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on Canada's Economic Prospects

The Canadian Primary Iron and Steel Industry

by The Bank of Nova Scotia

ROYAL COMMISSION ON CANADA'S ECONOMIC PROSPECTS

THE CANADIAN PRIMARY IRON AND STEEL INDUSTRY

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1

DEFINITION AND DESCRIPTION OF THE INDUSTRY

THE CANADIAN primary iron and steel industry is "primary" mainly in the sense that its finished products are the raw materials of a variety of other manufacturing industries. In the circumstances of its historical development and in its relation to other parts of the economy, however, it is clearly more akin to the recognized secondary industries such as textiles and the metal-fabricating industries than to those branches of Canadian manufacturing, notably pulp and paper, sawmilling, and base metal smelting and refining, that are engaged in the primary processing of the country's crude materials largely for the export market. It is not, in general, based on Canadian natural resources, since its raw materials have been and still are largely imported; and it was built up like most of the secondary industries, with tariff protection, to serve the domestic market.

For the purposes of this study, primary iron and steel includes pig iron and ferro-alloys, crude steel and steel rolling mill products but not fabricated steel, though the primary steel producers in some cases operate plants making such fabricated steel items as pipes and tubes, wire, fencing and nails. Nor is the Canadian iron ore industry treated, except incidentally. In contrast to the United States, where iron ore mining has always been, along with pig iron production, steel making and steel rolling, an integral part of the primary iron and steel industry, the Canadian iron ore industry which is now assuming substantial proportions, does not for the most part supply the Canadian steel industry and is in fact largely an export industry.

Canada, until recently, had a negligible production of iron ore. The Nova Scotia steel industry, though it has always used Canadian coal, became a user of Canadian iron ore only by virtue of the union of Newfoundland (its source of iron ore) with Canada in 1949; while the Ontario steel industry has long had established sources of supply for both its coal and the bulk of its iron ore in the United States. In 1955, when Canadian production of iron ore was about 17 million tons, the Canadian steel industry drew from domestic sources only about 1½ million tons of the five million tons it consumed. In the decades ahead more Canadian ore will undoubtedly be used by the Canadian steel industry, as U.S. iron ore reserves are depleted and as Canadian production rises, but in the meantime there is little reason for a study of the steel industry to concern itself in a major way with this resource and export industry.

The Canadian primary iron and steel industry, as defined by the Dominion Bureau of Statistics, embraces several dozen firms (see Table 1). Only four companies, however, are "integrated" producers in the sense that they operate (1) coke ovens to produce coke from coal, (2) blast furnaces into which the coke is charged along with iron ore and limestone to produce pig iron, (3) steel furnaces (mainly of the open-hearth type) in which the molten iron from the blast furnace is combined with steel scrap and other materials to produce crude steel ingots, and (4) rolling mills in which the steel ingots are first reduced to blooms, billets and slabs or "semis", and then processed into various forms of finished steel, of which the most important are bars, rails, wire rods, structural shapes, plates, hot-rolled and cold-rolled sheets and strip, galvanized sheets and tinplate.[1] The rest of the industry consists of numerous smaller firms (or units in other industries such as automobiles and railroad equipment) most of which make steel in electric furnaces from scrap and then roll or cast it.

The overwhelming importance of the four large producers—Dominion Steel and Coal Corporation, Limited (Dosco), Sydney, Nova Scotia; Algoma Steel Corporation, Limited, Sault Ste. Marie, Ontario; The Steel Company of Canada, Limited, (Stelco), and Dominion Foundries and Steel, Limited, (Dofasco), both at Hamilton, Ontario—is indicated by the fact that they produce all of the pig iron, over 90% of the steel ingots and castings, and nearly 90% of the steel rolling mill products made by the industry. Among the other firms, the most important is Atlas Steels, Limited, at Welland, Ontario, which produces alloy steel in electric furnaces from scrap and makes specialty items, including tool and aircraft steels and stainless steel bars, sheets and strip. Mention should also be made of the three steel mills in the west—Manitoba Rolling Mill Company, Limited, at Selkirk, Manitoba; Premier Steel Mills, Limited, at Edmonton, Alberta; and Western Canada Steel, Limited, at Vancouver, B.C.—all of which melt down scrap to make concrete-reinforcing bars and other merchant bars and shapes, and of Burlington Steel Company, Limited, at Hamilton, Ontario, which rerolls old rails to make these products.

The importance of the four large integrated companies is reflected also in the principal statistics of the industry by provinces. Ontario, where three of the four big steel plants are located, accounts for some two-thirds of the

[1]A brief description of the principal processes of the steel industry is contained in Appendix A and a glossary of terms in Appendix B. Items (2) and (3) above will be illuminated by Tables 2 and 3 in Appendix C; these show materials charged to iron blast furnaces and steel furnaces in Canada in recent years.

employment in the industry and for over three-quarters of the gross selling value of products (see Table 4).

The present study will deal mainly with the four large producers. For the sake of convenience, however, use will be made of statistics for the industry as a whole as published by the Dominion Bureau of Statistics. And there will be some reference to other firms for special reasons in particular parts of the study.

2

RELATIVE SIZE AND IMPORTANCE OF THE INDUSTRY

THE PRIMARY iron and steel industry is now one of the half-dozen most important of Canada's manufacturing industries. In the past few years, only the two great export industries, pulp and paper and sawmilling, have consistently outranked it in the main measures by which the relative importance of industries is judged in official statistical compilations.

Measured by the selling value of its products at the plant, it ranked seventh among Canada's leading manufacturing industries in 1953 (see Table 5), the same rank it held in the war years 1941 and 1942 and much higher in the scale than the rank of seventeenth which it held briefly at the end of the 'twenties (see Table 6). In terms of value added by manufacture, which is a more significant measure, it stood sixth in 1953, with $217 million, being outranked only by pulp and paper ($600 million), non-ferrous metal smelting and refining ($310 million), motor vehicles ($274 million), sawmills ($269 million), and aircraft and parts ($261 million). In employment, with nearly 35,000 employees, it was also sixth—well behind pulp and paper and sawmills with roughly 60,000 each, but only a little behind aircraft and parts, railway rolling stock and men's factory clothing. (The growth of employment in the Canadian primary iron and steel industry over the years is shown in Chart 1.) In cost of fuel and electricity, another significant measure, it was third, with only pulp and paper and non-ferrous metal smelting and refining ahead.

The fact that the primary iron and steel industry ranks as high as it does, especially in relation to the three big export industries based on forest and mineral resources, becomes rather impressive in the light of several other pertinent considerations. Canada is the world's largest importer of machinery and transport equipment. Her imports of these goods, including both finished machinery of all kinds and fabricated steel parts for the manufacture of automobiles, aircraft, railway rolling stock and other items, ran in the years 1951 to 1955 from $1 billion to about $1.5 billion annually. She is a large importer, too, of the simpler steel manufactures such as pipes and tubes.

Finally, she is a substantial importer of unfabricated steel, bringing in roughly a million tons of rolling mill products each year. The growth of the Canadian primary iron and steel industry to its present capacity of 5½ million tons of crude steel a year, along with these big imports of steel and steel goods, is striking evidence of the expansion of the Canadian economy.

Canada's steel industry, as Table 7 shows, is eleventh in the world in size. It is interesting to note that, despite the phenomenal recovery and growth of world steel production since the war to a figure well over twice as large as the average for the years 1935-1939, Canada's rank as a steel-producing country is a little higher than it was then. The giant United States industry, which accounts for about 40% of a total world production approaching 300 million tons, of course dwarfs all others. Russia's rapidly expanding industry is now thought to be producing over 40% as much as the U.S. industry, and Western Germany and the United Kingdom (the latter was overtaken by the former in 1955) each somewhat less than half as much as Russia. France, in turn, produces roughly three-fifths as much as either of these two countries, Japan about two-fifths as much, and Belgium, Italy, Czechoslovakia and Poland only moderately more than Canada's 4½ million tons. On a per capita basis, of course, Canada's rank is considerably higher, since her population is very much smaller than that of almost all the countries that exceed her in steel production.

In per capita *consumption* of crude steel, Canada actually ranks second to the United States (see Table 8). Her rank in per capita steel consumption is considerably higher than it was before the war, the increase over the prewar average, as Table 8 shows, exceeding by a considerable margin that of any of the other leading steel-consuming countries. The gap between Canada and the United States is very large, Canada's annual per capita consumption of crude steel amounting in 1953 to 774 lbs. against 1,376 lbs. for the United States. The discrepancy reflects both a somewhat lower standard of living and the big Canadian imports of machinery, household durable goods, transport equipment, other finished steel goods and fabricated parts referred to above. The United States is not only self-sufficient in all these goods, but is a substantial net exporter of steel, especially in the form of machinery and equipment. The rate at which Canadian per capita steel consumption approaches the present U.S. rate depends partly on how fast the economy grows and the standard of living rises and partly on the extent to which Canada's metal-using industries develop. The rate at which per capita steel *production* grows depends in addition on the extent to which Canada supplies an increasing proportion of her own requirements of unfabricated steel.

3

GROWTH OF THE INDUSTRY BEFORE WORLD WAR II

THE HISTORY of iron making in Canada goes back two hundred years to the founding of Les Forges de St. Maurice near Three Rivers in Quebec in the 1730's. This was the first of many iron-making operations established in Quebec, Nova Scotia and Ontario over the next century and a half to make iron tools and utensils for the settlers, and its active life was much the longest and most colourful, lasting until 1883. Most of the others were comparatively short-lived, as was the attempt to produce steel in Nova Scotia in the early 1870's. Meanwhile steel-rolling and fabricating plants were being established on a small scale, but steel for them had to be imported. It was not, in fact, until about the turn of the century that basic steel-making plants were successfully established in Canada using the techniques that had made possible large-scale steel production—the Bessemer process invented in 1856 and the open-hearth process invented in 1864.

The decision to encourage a steel industry was part of the National Policy of 1879. Up to that time iron and steel had entered free or had been subject to nominal rates of duty, but in 1879 "the iron and steel industry received important new protection with promises of more to come".[1] Duties on rolled and forged steel items ranged up to 20%. Steel ingots were to be admitted free until they could be made in volume in Canada, but in 1883 they were made subject to a specific duty of $5.00 a ton. In the same year, a bounty was established on pig iron produced from domestic ore; this was extended in 1894 to Canadian-produced steel and in 1897 to pig iron produced from foreign ore. (With various changes these bounties continued in effect until December 31, 1910). The broadened schedule of bounties was associated with some tariff reductions. However, by 1897 the principle of protecting the growing iron and steel industry substantially, but of allowing items not made in Canada, or steel for the use of certain manufacturers in their own plants to come in duty free had been established.

It is difficult to decide what part protection played in the establishment of the Canadian steel industry. One historian of note believes that, while it

[1] O. J. McDiarmid: *Commercial Policy in the Canadian Economy*, Harvard University Press, 1946, p. 162.

was important in the development of the rolling mill part of the industry, it was not a decisive factor in the establishment of iron blast furnaces and steel furnaces: ". . . practically all the successful pig iron and steel plants were started because of fundamental technical conditions that favoured their development rather than because of the application of the national policy of protection to the iron and steel industry."[1] However that may be, companies which were the forerunners of three of today's four main producers were established between 1895 and 1905. As a result of favourable terms offered by the city of Hamilton, Ontario, a blast furnace was erected there in 1895, and a steel plant added two years later and rapidly expanded. The original intention had been to use Ontario ores and thus take advantage of the Dominion and Ontario bounties, but these ores proving unsatisfactory it became necessary to import Lake Superior ore. Interests which had been developing the Cape Breton coal mines were behind the establishment of an iron and steel industry at Sydney, Nova Scotia, to provide a regular outlet for coal. Ore reserves at Wabana, Newfoundland, were bought from the Nova Scotia Steel and Coal Company, which already had a blast furnace at New Glasgow and was later to found the Eastern Car Company there to build steel railway cars. The Sydney company planned to produce only blooms and billets, but was persuaded by the booming market for finished steel to put in a wire rod mill in 1904 and a rail mill in 1905. With the big domestic demand for rails arising from the rapid pace of railway construction in Canada, and with a good European export business, it did very well. The Algoma Steel Company was established at Sault Ste. Marie in 1901, and this plant too expanded rapidly, largely in response to the heavy Canadian demand for steel rails.

Thus by the outbreak of World War I the Canadian primary iron and steel industry had reached substantial proportions. Pig iron production had risen from 97,000 tons in 1900 to 525,000 tons in 1905 and 1,129,000 in 1913, and steel production from 26,000 tons in 1900 to 452,000 tons in 1905 and 1,169,000 in 1913 (see Table 9). The war, as Chart 2 shows, brought still further expansion, but it also ushered in a long period between the two wars when growth was almost at a standstill. The reasons for this are numerous. For one thing the industry had undoubtedly become over-expanded during and just after the war in relation to peacetime demand. And this fact, with the problems of reconversion to peacetime production, imposed severe financial strains. For another thing, the market for rails, on which Algoma and Dosco depended heavily, had contracted with the completion of the third transcontinental in 1915, which marked the end of the big period of railway building. Still a third factor was that the steel-using secondary industries were as yet little developed. Finally, during the boom of the late 'twenties, some of the types of steel most in demand—for instance, sheets and strip for the rising automobile industry and structural steel for the busy construction industry—were not made or were made in only small

[1]W. J. A. Donald, *The Canadian Iron and Steel Industry*, Boston, 1915, p. 124.

quantities by the Canadian steel industry, and as a result imports provided a larger part of the substantially increased consumption than did domestic production (see Chart 3).

During this difficult period, the Hamilton companies—Stelco (which had been formed by an amalgamation of the Hamilton Steel and Iron Company and other companies in 1910) and Dofasco (started as a steel foundry in 1913 and extended by the addition of a plate mill in the 'twenties)—were in the best position because of their favourable location in relation to the big southern Ontario market and the fact that they were not dependent on rails. The geographical disadvantage of the other two companies was becoming more obvious and both had serious difficulties long before the depression. Algoma is said to have operated at an average of only 29% of capacity in 1921-28 and went into receivership in 1932.[1] The companies that were the forerunners of the present Dosco had been in financial straits for some years when Dosco was incorporated in 1928, and the company underwent several reorganizations during the 'thirties'.[1]

In the United States, for a variety of reasons, steel expansion did not languish in the 'twenties as it did in Canada. It is true that the depression of 1921 brought a pause in expansion, but between 1923 and 1931 steel furnace capacity in the United States increased by over ten million tons—from about 66 to over 77 million tons (see Table 10). The U.S. industry was much more diversified than the Canadian industry and was able to benefit from the high and rising demands of the secondary steel-using industries, which were far more fully developed than they were in Canada. Continuous wide-strip mills[2] were beginning to be installed at this time to produce sheets and strip for the rapidly expanding automobile, household appliance and container industries.

