot explain the post-1958 price restraint, the most logical hypothesis is that foreign competition might be the cause of such restraint.[29]

The Effects of Foreign Competition on the Short-run Behaviour of Canadian Primary Steel Firms

Domestic steel prices increased at a very fast rate relative to other prices between 1950 and 1958, but thereafter domestic steel firms apparently decided that further price increases would not be advisable. The stability of steel prices in 1959 and 1960 could be attributed to a weakening of domestic demand (production was off in those two years)

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[28]Eastman and Stykolt, op. cit., The Tariff and Competition in Canada, p. 362.

[29]This conclusion was also reached in Elver's study. The discretionary power utilized by domestic steel firms was limited by external competitive pressures in the 1960's rather than by internal competitive pressures which ". . . probably could not provide by themselves effective competition." Elver, op. cit., p. 119.

but after 1960 stable or declining steel prices were accompanied by a rapid expansion of demand and output and by high levels of capacity utilization in the industry. The history of Stelco, written shortly after domestic steel prices were stabilized, indicated that foreign steel prices had an important influence on the pricing policy being currently followed in the Canadian industry.

> Nevertheless, steel market conditions outside Canada did have a powerful influence on Stelco's pricing. If American companies had not allowed their prices to rise as sharply Stelco would likely have had to keep its prices down further, even at the cost of being forced to lower profit margins to finance more of its building programme through borrowing, and paying for it by keeping down salaries, wages and purchasing costs and by eliminating marginally necessary expenditures of all kinds. The increasing pressures of competition from the fully recovered, highly efficient, low-cost European steel industry was undoubtedly one factor in holding Stelco prices stable from 1957 to 1959 and into 1960, in spite of rising labour costs . . . . Of all potential difficulties, the prospect of foreign competition to come was management's chief cause of concern in considering the immediate future of the company at the close of the decade.[30]

This analysis is very much in line with what would be expected on the basis of the conclusions concerning foreign competition which were reached in Chapter IV. During the 1950's Canadian steel firms were chiefly concerned with improving their competitive position vis-à-vis U.S. firms. However, they were able to pursue this policy successfully without apparently feeling much strain on their profits position because U.S. steel firms were raising prices sharply during the 1950's.

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[30]Kilbourn, op. cit., p. 226.

Although strongly influenced by steel prices in the United States, another factor was beginning to impinge on Canadian firms' pricing decisions at the end of the 1950's. This factor was increasing competitive pressure from offshore steel producers, particularly ECSC and Japanese steel producers. As excess capacity began to develop in the world steel market around 1958-1959, the ECSC producers began to increase their export efforts towards the North American steel market, as evidenced by the generally downward trend in the export prices of these countries and the rising share of ECSC steel imports in the total for Canadian steel imports.[31] These pressures were further intensified in the 1960's when Japanese steel imports into Canada began to rise as the export prices of Japanese steel suppliers began to decline.

The results of these increasing competitive pressures from offshore steel suppliers did not become immediately obvious in the aggregate trade data for the Canadian steel industry for the variety of reasons discussed in Chapter IV. However, in 1964 the ratio of steel imports to steel consumption in Canada did begin to rise despite the continued increase in domestic output and sales and despite the fact that the Canadian exchange rate had depreciated in the early 1960's, further insulating Canadian producers from foreign competition. High capacity utilization ratios in 1964 and 1965 would help to account for a part of

[31] A recent study has pointed out that European steel producers are often more dependent on export sales than they are on home sales so that when steel is plentiful they will quote prices for exports which are below their break even point in the hope of making up their losses in better times. North American producers do not follow this practice. Arthur D. Little, Inc., The Future of Steelmaking in Sydney, Report to the Government of Nova Scotia (1960).

this rise in imports. Even if increasing pressures from foreign steel suppliers did not lead to an erosion of the overall Canadian steel market by imports and an impairment of domestic production in Canada, it did give rise to domestic price effects. Specifically, increased foreign competition is the most logical explanation of the post-1958 stability of Canadian primary steel product prices.[32] The period of price stability in the Canadian primary steel industry was ushered in by a three month strike at Stelco. Stelco and the other firms in the industry apparently did not believe that it would be possible for them to pass on rapidly increasing wages through higher prices as they had done in the 1950's. By the end of the 1950's Canadian firms were already anticipating that foreign competitive pressures in the 1960's would be a more serious problem than they had been in the 1950's.

After 1958 foreign competitive pressures were making themselves felt in the Canadian steel market not only directly but also indirectly by means of the effect of increasing foreign competitive pressures on U.S. steel prices which had ceased their upward surge in 1959, one year later than in Canada.[33] M.A. Adelman described the situation in the U.S. steel

[32]Elver, op. cit., p. 90, also thinks that the price stability of the post-1958 period in the Canadian steel industry would not have been expected if domestic firms had not come under pressure from offshore steel imports. Furthermore, Daly, Keys, and Spence point out that "At one time, price competition in Canada on steel products was largely from the United States, but recently Canadian pricing practices, particularly on certain standard products, are influenced more by European and Japanese prices," D.J. Daly, B.A. Keys, and E.J. Spence, Scale and Specialization in Canadian Manufacturing, Economic Council of Canada, Staff Study No. 21 (March, 1968), pp. 71-72.

[33]See Table A-3.

industry at this time as follows: ". . . in the 1950's it pushed up prices and wages in fair weather and foul, apparently regardless of demand. We need some theory to explain this behaviour and also the turnabout of 1959, when management decided to stand and fight rather than raise wages and prices."[34] Obviously, the situation in the Canadian steel industry had much in common with the situation in the U.S. industry around 1958-1959.

Adelman explains the stability of U.S. steel prices after 1959 as follows: "The most reasonable expectation as of the end of 1958 was that U.S. steel imports would continue to grow . . . . If at existing price levels there was a danger of increasing foreign competition as trade channels were established then to increase price further would be reckless."[35] Expectations of domestic firms in both the Canadian and U.S. steel industries appear to have been the same at the end of the 1950's — foreign competition had become a threat and was likely to remain a threat into the 1960's. Although neither Canadian nor U.S. steel prices were significantly lowered after 1958-1959, Canadian steel prices were in effect lowered as far as foreign competition is concerned by the 1959-1962 depreciation of the Canadian dollar. If this had not happened, and if Canadian firms still kept their steel prices stable after 1958, then the steel import to consumption ratio would probably have

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[34]M. A. Adelman, "Steel, Administered Prices, and Inflation," The Quarterly Journal of Economics (February 1961), p. 20.

[35]Ibid., p. 32.

risen even before the 1964-1966 period.[36]

Therefore, it is concluded here that the stability of domestic steel prices after 1958, and their failure to increase through to 1965, reflects the increasing competitive pressures domestic firms experienced as a result of the downward trend in the steel export prices of the ECSC countries and Japan after 1958 and the effects of these price movements on Canadian steel imports. Developments in the international steel market seem to be a much better explanation of the post-1958 stability of domestic steel prices than any observable developments within the industry itself. The stability of steel prices is interpreted as a reaction to the actual and potential impact of increased competition from offshore steel suppliers on the sales and profits of domestic firms. The price reaction of domestic firms helps to explain the decline in the rates of return on capital being earned by the major domestic firms in the 1960's. However, had domestic firms continued to raise their prices after 1958 then domestic profits would no doubt have been still more adversely affected. Domestic steel firms apparently lost some of the discretionary power over prices which they had possessed in the 1950's. However, with the exception of Dosco, the decline in profit rates in the domestic industry was not very marked. This implies that rising pro-

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[36]In the absence of the exchange depreciation, Canadian home prices would have been only marginally below U.S. home prices for steel products after 1958 and the steel import to consumption ratio in the United States rose from around 1.5 per cent in the 1955-1957 period to 5 per cent between 1960 and 1962, and was greater than 10 per cent in 1965 and 1966. Singer, op. cit., p. 62.

ductivity was playing an important role after 1958 in preventing rising input prices in conjunction with stable product prices from having the adverse effect on profits they might otherwise have had. This point is taken up in Chapter VI. Since Dosco seems to have been especially strongly affected by foreign competition, the position of this firm is examined separately in the following section.

The Effect of Foreign Competition on the Short-run Behaviour of the Dominion Steel and Coal Corporation

Because of Dosco's poor performance in the post war years, a great deal of concern developed over the possibility that the Sydney mill would be closed down, with severe deleterious effects on the industrial climate in the Sydney area. As a result, several studies of Dosco's competitive position were undertaken in the 1960's.[37] These studies stressed the fact that steel costs of production were higher at the Sydney mill than at the mills of the other major steel firms and that foreign competition fell more heavily on Dosco because of its geographical location and product mix — factors which have also been stressed above. Hawker-Siddeley announced that it planned to close down the Sydney mill as of April 1968 and the President of Dosco, in the firm's 1967 Annual Report, attributed this to the significantly lower

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[37]These include: The Future of Steelmaking in Sydney, Report to the Government of Nova Scotia, Arthur D. Little Inc. (1960); Evaluation of Proposed New Bar and Rod Mill in Sydney, Report to the Government of Nova Scotia, Arthur D. Little Inc. (1962); and Sydney Steelmaking Study, initiated by the Voluntary Planning Board of the Province of Nova Scotia, Dosco Steel Ltd., and the Atlantic Development Board (February, 1968).

demand for Dosco's products, specifically referring to import competition as a prime factor in this regard. In order to prevent the closing of the mill, the Government of Nova Scotia purchased the mill in 1968 and is operating it as the Sydney Steel Company.

One serious problem for Dosco was that during the 1950-1966 period it was unable to reach minimum efficient scales of output. For this reason alone, Dosco's competitiveness relative to the other major firms weakened as the other firms grew relative to Dosco.[38] The demand for its main products (shaped steel) did not grow as fast as did the demand for flat-rolled products in the post-war period. In contrast to Dosco, Dofasco expanded more rapidly than the other major firms, and it was specialized in flat-rolled steel products. Hence production and distribution costs were higher for Dosco than for the other major firms.[39]

In the mid-1950's Dosco's share of domestic steel capacity was about 14 per cent but by 1966 it had fallen below 10 per cent.[40] Steel production, measured in net ingot-tons of steel, declined from 12 per cent of total production in 1959 to 9 per cent in 1966.[41] This decline occurred despite the fact that capacity utilization in the industry was at

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[38]See Table 3-1.

[39]This point is discussed further in Chapter VI.

[40]Dominion Bureau of Statistics, Iron and Steel Mills, No. 41-203 (Ottawa: Queen's Printer, 1967).

[41]Algoma Steel Corporation, op. cit., Statistical Supplement (1967); and Annual Reports of Dosco.

fairly high levels in the 1960's, allowing Dosco to benefit in its role of residual supplier to the Ontario steel market when steel was in short supply and delivery dates from the Ontario mills were lengthy. Also, Dosco's export sales tended to increase as a proportion of its total sales after 1956 and especially in the 1960's. In the 1962-1964 period these sales were in the neighbourhood of 25 per cent of Dosco's total sales.[42] A large proportion of these exports were rails and semis directed to the Latin American countries.

Since world steel prices were declining so sharply in the 1960's, export sales from Canada during this period were undoubtedly less profitable than domestic sales. This helps to explain the fact that Dosco's profits declined so very sharply in the 1960's. Furthermore, in the more competitive atmosphere in the 1960's domestic firms began to offer some price and service concessions on part of their domestic sales.[43] The increase in foreign competition was having some effects on internal competitive pressures as well in the 1960's. For example, Dosco, which was hardest hit by foreign competition, introduced a new basing point in Montreal in 1966 which put out base prices that were less than Stelco's base prices plus transportation to the Montreal market for some steel products.[44]

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[42]Dosco provided this information to me but requested that the actual export-sales/total-sales ratios be treated as confidential.

[43]For example, Elver points out that firms were tending ". . . to price differentially in 1965-1966 for some products in regions most susceptible to overseas competition." Op. cit., p. 116.

[44]Elver, op. cit., p. 116.

The fact that Dosco did not participate in the flat-rolled steel products market, where profit margins (per ton of steel) are higher than for other steel products, also resulted in a reduced profit position for Dosco. Dosco did finally enter this market in 1966-1967 when its new flat-rolling mill in Quebec was opened, but this mill was not fully operational even in 1967. Finally, despite the relatively slow growth of Dosco's capacity, its capacity utilization was low in the 1960's. It was below 85 per cent in 1961, 1962, 1965, and 1966.[45] The underutilization of capacity, because of the large proportion of steelmaking costs which are fixed, significantly raises unit production costs, and with fixed product prices, profits are squeezed.

Dosco's profit position, its rate of return on capital, was considerably below that of the other major firms in the 1950's.[46] But after 1957, the profit return for this firm declined even further. Net profits (after taxes) earned by Dosco fell from $7.1 million in 1957 to $1.0 million in 1965. In 1966 Dosco sustained losses of $1.9 million and by 1967 losses had risen to $9.4 million.[47] The increase in foreign competition in the post-1957 period contributed significantly to the

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[45] Dominion Bureau of Statistics, Iron and Steel Mills, and Annual Reports of Dosco.

[46] See Table 5-8.

[47] Annual Reports, The Dominion Steel and Coal Corporation Ltd.

serious impairment of Dosco's sales and profit performance.[48] The short-run effects of foreign competition on Dosco seem to follow more closely the events set out in the general model in Chapter II than is the case for the other major steel firms. On the other hand, it is argued below that increased foreign competition did not result in a significant lowering of costs by Dosco although it does appear to have had this effect for the other major firms. The question of the technological response of the Canadian steel firms to increased foreign competition is taken up in the following chapter.

Summary and Conclusions

The analysis contained in this and the preceding chapters allows for the following conclusions. Canadian primary steel firms were fairly well insulated from strong foreign competitive pressures during most of the 1950's and internal competitive pressures do not appear to have been strong. Around 1958 the situation began to change insofar as foreign competitive pressures facing domestic firms increased as excess steel-making capacity began to emerge on the world market. As one result of this, the export prices of the ECSC countries and Japan fell in the majority of the post 1957 years through to 1966. Canadian steel firms,

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[48] In his statement announcing the proposed closing of the Sydney mill, the President of Dosco emphasized the effects of steel imports: "They have made serious inroads into nearly all product lines, particularly in Eastern Canada where Sydney steel has its major market. Offshore producers apparently can afford to land their surplus steel at ports in the area at prices no domestic mill can afford to meet in quantity." The Halifax Chronicle-Herald (October 14, 1967).

which had been raising prices sharply, lowered domestic prices very slightly between 1960 and 1964 and only raised them slightly in 1965 and 1966. Increased foreign competition from offshore steel suppliers appears to offer the best explanation for the price restraint exercised by domestic steel firms in the post 1958 period. U.S. steel prices levelled off one year later and also remained virtually stable until 1965-66.

Canadian steel firms have found that given their current price levels and the high capacity utilization ratios in the industry in 1963-64 they were no longer able to replace steel imports with domestically produced steel in the 1960-66 period. The ratio of steel imports to domestic steel consumption actually rose in the 1964-66 period. Increased foreign competition caused domestic steel firms to practise greater price restraint in the 1960's, but it did not take the form of an import erosion of the domestic market. However, the rates of return on capital did decline slightly in the 1960's owing to the increased foreign competition and the price restraint this imposed on domestic firms. Therefore, the short-run reaction of domestic steel firms to increased foreign competition has primarily taken the form of a price reaction, as expected in the model developed in Chapter II. The much slower rate of increase in wages in the steel industry in the second half of the 1950-1966 period is also in line with the model since it indicates a greater concern on the part of domestic firms with their cost positions.

The final question to be dealt with, is whether increased foreign competition has also had effects on the rate at which technological improvements were being introduced into the domestic industry during the latter half of the 1950-1966 period. Since increased foreign competition affected both domestic prices and profit rates in the post-1958 Canadian steel industry, there are good reasons for believing that domestic firms will have become increasingly cost-conscious as a result. Increased foreign competition is expected to result in an increase in the rate at which domestic firms are introducing technological innovations into their production processes. This should be accompanied by an increased rate of investment on the part of domestic firms and in rising average labor productivity in the industry for the reasons discussed in Chapter II. The following chapter attempts to judge whether the observable behaviour of the domestic steel firms in the 1950-1966 period is consistent with these expectations concerning the longer-run reaction of domestic steel firms to increased foreign competition.

CHAPTER VI

THE TECHNOLOGICAL RESPONSE OF CANADIAN PRIMARY STEEL FIRMS TO INCREASED FOREIGN COMPETITION

The main conclusion which can be drawn at this point is that foreign competition facing domestic steel firms increased in the second half of the 1950-66 period and placed downward pressure on domestic steel prices. It is argued in this chapter that in order to maintain their profit positions as best as they were able under these conditions, it became necessary for domestic firms to improve their efficiency and to search out and apply new techniques of production. Substantial investment expenditures would be required both to produce for the growing market and to introduce new techniques of production.

If oligopolistic firms have been fairly well insulated from competitive pressures it is possible that such firms will have put off replacing some of their older capital equipment in order to protect their sunk investment in this equipment. They may have done this even though it would have been economically wise to have replaced this equipment.[1] However, even if the domestic steel firms were not ignoring valid replacement criteria in the 1950's, it is clear that if competitive pressures had been stronger and put downward pressure on domestic steel prices,

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[1]If this is the case, firms would be failing to behave as profit maximizers during such a period. As discussed in Chapter II, this does not necessarily imply irrational behaviour on the part of these firms if their profits were "satisfactory" and they were pursuing other goals.

then other things being equal, domestic firms would have been forced to replace some of their older capital equipment earlier than they actually did. In any event, the increase in foreign competition after 1958 led to a strong expectation that the rate of introduction of new techniques into the steel industry would rise and would be accompanied by rising investment expenditures and rising average labor productivity.[2] The following section reviews the behaviour of investment expenditures and average labor productivity in the Canadian primary steel industry during the 1950-1966 period in order to ascertain whether their behaviour is consistent with the expectations discussed here.

Capital Expenditures and Average Labor Productivity in the Canadian Primary Steel Industry

The vehicle for effecting the sort of technological response discussed above is the capital expenditures (investment) of the primary steel firms. These expenditures have increased sharply during the 1950-1966 period, although their year-to-year behaviour has been quite volatile.[3] There is no strong upward trend discernable in the capital expenditures series for the 1951-58 period, but after 1958 there is a strong and fairly consistent upward trend in these annual expenditures.[4] The index

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[2]The basis for these hypotheses has been discussed at length in Chapter II.

[3]See Table A-17.

[4]See Table 6-1. The year 1951 is used as the base for the index because capital expenditures in 1950 were very low, after having been at very high levels in 1948 and 1949.

for capital expenditures by primary steel firms (1951 = 100) stood at 111 in 1958 as compared with 406 in 1966.

TABLE 6-1

INDEX OF CAPITAL EXPENDITURES IN THE CANADIAN PRIMARY STEEL INDUSTRY

1951	1952	1953	1954	1955	1956	1957
100	145	99	67	69	123	141

1958	1959	1960	1961	1962	1963	1964
111	154	228	134	224	223	410

1965	1966
303	406

Source: Table A-17.

As discussed in Chapter II, capital expenditures on new plant, machinery, and equipment are strongly influenced by the growth of demand and production in the recent past and by estimates of future growth, as well as by the need to improve efficiency and be in a position to meet current and future competitive pressures. The general acceleration in steel demand and production in the post-1958 period in Canada would by itself lead to an accelerated rate of capital expenditures during this period. Taking capital and repair expenditures together for the primary steel industry, a similar trend emerges.[5] A much faster rate

[5]See Table A-17. Capital and repair expenditures are estimated from industry surveys carried out by the Department of Trade and Commerce. Repair expenditures represent outlays geared to maintaining the existing stock of durable assets in a state of normal working efficiency and firms are asked to include outlays designed to improve the efficiency of existing capital equipment in their capital expenditures series.

of capital and repair expenditures occurs in the post-1958 period, and especially in the 1960's.[6]

Although the higher growth rates of domestic consumption and production of primary steel certainly explain a large part of the accelerated rate of capital expenditures after 1958, there is evidence that these expenditures were not simply the result of expanding markets but also represented an attempt by firms to replace their older higher-cost capital equipment with technologically advanced equipment in order to successfully meet the more competitive conditions which characterized the 1960's. Capital expenditures per ingot ton of steel produced in the industry were at noticeably higher levels after 1958 and especially in the 1960's and the same is true for these expenditures when expressed as a per cent of sales by domestic firms.[7] Therefore, even after taking the higher levels of production and sales of primary steel into account, the rate of investment expenditures increased in the 1960's. This is certainly consistent with the hypothesis that the increased foreign competition in the 1960's was likely to cause firms to increase the rate at which they were investing in new technology.

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[6]This conclusion also holds when real capital expenditures in the steel industry are considered. Data for capital expenditures in Table A-17 were deflated by the implicit price index of Business Gross Fixed Capital Formation in the Canadian manufacturing industry to obtain an estimate of real capital investment in the primary steel industry. This series shows the same general characteristics in terms of growth rates as the money capital expenditures series in Table A-17. See Table A-18.

[7]See Table 6-2.

TABLE 6-2

CAPITAL EXPENDITURE RATIOS IN THE CANADIAN PRIMARY STEEL INDUSTRY ($'s and percents)

	Capital Expenditures Per Ingot Ton of Steel	Capital Expenditures As a Percent of Sales
	$	%
1950	2.05	2.5
1951	14.10	13.8
1952	19.68	18.5
1953	12.13	13.4
1954	10.50	10.5
1955	7.62	7.7
1956	11.64	9.2
1957	14.01	12.1
1958	12.81	10.1
1959	13.12	11.1
1960	19.76	17.2
1961	10.43	9.5
1962	15.73	15.5
1963	13.68	12.4
1964	22.58	19.9
1965	15.14	13.6
1966	20.39	17.7

Source: Tables A-17, A-19, and A-10.

Furthermore, increased foreign competition also appears to have had indirect effects in this regard. The exposure of domestic steel customers to foreign steel supplies in the 1960's has apparently made them more demanding about the exactness of specification of the steel they require, so domestic firms have had to invest in new steel technology which allows for the efficient production of high-quality steel in the smaller batches necessary to meet the more exact customer specifications.[8] There is no way of separating out that part of investment expenditures undertaken for purposes of expanding capacity from that part made solely for cost-savings or quality improvement, but it does seem significant that at the same time foreign competition was increasing in the steel industry the ratio of capital expenditures to domestic production and sales of primary steel also increased.

Average labor productivity in the primary steel industry is measured here in terms of output per man-hour-worked by production workers in the industry.[9] The index of average labor productivity for the steel industry has a strong upward trend in the post-war period and no doubt reflects the fact that the labor force in the industry was being provided with an enlarged and technically improved capital stock.[10] However, short-run changes in the index are significantly affected by changes in the rate of capacity utilization in the industry. For example,

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[8]This is discussed further on p. 167.

[9]The derivation of this ratio is given in Table A-19.

[10]Table 6-3.

capacity utilization in the steel industry was relatively low in 1952, '54, '58, '60, and '66, while output per man-hour declined in 1951-52, '54, '60, and '66.[11] The only year when low capacity utilization was not accompanied by a decline in output per man-hour was 1958, and this was a strike year in the industry so man-hours worked in the industry declined sharply in that year.

TABLE 6-3

INDEX OF AVERAGE LABOR PRODUCTIVITY IN THE CANADIAN PRIMARY STEEL INDUSTRY

(1950 = 100)

1950	1951	1952	1953	1954	1955	1956	1957
100.0	93.8	94.4	107.9	105.4	121.8	129.5	132.9
1958	**1959**	**1960**	**1961**	**1962**	**1963**	**1964**	**1965**
144.2	160.4	155.8	183.0	190.2	204.6	207.1	217.0
1966							
178.9							

Source: Table A-19.

The long-term trend in average labor productivity has been clearly upward, but its rate of increase was much faster in the second half of the 1950-1966 period. Between 1950 and 1957 output per man-hour increased at an annual average rate of 4.6 per cent, while in the 1957-1965 period the annual average rate of increase was only a little

[11] Compare Table 5-4 with Table A-19.

under 8 per cent.[12] The fact that the rate of increase in investment and in average labor productivity in the industry accelerated in the post-1958 period suggests that the increased capital expenditures were having significant effects on output per man-hour and on the general efficiency of firms in the industry as a result of the new and enlarged capital stock which these expenditures were representing. This also helps to explain why the profit rates of domestic steel firms were not more seriously affected than they were in the post-1958 period given the price and cost conditions in the industry as discussed in Chapter V. The trends in investment and output per man-hour in the steel industry are clearly consistent with the hypothesis that the increased foreign competition after 1958 would make firms more cost conscious and cause them to increase the rate at which they were introducing new techniques of production into their steelmaking processes. To the extent that firms did do this, both the rate of increase of investment and of average labor productivity in the industry would be expected to rise noticeably after 1958, as they in fact did. The following section reviews the rate at which the two major steelmaking innovations were adopted by Canadian and foreign steel industries during the 1950-1966 period.

The Rate of Introduction of Two Major Primary Steel Innovations in the Post War Period

The technology of the two most outstanding post war innovations in the steel industry, the basic oxygen and continuous casting processes,

[12]The year 1966 is not used as the terminal year for these comparisons because capacity utilization dropped off sharply in that year and adversely affected the long-term upward trend in the labor productivity series.

is discussed in Appendix I. Of the two innovations, the basic oxygen converter has had the greater impact in terms of its use on a commercial basis in world steel technology. However, even in 1960 the capacity of existing oxygen converters as a per cent of crude steel production on a world-wide basis was only 4 per cent.[13] After 1960 the rate of introduction of this process into world steelmaking technology increased sharply and by 1965 oxygen converter capacity represented 22 per cent of world crude steel production. This reflects the fact that by the beginning of the 1960's the cost-saving potential of this process was widely recognized. The first basic oxygen or L-D converter came into operation in Austria in 1952. One Canadian and one U.S. firm introduced the process on the North American continent in 1954.[14] Because Dofasco was a world leader in the introduction of this process, Canadian oxygen converter capacity as a per cent of world oxygen-converter capacity has been very high in the post-1954 period.[15] In 1960 Canadian oxygen converter capacity was still over 11 per cent of world capacity while Canadian production has been only around 2 per cent of world steel production in the post-war period. Although Canadian oxygen converter capacity declined as a per cent of world converter capacity in the 1960's (as foreign steel industries began to invest heavily in this process), it is still clear that the Canadian industry was a world leader in adopting

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[13]Table 6-4.

[14]W. Adams and J.B. Dirlam, "Big Steel, Invention, and Innovation," The Quarterly Journal of Economics (May, 1964), pp. 167-68.

[15]Table 6-4.

TABLE 6-4

CANADIAN AND WORLD OXYGEN CONVERTER CAPACITY

Year	(millions of net tons at year-ends) World Crude Steel Production	World Oxygen Converter Capacity	Canadian Oxygen Converter Capacity	(per cents) World Oxygen Converter Capacity as % of World Production	Canadian as % of World Oxygen Converter Capacity
1953	257.9	0.5	0.0	0.2	-
1954	246.2	1.0	0.35	0.4	35.0
1955	297.5	1.0	0.35	0.6	35.0
1956	311.5	2.0	0.53	0.6	26.5
1957	322.0	7.0	0.71	2.2	10.1
1958	298.9	10.0	1.11	3.4	11.1
1959	335.8	14.0	1.44	4.2	10.3
1960	379.7	15.5	1.77	4.1	11.4
1961	390.1	23.0	1.87	5.9	8.1
1962	394.1	31.9	2.10	8.1	6.6
1963	422.7	52.0	2.55	12.3	4.9
1964	479.0	77.0	3.10	15.7	4.0
1965	501.4	110.0	3.55	21.9	3.0

Source: A.K. McAdams, "Big Steel, Invention, and Innovation, Reconsidered," The Quarterly Journal of Economics (August, 1967), p. 459; and Canada, Iron and Steel Mills 1966 (D.B.S. No. 41-023) and previous issues.

this significant steel innovation.