In the 'thirties, of course, activity in the steel industries of both countries sank to a low ebb. Demand for steel reflected the contraction in construction and in the capital-goods industries which accompanied the drastic fall in capital investment as the depression deepened. In Canada, production fell in 1932 and 1933 to the lowest level since 1904, and operations were only around 20% of capacity (see Table 9 and Chart 2). The much bigger and stronger U.S. industry underwent a similar contraction, operating in the worst year of the depression at just under 20% of capacity, and expansion lagged for several years (see Table 10). It was resumed again, however, in the latter half of the decade, and by 1939 capacity had reached nearly 82 million tons. This was 20 million tons more than the capacity of 1920; whereas total capacity in the Canadian industry, despite some expansion at Hamilton, was very little larger at the end of the 'thirties than at the beginning of the 'twenties.

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[1]See *American Influence in the Canadian Iron and Steel Industry*, by Donald Eldon. Ph.D. Thesis, Harvard University, 1952.

[2]See "Wide Strip Mills—Evolution or Revolution?" by Frank H. Fanning in *Blast Furnace and Steel Plant*, August, 1952; pp. 913-920.

4

WARTIME AND POSTWAR GROWTH

World War II marked the beginning of an entirely new period of growth. In fact, basic steel-making capacity in Canada at the beginning of 1956 was almost two and one-half times as large as at the beginning of 1939 (see Table 11). This was a considerably sharper increase than in the United States, as might be expected in view of the huge size of the U.S. industry; there the 1939-56 increase amounted to 57% (about 47 million tons). More than a million tons were added to the Canadian industry in the early war years, boosting annual capacity from 2.3 to 3.6 million tons between 1940 and 1944. And since 1947 a further two million tons have been added, bringing it to 5½ million tons annually. Particularly in the later period, extensive improvements have also been made to rolling facilities, with the addition of new mills and the modernization of old ones. In the eight years 1948 to 1955, new capital investment in the primary iron and steel industry amounted to no less than $279 million, and further expenditures of $56 million are forecast for 1956 (see Table 12).

As of the beginning of 1956, the iron blast furnace plants of the four main producers (including Algoma's subsidiary, Canadian Furnace Company, Limited, at Port Colborne, Ontario, which makes pig iron and ferro-alloys) had 616 coke ovens and 15 blast furnaces (see Table 13). These blast furnaces, with an annual capacity[1] of about 3.7 million net tons, produce enough pig iron to take care of the steel-making needs of the four companies, to supply merchant pig iron to Canadian iron foundries and other industries and to give Canada a substantial net export of pig iron (see Table 14). The steel-making furnaces of the four consisted, at January 1, 1956, of 34 open hearths with an annual capacity approximating four million net tons of crude steel, two oxygen steel-making vessels with an annual capacity of 365,000 net tons and ten electric furnaces with an annual capacity in excess of 400,000 net tons (see Table 13). Several dozen other electric furnaces, most

[1]Capacity: the production which the given equipment will turn out in a year, working at normal efficiency, 24 hours a day, and irrespective altogether of materials and labour supply or the market, although allowing for such shutdowns as may be necessary for repairs and overhauling or rebuilding.

of them small, and five small open-hearth furnaces were being operated by the other steel producers or in the steel-producing units of other industries. Rolling-mill equipment in the industry included five blooming mills, four billet mills, three rail or rail and structural mills, numerous bar and rod mills, four hot-strip mills, various cold-rolling mills, two electrolytic tinning lines, two continuous galvanizing lines and a great variety of ancillary equipment, the bulk of it, as in the case of iron and steel furnace capacity, operated by the four large companies.

In the past 15 years the efficiency of the industry has been greatly increased. The average size of blast furnaces has risen considerably; six of the 15 now in operation are over 20 feet in diameter and a seventh large unit is being installed. A similar increase has taken place in the average size of open-hearth furnaces. At the beginning of the war there were only three open-hearth furnaces in Canada with a capacity of as much as 150 tons per "heat". There are now 17 of at least this size, and six of them are over 300 tons. In addition, the new oxygen steel-making process developed in Austria has been introduced, and the capacity of this unit is currently being substantially increased. With the new installations, some of the older, smaller and less efficient blast furnaces and open hearths are being allowed to go out of use.

At the rolling mill level, the industry has undergone what amounts to a transformation. In the process of expansion, many of the old hand-processes have been replaced by automatic equipment, and the range of products has been greatly extended. Mills that formerly required a good deal of hand labour have been fully mechanized, old facilities have been replaced by larger and more efficient ones, and a great deal of completely new equipment has been added. Before the war, there was only one strip mill (a reversing mill) in Canada, and most of the steel sheet made was rolled on old-fashioned hand mills. There are now four strip mills—two continuous, one reversing and one "planetary"—producing hot-rolled sheets and strip in coils. New cold-rolling mills, which process this hot-rolled steel without the application of heat to produce lighter and finer-quality sheets and strip, have been added. Galvanized sheets, formerly produced by hand-dipping, have since the summer of 1955 been turned out in quantity by two continuous galvanizing lines. Two electrolytic tinning lines, installed in 1949, are producing a much-increased quantity of tinplate by a process that came into prominence during World War II because of the great saving in tin as compared with the old "hot-dip" hand process. (The latter, however, is still in use to some extent since containers for some products, such as baby foods, must be made of a tinplate with a heavier coating of tin.)

The changes that have taken place both in the quantity and in the pattern of production are graphically portrayed in Chart 4. Production of hot-rolled steel, it will be seen, more than doubled between 1940 and 1955. More striking is the fact that nearly three-quarters of the expansion was in flat-rolled products, that is, plate, skelp (which is heavy strip or plate for the manufacture of pipe), and hot-rolled sheets and strip, some of it to be processed later into cold-rolled sheets and strip, galvanized sheets and tinplate. Output of flat-rolled steel in 1955 was slightly larger than the 1940 output of all hot-rolled products together and made up very little less than half of the total as compared with about 20% in 1940 and less than 10% in 1930. Rails and rail fastenings, which before World War I accounted for more than half of total production and as late as 1930 for about one-third, made up less than 10% of the total in 1955, though the actual tonnage produced was not very different from what it was twenty-five years earlier. The tonnage of structural shapes was a little larger and that of wire rods moderately larger than in 1940, though om course in each case it had become a smaller proportion of the total; and the tonnage of bars had increased by about 60% since 1940, a substantial part of the increase being in concrete-reinforcing bars.

These far-reaching changes have strengthened the position of the industry and of individual companies in various ways besides making their equipment more up-to-date and efficient. Generally speaking the thin flat-rolled products, particularly such highly processed ones as cold-rolled sheets and tinplate, are more profitable than the tonnage items. Demand for them has also tended to be more stable than that for some of the heavier types of steel. Demand from the container industry, for instance, the main user of tinplate, fluctuates comparatively little whereas demand for rails and structural steel shapes has historically, if not in the postwar period, swung widely with business activity. The spectacular postwar increase in the production of thin flat-rolled products may therefore have important implications for the stability of the industry. The greater part of the increase, including the galvanizing and tinning lines, has been at Hamilton; but Algoma, which until recently had no flat-rolling facilities, now produces between 40% and 50% of its tonnage in the form of sheets, strip and skelp. Dosco, indeed, is the only one of the four big companies which as yet produces no flat-rolled steel; rails are still the core of its production, currently making up about 40% of the total, and an important phase of the postwar modernization program has been the electrification and complete revamping of the blooming mill and the rail-finishing mill, making the latter one of the most efficient, if not the most efficient, on the continent. In its postwar capital investment programme, Dosco has concentrated on improving operating efficiency rather than on expanding production, though basic steel-making capacity is now being increased (see Table 13).

The rounding out of facilities which has taken place is also a source of strength. During the war and well into the postwar period, one of the measures taken to maximize steel production was to require Dosco and Algoma, which had excess primary capacity, to ship ingots, billets and slabs to Hamilton, where there was excess finishing capacity.[1] These imbalances have been much reduced. Thus Algoma in 1954 and 1955 made only about 16% of its dollar sales of steel products in the form of unfinished steel for rerolling by other steel producers, compared with 29% in the five years prior to its modernization and expansion programme; and the company stated in its 1954 Annual Report that over 80% of its steel production in that year was rolled on equipment installed since 1942. It is, of course, true that a steelworks is practically never completely in balance. One reason for this is that the minimum economic production unit may very well be larger than is actually needed at the time it is installed. Dosco, for instance, has excess blooming mill capacity until its current primary expansion is completed, and in the present shortage situation is rolling ingots for Stelco, which has a blooming mill bottleneck until such time as its projected new blooming mill can be constructed. Moreover, historically, demand has rarely been strong for all the various types of finished steel at the same time as it has been during most recent years, and it is therefore not unusual for a plant to have aggregate finishing capacity well in excess of its primary capacity, the idea being to shift production into the line or lines for which demand is strong at any one time. Nevertheless, it is probably fair to say that the balance between steel-making and steel-finishing capacity in Canada is better now than ever before. It should be mentioned, too, that Dofasco, which formerly bought its pig iron, became an integrated producer with the installation of its first blast furnace in 1951. In short, improved equipment, larger and more diversified production, and better balance have strengthened the industry and reduced its vulnerability.

[1]In connection with this control over production and in consideration of the price ceiling on steel, the Federal Government paid out over $50 million in "production and transportation subsidies" to the various steel companies from 1942 to March 31, 1951, between half and two-thirds of the total going to Dosco.

5

THE ROLE OF IMPORTS

THE BIG postwar increase in Canadian steel production (see Table 9) would naturally lead one to expect a decline in the importance of primary steel imports. In point of fact, however, little decline has occurred. In 1955, Canada imported around a million tons of steel rolling mill products, or the equivalent of perhaps 1.3 million tons of ingots, allowing for an average loss of 25% between the ingot and the finished product. Since Canada's own ingot production was approximately 4.4 million tons, and exports (see Table 15) the equivalent of approximately 0.6 million, it is apparent that imports supplied between 25% and 30% of a total consumption of well over five million ingot tons. If pipes and tubes, castings and forgings and a few other items not embraced in this calculation are included with the imports, as they presumably are in the figures in Chart 3 (which were originally prepared by the basic steel producers for inclusion in their 1954 submission to the Minister of Finance regarding the customs tariff on primary iron and steel), the percentage would be closer to the upper than to the lower limit of this range.

This is a much smaller percentage than in the late 'twenties, when imports supplied between 55% and 60% of consumption (see Chart 3) and somewhat smaller than in the late 'thirties, when they supplied between 35% and 40%. But it is only moderately less than the average for the rest of the postwar period, and it must be remembered that imports in 1955 were limited by the world-wide shortage of steel. In other words, the growth in the Canadian market for steel has been so large that, in spite of the big rise in domestic production, imports in total have remained large both absolutely and relatively.

Changes have of course taken place in the pattern of imports as Canadian output of some products has increased and as new lines have come into production. As the concentration of the postwar expansion of rolling mill capacity in flat-rolled products would suggest, domestic production is now providing a considerably larger proportion of the consumption of this group of steel products than it was before the war, and imports of flat-rolled steel consequently do not bulk as large in the total as they did then. As Table 16 shows, flat-rolled products (skelp, plates, sheets and strip) in 1939 accounted for about three-quarters of total primary steel imports of roughly half a million tons; whereas in 1954 and 1955 these products made up only around half of imports totalling about 800,000 to 1,000,000 tons. Perhaps the most striking example in the group is tinplate (reflected in "coated sheets and strip" in the Table), in which Canada has become virtually self-sufficient in the past few years, imports dwindling to a trickle. On the other hand, the share of the market for structural steel supplied by imports has increased rather than diminished, since production has expanded only moderately while requirements have risen sharply because of the postwar construction boom. As a result, imports of structurals, which made up only 12% of the total in 1939, made up 35% to 40% in 1954 and 1955.[1]

Imports cannot, however, be discussed very meaningfully in terms of these broad groups. Steel is put to so many specialized uses that one broad classification may contain literally hundreds of what are in effect different products because of differences in size and other specifications. The range of items made in Canada has been greatly extended. For instance, stainless steel sheets and strip and many special alloy steels not produced before the war are being turned out in considerable volume and the number of cold-rolled and cold-drawn items available from Canadian mills is now much greater. But there are still many items for which the Canadian market must depend largely or entirely on imports. For example, no sheets wider than 52 inches and no plates wider than 100 inches are yet rolled in Canada. No terneplate is made, practically no high-silicon sheets for the electrical industry, no wide-flange structural sections (the big H-shaped columns and beams used in the construction of large buildings), not to mention many specialty items for which Canadian demand is small. Items not made in Canada account, in fact, for a considerable proportion of steel imports.

A second factor in the continuing big volume of imports is that the quantity of many products turned out by the Canadian industry is insufficient to meet demand when business conditions are active. At such times, therefore, imports even of many standard items made by the Canadian industry are apt to be substantial, and there is some tendency for Canadian consumers to order a portion of their needs abroad even in times of ample domestic supply in order to have an alternative connection in times of domestic stringency.

Finally, the facts of geography mean that import competition plays a considerable rôle in some sections of the far-flung Canadian market, especially those farthest away from the eastern mills. In most sections of the big central Canadian market, with the exception of southwestern Ontario, competing

[1]The changing proportion of imports to production for various individual items is presented in more detail in Chapter XI.

U.S. mills have a freight disadvantage that helps to limit import competition significantly in that region, a fact that will be discussed later in more detail. But west of Winnipeg the Canadian mills find difficulty in competing with more conveniently located U.S. mills, and on the West Coast and in the Montreal area overseas competition makes itself strongly felt, particularly in times of over-supply.