The position of the Canadian industry relative to foreign steel industries is of interest in this regard. In 1965 over 32 per cent of Canada's steel output was being produced by the basic oxygen process as compared with 17 per cent for the United States, 21 per cent for the United Kingdom, and 19 per cent for the ECSC countries.[16] Only a few countries were ahead of Canada in the use of this process; by 1965 Japan was producing 55 per cent of its steel by the basic oxygen process and Austria's proportion was 69.1 per cent. The significant cost savings which the basic oxygen process allows are discussed in Appendix I and further below. The Canadian industry adopted this innovation much more quickly than did the steel industries of Canada's main foreign competitors with the exception of the highly efficient Japanese steel industry.

The rate of introduction of continuous casting machines into the world steel production processes has been much slower than was the case for the oxygen converter process. Even as late as 1966 the total world capacity of continuous casting machines was only about 15 million tons, which represented less than 5 per cent of total world steelmaking capacity.[17] On the other hand, the rate at which this innovation was being introduced into steel technology did increase sharply after 1963. Between 1963 and 1966 ten of the fifteen million tons of capacity exist-

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[16]Table 6-5.

[17]See Table A-20.

TABLE 6-5

PERCENTAGE OF TOTAL OUTPUT OF STEEL PRODUCED BY:*

	Open Hearth Process		Electric Process		Pure Oxygen Process	
	1964	1965	1964	1965	1964	1965
Germany	45.1	42.9	8.0	8.5	14.0	19.1
Belgium	5.1	4.2	4.7	4.5	7.3	15.8
France	26.2	24.4	8.5	9.0	11.2	13.1
Italy	49.9	40.6	43.1	37.4	2.4	22.0
Luxembourg	-	-	1.5	1.3	6.0	10.6
Netherlands	22.2	24.3	8.3	6.6	69.5	69.1
ECSC	33.7	31.2	11.6	12.0	12.6	19.2
Austria	25.8	26.1	12.7	12.8	61.5	61.1
Denmark	94.4	94.4	5.6	5.6	-	-
Norway	-	-	60.1	59.5	39.9	40.5
U.K.	70.5	63.7	11.2	12.7	11.7	20.5
Sweden	32.0	32.2	41.5	38.1	16.2	21.8
Switzerland	-	-	100.0	100.0	-	-
Total for European OECD	42.1	38.8	13.4	14.1	14.0	20.6
Canada	58.4	44.0	11.1	12.8	30.5	32.2
United States	77.2	71.7	10.0	10.5	12.2	17.4
Japan	34.8	24.7	21.0	20.3	44.2	55.0
TOTAL OECD	55.7	50.6	13.1	13.5	17.9	24.4

*The remaining allocation, for those countries which do not add to 100 in any one year, represents steel production by the Bessemer processes — Canada has no Bessemer and the U.S. has less than 1 per cent.

Source: OECD, The Iron and Steel Industry in 1965 and Trends in 1966 (Paris: OECD, 1966), Table 5 in Statistical Annex.

ing in 1966 was put into operation. In the two years following 1966 continuous casting capacity rose from 15 to 38 million tons, indicating that by the mid-1960's the process had become commercially attractive, and it is expected that increasing amounts of continuous casting capacity will be added to total world steelmaking capacity in coming years.[18]

The Canadian industry was also a world leader in the introduction of this process. In 1962 Canada's continuous casting capacity represented 4.8 per cent of world continuous casting capacity.[19] In the 1960's this proportion rose further and by 1966 Canadian continuous casting capacity represented 8.5 per cent of world continuous casting capacity although Canadian production was only about 2 per cent of world steel production. Therefore, it is clear that Canadian primary steel firms have been relatively quick in adopting the two major post-war technological innovations. This very competitive behaviour is also consistent with the hypothesis that Canadian steel firms were becoming increasingly aware of the potential threat of foreign competition by the end of the 1950's and were responding by attempting to keep their operations as efficient as possible by searching out and applying the latest technological developments. The following section pursues this question further by looking at technological developments in the Canadian and U.S. steel industries in greater detail.

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[18]United Nations, Economic Commission for Europe, The Economic Aspects of Continuous Casting of Steel (New York: United Nations, 1968), p. 195.

[19]Table 6-6.

TABLE 6-6

ANNUAL CAPACITY OF CONTINUOUS CASTING MACHINES IN CANADA AND THE WORLD STEELMAKING INDUSTRIES

	(millions of tons)		(per cent)
	Canadian Capacity for Continuous Casting Machines	World Capacity for Continuous Casting Machines	Canadians as % of World
1955	.09	.38	24.5
1960	.09	1.65	5.6
1962	.20	4.23	4.8
1964	.58	6.85	8.5
1965	.73	9.00	8.1
1966	1.30	15.27	8.5

Source: Canada, Department of Energy, Mines and Resources, Mineral Resources Division, Primary Iron and Steel (January 1968), Metallurgical Works in Canada; and Table A-20.

Technological Innovations in the Canadian and U.S. Steel Industries

Canadian primary steel firms have introduced many significant technological innovations into their steelmaking operations in the post-war period and most of these have occurred since the mid-1950's. These innovations have affected all three of the main stages of the steelmaking process. One area where the major Canadian steel firms were leaders in technological innovation is in the preparation of iron ore prior to being charged into the blast furnace. Until the mid-1950's

iron ore was smelted in its natural state after being crushed and possibly slightly concentrated (increasing the iron content of the ore by removal of other elements).[20] Since that time firms have made great strides in the benefication of iron ores.[21] The concentration of iron ore was carried much further, and since the concentration process began to result in a product which was too fine for efficient blast furnace use, agglomeration techniques, specifically sintering and pelletizing were also developed. These techniques put the concentrates into a physical form (e.g. pellets) that can withstand the weight of the charge in the blast furnace.

Aside from raw material processing at the blast furnace level, natural gas or oil injection into the blast furnace has also been developed. These facilities increase "top" temperatures and pressures, which improves the efficiency of the furnace. Dofasco was the first firm in North America to bring a blast furnace into commercial operation that was equipped to employ oil in addition to coke as fuel. Because costs of oil are well below those of coke, this is a cost-saving technique. This furnace began operation in 1960.[22] Since the mid-1950's Canadian

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[20]G.E. Wittur, Primary Iron and Steel in Canada, Mineral Information Bureau, Department of Energy, Mines, and Natural Resources, Canada, MR 92 (1968), pp. 79-80.

[21]A discussion of the benefication processes is found in T.H. Janes and R.B. Elver, Survey of the Canadian Iron Ore Industry During 1958, Department of Energy, Mines and Resources, MR 31 (1959), pp. 51-55.

[22]Dominion Securities Corp. Ltd., Dominion Foundries and Steel Ltd., (November 1965), p. 9.

firms have made great cost-savings at the blast furnace level. Stelco estimated that during the 1955-65 period it had been able to increase the capacity of its existing blast-furnace facilities by 75 per cent, and Algoma estimated that it had raised the capacity of its ironmaking facilities by 41 per cent between 1959 and 1964 as a result of these innovations and could raise its capacity by a further 35 per cent by increasing the proportion of pellets in its blast furnace charge still further.[23] Stelco and Dofasco have estimated that in the 1965-1970 period cost savings per ton of pig iron produced by using pellets to replace raw iron ore would be roughly $1.51 and $1.48 respectively.[24]

Industry sources have claimed that blast-furnace technology has been more advanced in the Canadian industry than in the U.S. steel industry in the post-war period. Both Algoma and Stelco have expressed the belief that their blast furnace operations are more efficient than those of most U.S. firms. The result is that costs per ton of pig iron are somewhat lower in Canada than in the United States. In any event, it is clear that technological innovations at the blast furnace level have been a significant source of cost-savings for the steel firms in Canada, especially in the late 1950's and into the 1960's.

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[23] Burns Bros. and Denton Ltd., An Investment Study of the Canadian Primary Steel Industry (July 1964), p. 43; and Dominion Securities Ltd., The Algoma Steel Corporation Ltd. (1965), p. 3.

[24] Dominion Securities Corp. Ltd., Dominion Foundries and Steel Ltd. (1965), p. 6; and The Steel Company of Canada Ltd. (1965), p. 7. See also, D.J. Daly, B.A. Keys and E.J. Spence, Scale and Specialization in Canadian Manufacturing, Economic Council of Canada, Staff Study No. 21, March 1968, p. 72.

The other two important technological innovations in post-war steel technology are more easily viewed in a quantitative manner. The first basic oxygen converter installed in North America was at Dofasco in 1954. Algoma introduced this important innovation at its Sault Ste. Marie plant in 1958. In 1966 Dofasco had all of its steel furnace capacity in oxygen converters and Algoma had over 50 per cent of its capacity in oxygen converters.[25] Neither of the other major firms had introduced this process as of 1966. However, both Stelco and Dosco had some of their open-hearth furnaces equipped for oxygen injection.[26] Dosco was late even in equipping its open-hearth furnaces for oxygen injection. In 1964 and 1965 oxygen injection was installed in two of Dosco's six furnaces and in 1967 another furnace was equipped for injection of purity (.90 oxygen). Prior to 1964 none of Dosco's furnaces was equipped for oxygen use. Stelco has 14 blast furnaces, 5 of which are equipped for oxygen injection. Of these, 4 were so equipped in the early 1950's when they were constructed and the fifth, Stelco's largest blast furnace, was equipped for oxygen injection when the furnace was constructed in 1961. Recent studies have shown that the basic oxygen process is overall more efficient than the open-hearth furnace equipped for oxygen injection.[27]

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[25]Canada, Department of Energy, Mines, and Resources, Primary Iron and Steel, Operators List for Metallurgical Works in Canada, List 1 (January 1968).

[26]The following information is based on correspondence between myself and the firms in question.

[27]See, for example, United Nations, Economic Commission for Europe, Comparison of Steelmaking Processes (New York: U.N., 1962), pp. 68-75. However, this study points out that with the combined use of oxygen (for direct oxydation of steel as well as for flame enrichment) it is possible to increase productivity of open-hearths by 15 to 25 per cent and to decrease fuel consumption by up to 35 per cent on the basis of conservative estimates (pp. 8-9).

But the use of oxygen injection in open-hearth furnaces is itself a significant source of cost-savings, and Stelco was a leader in introducing this process.

Stelco has pointed out that the major advantage of the basic oxygen process is that it produces both large and small tonnages of steel efficiently. But this firm claims that for larger tonnages production costs are roughly comparable for an oxygen converter and an oxygen-lance-equipped open-hearth furnace, and that the construction costs of the basic oxygen converter are only slightly less than for an oxygen equipped open-hearth furnace.[28] But even taking this into account, the basic oxygen process is still clearly more efficient. In February 1969 Stelco announced that construction would begin to replace 8 of its 9 open-hearths which are not oxygen equipped by 3 basic oxygen furnaces. Stelco has pointed out that the more competitive atmosphere of the 1960's has forced domestic firms to supply steel with much more exact quality specifications and this necessitates producing steel in smaller batches. This development made the oxygen converter seem even more attractive.

One reason which Stelco mentions for not converting to the basic oxygen process prior to 1969 is the fact that this process uses a higher hot metal charge (iron rather than scrap), so that Stelco had to first expand its iron-making facilities, an expansion that was completed in 1968 by the addition of another blast furnace and coking ovens. Techno-

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[28]Correspondence between myself and the Economic Research Department of Stelco.

logical inter-relationships such as this no doubt have an important influence on the rate of introduction of new techniques in industries such as primary steel where the capital equipment being used is very durable. The following table indicates the rate at which the oxygen converter process was introduced into the Canadian steel industry. Oxygen converter capacity of Canadian steel firms, as a per cent of their total steelmaking capacity, rose especially sharply in the 1957-1960 period, but in the 1960's it continued to rise at a fairly steady and consistent rate. As pointed out above, the Canadian industry was ahead of most foreign industries in adopting this significant cost-saving innovation.

The first continuous casting machine to go into commercial operation in North America was at Atlas Steel (in Welland) in 1954. This machine had an annual capacity of 93,500 tons. No other continuous casting machines went into commercial operation on this continent until 1962 when small machines were installed at one U.S. steel plant and at Stelco's Premier Steel works. Further continuous casting capacity was added in the Canadian industry between 1962 and 1966, including an installation at Dosco's Montreal works in 1965. Stelco added a large continuous casting operation to its Hamilton works in 1966 and Algoma began construction of two machines in early 1967 with a combined capacity of 600,000 tons per year. By 1966 the combined continuous casting capacity of Canadian and U.S. steel firms was 4.27 million tons annually which represented about 28 per cent of total world capacity of continuous casting machines. However, Canadian

TABLE 6-7

CANADIAN OXYGEN CONVERTER CAPACITY
AND TOTAL STEELMAKING CAPACITY
(tons, 000's and per cents)

	Canadian Converter Capacity	Canadian Total Capacity	Canadian Converter Capacity as a % of Total Capacity
1954	350	4,883	7.2
1955	350	5,197	6.7
1956	525	5,470	9.6
1957	710	5,913	12.0
1958	1,110	6,314	17.6
1959	1,440	6,719	21.5
1960	1,770	7,268	24.4
1961	1,870	7,826	23.9
1962	2,100	8,076	26.0
1963	2,550	8,986	28.3
1964	3,100	10,345	30.0
1965	3,550	11,255	31.5
1966	3,550	11,637	30.5

Source: Tables 6-4 and 5-4.

capacity accounted for roughly 30 per cent of the combined U.S. and Canadian continuous casting capacity in that year,[29] even though the U.S. steel industry is about 13 times larger than the Canadian industry. Firms in the Canadian industry were also leaders in the introduction of this process and were again ahead of firms in the U.S. steel industry in adopting this innovation. Canadian steel firms in general appear to have been much more willing to adopt the latest technological innovations than their counterparts in the U.S. steel industry.

In the mid-1960's an extensive controversy developed concerning the rate at which the United States steel industry has introduced available technological innovations relative to foreign industries.[30] The original article, by Adams and Dirlam, attempted to explain the lack of price response on the part of domestic steel firms to the rise in the steel import to consumption ratio in the United States after the mid-1950's. The authors claim that U.S. firms were unwilling to lower domestic steel prices even when imports began to erode their markets because of the vertically integrated structure of the industry and the addiction of domestic firms to target-rate-of-return pricing.[31] However,

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[29]See Tables A-20 and 6-4.

[30]W. Adams and J.B. Dirlam, "Steel Imports and Vertical Oligopoly Power," The American Economic Review (September, 1964), and comments by Slesinger, Hone and Schoenbrod, and the authors in The American Economic Review (March, 1966); Adams and Dirlam, "Big Steel, Invention, and Innovation," The Quarterly Journal of Economics (May, 1966) and comments by McAdams and the authors in The Quarterly Journal of Economics (August, 1967), and a further comment by Rosegger and the authors in The American Economic Review (September, 1967).

[31]Adams and Dirlam, "Steel Imports and Vertical Oligopoly Power," op. cit., p. 652.

the authors take their argument further and claim that not only was the price response inadequate, but that U.S. firms also lagged in introducing new techniques of production.

> The rising volume of steel imports . . . eventually pressured domestic steelmakers to introduce modern production techniques already in widespread use in other major steel-producing countries. Most noticeable among them were the oxygen process and continuous casting. Both were adopted by major U.S. producers belatedly and with apparent reluctance.[32]

This discussion of the post-war behaviour of the U.S. steel industry lends support to the general hypothesis contained in the model in Chapter II. For example, Adams and Dirlam claim that "In a manner consistent with homogenous oligopoly behaviour, the domestic steel producers reacted to the import threat with a technological and political counterattack. The technological move was designed to introduce cost-reducing equipment and thus render the industry more competitive and less vulnerable to foreign steel produced under modern technologically progressive conditions."[33] Although the expected technological response was lagged, the authors believe that increased import pressures eventually gave rise to a significant technological response in the mid-1960's.[34]

It was the authors claim of technological backwardness to which others took strong exception. For example, Hone and Schoenbrod pointed out that ". . . even by 1960 only 2.6 per cent of the European Iron and

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[32] Ibid., p. 646.

[33] Ibid.

[34] Ibid., p. 647.

Steel Community's installed capacity was in oxygen converters and only by 1963 had it reached 10 per cent. Yet, by then the United States capacity in oxygen converters was the same as the Community's at 10 per cent of capacity.[35] But Adams and Dirlam answer this by pointing out that in September 1963 ". . . the United States still had only 10.04 million tons of L-D converter capacity in place — compared with 46.20 million tons for the world as a whole . . . . Moreover, the lag of the United States behind foreign steel producers was all the more remarkable, because the L-D process developed by the Austrians was immediately applicable to conversion of the low phosphorous ore found in North America."[36] From the analysis carried out above, it seems fairly clear that the U.S. steel industry was significantly lagging behind the Canadian and most foreign steel industries in adopting both the basic oxygen and continuous casting processes.

The later article by Adams and Dirlam investigates the relatively slow rate of introduction of the oxygen process by the large U.S. steel firms in greater detail.[37] This article attacks the "Schumpeterian hypothesis" that even if large oligopolies do not compete with prices,

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[35]Hone and Schoenbrod, "Steel Imports and Vertical Oligopoly Power: Comment," The American Economic Review (March, 1966), pp. 156-59.

[36]Adams and Dirlam, "Steel Imports and Vertical Oligopoly Power: Reply," The American Economic Review (March, 1966), p. 163.

[37]Adams and Dirlam, "Big Steel, Invention, and Innovation," op. cit., pp. 167-89.

they do compete technologically because firms with a high degree of market power have both greater incentive and resources for research and innovation.[38] They come to the conclusion that "In sum, given the steel industry's record of innovation with respect to oxygen steelmaking, it seems reasonable to suggest that Big Steel is neither big because it is progressive nor progressive because it is big."[39]

Even more important, the authors explicitly point out that the U.S. steel firms were ignoring the valid replacement decisions which were discussed in Chapter II because they were insulated from significant competitive pressures during most of the 1950's.

> Relying on its insulation from domestic and foreign competition, Big Steel decided to wait until its technologically obsolescent facilities were fully depreciated. Unlike firms in a competitive industry, it was not compelled to regard investment, once made, as truly sunk costs and to take into account only the operating expenses of existing equipment. Instead it afforded itself the luxury of protecting 'vast investments in fixed capital'.[40]

According to the authors, it would have been profitable for U.S. steel firms to scrap their open-hearth furnaces and replace them with oxygen converters during the 1950's.

> Earlier discussion has indicated that the operating savings resulting from the use of the oxygen converter may reasonably be taken to be $5 per ton. While a single figure is,

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[38] Ibid., p. 175.

[39] Ibid., p. 184.

[40] Adams and Dirlam, "Steel Imports and Vertical Oligopoly Power: Reply," op. cit., p. 165.

> of course, subject to qualification, it does not appear that $15 per ton is a serious underestimate of the investment that would have been required in the years 1950-1960 to install oxygen converters in United States mills. Unless the cost of capital to steel companies was as high as 33 per cent during this period they could have shown a clear gain by replacing open-hearth with oxygen capacity.[41]

This means that the low capacity utilization in the U.S. steel industry relative to many of the other steel industries of the world in the late 1950's and early 1960's cannot explain the slow rate of adoption of the oxygen converter process in the United States steel industry.

Although the U.S. steel firms were slow to respond to increased foreign competition, they did finally make a noticeable technological response. Adams and Dirlam point out that by 1964 the steel firms in the United States were installing oxygen converters at a very fast rate despite their low capacity utilization rates, and they claim that import competition was the prime factor in forcing domestic firms to introduce this innovation.[42] This occurred because by the mid-1960's U.S. steel firms felt they could no longer continue to protect their sunk capital investments.

> Eventually, of course, the steel giants abandoned this idée fixé because, as McAdams himself admits, 'In 1962 it appeared that the costs to the United States producers for not

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[41] Adams and Dirlam, "Steel Imports and Vertical Oligopoly Power: Reply," op. cit., p. 166.

[42] Adams and Dirlam, "Big Steel, Invention, and Innovation," op. cit., p. 183.

> innovating were significantly raised by actual and threatened competition from both domestic and foreign steelmakers.' But this merely restates the central proposition of our article — that it is the cold wind of competition, and not industrial concentration, which is conducive to innovation and economic progress.[43]

This argument is lent support by representatives of the U.S. steel industry itself. In a recent article, the vice-president of Jones and Laughlin claimed that the great technological innovations in the steel industry in the last 15 years have received their impetus not only from changing demand and supply conditions at home but also from increasing domestic and foreign competition. Even more significant, he points out that "The construction of new primary production facilities has been primarily a response to the need for greater efficiency and only secondarily to increased capacity."[44]

It is clear that the Canadian and U.S. steel industries had a great deal in common at the end of the 1950's. Both industries were facing increased foreign competition and firms in both industries responded by stabilizing their product prices and attempting to improve their efficiency. Nevertheless, it is also clear that the response of U.S. steel firms was slower and less vigorous than was the case for

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[43] Adams and Dirlam, "Big Steel, Invention, and Innovation: Reply," The Quarterly Journal of Economics (August, 1967), p. 481.

[44] W. P. Getty, "The Technological Improvements in the American Steel Industry," Yearbook of the American Iron and Steel Institute (New York: AISI, 1968), p. 45.

Canadian primary steel firms. U.S. steel firms apparently waited until the import threat gave rise to an actual erosion of the U.S. market before they attempted a strong technological response. In 1957 steel imports as a per cent of steel consumption in the United States was less than 2 per cent, but by 1960 it was almost 5 per cent and by 1965 the ratio had risen to over 10 per cent.[45] On the other hand, the steel import to consumption ratio in Canada has always been considerably higher than this although in the 1950's Canadian firms had succeeded in reducing the ratio considerably. The management of Canadian steel firms have no doubt been very conscious of the threat which foreign competition can pose, since the Canadian market has always had a high import to consumption ratio. This situation is in sharp contrast to the position of U.S. steel firms which were almost completely insulated from significant import competition prior to the end of the 1950's. It is believed that this factor played an important role in explaining the initial insensitivity of U.S. steel firms to increased foreign competitive pressures (as stressed by Adams and Dirlam) in contrast to the much more noticeable technological response undertaken by Canadian steel firms in the late 1950's and early 1960's.

The Longer-run Effects of Foreign Competition on the Canadian Primary Steel Industry

When foreign competition facing domestic steel firms increased in the second half of the 1950-1966 period, it placed downward pressure

[45]Singer, op. cit., p. 64. Furthermore, during this period, Canadian steel firms were investing much more heavily in new capital facilities than were U.S. steel firms. Daly, Keys, and Spence, op. cit., p. 73.

on Canadian steel prices and certainly increased the incentive of Canadian firms to lower their costs of production and become more efficient. On the basis of the model developed in Chapter II, domestic firms would be expected to become much more cost conscious and would probably become less willing to increase wages in the industry at as fast a rate as in the past. The greater interest in reducing unit production costs would encourage firms to accelerate the rate at which they were introducing currently available technological innovations and in general to search out and apply new techniques of production. The technological response would reveal itself in the form of a rising rate of investment and in an acceleration in the rate of increase of average labor productivity in the industry.

The above analysis of the behaviour of domestic steel firms when foreign competition facing them increased in the post-war period has generally been consistent with these expectations. The consistency of the behaviour of the Canadian steel firms with the expectation generated by the model supports the hypothesis that increased foreign competition is likely to cause domestic oligopolies to become more efficient. Although the above analysis does not prove a causal relationship between increased foreign competition and the increased efficiency of domestic steel firms, it can be shown that in fact domestic steel firms do make a direct connection between increased foreign competition and the necessity to improve their productive efficiency. In the specific case of Dosco, it can also be shown that the failure to do so can have very

serious consequences.

The effect of increased foreign competition on Dosco has been in sharp contrast to the effect it has had on the other major steel firms. At the same time that foreign competition began to increase after 1958, the capital expenditures of the three largest steel firms increased noticeably and were at much higher levels in the 1960's, even after the sharp expansion of output by these firms is taken into account.[46] But Dosco's capital expenditures were at very low levels during the 1958-1963 period. In the 1964-66 period Dosco's capital expenditures did increase but this primarily reflected the construction at Contrecoeur Quebec of a new bar and rod mill in 1964 and a new flat-rolling mill which came into partial operation in 1967. Dosco apparently did not make the sort of technological response to the increased foreign competition that the other major firms did, and the technological response which it did make appears to have come quite late. The failure of Dosco to make the sort of technological response required by the changed competitive conditions in the post-1958 period should be reflected in its cost structure relative to that of the other major firms. Specific data on costs of production for the major firms separately are not available. However, a consulting firm reporting to the Province of Nova Scotia did have data on the operating costs of the major steel firms and their report estimated that the operating costs of the Sydney mill were from $8 to $10 per ton higher than at the mills of the other major firms.[47] At the time that

[46]See Table A-21.

[47]Financial Times, December 11, 1967.

Dosco announced the proposed closing of its steel mill at Sydney the firm declared that the mill had ". . . an abnormally high cost of production due to its size and attendant maintenance and manning costs."[48]

Despite the fact that foreign competition fell especially heavily on this firm, it apparently did not make an adequate attempt to lower its unit production costs by means of technological innovations. As a result, its profit position was seriously eroded and by 1966-67 it was incurring large losses on its operations. This in turn seriously impaired the ability of the firm to make a technological response. As far back as 1964 investment houses in Canada were expressing concern about the ability of this firm to obtain adequate financing for its needed capital expenditures.[49] The important question here is why foreign competition affected Dosco in this damaging manner while apparently causing the other major firms to increase their competitiveness by improving the efficiency of their operations. The answer appears to be in line with the arguments contained in the model. Marginally efficient firms will be more adversely affected by increased foreign competition and may be driven out of the industry altogether. Dosco was the marginal major firm and in addition was most subject to import competition owing to its geographical location. Lacking the prospect for an expanding market Dosco appears to have been unwilling to introduce the latest improved technology into its production process. It is possible that

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[48]The Halifax Chronicle-Herald, October 14, 1967.

[49]Burns Bros. and Denton Limited, op. cit., p. 54.

even with a technological response equal in magnitude to that of the other major firms, Dosco's competitive position may not have increased sufficiently to allow it to successfully compete in the more competitive post-1958 environment. The owners of Dosco had apparently come to this conclusion by 1967:

> The steel mill at Sydney had become outdated by technological developments in steelmaking. If the money was available to completely modernize the mill, its geographical location relative to markets and the resulting freight charges on its products would still prevent Sydney from being truly competitive with other steel producers.[50]

The president of Dosco has been very explicit in recognizing that the increased foreign competition after 1958 in the Canadian steel industry made it necessary for domestic firms to improve their efficiency if they were to survive. "Excess steel capacity throughout the world has eroded prices in the already depressed market served by Dosco Steel and this factor has in turn prevented wage increases from being sufficiently recovered through increased productivity or selling prices."[51] Since the management of Dosco had apparently decided that even with a technological response the firm would not be able to compete successfully in the more competitive atmosphere in the 1960's, the firm did not attempt the sort of technological response that the other major firms show evidence of effecting. The lack of technological response to the increased foreign competitive pressures after 1958 on the

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[50] The Halifax Chronicle-Herald, October 14, 1967.