The extent to which imports supply the market in the different regions of Canada is indicated in Table 17.[1] They play the least important rôle in the Maritime Provinces, mainly because one domestic producer is located there and products not made in the area can be more cheaply brought from central Canada than from the less accessible U.S. mills. In all regions, it will be seen, imports of semis are negligible, and imports of bars and rods and of rails are small in relation to the amount supplied by domestic production with one exception, rail imports into British Columbia. Imports of structurals supply a substantial portion of the market in all regions, reflecting the fact that wide-flange beams are not made in Canada. Imports of plates and skelp and of sheets and strip are relatively more important in the Prairie region, in British Columbia and even in Quebec than in the big Ontario market. In those three regions imports that are competitive with items made in Canada play a relatively larger part than they do in the Ontario market.

This consideration of imports leads naturally to a discussion of the competitive position of the Canadian industry. Canadians are accustomed to thinking of their secondary industries as operating at a considerable disadvantage in relation to comparable U.S. industries because, having to serve a relatively small market with a multiplicity of products, they operate under such handicaps as short runs and frequent retooling and are unable to achieve the cost savings associated with large-scale production. Real as these cost disadvantages are, it is difficult to measure them precisely. They also undoubtedly vary greatly from industry to industry. Some attempt will be made in the following sections, however, to see how costs in the Canadian primary iron and steel industry compare with those in the U.S. industry and to form a judgment about the competitive position of the Canadian industry.

[1]The regional analysis of the Canadian market for steel was prepared by Mr. J. P. Lounsbury of the Department of Trade and Commerce, with the co-operation of the steel companies.

6

COSTS AND PRODUCTIVITY

THE RAW material costs of the Ontario steel producers are probably not significantly different from those of their U.S. competitors when the Canadian dollar is at parity with the U.S. dollar, though variations in the exchange rate can make an appreciable difference. Their sources of iron ore and of coking coal are largely the same and both commodities enter Canada duty free. The Pittsburgh producers may be more conveniently located in relation to the big coal fields of West Virginia, Pennsylvania and Kentucky, but they have a more expensive haul for ore from the Mesabi Range in Minnesota. As far as steel producers around the Great Lakes are concerned, whether north or south of the border, their costs of assembling steel-making raw materials are roughly the same. If there is any advantage, Algoma, at the eastern end of Lake Superior, is as favourably located as any, being closer to the Mesabi than any other producer except the small plant at Duluth and having available from its own nearby mines "Algoma sinter", a premium agglomerated ore that contributes to the high efficiency of its pig iron operation.[1] Algoma's location, moreover, though it has disadvantages as far as the main part of the Canadian market is concerned, puts it in a good position to export pig iron to foundries in the United States; in fact more than half its merchant pig iron is sold in that country.

Dosco is conveniently located in relation to its supplies of coal and iron ore, and the delivered cost of its ore is less than that of Lake Superior ores laid down in southern Ontario. However, the high phosphorus and silica content of the Wabana ore and the high sulphur content of the Cape Breton coal involve certain processing problems. The elimination of the phosphorus, necessary to produce good quality steel, lengthens the operation and reduces the net yield at both the blast furnace and open-hearth stages, thus raising costs appreciably. To some extent the cheaper cost of ore offsets the more

[1]The use of a "premium charge" in the blast furnace, i.e. the addition of materials with an iron content higher than that of ordinary iron ore such as sinter, screened ore, or extra high-quality ore, is now common practice and increases the yield from the blast furnace substantially.

expensive processing, but Dosco's steel-making costs may, on balance, be somewhat higher than those of the Ontario producers.

It is probably fair to say, however, that generally speaking the Canadian industry is at little disadvantage as compared with the American up to the blast furnace level, except to the extent that the average size of blast furnaces is somewhat smaller in Canada than in the United States. In fact, the disadvantage is probably not very great up to the ingot level, except, again, to the extent that steel furnaces, too, are on the average smaller than in the United States. In recent years, however, several large new open-hearth furnaces have been built, Stelco has been using oxygen to increase open-hearth efficiency and Dofasco has introduced the highly efficient oxygen steel-making process—all of which have improved the Canadian industry's steel-making position in relation to that of the U.S. industry. One advantage of the oxygen process in times of high scrap prices like the present (see Chart 5) is that it uses 75% molten iron from the blast furnace and only 25% scrap. In the open hearth the customary 50-50 ratio of pig iron to scrap can be varied fairly widely depending on the relative prices of pig iron and scrap; and Algoma, which has an efficient pig iron operation but is poorly situated for purchasing scrap, can be relatively independent of expensive purchased scrap by using a high proportion of "hot metal" from its blast furnaces with the "plant scrap" available from rolling-mill operations, which all steel mills use.

Furthermore, the recovery and sale of valuable by-products from coke and the use of coke oven gas in the plant are standard practice in the Canadian as in the American industry. The use of slag (the waste matter from blast furnace and open-hearth operations) for fill in the construction of ore-docks and the extension of properties is also common, and in some cases, where there is a convenient market outlet, blast furnace slag is sold. Coke, both metallurgical grade and so-called "breeze", which is unsuitable for blast furnace use, is also sold in some cases. In addition, "flue dust" and "mill scale" from iron- and steel-making operations are "sintered" and re-used, or mill scale is charged directly into the blast furnace without sintering. Actually, such devices for preventing waste and saving costs mean many millions of dollars to the industry annually.

At the rolling mill level, however, the Canadian industry cannot hold its own so well on the score of costs. The Canadian market for steel amounts to only around three to four million tons of rolling-mill products annually, of which, as has been noted, the domestic industry supplies between 70% and 75% (cf. Table 17). The entire Canadian production of steel is thus less than the individual output of a number of the large U.S. mills and the Canadian companies are relatively small, only one of them having an ingot output of as much as two million tons, and two of them being below a million tons. There are of course many companies as small as this in the United States but because the market is large they have more opportunity for specialization. They do not attempt to serve as widespread a market with as great a variety of products as the Canadian mills do. In any case, the U.S. mills that ship to the Canadian market are in general the large specialized mills that have the advantages of big tonnages and long runs.

The limited size of the Canadian market affects both the type of equipment in Canadian steel mills and the way it is operated. Instead of specialized mills, numerous combined or versatile mills are in use. Algoma, for instance, operates a combined bar and strip mill and its heavy rail and structural mill is interchangeable with its medium rail and structural mill. The time involved in shifting the machinery is not all lost, since necessary maintenance work can be done during the down time, but certainly output is reduced as compared with that of a single-purpose mill. Similarly, Stelco and Dofasco operate combined plate and hot-strip mills, the strip capacity standing idle while the mill is running on plate. Dofasco's hot and cold mills are, moreover, of the reversing type, passing the steel back and forth between the same rolls to reduce it instead of through a series of rolls set one after another. While these involve a smaller capital outlay, they are less efficient than continuous mills.

In addition, because Canadian orders for particular types or sizes of bars or sections or for particular gauges and widths of sheets or strip are comparatively small, the machinery has to be stopped for adjustment or the rolls changed much oftener than is usual in U.S. mills, with a loss each time of half an hour to as much as two hours. One company reports that over a two-month period the average size of the orders put through a U.S. 56-inch hot-strip mill was 2½ times that of the orders put through its own hot-strip mill, and that consequently the number of changes for gauge and width was only around 40% of the number required in that period on the Canadian mill. This company reports also that whereas a U.S. cold-reduction mill may run for a week or more on one order, its own cold-reduction mill may have to stop for order changes many times in 24 hours.[1] Another company states that its electrolytic tinning line has to be stopped to change sizes five times as frequently as that of a large U.S. mill with which a comparison was made.[2] Volume is particularly important in rolling structural shapes, but Algoma may have to change its rolls every 500 tons, where a big U.S. mill might run over a thousand tons at a time. The normal procedure in a steel mill is to have a "production cycle", each item being run at intervals varying from two or three weeks to as much as two months, so that orders can accumulate to produce longer rollings. The smallness of Canadian orders means, however, that Canadian mills have more difficulty than U.S. mills

[1]Brief presented to the Royal Commission on Canada's Economic Prospects by The Steel Company of Canada, Limited, January 1956.

[2]Statement of Mr. A. G. Wright, President, Dominion Foundries and Steel, Limited, to the Royal Commission on Canada's Economic Prospects, January 1956.

in achieving rollings of economic size, and that for the sake of customer goodwill they may, at least in normal times, accept orders too small to be very profitable and sometimes interrupt their production cycles to avoid delay in filling a customer's order.

How much all this decreases productivity it is difficult to say. But certainly per-man-hour productivity, which as has been suggested is probably nearly as good at the blast furnace and open-hearth stages as in the U.S. industry, is lower than in the U.S. industry at the rolling mill level, probably by a fair margin. This is so even though productivity in the Canadian industry, if measured by ingot output per man-hour, appears to have increased since just before the war by something like one-half and if measured by net value added per man-hour by somewhat more (see Table 18). Offsetting this cost disadvantage to some extent is the fact that the level of wages is lower in Canada, though the differential has narrowed since the war. Average hourly earnings in the Canadian primary iron and steel industry at September 1, 1956, were $2.03, about 21% lower than the comparable U.S. figure of $2.58 (see Table 19). The U.S. figure was double the monthly average for 1946 and just over three times the average for 1939. The Canadian figure was nearly 2½ times the monthly average for 1946 and, though fully comparable figures for 1939 are not available, appears to be about 3½ times the 1939 figure. Comparisons of the cost to the respective industries in the two countries of other labour items such as unemployment insurance contributions, pension plans, health benefits, paid statutory holidays, and vacations with pay are difficult to make. There is no doubt that here, as in the average level of wages, the differential has narrowed in the past ten years. Nevertheless, the scale of pensions and health benefits is certainly higher in the U.S. than in the Canadian industry, and such information as is available suggests that the cost of the so-called "fringe benefits" is probably somewhat lower for the Canadian industry, though perhaps not as much lower as the cost of actual wages.

Capital costs are higher for the Canadian industry than for its U.S. counterpart; and it should be noted that the primary iron and steel industry is one requiring a very heavy capital investment. The main element in these higher costs is the tariff on machinery and equipment, much of which is imported. As may be seen in Table 12, machinery and equipment account for over two-thirds of total capital expenditures of $335 million made by the Canadian primary iron and steel industry in the past eight years and forecast for 1956. The normal duty on rolling mill machinery from the United States, the source of most of the imports, is 22½%. However, if it is of a class or kind not made in Canada, the duty is only 7½%, and it is a fair assumption that a good deal of the machinery for this industry enters at the lower rate. Actually the average ad valorem rate on imports of rolling mill machinery in 1954, the latest year for which figures are available, was about

13½%. Rolls for use in rolling iron or steel enter duty free. The cost of structures is somewhat higher in Canada mainly because the price of fabricated structural steel in this country reflects to some extent the substantial protection (25% m.f.n., 17½% B.p.) which the structural steel fabricators enjoy. Materials other than steel would probably not differ much in price, and construction labour is cheaper than in the United States. All in all the cost of physical assets might perhaps be around 15% higher in Canada than in the United States.

One aspect of capital costs not so far discussed is the cost of capital funds. Interest rates are normally somewhat higher in Canada than in the United States. However, as the next section will indicate, the Canadian primary iron and steel industry has had little recourse to the capital market in Canada—or in the United States for that matter—since the war. One loan for capital purposes was floated in the United States, and debentures have been issued in Canada by three of the major companies; but this borrowing has constituted a comparatively small portion of total postwar capital expenditures, which to a large extent have been financed out of retained earnings and depreciation allowances.

Thus, in certain respects, chiefly having to do with rolling mill operations, the Canadian industry is at some disadvantage in the cost of producing primary steel products. At the earlier levels, however, there appears to be comparatively little disadvantage, and in addition certain other factors affect the strength of the companies individually. The Hamilton companies, as has already been indicated and as will be discussed in more detail later, have a decided freight advantage over both their U.S. and Canadian competitors because of their location in the heart of Canada's major steel-consuming area. Stelco operates numerous fabricating plants at Hamilton, Toronto and Montreal, which produce a very large variety of such products as nails, bolts, wire, fencing and pipe, and provide an assured outlet for a certain amount of steel. Dosco's position as a steel producer is strengthened by the operations of certain of its subsidiaries, including the Wabana Mine (which is a substantial exporter of iron ore) and several of the Quebec and Ontario fabricating plants. Algoma's is strengthened by its pig iron operations and by the operations of its subsidiary, Algoma Ore Properties, which exports a premium product, "Algoma sinter". Whatever the net disadvantage may be, there is, in fact, practical evidence in the postwar financial record of the Canadian industry, in the increasing share of the market for certain products which it has gained and in comparative U.S. and Canadian steel prices of its ability to compete successfully in the average conditions of the past ten years.

7

PROFITS AND PRICES

AFTER A brief lull in 1946, when steel production fell back to the lowest level since 1940 (see Chart 2), partly because of a prolonged strike that closed three of the major producers, demand for steel rebounded strongly, and the earnings record of the industry has been good in every subsequent year, including 1954, a year of comparatively slack demand. It should be noted in passing that, with the exception of Atlas Steels, where the wartime expansion—about a sixfold increase in capacity—created serious problems of over-expansion (which, however, have now been largely overcome), the companies emerged from the war in a generally satisfactory condition. The wartime expansion and reconversion to peacetime production were facilitated by such measures as accelerated depreciation, government loans (some of them interest-free) and remission of duties; and in some cases capital assistance was extended by the government, assets of substantial value being turned over to the industry on very favourable terms when settlement was made.[1] The companies therefore entered the postwar period with enlarged and improved plant acquired without strain on their financial resources and with their financial position strengthened as a result of the high level of operations during the war. Furthermore, since 1950 capital cost allowances permitting the rapid write-off of new assets have been allowed under the income tax regulations, and these have greatly facilitated the postwar expansion.

The excellent earnings position of the primary iron and steel industry is indicated in Table 20. The aggregate net operating earnings of the four major companies and Atlas Steels rose each year from 1946 to 1953, increasing nearly sixfold over the period—from $16 million in 1946 to nearly $94 million in 1953. They then dropped back in 1954 (though the decline was not as sharp as the 25% fall in the industry's operating rate) to the lowest level since 1950. In 1955, however, they again jumped sharply, rising by more than 45% to over $112 million.

[1]Algoma benefited particularly under the capital assistance programme.

The extent to which these earnings have been retained for use in the business, whether through normal depreciation allowances, through accelerated depreciation or as undistributed profits, is also indicated in Table 20. Income taxes payable, which rose more or less in line with the rise in earnings from 1946 to 1951, have since then been substantially reduced by the capital cost allowances referred to above, of which the companies have taken considerable advantage. Thus income taxes in the years 1952 to 1955 accounted in the aggregate for only 18% to 23% of net income before depreciation and taxes (i.e. net operating earnings plus miscellaneous non-operating income less bond interest) as compared with 27% to 36% in the years 1946 to 1951. Dividend policy has been conservative, total dividend payments increasing only from some $3½ million in 1946 to about $10 million in 1955. Algoma has paid no dividends on its common stock and Atlas paid no dividends on its 1954 and 1955 operations. Dosco, Dofasco and Stelco have paid each year, but on the whole at a modest rate. Aggregate dividend payments in the past six years have accounted for a somewhat smaller proportion of net income before depreciation and taxes than in the earlier postwar years —10% or less in each year except 1954 (when they accounted for about 12%) as against 13% to 21% in 1946 to 1949. As a result of these various factors, the proportion of net income retained for use in the business has increased, and the actual amounts retained have risen even more sharply than earnings —more than fivefold from 1946 to 1951 (from $9 million to $49 million) and then (with of course a sharp dip in 1954) by a further 50% to over $75 million in 1955 (see Table 20).

In these circumstances, it has been possible for the companies to finance large capital expansion programmes to a very considerable extent out of their own resources. Stelco made capital expenditures of some $125 million from 1947 to 1954, of which between $37 and $38 million was raised by borrowing, chiefly through two issues of debentures in 1947 and 1951, the rest being financed internally. The current programme of $98 million is also being financed from retained earnings and depreciation, though in connection with it the company has raised $28 million in 1956 through the issue of new share rights. Algoma has spent approximately $85 million on its postwar expansion, all financed internally with the exception of a long-term loan of $15 million obtained in the United States and conditional on sales of iron and steel products to the lender. Dosco carried out an $85 million capital programme from 1946 to 1955 inclusive, raising on the market two debenture issues, in 1951 and 1955, totalling $18 million, and three issues of first mortgage serial bonds totalling $7.3 million—the latter for the expansion of power facilities. Dofasco has raised a relatively larger proportion of its funds in the capital market; but well over half of a postwar capital expansion totalling $64 million has been financed out of retained earnings and depreciation allowances, $27.7 million having been raised by the issue of common stock ($8.7 million), preferred stock ($8 million) and debentures ($11 million). A further $5 million in new share rights and $15 million in debentures have been issued in 1956 to finance the current expansion programme.

Because of differences in tax and depreciation rates and regulations, variations in accounting practices and the fact that many steel companies carry on a variety of operations in addition to steel making, comparisons of the rates of profit of U.S. and Canadian steel companies are difficult to make and of doubtful validity. However, for what they are worth, two simple and admittedly crude tests, based merely on published net profits, have been applied; and these appear to indicate that the recent profit experience of the Canadian steel companies compares not unfavourably with that of U.S. steel companies. When they are ranked among U.S. steel companies according to their rated capacity in 1955, it is found that their rank in net profits corresponds roughly to their rank in capacity; in most cases it is a little higher. Stelco, for instance, ranked eleventh in ingot capacity and ninth in net profits in 1955 (see Table 21). Comparisons on the basis of net profits as a percentage of net sales can be made for only three of the five Canadian companies, since two of them do not publish sales figures. The profit-to-sales ratios of these three companies, however, compared satisfactorily with those of the U.S. companies; indeed, the ratios of the three Canadian companies were in the same general range as those of the seven or eight largest U.S. companies (see Table 21).

Price comparisons are even more difficult to make than profit comparisons. Canadian steel prices are not published as are U.S. prices. Moreover, the pricing of steel is highly complicated. "Base" prices are quoted for certain standard items—bars, plates, structural shapes, hot-rolled sheets, cold-rolled sheets, and so on—and "extra" charges are made for size and quality specifications. If the order is below a certain minimum, there may be a quantity extra as well. Few items are sold at the base price, and the extras vary greatly on particular products. They probably amount, however, on the average to around 15% of the base price though in the case of some very highly specialized items they might amount to a good deal more than this. Over the years the U.S. steel industry has established a complicated system of extras covering many hundreds of items, and in general the Canadian industry follows U.S. practice. (Overseas steel producers have a different set of extras.) Thus Canadian extras, though not identical with U.S. extras, are so nearly the same that a comparison of U.S. and Canadian prices omitting the extras and using base prices only is legitimate and gives a reasonably accurate picture.

Such information as is available indicates that the spread between U.S. and Canadian mill prices has narrowed considerably over the past two decades (see Table 22). The narrowing has not been steady since price changes in the two countries occur at different times, but the trend is clear. The Canadian price for heavy rails, which was roughly $6.00 a gross ton (15½%) higher than the U.S. price in the mid-thirties, was identical with it at the beginning of 1956. Wire rods, which were 10% to 15% higher in price in the 'thirties, have in the last year or two been slightly below the U.S. price. The price of steel plates which, in 1938, was around 16% higher than the U.S. price, was 8% higher at the beginning of 1956. The prices of hot and cold-rolled sheets, galvanized sheets and tinplate have also declined relative to U.S. prices until early in 1956 they were only 2% to 5% above them. The fact that the Canadian mills have been able to meet competition and narrow the spread between their prices and U.S. prices is a significant indication of the increased efficiency they have achieved with improved equipment and bigger volume. It is an indication, too, that their cost disadvantages as compared with U.S. mills cannot be too severe.

8

FREIGHT COSTS[1]

IN ASSESSING the competitive position of the primary iron and steel industry, two other main factors in addition to production costs must be considered—freight costs and the tariff. Freight costs are, indeed, an important element to be taken into account in discussing steel prices, adding a further complication to the already complex steel price picture. Not only in Canada but in the United States as well, absorbing freight is a recognized method of meeting competition from a particular competitor at a particular point. Because of the location of the Canadian mills and the great distances over which the Canadian market is spread, comparative freight costs bulk especially large in this country. It has already been pointed out that competing U.S. mills have a freight disadvantage in most parts of the eastern Canadian market but that in western Canada the advantage is on the side of the U.S. mills. Furthermore, an important factor in overseas competition is that cheap ocean freight rates give overseas exporters an advantage over the Canadian producers in reaching areas within a certain radius of both the Atlantic and Pacific seaboards. Finally, the favoured location of the Hamilton producers close to the major part of the Canadian market for steel gives them a freight advantage in this area over their Canadian as well as their U.S. competitors.

The most significant freight advantage accruing to the Canadian mills is that enjoyed by the Hamilton producers in the big steel market stretching from the Niagara Peninsula well to the east of Toronto. In fact, it provides them with a considerable degree of natural shelter from U.S. competition quite apart from the tariff. The rail freight rate on bars and plates from Hamilton to Toronto, for instance, is 13¢ per 100 lbs. whereas bars coming from Buffalo must pay 43¢ per 100 lbs. and plates from Pittsburgh 77¢ per 100 lbs.[2] Similarly, as Table 23 shows, rates are much lower from Hamilton than from U.S. points of supply to such important steel-consuming centres as St. Catharines and Oshawa. This advantage is less

[1]The freight rates quoted in this section are as of the fall and winter of 1955-56. Since then there have been freight rate increases in both the United States and Canada.

[2]These comparisons are based on published rail rates. It should be noted that, since within the Province of Ontario no legislative body regulates truck rates, there is also a substantial use of trucks in Southern Ontario at less than rail rates, trucking having certain advantages in speed and in the convenience of mill-to-plant pick-up and delivery.

marked at points farther eastward, but the Hamilton producers can reach even Halifax more cheaply than can competing U.S. mills. Actually, almost the only part of the eastern market in which the Hamilton producers do not derive some advantage over their U.S. competitors from lower freight costs is southwestern Ontario, especially Windsor, where the freight rate from Detroit is 14¢ per 100 lbs. against 29¢ from Hamilton. Incidentally, Windsor, as the site of a large part of the Canadian automobile industry, is one of the main points of competition from U.S. imports coming in for use by automobile manufacturers duty free or subject to a drawback of the duty.[1] The situation is quite different in western Canada, where the U.S. mills generally have the freight advantage. Before going on to discuss this, however, something must be said about the effects of the location of Dosco and Algoma on their competitive position with regard to the Hamilton producers.

It is a well-known fact that both Algoma and Dosco absorb substantial amounts of freight to meet the prices of the Hamilton producers in the major portion of the central Canadian market. The freight to Toronto, for instance, on various products which both Algoma and Stelco produce—bars, light structurals, sheets and strip—is 55¢ per 100 lbs. or $11.00 a ton from Sault Ste. Marie against 13¢ or $2.60 a ton from Hamilton, so that Algoma, to meet Stelco's prices, must absorb $8.40 a ton in freight costs. To Montreal the discrepancy is less: $4.20 a ton in the winter and $5.80 in the summer when a water-competitive rate is in effect (see Table 23). One of Dosco's methods of minimizing its freight disadvantage in central Canada is to ship "semis" (which pay from one-third to one-half less freight than finished products) from Sydney to points closer to the main consuming markets for finishing. Substantial quantities of blooms and billets are sent from Sydney to a Montreal subsidiary for rolling into bars and structurals at a freight rate equivalent to 38¢ per 100 lbs. as against 59¢ per 100 lbs. for the finished products. And wire rods to make barbed wire and other wire products such as nails and fencing are sent to finishing plants at Montreal, Toronto and Windsor, the freight from Sydney to Toronto, for instance, being only $10.26 a ton on wire rods as against $20.40 on wire.

Though Dosco and Algoma thus have certain disadvantages in the central Canadian market, they have advantages in other respects that are at least a partial compensation. Both companies sell rails f.o.b. to the two main carriers. Dosco has a very large freight advantage in the Maritime market (small though that market is) on the products which it makes. The rate on bars from Sydney to Halifax, for instance, is 26¢ per 100 lbs. against $1.14 from Hamilton, $1.24 from Fairless, Pennsylvania, and $1.30 from Buffalo. In the Maritime area, too, Dosco is the only Canadian company whose freight rates are lower than the ocean freight rates from the United Kingdom and continental Europe to Atlantic ports, which are between 60¢ and 70¢ per 100 lbs. Dosco can also reach Quebec and Montreal more cheaply than

[1]See Chapter IX.

either its overseas or its U.S. competitors and Quebec more cheaply than the other Canadian producers as well (see Table 23). Dosco also has the advantage of water transportation to the Canadian West Coast and for its recently revived export business. In the earlier postwar years, Dosco's exports, which prewar were as high as 50% of production, had dwindled to less than 5%; but in 1955, largely because of substantial sales of steel rails to Mexico, they accounted for roughly 20% of production.

As for Algoma, it is the most favourably situated of the four producers in relation to the western Canadian market. Use can be made of cheap water transportation for shipping certain products to certain markets, notably pig iron and strip exports to the United States. Algoma is conveniently situated, too, for selling grinding balls and grinding rods to the northern mines. Finally, an important development in line with the company's objective of selling products closer to Sault Ste. Marie is the establishment on a site owned by Algoma, adjacent to the steelworks, of the $20 million plant of the Mannesmann Tube Co. Ltd. This plant, scheduled to go into production late in 1956, will have an annual capacity of 225,000 tons of seamless pipe and tubing for the oil industry and will purchase from Algoma its entire requirements of "tube rounds", the primary steel product from which seamless pipe is made.

In most parts of the western Canadian steel market the major Canadian producers have a freight handicap to contend with, since the U.S. steel mills which compete with them are strung out at various points across the country. In the Winnipeg area the main competition comes from Chicago. Here Algoma has little or no freight disadvantage, having about the same rate as Chicago's $1.42 per 100 lbs. The Hamilton producers, however, have rates of $1.58½[1] (boat and rail) in the summer and $1.84[2] in the winter on bars, and of $1.40[3] (summer) and $1.47[3] (winter) on plates and sheets. Farther west, as a glance at the map will show, the geographical disadvantage of the Canadian producers becomes increasingly severe compared with mills in Utah, Colorado, California, and Washington; and on the West Coast there is competition from overseas producers who have the advantage of cheap water rates.

Various competitive rates,[4] including a number of "agreed charges", have been obtained from the railways, which reduce the freight handicap. They do

[1]Minimum 40,000 lbs.

[2]Minimum 36,000 lbs.

[3]Minimum 80,000 lbs.

[4]"Competitive rates are lower than the normal rates which would ordinarily be charged on the same commodities and are made by the railways for the purpose of obtaining or retaining traffic which would otherwise be forwarded by competing transport agencies. . . . As a result of competition from steamships and trucks the railways have been compelled to introduce competitive rates in areas influenced by competition while leaving rates unchanged between intermediate points or within other areas not so influenced. . . . The final type of competition which has influenced rates has aptly been termed 'market-competitive'. It arises out of the efforts of a producer at a distant point to sell his goods in a market which is also served by a producer with a short haul. . . . A different type of market-competitive rate is one published to meet competition of extraneous sources; for example, a rate on glass from Ontario points to Vancouver to meet the competition of similar glass imported direct from Belgium by steamship to Vancouver." *Report of the Royal Commission on Transportation,* 1951, pp. 83-84.

not, however, eliminate it. The railways will not establish a rate that "does not return its operating costs and something more", preferring to "forgo the traffic to competitors rather than accept it at a loss".[1] Nor do they feel that the entire burden of equalizing freight rates should fall on them: the shipper in most cases must absorb part of the cost.