[51] Ibid.

part of Dosco certainly contributed to the fact that import competition eventually drove Dosco out of the domestic market while, on the other hand, these same pressures apparently caused the other major firms to become more cost conscious and more efficient in the post-1958 period.

The major Canadian steel firms seem to be very much aware of the relationship between increased foreign competition and the need to be as efficient as possible and the three largest steel firms have acted accordingly. For example, in its submission to the Carter Commission Algoma pointed out that

> If the steel industry is to take full advantage of these growing market opportunities and play its part in meeting the nation's economic objectives it will be essential to increase productivity as well as capacity. Increased production is not enough in itself. It must be efficient production, and efficiency is doubly important today in light of the world situation of surplus capacity and severe competition in steel.[52]

There is still concern that world steel capacity will continue to run ahead of world steel production in the foreseeable future. Therefore, the strongly competitive atmosphere of the 1960's is likely to continue into the 1970's.[53] Given these indications about the future,

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[52]Algoma Steel Corporation, op. cit., p. 17. The emphasis has been added to the quote.

[53]"In 1967 and 1968 the dominant factor in the iron and steel industry throughout the world was still, in the opinion of many of the member countries, the imbalance between production capacity and demand for steel; as recent studies have demonstrated, this is likely to continue over the next few years." Organization for Economic Co-operation and Development, The Iron and Steel Industry in 1967 and Trends in 1968 (Paris: OECD, 1968), p. 13.

Canadian steel firms have expressed concern about the need for insuring that adequate financing for future expansion and technical improvements will be available to the Canadian industry. For example, Algoma argues very explicitly that the increased competition from offshore steel firms has created very serious problems for the Canadian industry and has made it necessary for domestic firms ". . . to risk large amounts of new capital in new methods" in order to increase productivity still further.

> With rapid advances in technology, the steel industry faces substantial and probably increasing risks of obsolescence; former ideas concerning appropriate rates of depreciation may well have to be changed. New iron and steel-making facilities are expensive and normally have a long life but the steel industry will more frequently than in the past find otherwise good equipment outdated.[54]

To the extent that domestic firms have acted in accordance with their views as stated here, further support is furnished for the claim that the increased foreign competition which developed in the post-1958 period in the Canadian primary steel industry encouraged firms to search out and apply the latest available technological developments at a more rapid pace than they would have in the absence of these pressures. To the extent that this occurred, the increased foreign competition will have given rise to an increase in the efficiency of domestic steel firms. The behaviour of the domestic steel oligopolists in the 1950-1966 period has clearly been consistent with this hypothesis.

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[54]Algoma Steel Corporation, op. cit., pp. 16-17.

CHAPTER VII

THE EFFECT OF FOREIGN COMPETITION ON THE CANADIAN PRIMARY STEEL INDUSTRY : CONCLUSIONS AND POLICY IMPLICATIONS

This study has attempted to shed some light on the general effect of foreign competition on the operating efficiency of firms in a domestic oligopoly; and in particular, on whether an increase in foreign competitive pressures will improve their efficiency. Foreign competitive pressures on firms in the Canadian primary steel industry increased in certain years during the post-war period and it is argued above that this exerted a downward pressure on domestic steel prices and costs. The model constructed in Chapter II attempts to predict how firms in an oligopoly situation, which had been well insulated from outside competitive pressures in the past, would react to an increase in foreign competition. Although it predicts that this pressure is likely to force domestic steel firms to become more efficient, the model also recognizes that very severe foreign competition could drive some or all domestic firms out of the industry in the long run.

The increase in foreign competition facing the steel oligopolists not only exerted a downward pressure on domestic steel prices but also exerted some downward pressure on the rate of profit being earned by the major steel firms. As a result firms became more cost conscious and more interested in searching out and applying available technological

innovations. When foreign competition did increase, it was accompanied by a sharp acceleration in the rate of investment in the industry, in part to improve the competitive position of the firms by introducing new efficient capital equipment. It should also be stressed that the willingness and ability of domestic firms to do this was significantly reinforced by the fact that domestic demand for steel was expanding rapidly at the time. These factors were reflected in a substantial increase in the rate of increase in average labor productivity in the industry. The result was that by the end of the 1950-1966 period the efficiency of Canadian steel firms had greatly improved and they had kept up with leading foreign firms in the development and adoption of the significant technological innovations in the steelmaking processes.[1]

The Canadian primary steel industry also provided an example of a firm which could not successfully meet the increased foreign competitive pressures. The impact of the increased foreign competition at the end of the 1950's and into the 1960's fell particularly heavily on Dosco, the marginal producer among the four major firms. Very little evidence was found of attempts by Dosco to improve its efficiency by means of technological innovation or the use of new techniques of production. Its

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[1]"Since the mid-1950's, Canadian steel producers have developed into one of this country's most efficient and internationally competitive manufacturing industries.... At the same time, steel company managements have pioneered new processes and operating methods and made large capital investments in new facilities." Daly, Keys, and Spence, op. cit., pp. 69-70. Barnett has pointed out that Canadian steel firms are generally regarded as among the most efficient in the world, particularly in the production of flat-rolled products. Barnett, op. cit., p. 39. Finally, Singer has stressed the tendency for Canadian steel firms to be world leaders in the introduction of technological innovations. J. Singer, op. cit., pp. 17-23.

ability to respond successfully to increased foreign competition was hampered by the decline in its profits and market share as a result of this competition, and it closed down as a major producer in 1968. If foreign competition is very severe, domestic firms may become convinced that even with a technological response they will not be able to compete with imports in the long run and earn what they consider a satisfactory profit return.[2]

The actual analysis of the behaviour of domestic firms indicates that in general they behaved in a manner consistent with the predictions in the model which suggest how increased foreign competition can result in improved industrial efficiency in the sort of oligopoly situation outlined in Chapter II. In the case of Dosco it indicates that failure, for whatever reason, to react to foreign competition in a way which will improve efficiency can have serious consequences for a domestic firm. This study cannot "prove" that the post 1958 behaviour of domestic steel firms was significantly influenced by foreign competition and that they became more efficient as a result; however, the conformity of their actual behaviour to the expectations generated by the model offers significant support to its usefulness. Further studies of a similar nature for other Canadian industries could reinforce or weaken the more general implications of this study as outlined below.

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[2]This would certainly be the case if import competition drove domestic prices below the unit operating plus capital costs of a new best-practice steel plant in the domestic industry.

The conclusion that increased foreign competition had generally beneficial effects on Canadian steel firms is directly relevant to the question of the effect of unilateral tariff reductions on the efficiency of domestic oligopolies. Tariff reductions could have the effect of increasing foreign competition facing domestic firms. To the extent that this is so, it follows that such reductions are likely to place downward pressure on domestic prices and costs and act as a spur to domestic firms to become more efficient.[3] In slightly different terms, it can be argued on the basis of this study that had domestic steel tariffs been considerably higher in the 1950-1966 period, domestic firms would have been more insulated from foreign competitive pressures and may not have felt the same compulsion to significantly improve their cost positions and become as technologically advanced as they in fact did during this period. Domestic steel firms have explicitly indicated[4] that the competitive situation they are facing or expect to face in the future does significantly effect the rate at which they introduce available technological innovations and replace their older more outdated capital equipment.

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[3]The increase in foreign competition at the end of the 1950's did place downward pressure on domestic steel prices. This lends support to the proposition that lowering domestic tariffs could be used as an anti-inflationary policy on a selective basis. The question of whether tariffs are a proper instrument for influencing domestic prices is beyond the scope of this thesis.

[4]See the examples given in Chapter VI, pp.175 and 177-82. Furthermore in correspondence between myself and Stelco, this firm has indicated that when domestic steel prices were being held stable so that domestic firms could improve their competitive position relative to foreign producers, they were still able to maintain their long run profitability ". . . by extending their production runs and introducing more advanced equipment" (November, 1968).

The Canadian primary steel industry has never been completely insulated from foreign competition in the post-war period and has not lagged behind in the use of new technology. Therefore, when foreign competition increased, domestic firms were generally in a favourable position for meeting the competitive challenge and keeping abreast in the use of the latest production techniques. The more technologically backward are domestic firms, the more insulated they have been in the past from strong competitive pressures, and the slower they are to react to increased competition, the greater the likelihood that increased foreign competition will have the sort of effect that it had on U.S. steel firms or on Dosco.[5] Governments which decide to use tariff policy as a spur to industrial efficiency may have to investigate ways of encouraging firms to respond by innovating and may consider offering adjustment assistance to help firms in meeting the competitive challenge from foreign sources. A policy of gradual tariff reductions on a pre-announced schedule would have the benefit of allowing firms time to anticipate the sort of adjustments they would have to make in order to modernize their production processes and be in a position to compete in the changing environment.

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[5]The effect of foreign competition on Dosco also supports the argument that increased foreign competition may drive marginal firms out of an industry and leave the remaining ones a larger domestic market. If as a result, domestic firms expand the scale of their operations and gain greater economies of scale, then this might also be a source of increased efficiency arising from increased foreign competition. Of course, in the case of Dosco, the Sydney mill is being run by the Government of Nova Scotia. However, even if this mill had ceased operation altogether and the domestic market was widened for the other major firms as a result, its effects on the scale of operations of the remaining three oligopolists would have been negligible.

Finally, although increased foreign competition appears to have had the sort of effects on the domestic steel industry as described above, it may not have these effects on other Canadian industries. Especially important in this regard is the helpful effect which the rapidly expanding domestic market for steel products had in encouraging domestic firms to innovate. Furthermore, the reaction of oligopolistic firms producing highly differentiated products to increased foreign competition might be quite different. One possibility here is that foreign competition might give rise to greater specialization in production on the part of domestic firms.[6] The experience of the primary steel industry does not offer sufficient evidence for suggesting broad generalizations about the effects of increased foreign competition on oligopolistic industries in Canada. Nevertheless, this study does indicate that increased foreign competition acted as a spur to domestic steel firms to become more efficient. The most important way they achieved this was by accelerating the rate at which they were introducing currently available technological innovations and by applying new cost-saving techniques of production. Insofar as foreign competition has tended to have this effect, the study lends support to the contention that at least in some cases tariff protection which effectively insulates domestic oligopolists from foreign competitive pressures, does foster industrial inefficiency in domestic oligopolies.

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[6]There is no evidence that increased foreign competition facing domestic steel firms gave rise to greater specialization in a narrower range of products. The technology of steelmaking militates against this sort of reaction. Steel firms have a strong preference for product diversification because of the strong cyclical nature of demand for many of their products. At a time when foreign competition facing Dosco was intensifying, this firm was, for a variety of reasons, attempting to diversify its production.

APPENDIX I

APPENDIX I

THE TECHNOLOGY OF THE BASIC OXYGEN AND CONTINUOUS CASTING PROCESSES IN PRIMARY STEELMAKING

The basic steelmaking processes were outlined in Chapter IV. The production of iron represents about 33 per cent of the total cost of producing heavy steel products, while the further production of steel ingots adds another 47 per cent to such costs. Rolling operations (primary and secondary) account for the remaining 20 per cent.[1] This gives a rough idea of the relative importance of the different stages involved in the production of primary steel products. Although there have been many important advances in steelmaking technology in the post-war period, the two most outstanding have been the oxygen converter method for producing steel ingots and the continuous casting process which allows for the production of steel billets and slabs directly from the steel furnace, thus eliminating the necessity for the primary rolling of steel ingots. In terms of impact, the introduction of the oxygen converter in the steelmaking process has been the more important of the two innovations.

The original Bessemer converter process for producing steel consisted of jetting a blast of air, containing oxygen, through molten

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[1]United Nations, Economic Commission for Europe, Long Term Trends and Problems of the European Steel Industry (Geneva: U.N., 1959), p. 80.

pig iron.[2] The oxygen reacted with impurities in the iron which were burned off in a gas or carried off into the slag which separated from the molten steel. The air blast presented a problem because air is only 20 per cent oxygen, the remainder being nitrogen, and the nitrogen makes the steel more brittle. The introduction of the open-hearth furnace (called the Siemens-Martin process in Europe) was especially successful because it produced steel almost free of nitrogen and could use a high charge of scrap steel if desired. On the other hand, the pneumatic process was less expensive and produced steel more quickly than the open-hearth furnace, even though the steel was not of so high a quality. After World War II, pure oxygen became available at commercially realistic prices and the possibility of making high quality steel by a pneumatic process became a reality.

The L-D converter or oxygen vessel came into commercial operation in Austria in 1952.[3] This process is often referred to as the basic oxygen process (BOP). The process itself is fairly simple. It refines pig iron into a steel by jetting pure oxygen vertically downward onto a bath of molten pig iron in a converter that is pear-shaped, with a restricted mouth. The lance, which is inserted from the top of the converter and jets the oxygen down onto the bath, burns the impurities out

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[2]A good history of the different steelmaking processes at the steel furnace level is contained in Adams and Dirlam, "Big Steel, Invention, and Innovation," The Quarterly Journal of Economics (May 1966), pp. 167-89, especially pp. 169-74.

[3]L-D stands for Linz-Donauwitz, the Austrian towns where the process was first used commercially.

of the melt. This process makes steel in smaller batches and at a considerably faster rate than does the open-hearth process. Cycles for the L-D converter are now less than an hour as compared with 8-12 hours for one cycle in the open-hearth furnace. Most L-D converters use a 25-30 per cent scrap content in the bath, but they cannot use a much higher percentage than this. Also, the L-D converter cannot charge a 100 per cent cold charge (i.e. all cold metal) into the furnace. Thus the process is not quite so flexible as the open-hearth process in these two instances. Basically, it demands more hot metal (iron) than does the open-hearth.

The L-D converter produces steel which is of as high a quality as that produced in the open-hearth furnace, and it does so more quickly and efficiently. From an economic viewpoint this process is more efficient than the open-hearth furnace. A recent U.N. study concluded that both investment and production costs for the oxygen converter are lower than for the open-hearth process.[4] After surveying the different steel-making processes they comment: "Summarizing the considerations examined in this chapter, it may be concluded that in all comparable conditions oxygen converters can secure the most economical results from the point of view of steel production costs and of capital investment, whether at the sole level of steel shops or including also related branches of the iron and steel and other industries."[5]

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[4]U.N. Economic Commission for Europe. Comparison of Steel-Making Processes (N.Y.: U.N., 1962), pp. 59-75.

[5]Ibid., p. 75.

An earlier U.N. study came to similar conclusions.[6] This study quotes estimates which indicate investment costs in the oxygen converter are about 70 to 75 per cent of those for an open-hearth shop and that processing costs per ton of L-D steel run between $3 and $12 per ton less than those of open-hearth steel.[7] By the end of the 1950's the opinion that the basic oxygen process was an extremely important technological breakthrough which would result in significant cost savings had become fairly wide-spread. Perhaps the best indicator of the superior efficiency of this process is the fact that the oxygen converter has been consistently replacing open-hearth furnaces in North America and the open-hearth and Bessemer-type converters in Europe. By 1965 steel produced by the oxygen process was already accounting for 19 per cent of the output of steel in the ECSC countries, 21 per cent of the output of the European OECD countries, 17 per cent of U.S. steel output, and 32 and 55 per cent of Canada and Japan's steel outputs respectively.[8] In the United States, the importance of oxygen converters is felt to be such that current estimates indicate some 45 per cent of U.S. steel production will be coming from oxygen converters by 1975.[9]

The second important technological innovation in the post-war steel industry is the continuous casting process. The traditional steel-

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[6]U.N. Economic Commission for Europe, op. cit., Long Term Trends and Problems of the European Steel Industry, p. 98.

[7]Ibid.

[8]See Table 6-5.

[9]Adams and Dirlam, "Big Steel, Invention, and Innovation," op. cit., p. 183.

making process casts molten steel from the steel furnace into steel ingots which are then reheated and rolled in the primary rolling mill into blooms, billets and slabs. The continuous casting machine casts molten steel from the furnace directly into an open-end mould from which solidified steel is continuously withdrawn and cast to desired lengths, resulting in the production of blooms, billets and slabs. A U.N. study has assessed the new process as follows:

> The many advantages of the continuous casting process account for its expanding development. In comparison with orthodox production methods of teeming into ingot moulds, continuous casting produces directly a semi-finished billet or slab suitable for subsequent hot working operations. The process thus by-passes ingot casting, stripping, re-heating and primary rolling. Reduced capital and space requirements, remarkably high yield of usable semi-finished material from a given weight of molten metal, and relatively low conversion costs are some of the resultant economic benefits.[10]

However, it is very difficult to quantify the cost-savings which this process allows, although they are apparently quite significant. The continuous casting process makes it possible to raise productivity and cut melting and rolling costs.[11] The process eliminates the cost of ingot moulds, bottom plates, ladle cars and pouring pit refractories and also the need for the heating and rolling of steel ingots in primary mills. The machines are easily automated and are labor saving. Cuts

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[10]United Nations Economic Commission for Europe, Economic Aspects of Continuous Casting of Steel (New York: U.N., 1968), prefatory note.

[11]Ibid., pp. 182-83. The following comments on the process are taken from this source.

in the wages bill for production workers can amount to about 10 per cent of specific production costs. The process is flexible and can be used to supplement primary rolling mills in cases where melting capacity exceeds the existing capacity of the primary rolling mill. The higher productivity of the process is cited as the main reason for its accelerated rate of adoption after 1960.

In 1959, a U.N. study dealing with steel technology was still referring to this process as being in its infancy.[12] However, after 1960 the rate of introduction of this process into the world steel production process accelerated. Annual capacity of continuous casting machines rose from 2 million tons in 1961 to about 26 million tons in 1967 — a tenfold increase. This compares with an expansion of crude steelmaking capacity of only 40 per cent during this period.[13] By 1967 annual capacity of continuous casting machines had risen to 5 per cent of total annual world crude steel capacity.[14] The increase in the rate of introduction of this technique in the 1960's was aided by the rapid expansion of the basic oxygen process. The oxygen process is especially well-suited to the use of continuous casting machines because the oxygen converter's heat-size is less and its heat-time shorter than for

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[12]United Nations, Economic Commission for Europe, op. cit., Long Term Trends and Problems of the European Steel Industry, p. 104.

[13]United Nations, Economic Commission for Europe, op. cit., Economic Aspects of Continuous Casting of Steel, p. 193.

[14]Ibid.

the open-hearth furnace at the same level of productivity.[15] As a corollary to this, the most recent U.N. study has pointed out that "It is mainly in the establishment of new steelmaking plant and in the expansion of existing capacity that continuous casting capacity has been introduced."[16]

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[15]United Nations, Economic Commission for Europe, op. cit., Long Term Trends and Problems of the European Steel Industry, p. 106.

[16]United Nations, Economic Commission for Europe, op. cit., Economic Aspects of Continuous Casting of Steel, p. 193.

APPENDIX II

TABLES A-1 to A-21

TABLE A-1

THE CANADIAN CUSTOMS TARIFF AS APPLIED TO SELECTED PRIMARY IRON AND STEEL PRODUCTS

	B.P.*	MFN	Tariff Item
Iron Ore	Free	Free	32900-1
Pig Iron ($ per ton)	$1.50	$2.50	37400-1
Ingots, n.o.p. ($ per ton)	Free	$3.00	37700-1
Semis (blooms, billets & slabs)	Free	5%	37800-1
Bars or rods (hot rolled)	5%	10%	37905-1
Bars or rods (cold rolled)	5%	15%	37905-1
Rods for wire manufacture	Free	$3.00	37915-1
Shapes & Sections (h.r. or c.r.)			
General, n.o.p.	5%	10%	38001-1
Large sections not made in Canada, ($ per ton)	Free	Free - $5.00	38002,003-1
Plate (hot or cold rolled)	5%	10%	38100-1
Sheet and Strip			
Hot rolled	5%	10%	38201-1
Cold rolled	5%	15%	38202-1
Coated with tin or enamel	10%	15%	38203-1
Galvanized	7.5%	15%	38204-1
Skelp	Free	7.5%	38400-1
Rails	5%	10%	38700-1

*The B.P. (British Preferential) section of the Canadian Tariff Schedule applies to Britain and the other Commonwealth countries; the MFN (Most Favoured Nation) section of the tariff applies to all other countries who are signatories of the General Agreement on Tariffs and Trade and to some of the Communist bloc countries. The third section of the Canadian Tariff Schedule is the General Tariff (not shown above) which applies to residual countries and is the highest of the three schedules.

Source: Canada. Mineral Resources Division, Department of Mines and Technical Surveys, G.E. Wittur, Iron and Steel, No. 24 (1965).

TABLE A-2

THE CANADIAN EXCHANGE RATE — PRICE OF THE U.S. DOLLAR IN CANADIAN CURRENCY

	Average Noon Rates — Spot $
1950	108.92
1951	105.28
1952	97.89
1953	98.34
1954	97.32
1955	98.63
1956	88.41
1957	95.88
1958	97.06
1959	95.90
1960	96.97
1961	101.32
1962	106.89
1963	107.85
1964	107.86
1965	107.80
1966	107.73
1967	107.87

Source: Bank of Canada, Statistical Summary (monthly), 1968 and prior issues.

TABLE A-3

PRIMARY IRON AND STEEL PRICE INDEXES —
CANADA AND THE UNITED STATES, 1950-1966
(Per cents)

	Canada - Rolling Mill Products	U.S. Finished Steel Mill Products	
	1956 = 100	1956 = 100	1957-59 = 100
1950	76.7	70.9	62.9
1951	86.4	76.4	67.8
1952	91.7	78.1	69.3
1953	94.1	84.2	74.7
1954	92.6	88.2	78.2
1955	94.0	92.2	81.8
1956	100.0	100.0	88.7
1957	106.4	109.6	97.2
1958	107.4	113.4	100.6
1959	107.2	115.2	102.2
1960	107.6	115.1	102.1
1961	107.0	114.7	101.7
1962	106.6	114.3	101.4
1963	106.4	115.0	102.0
1964	106.1	115.9	102.8
1965	108.1	116.5	103.3
1966	110.2	118.0	104.7

Source: Dominion Bureau of Statistics, Wholesale Prices Section; American Iron and Steel Institute, Annual Report, 1967, and prior reports.

TABLE A-4

CANADA AND UNITED STATES (a)—COMPARISON OF BASE PRICES OF SELECTED STEEL PRODUCTS AS AT JANUARY 1954-1966, AUGUST 1966 and JUNE 1967

(Canadian Dollars per Hundred Pounds)

	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Aug. 1966	June 1967
Structural Steel Shapes, Carbon															
U.S.	$3.99	$4.19	$4.53	$4.79	$5.12	$5.27	$5.33	$5.57	$5.88	$5.93	$6.15	$6.14	$6.14	$6.31	$6.31
Canada—Sault Ste. Marie	4.60	4.60	4.80	5.05	5.30	5.50	5.50	5.50	5.50	5.50	5.50	5.50	5.75	5.75	5.95
—Hamilton	4.60	4.60	4.95	5.15	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.65	5.65	5.65
Steel Plate, Carbon															
U.S.	3.99	4.17	4.43	4.65	4.97	5.08	5.14	5.37	5.67	5.72	5.99	5.98	5.98	5.98	5.98
Canada (b)	4.60	4.95	4.95	5.25	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45	5.45
Hot-Rolled Sheet, Carbon															
U.S. (18 gauge and over)	3.82	4.09	4.26	4.49	4.79	4.89	4.95	5.17	5.45	5.50	5.72	5.71	5.71	5.88	5.88
Canada (over .080")	4.25	4.25	4.30	4.60	5.00	5.00	5.00	4.95	4.95	4.95	4.95	5.15	5.15	5.15	5.35
Cold-Rolled Sheet															
U.S.	4.65	4.88	5.25	5.51	5.87	6.02	6.09	6.36	6.71	6.77	7.04	7.04	7.04	7.20	7.20
Canada	5.10	5.10	5.25 (c)	6.05	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.60	6.60	6.80
Merchant Bars, Carbon															
U.S.	4.04	4.24	4.58	4.87	5.27	5.45	5.51	5.75	6.07	6.13	6.40	6.39	6.39	6.34	6.34
Canada—Sault Ste. Marie	4.60	4.60	4.80	5.05	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.30	5.65	5.65	5.65
—Hamilton	4.60	4.60	4.95	5.15	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.65	5.65	5.65

(a) U.S. prices are Pittsburgh base prices.
(b) Up to 1959 Hamilton only; from 1959 on Sault Ste. Marie supplied sheared mill steel plate at identical mill base price as Hamilton.
(c) In July 1956 price increased to $5.75.

Note: U.S. prices have been converted to Canadian funds at yearly average spot rates.

Sources: *Iron Age* and The Algoma Steel Corporation, Limited.

Source: The Algoma Steel Corporation, op. cit., Statistical Supplement, Table 25.

TABLE A-5

PRICE LEVEL INDEXES FOR IRON AND STEEL PRODUCTS

INDEXES OF PRICE COMPETITIVENESS

U.S. FOR EACH YEAR = 100

(per cents of U.S. prices)

	1957	1961	1962	1963	1964
U.S.	100	100	100	100	100
U.K.	87	80	79	77	81
E.E.C.	90	78	76	74	80
Japan	n.a.	79	72	72	72
Canada*	108	98	93	92	88

n.a. = not available

*Canada data not in original table. Data for Canada taken from Table 4-3.

Source: Kravis and Lipsey, op. cit., p. 28.

TABLE A-6

CONTINENTAL PRODUCERS EXPORT PRICES —
PRIMARY STEEL PRODUCTS
(U.S. $ Per Metric Ton, f.o.b.)

	Concrete Re-Inforcing Rounds	Merchant Bars	Joists and Channels	Wire Rod	Plate	H.R. Hoop and Strip
July 1955	104-108	-	103-108	112-76	115-117	105-110
July 1956	115-118	-	128-132	112-116	150-157	110
Jan. 1957	116-120	-	136-138	115-118	165-170	113
July 1957	109-112	-	125-127	116	150-155	113-115
Jan. 1958	82-85	-	106-108	112	125-128	115
July 1958	80-82	-	87-88	87-90	95-98	102-105
Jan. 1959	76-78	82-84	81-83	85-86	85-87	96-98
July 1959	98-100	103-106	94	123-125	103-105	107
Jan. 1960	108-110	110-114	101-102	140	110-112	110-112
July 1960	100-102	102-105	96-98	116-118	105	111-112
Jan. 1961	96	99-101	94-95	105-107	99-100	109-111
July 1961	89-90	99-100	93-95	95-98	44-96	104
Jan. 1962	83	95	94	89	91	93
July 1962	70-72	82-83	83-84	81-82	97-98	92-94
Jan. 1963	71-71.5	78-79	78	82-83	88	93
July 1963	74	79-80	77-78	70-80	85-86	87
Jan. 1964	75-76	80-82	75-78	78	84-85	84
July 1964	85	79-80	86	98-96	116-113	98
Jan. 1965	81	91	84-86	89-90	99	95-96
July 1965	77-78	88-89	82-83	87-88	86-87	90-92
Jan. 1966	79	84-85	76	82	87-90	85-86
July 1966	74	83	78	76-77	85	86

Source: Organization for Economic Co-operation and Development, Iron and Steel 1965 and Trends in 1966 (Paris: OECD, 1966).