Probably the most important rates in assisting the eastern steel industry to compete in western Canada are the "agreed charges"[2] to the West Coast —$1.10 per 100 lbs. on carload lots of bars, sheets, and plates, 95¢ per 100 lbs. on skelp, $1.20 on wire rods, $1.23 on rails ($1.43 to Kitimat).[3] Indeed, the steel companies maintain that only by virtue of these rates are they able to compete at all on the West Coast. West Coast agreed charges are the same for all shippers in the entire triangular area between Montreal, P.Q., Windsor, Ontario, and Sault Ste. Marie, Ontario, who enter the agreement. The extent to which they assist with the freight disadvantage can be judged from the fact that the $1.10 rate compares with a transcontinental commodity rate of $2.10 (which also applies to shipments originating anywhere in the triangular area described above) and with rates of 99¢ from Fontana, California, 94¢ from Geneva, Utah, 23¢ from Seattle, Washington, and water rates from the United Kingdom and Continental Europe in the general range of 75¢ to 90¢.[4]

The maximum rail rate that can be charged in the Prairie Provinces is the transcontinental commodity rate plus one-third. Thus the maximum on bars, sheets and plates is $2.10 plus 70¢, or a total of $2.80 per 100 lbs.[5] This rate is a competitive rate and therefore is not subject to reduction under the "bridge subsidy" arrangement, which followed the 1951 Royal Commission on transportation. The ordinary non-competitive rates, however, are subject to such a reduction, the funds for the subsidy being provided by an annual vote of parliament of $7 million to give relief to shippers on goods moving under "non-competitive" or normal rates over the so-called "bridge", which is roughly the territory between Sudbury and the Head of the Lakes. Thus the commodity rates on plates and sheets from Hamilton or Sault Ste. Marie to Edmonton and Calgary are reduced by the subsidy from $2.83 per 100 lbs. for a minimum of 80,000 lbs. and $2.48 for a minimum of 120,000 lbs. to $2.64 and $2.30 respectively. Since the annual amount available had not all been used by November of 1955, an additional seven cent subsidy was made available for the winter months, bringing the above rates down to $2.57 and $2.23 respectively.

[1] *Report of the Royal Commission on Transportation*, 1951, p. 85.

[2] "Agreed Charges" are contract rates negotiated between a shipper and the railways in return for a guarantee that a certain percentage of his shipments to the designated point of the products involved will go by rail. Once an agreed charge is established other shippers may enter the agreement within 24 hours of giving "notice of intent".

[3] Minimum shipments: wire rods 80,000 lbs., bars, sheets, plates, rails, 100,000 lbs., skelp 120,000 lbs.

[4] These are "conference" rates. Ships not in the conference may transport shipments at rates lower than these.

[5] Minimum 80,000 lbs.

On some products, the best rate to Prairie points may be the agreed charge to the West Coast plus the regular rate from Vancouver back to that point: the best all-rail rate on bars from Hamilton to Edmonton is the West Coast agreed charge of $1.10 per 100 lbs. plus the regular rate of $1.35 per 100 lbs. from Vancouver back to Edmonton, a total of $2.45.[1] (If this rate were used the goods would not of course actually make the journey to the Coast but would be shipped direct to Calgary). There are also competitive rail rates on steel items from certain eastern points to Prairie destinations which differ from agreed charges in that they are not contract arrangements, but are made available without obligation to a shipper who has to meet short-haul competition on a particular product at a particular point. Thus the rate on angles, channels and certain other structural shapes from Sault Ste. Marie to Edmonton is $2.26 per 100 lbs. and to Calgary $2.01.[2] Like the agreed charges, however, these special rates remove only part of the freight disadvantage: the Calgary rate compares with $1.69 from Geneva, Utah and $1.50 from Seattle, the Edmonton rate with $1.94 from Geneva and $1.60 from Seattle. The remainder of the difference between the U.S. and Canadian rates must be absorbed by the shipper.

One offset to the freight disadvantage which the eastern Canadian mills have in the West is the fact that some of the competing western U.S. mills have higher base prices than the eastern mills. This is not generally true at either Chicago or Geneva, Utah, where published base prices[3] on most items are no higher than prices at eastern U.S. mills. But prices at most California mills and at Seattle, Washington are substantially higher. For instance, the base price of standard structurals is $4.65 per 100 lbs. at Bethlehem, Pennsylvania and Buffalo, New York and $4.60 per 100 lbs. at Chicago, Illinois and Geneva, Utah; but it is $5.25 at Fontana, California and $5.35 at Seattle, Washington. The base price of plates is $4.50 per 100 lbs. at Pittsburgh, Buffalo, Chicago and Geneva, but $5.15 at Fontana and $5.40 at Seattle; and bars are $4.65 at the first four points but $5.35 at Fontana and $5.40 at Seattle. Hot-rolled sheets 18 gauge and heavier are $4.32½ at Pittsburgh, Pennsylvania and at Chicago and $4.42½ at Detroit and at Geneva, Utah, but they are $5.02½ at Pittsburg, California and $5.07½ at Fontana, California; and galvanized sheets are $5.85 per 100 lbs. at Sparrow's Point, Maryland, and Gary, Indiana, but $6.60 per 100 lbs. at Pittsburg, California.

[1]Minimum 100,000 lbs.
[2]Minimum in each case 80,000 lbs.
[3]All prices quoted are as of January, 1956.

9

THE TARIFF

THE FINAL factor to be considered in assessing the industry's competitive position is, of course, the tariff. A detailed discussion of the primary iron and steel tariff is outside the scope of this study, particularly since a complete investigation of it by the Tariff Board is now in progress. There is general agreement that an overhaul of the schedules is badly needed to bring definitions into line with current practice and to remove anomalies that have developed over the years. The discussion here will not go into these intricacies but will be confined to a general discussion of the nature and incidence of the iron and steel tariff.

The rates are in some cases specific and in some cases ad valorem, the specific rates generally going back a long way, sometimes at least as far as 1907, and the ad valorem rates in many cases representing adjustments to the tariff in more recent years as new products began to be made in Canada. A number of the basic rates are shown in Table 24. It will be seen that the ad valorem rates range from fairly substantial ones of up to 22½% under the most-favoured-nations tariff and up to 15% under the British preferential on various kinds of sheets and strip, down to 5% (m.f.n.) and free (B.p.) on skelp. The specific rates range from $8.00 a ton (m.f.n.) and $4.25 (B.p.) on plates not more than 66 inches in width to $3.00 a ton (m.f.n.) and free (B.p) on heavy structural shapes. The incidence of the specific duties has naturally been considerably reduced by the rise in prices: $8.00 a ton in 1938 when the U.S. base price of plates was $43.00 a ton was equal to about 19% ad valorem; at the beginning of 1956, when the U.S. base price was $90.00 a ton, it was equal to about 9%. At 1956 prices, in fact, the specific duties generally are the equivalent of less than 10% ad valorem and a good many of them, including the structural item above, are the equivalent of less than 5%. In addition, the tariff contains numerous items under which steel for specific end-uses may be imported duty free or at reduced rates, or with a drawback of a certain percentage of the duty. For example, all ship steel comes in duty free, as do items for use in the manufacture of agricultural implements and traction engines; and sheets and terneplate of certain gauges and widths for automobile stampings are subject to a drawback of 99% of the duty, steel for files, wrenches, hammers and hatchets to a drawback of 60% and steel for skates or bicycle chains to a drawback of 40% (see Table 24).

No statistics of the amount of duty refunded under these drawback items are published and they cannot, therefore, be taken into account in calculating the incidence of the tariff. Leaving them aside, the average ad valorem equivalent of the duties paid on steel rolling mill products entering Canada, including those that entered free or at reduced rates of duty under special items as well as those that paid the full rate of duty under the regular items, has in recent years been around 8% (see Table 25). The duty on imports from the United States, which accounted for 79% of the total tonnage imported in 1953 and 1954, the latest year for which complete figures are available, was between 8% and 9%; on those from the United Kingdom, which accounted for 11% in 1953 and 10% in 1954, it was about 3%; and on imports from all other countries, which accounted for the remaining 10% in 1953 and 11% in 1954, it was between 6% and 7%. The reduction since 1939 in the ad valorem equivalent of duty collected on imports from the United States and from the group including all other countries except the United Kingdom reflects in part the decline in the incidence of specific duties resulting from the rise in prices and in part reductions in rates of duty under the General Agreement on Tariffs and Trade. The rise in the ad valorem equivalent of duty collected on imports from the United Kingdom reflects rather a change in the composition of imports—chiefly the fact that imports of tinplate which made up over two-thirds of total steel imports from the United Kingdom in 1939 and came in duty free have now dwindled to less than 10% of the total and must in general pay the regular duty of 15%. Thus some factors have tended to raise the ad valorem equivalent of duty collected and some to lower it, the net result being a rather surprisingly small decline in the average duty collected on all imports.

Because tariff items in some cases cover a variety of steel products—one item may cover billets, bars and rods, another plates, sheets and strip—it is impossible to separate the imports accurately into groups and so to calculate the ad valorem equivalent of the tariff by products. A rough division has, however, been made (see Table 26), and it is apparent that in 1953 and 1954 the average duty on structurals was about 4%, on skelp 5%, on rails and track fastenings 6%, on plates 6% to 7%, on bars and rods 9% to 10%, on uncoated sheets and strip 10% and on coated sheets and strip (mostly galvanized sheets and tinplate) 12% to 13%.

It seems to be fairly clear that full advantage of the tariff is not taken in the big eastern market where the Hamilton mills have a significant freight advantage over competing U.S. mills. The theoretical calculations shown in Table 27 indicate that Canadian delivered prices at Toronto, that is Hamilton mill prices plus freight to Toronto, are substantially below comparable U.S. delivered prices in that market, that is U.S. prices at the mills from which the competing products are likely to come, plus freight to Toronto plus duty calculated on the base prices. Canadian base prices are in most cases higher than U.S. base prices, but lower freight from Hamilton to Toronto more than offsets these higher base prices. The situation in the Montreal market is similar (see Table 28), though there is variation in the amount of advantage at Toronto and at Montreal, depending on the origin of the imports. These two Tables indicate that lower freight costs are a significant aid to the Hamilton producers in meeting U.S. competition in the central Canadian market, quite apart from the tariff. The tariff nevertheless has the advantage of preventing end-of-run competition from the United States of the sort that is troublesome to numerous Canadian manufacturing industries in times of over-supply across the border.

The situation revealed by the theoretical calculations in Table 29, which illustrates the competitive position in the west of Canadian mills in relation to competing U.S. mills, is in striking contrast to that in eastern Canada as shown in Tables 27 and 28. It is clear that, even with the tariff, in quite a few cases freight must be absorbed to meet U.S. competition. (And of course no account is taken in either Table 29 or Table 28 of competition from overseas supplies benefiting from cheap water rates). Profits must obviously be lower on western than on eastern sales. Apparently, however, the volume obtained by these sales makes them worthwhile.

10

OVERSEAS COMPETITION

So far little has been said about overseas competition except to indicate that it is a factor in the Canadian steel market on both coasts, mainly in the Montreal and Vancouver areas. There is some apprehension that the St. Lawrence Seaway may extend the area of overseas competition. And therefore, though it promises benefits over the long run in the form of lower transportation costs for Labrador iron ore when supplies are needed in quantity for Ontario blast furnaces, the Seaway is regarded by the Canadian steel industry with mixed feelings.

As the previous Chapter indicated, overseas imports of primary steel constitute a relatively small proportion of total imports—roughly one-fifth as against four-fifths from the United States. As with other types of imported goods, proximity to the United States has meant that the Canadian market for steel is strongly influenced by U.S. preferences and standards. Thus Canadian consumers of steel tend to prefer open-hearth steel, which accounts for all but a small fraction of U.S. production, to Thomas steel,[1] which is important in Continental Europe.[2] And the Canadian construction industry is accustomed to using U.S. engineering specifications, measurements and standards for steel, which of course differ from those used in Europe, though some of the big overseas mills now make structural steel to meet U.S. specifications. In addition, U.S. mass production of thin flat products on continuous wide-strip mills (which have only recently begun to play a substantial part in western European steel production)[3] has up to now offset, in these

[1]The *basic* (as opposed to the *acid*) Bessemer converter, known as the Thomas converter, was devised to treat iron produced from ore with a high phosphorus content, such as certain ores of the Lorraine Basin in Eastern France and Luxembourg, and certain Swedish ores. Wabana ore is also of this type and therefore suitable for use in the Thomas process. Thomas steel is said by its makers to compare in quality with standard open-hearth steel.

[2]For an analysis of Western European steel production by processes see *The Iron and Steel Industry in Europe*, A Study by the Iron and Steel Committee, The Organization for European Economic Co-operation, Paris, 1956, p. 29 and Tables 5 to 8 in the Statistical Annex.

[3]One continuous wide-strip mill came into operation in the United Kingdom and one in Germany in the late 'thirties. And a second U.K. mill was being built when World War II broke out. As late as 1948 only 10% of western European (including U.K.) thin flat-rolled production was from continuous strip mills but, with around a dozen continuous or semi-continuous mills now in operation, their importance is rising rapidly. See *The European Steel Industry and the Wide-strip Mill*, United Nations, Geneva, 1953.

products, the advantage accruing to European steel producers from lower wages.[1] For these various reasons, overseas imports of primary steel into Canada (which tend to vary considerably in size and composition from year to year) have been small in relation to those from the United States and have consisted largely of heavy products such as plates and structural shapes, where the lower level of wages has enabled overseas producers to remain competitive.

Nevertheless, the Canadian industry appears to be more concerned about overseas than U.S. competition. This attitude is partly explained by the competitive situation vis-à-vis the United States, i.e. the limiting of U.S. import competition in eastern Canada by the freight advantage of the Canadian mills. It is also partly explained by the fact that some of the products in which overseas competition is most evident are subject to relatively low rates of duty, and in some cases to duty-free entry under the British preferential tariff. Probably most important of all in explaining it, however, is the volatility of certain overseas prices.

In contrast to the comparatively stable price policies pursued by the steel industry on this continent, western European (and also Japanese) exporters are apt to reduce prices drastically during a competitive period and to charge high premiums in times of scarcity. The fluctuation in British prices is less marked, but they too are more volatile than North American prices. Table 30, prepared by the United Nations Economic Commission for Europe, brings out this contrast. Because of the difficulties involved in making international price comparisons, this Table is not intended to compare actual prices as between the different countries, but to show *relative price movements*. E.C.E. comments: "During the recession of 1949 to 1950, Continental export prices fell by 50%, although the volume of exports in those two years actually increased; this may be explained partly by the devaluation in October 1949 and partly by the fact that the annual export statistics do not reflect the decline in steel demand which occurred during the last month of 1949 and the beginning of 1950. The main explanation, however, lies in the extreme sensitivity of the Belgian-Luxembourg steel industry to fluctuations in steel demand on the world market. When, as a result of the Korean war, steel was again in great demand, Continental export prices nearly trebled within a year."[2] In the same period, it will be seen, U.S. export prices increased by only about 6%.

The wide fluctuations in western European export prices for steel stem from the large proportion of their output which the major western European

[1]Only one-fifth as many men are required to operate a continuous mill, in proportion to the tonnage produced, as to operate the older type of hand mill. A comparison of U.S. and western European wages in the steel industry at the end of 1951 and of the prices of steel sheets as at July 1952 showed that although wages and social charges per man-hour in Belgium, France, Western Germany and the United Kingdom were less than one-third of those in the United States, the prices of sheets were about 20% higher (except in the case of the United Kingdom where they were a little lower than in the United States). See *The European Steel Industry and the Wide-strip Mill*, United Nations, Geneva, 1953, pp. 31-34.

[2]*European Steel Exports and Steel Demand in Non-European Countries*, United Nations, Geneva, 1953, p. 40.

steel producers export—nearly three-quarters in Belgium-Luxembourg, one-quarter to one-third in France, and one-sixth in the United Kingdom and Western Germany.[1] In times of over-supply, competition in the highly variable world market is apt to lead to severe price-cutting, particularly on the part of producers with very small home markets. This is not, of course, a new phenomenon. In the 'thirties, when Belgium and Luxembourg depended on exports as much as they do now, and the other countries considerably more, the countries with the smallest home markets cut prices ruthlessly in order to keep their mills operating at even minimum levels, those with larger home markets preferring to allow exports to fall rather than to sell at a loss. (It was out of the consequent market disorganization that the International Steel Cartel grew). In times of world steel shortage, on the other hand, producers who have cut prices drastically during a slump tend to try to compensate for past losses and to protect themselves against future losses by charging all the traffic will bear. In the postwar period, there has been a special incentive to sell in the North American market to earn dollars and this appears to have led to prices for these markets being somewhat lower than those for other markets.

E.C.E. observes that "the problem of laying down and implementing a sensible long-term price policy for the export market is principally a matter for the Continental steel producers rather than producers in the United States, who are already following such policies, or those in the United Kingdom, who have generally endeavoured to maintain a certain price stability".[2] There appears to be some hope that the functioning of the European Coal and Steel Community (the Schuman Plan), which is endeavouring to improve the efficiency of the European steel industry[3] and to persuade it to adopt more rational price policies than have prevailed in the past, may have a stabilizing effect on European export prices. Moreover, the domestic market for steel within the Community and in the United Kingdom is growing and, if the experience of the United States following the introduction of wide-strip mills is any indication, is likely to show further sharp growth. There may be, as there was in the United States, a period of excess capacity; but, if economic activity remains high and the standard of living continues to rise, the reduced cost, improved quality and greater availability of flat-rolled steel brought about by continuous strip mills should develop the market for consumer durable goods, and other goods using flat-rolled steel, in western Europe as in the United States.[4]

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[1] *European Steel Exports and Steel Demand in Non-European Countries*, United Nations, Geneva, 1953, p. 3.

[2] *Ibid.*, p. 48.

[3] "At the close of the last war the European steel industry was undoubtedly in great need of modernization—the most modern plants in France were those that were constructed just after 1918, and the average age of German mills was estimated at forty-two years. In addition, there was a pressing need for wide-strip mills . . . There can be little doubt that this ossification in technique was largely due to the extensive cartellization that existed before the war." *The First Three Years of the Schuman Plan*, by Derek Curtis Bok, Princeton University, 1955, p. 42.

[4] *The European Steel Industry and the Wide-Strip Mill*, United Nations, Geneva, 1953. See also *The European Steel Market in 1954*, United Nations, Geneva, 1955, Chapter IX.

From the point of view of the Canadian steel industry, the prospect of a growing domestic steel market in western Europe is a favourable one, since it may mean less pressure to export, and a greater degree of export-price stability. And if the world economy continues to expand and to function at a high level, the demand for steel in industrializing under-developed countries should mean a growing market for European steel.

11

FACTORS AFFECTING STEEL EXPANSION

AMONG THE major Canadian manufacturing industries, primary iron and steel is an outstanding example of Canadian ownership and control. A recent study by the Dominion Bureau of Statistics[1] estimates that total capital invested in the industry at the end of 1953 amounted to $355 million, of which $296 million, or 83%, was owned in Canada. This was the highest percentage of Canadian ownership among the manufacturing industries analyzed (see Table 31). It is followed by textiles (80%), beverages (73%), and transportation equipment other than automobiles (68%). Canadian ownership in pulp and paper, in petroleum refining, and in mining, smelting and metal refining is between 40% and 50%, in chemicals and electrical apparatus between 35% and 40%, and in rubber and automobiles and parts 20% to 25%. The comparison on the basis of *control*[2] rather than ownership is even more striking, the percentage of Canadian control ranging from 96% in the primary iron and steel industry down to only 5% in automobiles and parts. Primary iron and steel is an industry, then, in which control lies practically entirely in Canada and in which decisions about expansion are definitely Canadian decisions.

Whether this fact has any bearing on the likelihood of future expansion it is difficult to say. The primary steel industry, not only in Canada but elsewhere, has been traditionally conservative. This is due in part to the fact that a heavy capital investment is required and that the industry is subject to very sharp fluctuations. New units, to be economic, must be of a certain size, and capital facilities are therefore costly; in addition, the technological changes now taking place in this industry may mean a fairly rapid rate of obsolescence. Not only are facilities costly, but they take a considerable time to construct, and there is always the danger that by the time they come into production business activity may have turned downward.

Since steel is the most important material in durable goods, demand for it swings widely with changes in national prosperity. As Table 32 shows,

[1] *Canada's International Investment Position 1926-54.*

[2] For definition see footnote 1 to Table 31.

between 1929 and 1932 the total national production (G.N.P. in constant dollars) fell 23% in Canada and 28% in the United States but steel production fell more than 75% in both countries. Then from 1932 to 1939 the total national production rose 38% and 46% respectively, but steel production quadrupled in Canada and increased nearly 3½ times in the United States. The swings in steel production from the wartime peak in 1944 to the low point in 1946 and back to the 1955 high, while not so violent as those of the 'thirties, were nevertheless at least twice as great as those in the total national production.

The primary iron and steel industry has tended in the postwar years to alternate between periods of over-supply and fierce competition and periods of acute shortage. In 1954, for instance, when the impact of reduced economic activity on the primary steel producers was aggravated by the fact that consumers of steel tended to live off their inventories, several not very lucrative export orders were accepted by the Canadian industry. It proved embarrassing to have to fill these in the stringent supply conditions of subsequent months when order books had been filled for months ahead and rationing of supplies had had to be resorted to. The recurrent periods of slack demand explain in part the strong desire of the industry to be sure the Canadian market justifies the expansion before going into a new product. Nor should the fact that the domestic producers are keenly competitive be lost sight of. One problem is that at some point the Canadian market for a particular product becomes large enough for one producer, yet if one goes into the new line another is impelled to do so for competitive reasons.

Its conservative attitude probably accounts in part for the lag in the Canadian industry during the 'twenties. As has been noted, the continuous wide-strip mills which revolutionized the industry in the United States by permitting cheap volume production of thin flat-rolled products for the automobile, household appliance and other industries, began to be installed in that country in the 'twenties and by 1939 over half the flat-rolled steel produced was being rolled on continuous wide-strip mills.[1] In Canada, however, the erection of a continuous hot mill was still in the discussion stage when war broke out in 1939, and it did not actually come into operation until the end of the war in 1945.

In the generally favourable conditions of the past ten years, the traditional conservatism of the industry has been less in evidence, and the timing and proportions of the postwar expansion in Canada suggest that the Canadian industry was, if anything, rather bolder than the U.S. industry in the early phase of the expansion that followed the outbreak of the Korean war. In the past, the Canadian industry showed no great tendency to pioneer, but in 1954 Dofasco introduced the Austrian oxygen steel-making process to this continent, Atlas similarly has introduced the European continuous

[1] *The European Steel Industry and the Wide-Strip Mill*, United Nations, Geneva, 1953, Table 3, p. 6.

casting process and installed a planetary hot-strip mill, about both of which more will be said later, and Stelco began experimenting in 1946 with the use of oxygen in the open hearth for the purpose of increasing efficiency and output.

Two recent developments at the rolling mill level also indicate a realization that only by keeping abreast of modern cost-reducing methods can the Canadian industry hope to increase, or even to hold, its share of the growing Canadian market. These are the introduction of continuous electrolytic tinning lines by both Stelco and Dofasco in 1949, and of continuous galvanizing lines by the two companies in mid-1955. In both these cases, the new domestic production has not only brought a decline in the importance of imports but appears to be developing the domestic market as well. The Canadian market for galvanized sheets was at the high level of 130,000 to 135,000 tons in 1951, 1952 and 1953, imports supplying 19,000 to 25,000 tons of this (15% to 18%) and domestic production averaging roughly 110,000 tons (see Table 33). In 1955, however, with the two new continuous lines in operation about half the year, production rose to 160,000 tons and imports were almost as large as the 1953 figure of 25,000 tons, indicating that the market had risen to 185,000 tons.[1] With both lines in operation for the full year in 1956, imports will likely fall off as they did in the case of tinplate. Since the two new tinning lines went into operation in 1949 the Canadian market for tinplate has risen from less than 210,000 tons annually, of which imports supplied roughly one-quarter, to an average over the six years of more than 260,000 tons, of which imports have supplied only a small fraction (see Table 34). At the same time, sheets for tinning also have virtually disappeared from the imports. The increase in the market for tinplate has been so marked, and the possibilities are so promising, with the growth of the food-canning industry as population rises, and with the increasing use of tin containers for non-food products such as motor oils, that Stelco and Dofasco are each installing a second electrolytic tinning line.

Another product for which the market has expanded sharply and of which domestic production is supplying an increasing share is skelp. Production figures of this item are not published separately by the Dominion Bureau of Statistics,[2] but an estimate of skelp consumption can be made from the tonnage of welded steel pipes and tubes produced. This estimate indicates that consumption of skelp in Canada considerably more than doubled between 1948 and 1952—increasing from 127,000 tons to nearly 290,000—and that it reached a still higher peak in 1955, approaching 350,000 tons. Over this period domestic production rose sharply, so that imports, which supplied around two-thirds of consumption in 1949 and 1950, fell in 1955

[1]No account is taken of exports, which cannot be segregated in the trade returns, and would in any case be very small.

[2]The legislation under which D.B.S. operates prevents it from publishing figures for a product made by so few firms that the statistics might in any way reveal the operations of a particular company.

to about half their peak volume and supplied only about 25% of the larger consumption (see Table 35). Indications point to a continued rise in demand for this product, now made by all three of the producers which make flat-rolled carbon steel. New welded-pipe mills have been or are being erected near Vancouver and at Edmonton, and one for Regina is being discussed; expansion is being carried out by Page-Hersey Tubes, Ltd., at Welland, and joint construction has been undertaken by Stelco and Page-Hersey at Welland, of a large-diameter pipe mill, which will make pipe of 20 to 36 inches in diameter, as compared with the present Canadian maximum of 16 inches.

Still another line in which expansion may be expected is silicon sheets and strip for the electrical apparatus industry. The use of this material has expanded substantially with the growth of the electrical industry, which in recent years has consumed about 21,000 to over 32,000 tons a year. The bulk of this has so far been imported. However, the present size of the market and the likelihood of continued growth certainly suggest greater Canadian production. Indeed, an industry representative said recently: "We see no reason why in the future, Canada could not become self-sufficient in the manufacture of electrical sheets."[1]

The outlook, in short, is for a continued increase in the volume of those thin flat-rolled steels already produced and for an increasing variety of products, though no doubt many specialty lines of which Canadian usage is small will not be made for many years to come. A large part of the expansion now in prospect is likely to go into thin flat-rolled products. One reason for this is that certain of these, such as cold-rolled sheets and tinplate, are among the most profitable lines in the industry; another is that, since thin flat steels are more closely related to the consumer-goods than to the capital-goods market, demand for them tends to be relatively stable.

The outlook for expansion in tonnage steels, items of low or medium-unit value such as plates and structurals, which are closely related to the capital-goods industries and traditionally have been subject to violent fluctuations in demand, is more problematical, particularly as these are the lines in which competition from European imports is most noticeable. With the exception of a period in the 'twenties and 'thirties when Dofasco had a small plate mill, a single-purpose plate mill has never been operated in Canada in peacetime. During World War I a plate mill was built at Sydney at the government's expense, but it was dismantled immediately after the war. It was rehabilitated, again at government expense, during World War II and it again went out of use with the cessation of hostilities. Two factors, however, have substantially improved the outlook for an expansion of plate capacity in Canada. In the first place, the market has grown significantly. In the past five years, including the off year 1954, it averaged roughly

[1]Statement of Mr. A. G. Wright, President of Dominion Foundries and Steel, Ltd., to The Royal Commission on Canada's Economic Prospects, January 1956.

325,000 tons annually compared with about 265,000 tons in 1948, 1949 and 1950 and about 105,000 tons in the five years before the war.[1] In 1955, it reached a record figure of over 370,000 tons; and it is worth noting that even in 1954, when it contracted considerably, it remained well above the 1948-50 average (see Table 36). One factor, moreover, that will bring further growth is the installation of the new Stelco-Page-Hersey large-diameter pipe mill, since the skelp it will use will be plate rather than the heavy strip used in smaller-diameter mills and since the largest sizes of pipe it will make will require plate wider than is now rolled in Canada. In the second place, it may be that the plate market, which in the past was very largely dependent on the highly volatile construction, railroad equipment and shipbuilding industries may become more stable with the increasing importance of the chemical and oil-refining industries, in which large quantities of plate are used for tanks, and with the growing demand for large-diameter pipe for oil and gas pipelines. And if the experience of the past ten years is any guide, it may be that the construction industry is becoming more stable than it used to be. When these factors are considered, it seems likely that a single-purpose plate mill may well be a development of the next few years and that Canada will supply an increasing proportion of her own plate requirements.