TABLE A-7

ECSC EXPORT PRICES AND PRICE INDEXES

(U.S. $ PER TON AND PER CENTS)

INDEX 1957 = 100

	Merchant Bars (Steel)		Heavy Sections (Steel)		Heavy Plates (Steel)		Cold Reduced Sheet (Steel)	
	$	Index	$	Index	$	Index	$	Index
1957	120	100	128	100	146	100	163	100
1958	87	73	92	72	99	68	148	91
1959	98	82	94	73	96	66	155	95
1960	102	85	96	75	103	71	173	106
1961	100	83	94	73	97	66	125	76
1962	88	73	87	68	96	66	124	76
1963	81	68	78	61	87	60	111	68
1964	92	77	85	66	108	74	124	76
1965	90	75	82	64	92	63	108	66
1st qtr. 1966	85	-	75	-	86	-	105	-

Source: Organization for Economic Co-operation and Development, Iron and Steel 1965 and Trends in 1966 (Paris: OECD, 1967).

TABLE A-8

JAPAN — PRIMARY STEEL EXPORT PRICES

(U.S. $ PER METRIC TON, F.O.B. JAPANESE PORT)

	Mild Steel Plain Round Bars	Mild Steel Equal Angles	Mild Steel Joists	Wire Rod	Mild Steel Plates	Rolled Hoop in Coils
Jan. 1960	112	125	145	125	115	125
Dec. 1960	103	118	125	111	110	118
June 1961	105	130	-	113	108	112
Jan. 1962	94	112	140	105	100	112
June 1962	79	92	120	94	100.2	115
Feb. 1963	84	90	110	92	100.2	115
May 1963	88	95	115	94	100.2	120
Dec. 1963	89	90	115	85	100.2	120
June 1964	89	90	115	91	103	120
Jan. 1965	100	102	115	98	108	105
June 1965	93	100	115	96	103	93
Jan. 1966	88	98	115	89	99	85

Source: Organization for Economic Co-operation and Development, Iron and Steel 1965 and Trends in 1966 (Paris: OECD, 1967).

TABLE A-9

U. K. BOARD OF TRADE PRIMARY STEEL PRICE INDEX

INDEX, 1954 = 100

1952	97
1953	99
1954	100
1955	105
1956	112
1957	125
1958*	129.9
1959	128.9
1960	128.5
1961	129.6
1962	133.3
1963	133.7
1964	134.3
1965	136.6
1966	140.8

*Prior to 1958 the index was based on 1959 = 100, but was converted to a 1954 = 100 base.

Source: American Iron and Steel Institute, Annual Statistical Report (New York: AISI, 1967).

TABLE A-1

CANADA'S EXPORTS AND IMPORTS OF PRIMARY

($ 000)

IMPORTS	1950	1951	1952	1953	1954	1955	1956	195
Pig Iron & Semis	3,375	11,389	12,265	3,938	1,851	1,900	2,906	3,7
Bars & Rods	9,441	24,850	22,164	15,744	10,495	14,824	26,238	18,4
*F. R. Products	66,005	108,479	84,412	78,689	53,260	75,235	124,742	116,0
**S. S. Shapes	16,424	38,828	35,554	29,562	32,481		81,145	83,0
***Rails & R'way Track Mat.	2,297	1,498	1,747	1,887	1,925	2,338	4,977	5,5
Total	97,542	185,044	156,142	129,820	100,012	132,129	240,008	226,9
EXPORTS								
Pig I. & Semis	21,331	14,434	25,032	29,508	17,861	33,695	20,749	42,2
Bars & Rods	2,701	5,968	12,493	4,913	2,221	4,834	7,614	7,8
F. R. Products	3,227	4,058	4,629	10,518	2,950	8,740	8,888	11,9
S. S. Shapes	352	780	1,588	1,265	163	567	2,445	2,3
R. & R. T. Mat.	898	4	148	169	68	9,750	9,347	12,1
Total	28,509	26,244	43,890	46,373	23,263	51,586	49,053	76,4
EXPORTS-IMPORTS								
Pig I. & Semis	17,956	3,045	12,767	25,570	16,010	31,795	17,843	38,4
Bars & Rods	-6,740	-17,882	-9,671	-10,831	-8,274	-9,990	-18,614	-10,5
F. R. Products	-62,778	-104,421	-79,783	-68,171	-50,310	-66,495	-115,854	-104,1
S. S. Shapes	-16,072	-38,048	-33,966	-28,297	-32,318	-37,265	- 78,700	-80,6
R. & R. T. Mat.	-1,399	-1,494	-1,599	-1,718	-1,857	7,412	4,370	6,6
Total	- 69,033	-158,800	-112,252	-83,447	-76,749	-74,543	-190,955	-150,3

* Flat-Rolled Products

** Structural Steel Shapes

*** Rails & Railway Track Material.

BLE A-10

RIMARY IRON AND STEEL PRODUCTS

$ 000)

	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
	3,785	2,843	3,444	4,600	1,641	2,458	2,491	3,473	5,631	6,256
	18,408	24,617	18,926	14,868	19,843	25,457	25,764	41,969	64,543	44,904
	116,092	80,067	59,668	61,007	53,275	57,898	80,761	121,587	155,745	117,008
	83,014	40,189	52,671	57,064	37,693	27,357	28,646	48,622	64,924	43,919
	5,500	2,614	6,068	1,752	1,097	775	1,540	1,508	1,562	1,900
3	226,999	150, 330	140,777	139,291	113,549	113, 946	139,202	217,159	292,405	213,987
9	42,226	24,278	32,622	53,350	52,232	48,878	59,540	76,410	65,906	61,271
4	7,843	3,785	8,778	14,809	11,848	9,447	12,817	14,549	16,144	18,155
8	11,906	7,392	38,587	52,226	35,795	48,799	61,350	71,708	78,140	76,956
5	2,328	3,777	2,863	2,102	1,781	2,867	5,006	3,461	3,753	7,187
7	12,166	17,482	4,379	6,524	8,138	12,669	17,308	21,669	11,600	11,547
3	76,469	56,714	87,229	129,011	109,794	122,660	156,021	187,762	175,543	175,116
3	38,441	21,435	29,178	48,750	50,591	46,419	57,049	72,937	60,275	55,015
4	-10,565	-20,832	- 10,148	- 59	-7,995	-16,010	-12,947	-27,920	-48,399	-26,749
4	-104,186	-72,675	-21,081	-8,781	-17,480	-9,099	-19,411	-49,879	-77,605	-40,052
0	-80,686	-36,412	-49,808	-54,962	-35,912	-24,490	-23,640	-45,161	-61,171	-36,732
0	6,666	14,868	-1,689	4,772	7,041	41,894	15,768	20,126	10,038	9,647
5	-150,330	-93,616	-53,548	-10,280	-3,755	+8,714	+16,819	-29,397	-116,862	-38,871

(Cont'd)

TABLE A-10 (Co

CANADA'S EXPORTS AND IMPORTS OF PRIMAR

SALES

SALES	1950	1951	1952	1953	1954	1955	1956	1
Pig I. & Semis	65,033	81,657	83,102	59,281	35,912	61,520	58,511	75,
Bars & Rods	72,396	95,204	105,728	96,672	91,089	125,390	169,360	155,
F.R. Products	96,401	137,235	151,394	154,024	144,226	205,586	264,118	260,
S.S. Shapes	13,337	23,261	23,248	28,725	20,056	26,694	36,361	42,
R. & R.T. Mat.	27,287	28,383	30,937	33,751	27,121	28,611	45,597	52,
Total	274,494	365,740	394,408	372,453	318,404	447,801	573,947	587,

Source: Canada. Dominion Bureau of Statistics. Trade of Canada, E and Imports by Commodity (no. 65-007); and Canada. D.B.S., and prior issues.

[redacted]

LE A-10 (Cont'd)
OF PRIMARY IRON AND STEEL PRODUCTS
SALES

1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
58,511	75,440	54,497	84,186	108,700	103,718	113,278	111,721	123,017	146,243	146,332
169,360	155,445	128,184	177,177	162,203	167,855	117,695	203,319	241,663	259,171	274,781
264,118	260,835	245,062	357,600	334,093	370,311	345,541	483,602	558,827	604,837	617,104
36,361	42,823	29,140	34,528	30,075	40,412	56,659	62,370	72,927	74,809	73,766
45,597	52,629	50,992	42,820	31,858	28,389	34,228	44,599	40,896	33,632	41,034
573,947	587,172	507,875	696,311	666,929	710,685	727,401	905,611	1,036,830	1,118,692	1,153,017

of Canada, Exports by Commodity (no. 65-004)
ada. D.B.S., Iron and Steel Mills, 1966 (no. 41-203)

[redacted]

TABLE A-11

PRIMARY STEEL EXPORTS FROM CANADA AS A PER CENT OF SALES BY DOMESTIC FIRMS

(per cents)

1950	1951	1952	1953	1954	1955	1956
10.4	7.2	11.1	11.8	7.3	12.9	8.5

1957	1958	1959	1960	1961	1962	1963
13.0	11.2	12.5	19.3	15.4	16.9	17.2

1964	1965	1966
18.1	15.7	15.2

Source: Table A-10.

TABLE

PRIMARY IRON

(Per

	1950	1951	1952	1953	1954	1955	1956	195
				Sales by Product Group as a				
				Primary Iron and S				
Pig Iron & Semis	23.7	22.3	21.1	15.9	11.3	13.7	10.2	12.
Bars & Rods	26.4	26.0	26.8	26.0	28.6	28.0	29.5	26.
Flat-Rolled Products	35.1	37.5	38.4	41.4	45.3	45.9	46.0	44.
Structural Shapes	4.9	6.4	5.9	7.7	6.3	6.0	6.3	7.
Rails & Material	9.9	7.8	7.8	9.1	8.5	6.4	7.9	9.
				Imports by Product Group as a				
				Primary Iron and S				
Pig Iron & Semis	3.5	6.2	7.9	3.0	1.9	1.4	1.2	1.
Bars & Rods	9.7	13.4	14.2	12.1	10.5	11.2	10.9	8.
Flat-Rolled Products	67.7	58.6	54.1	60.6	53.3	56.9	52.0	51.
Structural Shapes	16.8	21.0	22.8	22.8	32.5	28.6	33.8	36.
Rails & Material	2.4	0.8	11.1	1.5	1.9	1.8	2.1	2.
				Exports by Product Groups as a				
				Primary Iron and S				
Pig Iron & Semis	74.8	55.0	57.0	63.6	76.8	58.5	42.3	55.
Bars & Rods	9.5	26.6	28.5	10.6	9.5	8.4	15.5	10.
Flat-Rolled Products	11.3	15.5	10.5	22.7	12.7	15.2	18.1	15.
Structural Shapes	1.2	2.3	3.6	2.7	0.7	1.0	5.0	3.
Rails & Material	3.2	-	0.3	0.4	0.3	16.9	19.1	15.

Source: Table A-10.

TABLE A-12

RIMARY IRON AND STEEL

(Per cents)

55	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
ct Group as a Per cent of Total Sales of nary Iron and Steel Products											
7	10.2	12.8	10.7	12.1	16.3	14.6	15.6	12.3	11.9	13.1	12.7
0	29.5	26.5	25.5	25.4	24.3	23.6	24.4	22.5	23.3	23.2	23.8
9	46.0	44.4	48.3	51.4	50.1	52.1	47.5	53.4	53.8	54.1	53.5
0	6.3	7.3	5.7	5.0	4.5	5.7	7.8	6.9	7.0	6.7	6.4
4	7.9	9.0	10.0	6.1	4.8	4.0	4.7	4.9	3.9	3.0	3.6
ct Group as a Per cent of total Imports of nary Iron and Steel Products											
4	1.2	1.7	1.9	2.4	3.3	1.4	2.2	1.8	1.6	1.9	2.9
2	10.9	8.1	16.4	13.4	10.7	17.5	22.3	18.5	19.3	22.1	21.0
9	52.0	51.2	53.3	42.4	43.8	46.9	50.8	58.0	56.0	53.3	54.7
6	33.8	36.6	26.7	37.4	41.0	33.2	24.0	20.6	22.4	22.2	20.5
8	2.1	2.4	1.7	4.3	1.3	1.0	0.7	1.1	0.7	0.5	0.9
ct Groups as a Per cent of total Exports of nary Iron and Steel Products											
5	42.3	55.2	42.8	37.4	41.4	47.6	39.8	38.2	40.7	37.5	35.0
4	15.5	10.3	6.7	10.1	11.5	10.8	7.7	8.2	7.7	9.2	10.4
2	18.1	15.6	13.0	44.2	40.5	32.6	39.8	39.3	38.2	44.5	43.9
0	5.0	3.0	6.7	3.4	1.6	1.6	2.3	3.2	1.8	2.1	4.1
9	19.1	15.9	30.8	5.0	5.1	7.4	10.3	11.1	11.5	6.6	6.6

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TABLE A-13

INDUSTRIAL PRODUCTION INDEXES — CANADA

(1949 = 100)

	Primary Iron and Steel	Durable Manufacturing	Total Index of Industrial Production
1950	109.4	106.5	106.9
1951	129.0	119.9	116.6
1952	127.9	124.8	120.9
1953	120.8	133.6	129.1
1954	94.6	124.8	128.5
1955	133.0	139.7	142.3
1956	158.3	153.3	154.9
1957	149.0	146.7	155.4
1958	121.8	139.9	154.4
1959	167.7	149.5	166.1
1960	162.1	146.4	167.4
1961	174.0	148.4	172.9
1962	193.0	165.0	186.0
1963	216.9	175.9	195.9
1964	291.2	212.7	235.3
1965	320.0	237.2	254.9
1966	324.8	255.2	275.1

Source: Dominion Bureau of Statistics, Canadian Statistical Review, monthly, no. 11-003.