The question of structural shapes, which are now much the largest item in primary steel imports, accounting in recent years for roughly one-quarter to well over one-third of the entire tonnage of rolling mill products imported (see Table 16), is a difficult one. The demand for this type of steel has in the past been particularly vulnerable to fluctuations in business activity, and the size of the Canadian market sets definite limits on production possibilities. Canada now has a substantial production of standard structurals, though not enough to satisfy her own needs in active construction periods. Algoma, the main producer, has gradually extended its range of sizes and now makes channels up to 15 inches in width, I-beams up to 18 inches and angles up to eight inches, while Dosco makes angles and channels up to six inches and Stelco three-inch and four-inch angles. In fact, a substantial proportion of Canada's requirements of standard structurals and sheet piling is now home-produced. Wide-flange beams, however, are to all intents and purposes not made in Canada. Algoma rolls some H-beams, i.e., a small type of wide-flange beam up to eight inches in size; heavier wide-flange beams cannot be rolled on Algoma's present mill. As Table 37 indicates, Canada is now supplying a smaller percentage of her requirements of structurals than before the war. Since mid-1954, when wide-flange imports were first segregated in the import figures, they have made up about two-thirds of all imports of structurals. Construction of a full-scale wide-flange mill (of which there is only a small number in the world, five of them being in the United States,

[1] No account has been taken of exports, which cannot be segregated in the trade returns, and would in any case be very small.

one in Germany, one in Luxembourg and a new one being built in the United Kingdom) would, according to industry sources, require a capital investment of $70 to $80 million. Since the capacity of such a mill would be 40,000 to 50,000 tons a month and since imports of wide-flange beams, even in the present period of high construction activity, have been averaging some 14,000 tons a month, it is obvious that it could satisfy the annual needs of the Canadian market in three or four months. It is thus likely to be a long time before the size of the Canadian market will justify construction of a "universal beam" mill.

One possibility for partial expansion into the wide-flange field does, however, exist. Inland Steel Company has recently constructed at Chicago a modified wide-flange mill, which makes a limited range of wide-flange beams —perhaps nine out of 35 sizes, none of them over 24 inches in width. A mill of this type, with a somewhat smaller size range, could be installed in Canada at a capital cost of $15 to $20 million. Another possibility that has been discussed in Canada is the welding of plates to make wide-flange sections. This is already done for special jobs and, with modern improvements in welding, volume production might possibly become economically feasible.

The fact is that there is a world-wide shortage of structural steel and plates. Most of the big postwar expansion in steel capacity, both on this continent and in Europe, has been in thin flat-rolled products and, unless Canadian production of structural steel and plates is expanded, shortages of these products are likely to continue to plague the construction industry, and other industries which use them, during periods of high demand.

12

THE LONGER-TERM OUTLOOK

To FORM an idea of what Canada's steel production and consumption might be in twenty-five years involves a number of basic assumptions about the growth of population and of the economy, which in turn depend heavily on judgments about the world economic and political climate. First of all, since the effects of another world war are completely unforeseeable, it is assumed that no major war will occur during the period. Secondly, since a healthy rate of growth in the Canadian economy is closely related to external conditions, it is assumed that the world economic climate will on the whole be reasonably satisfactory—that, although there may be periods of recession, there will not be a severe and prolonged depression like that of the 1930's, nor a long-continued period of weak demand for Canada's basic exports.

In these circumstances, Canada could be expected to continue to experience a rapid rate of population growth. A strong new surge of population growth has been set in motion since the war. If the economy continues to function at a high level, and if the birth rate and immigration, both of which are strongly influenced by economic conditions, are sustained somewhere near recent levels, Canada might well have a population of 25 to 27 million by 1980. If at the same time real output per head increased at the average rate of the past quarter century, 1¾% per annum—a rather conservative assumption in view of the recent rate of technological progress—the Gross National Product in 1980 would be around 2½ times as large as it is today. This is, of course, only a broad approximation. The increase might be greater if, as seems quite likely, the rate of technological advance should be speeded up or if a larger percentage of the population should be productively employed. On the other hand, the rate of increase would be retarded if the trend towards more leisure, whether through shorter hours or more holidays, should become more pronounced.

With a population of, say, 26 million and a Gross National Product of $68 billion (at 1955 prices) the Canadian per capita production and standard of living would be somewhat higher than that now prevailing in the United States. It does not follow, however, that per capita steel consumption would necessarily be as high as the 1375 ingot lbs. now consumed annually in the United States, which would mean a total consumption of 17½ to 18 million tons annually, over three times the present rate. As has already been pointed out, the high rate of U.S. steel consumption is accounted for by the fact that the United States is not only self-sufficient in steel and steel goods, but is a substantial exporter of steel, particularly in the form of machinery and equipment. While it may be confidently expected that Canada will, as time goes on, manufacture a larger proportion of her own requirements of machinery and transportation equipment, it is not to be expected that she will, even in twenty-five years, be in a position to supply all the varied kinds of machinery needed in a complex industrial economy. Moreover, technological changes of one sort and another, including the substitution of other materials such as aluminum, plastics and cement for steel in certain uses, may affect steel consumption. Considerations such as these make it impossible to predict with any degree of accuracy what the level of Canadian steel consumption will be in 1980, though some of the broad lines of development that are likely to take place can be indicated.

As far as competition from other materials is concerned, there is no doubt that it will be a factor in the demand for steel and that periods of acute steel shortage like the present speed the trend towards substitution. The shortage of structural steel, for instance, has caused builders to turn in many cases to reinforced concrete construction, in which the use of steel is limited to reinforcing bars embedded in the concrete. However, the advantages of all-steel construction in lightness, strength, ease of construction and space saving seem to assure structural steel (if it can be obtained) of supremacy in this field. Plastics also offer competition to steel—in pipe, for instance, in certain uses in automobiles, and in a wide variety of small manufactured articles—though the tonnages used, important as they may be to the plastics industry, are small in relation to total steel consumption. The major competition to steel comes from aluminum, which is being increasingly used as a steel substitute in the household appliance, automobile, railroad equipment, construction and even the shipbuilding industries, in uses where its lightness and freedom from rust are considered compensation for its higher cost (which is now about two to one on an equal volume basis).[1] About half the aluminum consumed throughout the world is said to be in direct competition with steel. It is true that this amount represents only a small fraction of steel consumption, and that no great inroads into the total steel market are likely for many years to come. Nevertheless, with the price differential narrowing, "the steel industry cannot afford to ignore aluminum as a competitor in certain fields [and] in order to protect its position, it is necessary for the steel industry also to adopt an imaginative approach and to concentrate particularly on new designs for using smaller quantities of steel in a

[1] *Competition Between Steel and Aluminum*, United Nations, Geneva, 1954, p. 148.

given structure."[1] From this point of view new technological advances now taking place—the development of lighter and stronger steels and of new corrosion-resistant alloys—are important. One study sums up the position of steel in relation to steel substitutes as follows: "As a result of the great advance in steel metallurgy during recent years, steel can be adapted even better than heretofore to widely varied requirements and can thus better resist invasion of its traditional fields. . . . Steel is still much the cheapest metal and in a great many uses it is distinctly superior even to the more costly metals. . . . There seems little reason to expect other materials to be substituted for steel to such an extent as to affect seriously the industry as a whole."[2]

Far more important than the increased use of substitutes in assessing future steel consumption in Canada are the growth prospects of the steel-using industries. No complete statistics of steel use by the various industries are available. Statistics of shipments from producing plants to consuming industries have been published since 1946 (see Table 38 and Table 39) but the division by industries is not complete: for one thing, 10% to 15% of the tonnage is shipped to warehouses and wholesalers and these statistics give no clue as to how it is eventually distributed among the various industries. (Warehouse sales are largely to small users of steel who may belong to any of the main industrial categories or to users who want small quantities of many different types of steel, though of course, in times of shortage like the present, large users who normally buy direct from the mills are apt to try to supplement their supplies from warehouses). Moreover, there is no breakdown of imports by consuming industries except the limited indication given by the end-use tariff items. The piecing together, for one postwar year, of such fragmentary figures as are available, suggests, however, that in that year the construction industry used between 25% and 30% of the steel consumed in Canada, the railways (including railway rolling stock as well as rails and other track material) another 20%, while mining (including gas and oil), containers, motor vehicles, electrical machinery and equipment, and "other machinery and equipment" took percentages ranging from 5% to about 10% each, and a miscellaneous group including agriculture, lumbering, utilities and shipbuilding the remaining 14% (see Table 40). Perhaps the most striking thing about this distribution is the preponderance of the construction industry and the railways. The contrast with a similar breakdown for the United States is notable: there the construction industry is estimated to have taken 17% (against 28% in Canada), the railways 8% (against 20% in Canada), and motor vehicles 22% (against only 6% in Canada).

The pattern suggested by Table 40 will undoubtedly change over the next quarter century, since the prospects for growth in the different indus-

[1] *Competition Between Steel and Aluminum*, United Nations, Geneva, 1954, p. 152.

[2] *Iron and Steel:* War Changes in Industry Series, Report No. 15, U.S. Tariff Commission, U.S. Government Printing Office, Washington, D.C., 1946, p. 23.

trial groups vary greatly. It seems likely, for instance, that from now on demand from the railways will be largely for replacement, and that consumption of steel by this industry will grow little if at all and will become a declining proportion of the total as it has in the United States over the past few decades. Agriculture and the farm machinery industry may well account for a smaller proportion of total steel consumption than they do now, even though farm mechanization still has a long way to go and there will be a continuing replacement demand. If, however, the assumptions on which this discussion are based turn out to be true, a continuing strong rate of growth can be expected in construction and in the resource industries, forestry, mining, and oil and gas. Indeed, the likely growth of oil-well drilling and pipeline building is one of the strong elements in the outlook for steel.

As far as the manufacturing industries are concerned, it seems reasonable to hope that, as the Canadian market grows, it will become economically feasible for Canada to supply an increasing proportion of her own needs for machinery and parts. In addition, with a growing population and a rising standard of living, the outlook is for a substantial growth in the household appliance, steel furniture and office equipment, and automobile industries. It does not follow, of course, that the growth in steel consumption will be directly proportionate to the growth in these manufacturing industries. The increase in the amount of steel used may be restricted by technological developments that make a given amount of steel go further than it does now, or by the use of substitute materials, including the use of glass and plastic instead of tinplate for some types of containers, and of aluminum for some applications in motor vehicles and household appliances. On the other hand, the growth of, say, the automobile industry may lead to a greater than proportionate increase in the consumption of primary steel in Canada if some of the parts and body stampings now imported from the United States because of the smallness of the Canadian market should by that time be made here.

What all this means for Canadian steel consumption twenty-five years from now cannot be measured precisely, though obviously a very substantial increase can be expected, assuming that economic activity remains at a fairly high level over the period. It has already been stated that, even if the Canadian economy achieves an over-all per capita production as high as that now obtaining in the United States, steel consumption can scarcely be expected to reach the present U.S. per capita level, which would mean a total consumption of between 17½ and 18 million ingot tons a year. If three-quarters of the gap between the Canadian rate of steel consumption and the present U.S. rate were closed by 1980, Canadian per capita consumption would be around 1225 lbs. annually, a rate, it should be noted, that has been exceeded in the United States only in the four most active postwar years, 1950, 1951, 1953 and 1955. At this rate, total Canadian consumption of primary steel in 1980 would approach 16 million tons. If only half the gap between the Canadian rate of consumption and the present U.S. rate were closed, the former would be about 1075 lbs., and total annual consumption would be around 14 million tons.

The further question remains: what level of Canadian steel *production* does this level of consumption imply? In the past quarter century the proportion of primary steel imported has declined from about one-half to less than one-third, and it is reasonable to expect a continuing decline. Imports cannot be expected to cease, if only because it is unlikely that all the specialty steel items and a full range of wide-flange beams will be made in Canada. However, as the industry grows in size and increases the variety of its products and the range of widths and gauges it makes, imports might very well become a comparatively small proportion of total consumption, perhaps as little as one-sixth or one-eighth. In other words, of a consumption of 14 to 16 million tons, the domestic industry might supply as much as 12 to 14 million tons and imports would very likely be below three million tons and quite possibly around 1½ million.

A possible production range can be arrived at in another way. Over the past quarter century Canadian steel production has increased at a somewhat faster rate than the total national production and in view of the factors that have been discussed this relationship might well continue. Thus an increase in the G.N.P. to 2½ times the recent level might mean a rise in steel production to something like 2¾ or perhaps three times the recent level—that is, again, roughly 12 to 14 million tons.[1]

It is interesting to see how these guesses about consumption and production of steel compare with various estimates and projections made by the steel companies. One company has expressed the opinion that, although the rate of growth since 1939, during which time steel capacity has more than doubled, will not likely be duplicated, there is no reason why Canada's steel production should not more than double again over the next twenty-five years, thus reaching at least ten million tons annually.[2] Another, projecting consumption by 1975 at something approaching 13 million tons annually, and estimating that Canada might by then be supplying as much as 85% of her own requirements, saw an increase in Canadian steel capacity to 11 million tons (double present capacity) by 1975.[3] A third projected Canadian steel consumption in 1980 at over 14 million tons and domestic production at close to 12 million tons, assuming Canada by then to be supplying 83% of her own steel needs.[4]

[1]With the Commission's middle estimate of a population of 26.7 million in 1980 and a G.N.P. of $75 to $80 billion at 1955 prices, this production range would be raised to approximately 14 to 16 million tons, and the consumption range to something like 16 to 18 million tons.

[2]Statement of Mr. A. G. Wright, President of Dominion Foundries and Steel, Ltd., to The Royal Commission on Canada's Economic Prospects, January, 1956.

[3]Statement of Mr. D. S. Holbrook, Executive Vice-President (now President) of Algoma Steel Corporation, Ltd., to The Royal Commission on Canada's Economic Prospects, January, 1956.

[4]Statement of Mr. H. G. Hilton, President of The Steel Company of Canada, Ltd., to The Royal Commission on Canada's Economic Prospects, January, 1956.

Even the most conservative of these guesses foresees a rise of well over five million ingot-tons in annual steel capacity in Canada by 1980. Where such an expansion might take place, whether it is likely to be of the conventional blast furnace open-hearth type or to embody some of the newer technological developments, and how much it might cost are all subjects for speculation, and all three are closely inter-related. As has been indicated, this is an industry requiring a very heavy capital investment. Statements by industry spokesmen in both the United States and Canada place the present cost of a completely new integrated steelworks, with all the requisite facilities, at over $300 per annual ingot ton. The cost of increasing capacity at an established plant, or "rounding out" as it is called, is of course less. But even this is said to be $180 a ton or more, and this contention is borne out by the experience of the Canadian primary iron and steel industry, which between 1948 and 1954 spent some $280 million to achieve an increase in capacity of around 1½ million tons. Clearly, at these prices the sums involved in increasing capacity by, say, eight million tons in the next 25 years are staggering—possibly around $2 billion if part of the expansion were at established plants and part at new sites.