TABLE A-14

ANNUAL AVERAGE OF HOURLY EARNINGS OF HOURLY RATED WAGE EARNERS IN CANADA

(Dollars; 1950 = 100 for index)

	Primary Iron and Steel		All Manufacturing Industries		Durable Goods Manufacturing	
	$	Index	$	Index	$	Index
1950	1.27	100.0	1.04	100.0	1.13	100.0
1951	1.43	112.6	1.18	113.5	1.27	112.4
1952	1.60	126.0	1.30	125.0	1.41	124.8
1953	1.70	133.9	1.36	130.8	1.48	131.0
1954	1.71	134.6	1.41	135.6	1.52	134.5
1955	1.81	142.5	1.45	139.4	1.56	138.1
1956	1.97	155.1	1.52	146.2	1.64	145.1
1957	2.15	169.3	1.61	154.8	1.73	153.1
1958	2.25	177.2	1.66	159.6	1.80	159.3
1959	2.36	185.8	1.72	165.4	1.87	165.5
1960	2.44	192.1	1.78	171.2	1.94	171.7
1961	2.54	200.0	1.83	176.0	1.99	176.1
1962	2.60	204.7	1.88	180.8	2.04	180.5
1963	2.67	210.2	1.95	187.5	2.11	186.7
1964	2.71	213.4	2.02	194.2	2.20	194.7
1965	2.83	222.8	2.12	203.8	2.31	204.4
1966	2.94	232.3	2.25	216.3	2.43	215.0

Source: Dominion Bureau of Statistics, Man-Hours and Hourly Earnings with Average Weekly Wages, monthly, no. 72-003, 1966 and previous issues.

TABLE A-15

WHOLESALE PRICE INDEXES FOR INPUTS INTO THE STEELMAKING PROCESS IN CANADA : 1950-1966

	Coal, U.S. Bituminous	Coke Metallurgical	Scrap, Iron and Steel	Iron Ore
	1935 - 39 = 100			1956 = 100
1950	198.5	204.6	244.4	na
1951	199.2	222.3	304.2	na
1952	198.9	224.2	316.8	na
1953	198.1	224.2	298.1	na
1954	191.6	224.2	211.7	na
1955	192.3	224.2	301.1	na
1956	208.9	228.4	408.7	100
1957	216.4	236.8	375.0	104.8
1958	213.3	236.8	276.1	107.4
1959	212.3	236.8	307.4	109.2
1960	209.7	236.8	288.5	111.2
1961	215.5	238.0	313.4	117.8
1962	225.6	252.4	279.0	120.0
1963	227.4	252.4	243.0	120.3
1964	227.3	252.4	269.4	119.5
1965	227.4	252.4	300.5	118.7
1966	235.6	252.4	282.7	119.0

na = not available.

Source: Dominion Bureau of Statistics, Price Surveys and Operations Section

TABLE A-16

COSTS OF FUEL AND ELECTRICITY, MATERIALS AND SUPPLIES, AND SALARIES AND WAGES : PRIMARY STEEL INDUSTRY IN CANADA

($ 000's)

	(1) Fuel and Electricity	(2) Materials & Supplies	(3) Salaries & Wages	(4) Value of Shipments
1957	28,053	332,794	171,993	711,116
1958	21,408	256,481	149,773	594,796
1959	26,440	361,948	185,274	789,811
1960	28,339	346,040	188,582	734,483
1961	29,670	351,055	193,712	774,748
1962	31,639	391,866	209,171	860,755
1963	35,082	436,597	222,217	963,206
1964	41,442	512,009	253,039	1,108,152
1965	47,703	565,741	277,126	1,231,765
1966	49,497	569,019	299,552	1,255,392

(percents)

	(1) as % of (4)	(2) as % of (4)	(3) as % of (4)
1957	3.9	46.8	24.2
1958	3.6	49.6	25.2
1959	3.3	45.8	23.5
1960	3.9	47.1	25.7
1961	3.8	45.3	25.0
1962	3.7	45.5	24.3
1963	3.6	45.3	23.1
1964	3.7	46.2	22.8
1965	3.9	45.9	22.5
1966	3.9	45.3	23.9

Source: Dominion Bureau of Statistics, Iron and Steel Mills, annual, no. 41-203.

TABLE A-17
CAPITAL AND REPAIR EXPENDITURES :
PRIMARY STEEL INDUSTRY

	Capital				Repair				
	Const.	Machinery & Equip.	Total	Index	Const.	Machinery & Equip.	Total	Grand Total	Index
		$000's		1951=100		$000's			1951=100
1950	1,704	5,225	6,924	-	5,914	17,976	23,890	30,814	-
1951	28,945	21,366	50,311	100	5,501	27,764	33,256	83,567	100
1952	20,517	52,381	72,898	145	6,308	31,428	37,736	110,634	132
1953	11,914	38,011	49,925	99	7,156	38,563	45,719	95,644	114
1954	6,239	27,300	33,539	67	5,167	31,566	36,733	70,272	84
1955	6,615	27,930	34,545	69	5,170	42,966	48,138	82,683	99
1956	7,613	54,083	61,696	123	6,531	56,215	62,746	124,442	149
1957	14,366	56,648	71,014	141	7,011	62,243	69,254	140,268	168
1958	15,420	40,433	55,853	111	6,474	47,192	53,666	109,519	131
1959	20,828	56,576	77,404	154	6,460	73,277	79,737	154,458	185
1960	23,789	90,975	114,764	228	6,535	79,938	86,473	201,237	241
1961	13,043	54,599	67,642	134	5,249	68,781	74,030	141,279	169
1962	20,898	91, 979	112,877	224	5,126	80,359	85,485	198,362	237
1963	28,309	83,811	112,120	223	5,121	88,455	93,576	200,855	240
1964	36,300	169,468	206,068	410	5,479	108,319	113,796	319,866	383
1965	25,310	127,099	152,409	303	6,482	122,996	129,478	281,887	337
1966	39,300	165,000	204,300	406	7,400	138,800	146,200	350,500	419

Source: Dominion Bureau of Statistics, Iron and Steel Mills (annual, no. 41-203) and Algoma Steel Corporation Ltd., op. cit., Statistical Supplement, Table 30.

TABLE A-18

REAL CAPITAL EXPENDITURES OF CANADIAN PRIMARY STEEL FIRMS*

(000's of constant dollars)

1950	9,219
1951	59,050
1952	82,839
1953	56,033
1954	37,769
1955	38,129
1956	65,149
1957	73,135
1958	57,344
1959	78,743
1960	115,109
1961	67,642
1962	111,319
1963	108,120
1964	193,128
1965	136,690
1966	174,914

% Changes	%
1951-58	-
1958-66	205.0
1950-60	196.2

*Capital expenditures of Canadian primary steel firms (Table A-17) deflated by the D.B.S. implicit price index of Business Gross Fixed Capital Formation in Canada.

Source: Table A-17 and Dominion Bureau of Statistics, National Income and Expenditure Division.

TABLE

AVERAGE LABOR PRODUCTIVITY IN THE

	1. Prod. Workers	2. Annual Prod. Ingot Tons* 000's	3. Annual Total Earnings of Prod. Workers* $000's	4. Av. Annual Weekly Wage of Prod. Workers* $
1950	25,530	3,384	72,543	54.31
1951	29,287	3,568	91,818	59.57
1952	30,670	3,703	105,415	66.03
1953	30,510	4,116	109,472	69.06
1954	24,395	3,195	87,350	68.23
1955	27,825	4,534	113,770	73.93
1956	31,072	5,301	136,178	81.05
1957	30,613	5,068	139,423	87.75
1958	25,281	4,359	115,403	89.40
1959	29,629	5,901	147,278	96.33
1960	29,172	5,809	153,812	97.42
1961	28,408	6,488	152,529	102.52
1962	30,101	7,174	165,556	104.91
1963	31,112	8,197	180,359	108.06
1964	33,911	9,128	200,756	109.96
1965	36,434	10,068	221,232	115.41
1966	37,984	10,020	277,126	118.27

*Data from 1957 onward are based on the revised SIC and new establishr

Source: Dominion Bureau of Statistics, Iron and Steel Mills (no. 41-203) a

TABLE A-19

IN THE CANADIAN PRIMARY STEEL INDUSTRY

4.	5.	6.	7.	8.	9.
Annual y Wage of Workers*	Man Wks. Paid per Year	Annual Av. Hrs. Wrk. Per Week*	Total Annual Man Hours Wrk.	Output per Man Hour	Index of Output per Man-hour (av. labor Productivity) 1950 = 100
$	3 ÷ 4		6 x 5	2 ÷ 6	
31	13,357.2	42.7	57,035.2	.0593	100.0
57	15,413.4	41.6	64,119.7	.0556	93.8
03	15,964.7	41.4	66,093.9	.0560	94.4
06	15,851.7	40.6	64,357.9	.0640	107.9
23	12,802.2	39.9	51,080.8	.0625	105.4
93	15,388.8	40.8	62,786.3	.0722	121.8
05	16,801.7	41.1	69,055.0	.0768	129.5
75	15,888.6	40.5	64,348.8	.0788	132.9
40	12,908.6	39.5	50,989.0	.0855	144.2
33	15,288.9	40.6	62,072.9	.0951	160.4
42	15,788.5	39.8	62,838.2	.0924	155.8
52	14,877.9	40.2	59,809.2	.1085	183.0
91	15,780.7	40.3	63,596.2	.1128	190.2
06	16,690.6	40.5	67,597.0	.1213	204.6
96	18,257.1	40.7	74,306.4	.1228	207.1
11	19,169.2	40.8	78,210.3	.1287	217.0
27	23,431.6	40.3	94,429.3	.1061	178.9

establishment concept.

41-203) and Review of Man-Hours and Hourly Earnings (no. 72-202).

TABLE A-20

WORLD CONTINUOUS CASTING CAPACITY

(millions of net tons)

	Europe (excl. U.S.S.R.	U.S.S.R.	United States and Canada	Japan	Others[1]	Total
1955	0.26	0.03	0.10	-	-	0.38
1960	0.83	0.36	0.10	0.10	0.25	1.65
1961	1.20	0.57	0.10	0.10	0.30	2.26
1962	1.97	1.55	0.22	0.11	0.39	4.23
1963	2.37	1.65	0.29	0.11	0.44	4.90
1964	3.60	1.65	0.94[2]	0.17	0.47	6.85
1965	4.10	1.65	2.36	0.23	0.70	9.00
1966	5.16	3.90	4.27	1.00	0.89	15.27

[1]Other countries consist of Argentina, Australia, Brazil, Mainland China, Chile, Hong Kong, India, Mexico, New Zealand, Peru, South Africa, Tunisia, Turkey, and Venezuela.

[2]Prior to 1964 virtually all the continuous casting capacity listed in this column was installed in Canada. Separate date for Canada are given in the text in Table 6-6.

Source: U.N., Economic Commission for Europe, Economic Aspects of Continuous Casting of Steel (New York: United Nations, 1968), p. 195.

TABLE A-21

PRODUCTION AND CAPITAL EXPENDITURES OF THE FOUR MAIN CANADIAN PRIMARY STEEL FIRMS*

	Stelco		Algoma		Dofasco		Dosco	
	Production (Steel Ingots) 000's net tons	Capital Expenditures 000's $	Production (Steel Ingots) 000's net tons	Capital Expenditures 000's $	Production (Steel Ingots) 000's net tons	Capital Expenditures 000's $	Production (Steel Ingots) 000's net tons	Capital Expenditures 000's $
1954	1,557	10,564	566	7,200	338	14,000	540	6,220
1955	2,060	18,334	990	5,800	542	14,812	670	9,024
1956	2,367	35,688	1,105	9,245	631	26,666	800	7,475
1957	2,178	47,066	1,066	25,790	604	13,470	870	15,135
1958	1,668	14,395	962	35,871	731	8,984	650	5,333
1959	2,438	35,123	1,372	13,762	884	28,548	700	6,439
1960	2,152	53,290	1,278	26,356	992	27,965	850	9,700
1961	2,445	38,754	1,650	17,961	1,126	16,999	590	3,520
1962	2,779	67,036	1,759	33,191	1,243	27,275	748	4,182
1963	3,110	52,236	2,092	31,545	1,391	25,810	890	9,337
1964	3,479	109,306	2,301	37,504	1,584	53,322	929	20,688
1965	3,846	75,540	2,486	25,196	1,785	45,510	867	20,199
1966	3,794	99,542	2,347	33,451	1,877	82,588	915	26,784

*Dosco's production figures, given in gross tons, were converted to a net tons basis. Capital expenditure data represent the total capital expenditures of these firms.

(Cont'd)

TABLE A-21 (Cont'd)

CAPITAL EXPENDITURES PER TON OF STEEL PRODUCED BY CANADIAN STEEL FIRMS

($ per ton)

	Stelco	Algoma	Dofasco	Dosco
1954	6.78	12.72	41.42	11.52
1955	8.90	5.86	27.33	13.47
1956	15.08	8.37	42.26	9.34
1957	21.61	24.19	22.30	17.40
1958	8.63	37.29	12.29	8.20
1959	14.41	10.03	32.29	9.20
1960	24.76	20.62	28.19	11.41
1961	15.85	10.89	15.10	5.97
1962	24.13	18.87	21.94	5.59
1963	16.80	15.08	18.55	10.49
1964	31.43	16.30	33.66	22.27
1965	19.64	10.14	25.50	23.30
1966	26.24	14.25	44.00	29.27

Source: Annual Report of the firms listed, 1966 and previous issues.

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