Some of the new technological developments in the industry, which cut capital costs very considerably, are therefore of the utmost importance. Oxygen converters, which have been or are being installed by three large steel producers in the United States since Dofasco introduced the process to this continent in 1954 and are now under active consideration by Algoma, involve only about half the capital cost of an open-hearth plant of the same capacity, even when the cost of the oxygen plant is included.[1] New processes for smelting iron ore are also being tested which would involve a much smaller capital expenditure than the conventional costly blast furnace. The blast-furnace method of producing iron for steel making cannot, it is said, be challenged economically for large-scale operations,[2] but for smaller-scale operations other methods may be more suitable, because of location and the types of ore and coal available, despite their relatively higher cost. "Sponge iron" for use in making specialty steels in electric furnaces can be produced from iron ore in a type of furnace much cheaper than a blast furnace; and its high purity is important since an increasing proportion of the available scrap consists of steel containing copper and other metals. Another high quality material that may have significance for smaller steel-making operations, since it does not require processing in a blast furnace, is the ingot iron which is a by-product from the operations of Quebec Iron and Titanium Corporation at Sorel (output of which is now something like 175,000 tons a year and is expected eventually to reach around 300,000

[1] *Some Important Developments during 1953 in Iron and Steel Technology*, United Nations, Geneva, 1954, p. 13.

[2] See "How to Use More Canadian Iron Ore in Canada" by P. E. Cavanagh, Ontario Research Foundation, (mimeo) January, 1956.

tons). This material, which is the equivalent of a high quality scrap, is now being exported, but its eventual use at or near Sorel is a distinct possibility.

Continuous casting, already in use in the production of non-ferrous metals and now being applied to steel, cuts costs considerably by making unnecessary the conventional equipment for pouring ingots, stripping and reheating them and reducing them to blooms or slabs, and by increasing the yield of usable steel from the weight of metal cast.[1] The planetary hot-strip mill, now in use, like the continuous casting process, at Atlas Steels,[2] "is an interesting attempt to solve the problem of producing hot-rolled strip from slabs with equipment of low capital cost, compared to the continuous or semi-continuous hot-strip mill."[3] It is "revolutionary in design and incorporates a basically new principle",[3] reducing a thick steel slab to a comparatively thin hot-rolled strip in one "pass" through the rolls instead of several passes back and forth through one set of rolls or through a consecutive series of rolls.

These processes are especially interesting to Canada not only because they hold out the promise of expanding steel capacity at a lower cost than is required for a blast furnace open-hearth installation, but also because they may make possible small-scale operations which would not be economic if blast furnaces and open hearths had to be built. Much of the expansion that is in prospect over the next 25 years will undoubtedly take place at established plants. There are, however, limitations of space—at Hamilton if not elsewhere—and for this reason, if for no other, it seems inevitable that eventually integrated steel operations will be set up at locations other than the present ones. (Incidentally, the fact that the new processes mentioned above save space makes them of special interest when expansion is desired at steelworks that are cramped for space). At the present time, and perhaps for as far ahead as 25 years, there appears to be only one area in Canada where a full-scale integrated blast furnace open-hearth steel plant might be justified—and that is somewhere on the St. Lawrence close to the Montreal market. A large mill there, using Labrador ore and low-freight U.S. coal brought back through the Seaway in returning ore vessels, is, indeed, a quite likely development of the next quarter century. Overseas or U.S. capital might conceivably be interested in such a venture, or one of the domestic producers might see fit to undertake it.

It seems unlikely that the market in western Canada will grow sufficiently, even in a period as long as this, to justify such an installation in British

[1] *Recent Advances in Steel Technology and Market Development, 1954,* United Nations, Geneva, 1955, p. 35.

[2] For a description of these two interesting new developments, an account of some of the problems involved in their practical application at Atlas Steels, and an evaluation of their economic significance see "Pioneering in New Developments in a Specialty Steel Mill", by H. George de Young, Executive Vice-President (now President) of Atlas Steels, Ltd., in *Year Book of the American Iron and Steel Institute 1955,* New York, 1955.

[3] *Some Important Developments During 1953 in Iron and Steel Technology,* United Nations, Geneva, 1954, pp. 27-29.

Columbia or in the Prairie Provinces. However, the establishment of a smaller and less costly installation, employing some of the new processes discussed above or others that may be developed in the future, is not unlikely. Where it might be located is another matter. There has long been talk of an integrated steel mill in the Vancouver area, though there are problems about adequate supplies of good-quality iron ore and coking coal. Alberta has ample supplies of good coking coal, and iron ore deposits in the southern part of the province have recently been mentioned as the possible basis of a steel industry. There is also available at Trail, British Columbia, a large accumulation of iron tailings, a by-product of the base metal smelting operations of Consolidated Mining and Smelting Company, Limited. The problems of assembling raw materials could probably be worked out if a large enough steel market were available. The total amount of primary steel consumed by the British Columbia and Prairie markets together is not only still quite small but is made up of a great diversity of products. How soon the market will grow sufficiently to justify an integrated mill in the West remains to be seen. Such a mill would have to meet the competition of the western merchant mills now operating on scrap, of the neighbouring U.S. mills and of overseas exporters, and it may be some time before the market possibilities look attractive enough to draw capital into such a venture.

Appendix A

A SHORT DESCRIPTION OF THE PRINCIPAL PROCESSES OF THE STEEL INDUSTRY[1]

The principal materials required in making steel are bituminous coking coal, iron ore, limestone, scrap and air. Large quantities of water are also used by the primary steel industry, especially in the rolling mills.

The first step in steel making is the *manufacture of coke* of metallurgical grade from suitable types of bituminous coal. Essentially the coking process consists of applying sufficient heat to the pulverized coal to drive off volatile chemical compounds in the form of gas, leaving a residue (coke) which is principally carbon, with relatively small amounts of impurities. In modern steel mills most of the coke is made in *by-product coke ovens.* These are rectangular in shape and are generally from 30 to 40 feet long, 6 to 14 feet high, and 11 to 22 inches wide. As many as 80 to 90 of them may be set side by side in a battery for ease in applying the heat and in charging the coal and discharging the coke. A modern by-product oven will accommodate from 16 to 20 tons of coal, which is charged in from the top, sealed in and then baked at from 1,600 to 2,100° F for around 17 or 18 hours. At the end of this time, the doors at the ends of the oven are opened, the red-hot coke is pushed out into a waiting car, sprayed with water to cool it, and screened ready for us in the blast furnaces. The gases which are given off during the coking process are piped to treatment plants where they yield valuable coal chemicals, including tar, ammonium sulphate, napthalene, benzol, toluol and xylol, and the surplus gas is then used as fuel in the coke ovens and the steel works or sold for domestic use.

The second step is the *making of pig iron in the blast furnace.* The latter is a huge cylindrical steel shell, often 100 feet or more in height, lined throughout with heat-resisting brick. Into this are charged from the top alternate layers of iron ore, coke and limestone in the proportions, roughly, of 2 tons of iron ore, 1 ton of coke and ½ ton of limestone for each ton of pig iron produced. Hot air, about 4 to 4½ tons for each ton of pig iron produced (or more than the weight of all the solid raw materials together), is blown into the bottom of the furnace from *stoves,* cylindrical brick-lined towers heated by gas. In this heat the coke burns (the temperature at the base of the furnace reaching about 3,500°F), and as it burns it removes oxygen from the ore in a chemical reaction, thus releasing the iron. Meanwhile, the limestone reacts with impurities in the ore and coke to form a molten slag. The iron then becomes liquid and absorbs silicon from the slag and carbon from the coke, and the ash from the burned coke is absorbed by the liquid slag. The iron and

[1]This description is taken in the main from *The Making of Steel,* a publication of the American Iron and Steel Institute.

slag form a molten mass at the bottom of the furnace, the slag floating on a pool of iron four or five feet deep. About every four or five hours iron and slag are drawn off or *tapped,* each tap yielding 100 to 300 tons of iron. The molten iron flows through a trough into a waiting ladle (or *hot metal*) car holding 40 to 160 tons and is then hauled away to be used in its molten state in the steel furnaces or cast into pigs for sale. As this process goes on, more coke, ore, and limestone are charged in at the top of the furnace so that a constantly descending column of raw materials is maintained. Once "in blast", the furnace is operated continuously day and night for long periods (five to seven years), until the brick lining wears out, or until demand falls off.

The third step is the *making of steel* itself in an open-hearth furnace, a bessemer converter or an oxygen furnace. More than 90% of the steel produced on this continent is made in *open-hearth furnaces.* These are rectangular completely enclosed brick structures. The floor, walls and roof of a single furnace may consist of upwards of a million bricks of various kinds, some chosen for their strength, some for their ability to retain as much heat as possible within the furnace, and some because they will not disintegrate when held at high temperatures for a long time. The open-hearth furnace gets its name from the fact that the saucer-shaped hearth or floor of the furnace (which may be as large as 40 to 50 feet long and 15 to 17 feet wide) is exposed to the sweep of the flames that melt the steel. The fuel, which may be natural or coke-oven gas, blast-furnace gas, oil or tar, or two or more of them in combination, is blown into the brick-lined interior of the furnace through burners at either end. To facilitate combustion, air, previously heated in chambers beneath the furnace, is blown in with the fuel. While the heat is being applied, scrap and a small quantity of limestone are charged into the furnace through doors at hearth level and become molten. Then molten iron is poured in through a spout set temporarily in the door. The ratio of molten iron to scrap may be 50:50; but it can be varied from as little as one-third iron with two-thirds scrap to as much as two-thirds iron with one-third scrap. In the intense heat of the furnace, which reaches about 3,000°F, various chemical reactions take place in which unwanted elements in the iron either pass off as gas or enter the slag produced by the limestone—the molten iron and the molten steel scrap working together to form a uniform mass of steel. At the end of six to eight or nine hours (depending on the size of the furnace), samples are taken and small quantities of iron ore and ferro-alloys added, as necessary, to give the batch or *heat* of steel the desired chemical composition. When this has been achieved, the plug at the bottom of the furnace is removed, the molten steel flows into a waiting ladle (the slag then flowing off into a smaller ladle), and the ladle is moved by crane over waiting ingot moulds into which it is poured or *teemed* to solidify, the moulds then being stripped off and re-used. Ingots may be of various shapes and sizes, but they are commonly rectangular in shape, about a foot and a half to a yard wide and six feet high, weighing several tons each. A 300-ton heat of steel could, for instance, produce 50 six-ton ingots, or 60 five-ton ingots.

Both the bessemer converter, which is now comparatively little used on this continent, and the *oxygen furnace,* a recent introduction from Austria, make steel in much smaller batches (say 40 to 50 tons at a time) than the big modern open-hearth furnace but in only a fraction of the time required for an open-hearth heat. The oxygen furnace is a tilting pear-shaped steel vessel, lined with refractory (heat-resisting) brick and open at the top. Into the open top are charged steel scrap and molten iron, usually in the proportion of 25% scrap to 75% hot metal, along with a little limestone. High-purity oxygen is then blown down through a vertical tube or *lance* at supersonic speed onto the top of the molten metal bath, oxidizing or burning out the unwanted elements in the iron. The vessel is then tilted, the steel poured from the open top into a ladle, and then from the ladle into ingot moulds. The actual "blowing" time is half an hour or less and the full cycle of charging, blowing, testing and pouring can be carried out in about 45 minutes, permitting the making of some 30 heats in a day as compared with about 2½ heats a day in a big open-hearth furnace.

The *rolling processes of the steel industry* consist basically of passing material between two heavy steel rolls revolving at the same speed but in opposite directions. Because the opening between the rolls is smaller than the material being rolled, the process shapes the steel, reduces it in cross-sectional area and elongates it. It also toughens and strengthens the steel by breaking down and packing together the non-uniform crystals in the ingot. In general, the more steel is rolled, the denser and tougher it becomes; in addition it becomes more malleable.

The first stage in the rolling process is the *blooming mill,* which gets its name from the Anglo-Saxon word "bloma", a mass or lump. This mill rolls down the massive steel ingots into smaller semi-finished forms which then pass on to the finishing mills. The ingots are heated, generally four to eight at a time, in *soaking pits* or underground furnaces (the doors of which are movable units of the roof), heated by oil or gas in much the same manner as an open-hearth furnace. If the ingots have been recently poured and are still very hot in the centre, heating them up to a uniform temperature of 2,200° F takes only a short time, as little in some cases as half an hour. They are then passed back and forth between two huge steel rolls, being turned at intervals so that pressure is applied to all four sides. An ingot 19 by 23 inches in cross section can be rolled down to a bloom 6 inches square in about 16 passes and in less than 5 minutes. Having become very long in the process, it is then sheared into lengths suitable for handling at the next stage.

Blooms may be either square or rectangular in cross-section and of various sizes, but not less than 36 square inches in cross-sectional area. Some blooming mills roll only blooms; others also roll *slabs,* which as the name indicates are wider and flatter in shape (always more than twice as wide as they are thick); and *billets,* which are square or rectangular in shape like blooms but much smaller. Blooms, billets and slabs are all semi-finished forms of steel, or *semis.* Often billets are rolled on a special *billet mill.* This may have as many as ten sets of rolls or stands through which the bloom is passed successively by machinery, being turned between the stands. The first six stands may, for instance, reduce an 8 by 8 inch bloom to 4 by 4 inches, the next four stands may reduce this to 2 by 2 inches. An automatic shearing device then cuts it into suitable lengths as it moves. A special *slabbing mill* may also be used for rolling slabs, since slabs rolled on blooming mills are of limited width. Blooms and billets go on to the finishing mills to be rolled into rails, bars, structural shapes, etc., slabs to be rolled into plates, sheets and strip steel.

The rolling of *bars, shapes and rails* involves passing preheated billets (for bars) or blooms (for shapes and rails) through a series of rolls, both the top and bottom roll in each set being cut out to form a groove which shapes the white-hot malleable steel as it is squeezed through. The first stands, or *roughing* stands, do not do much more than reduce the cross-section of the bloom or billet and elongate it, but the later ones gradually give it the T shape of a rail, the I shape or H shape of a beam, the L shape of an angle, the ⊔ shape of a channel, or the round, square, hexagonal, diamond or other shape of a bar. Structural shapes may go through nine or more passes from bloom to finished product. Rails, because of the severe wear to which they are subjected, require seven to nine passes for roughing and six passes for finishing. All this is done rapidly so that the steel has no time to cool off during the rolling. In a modern high-speed continuous bar mill, for instance, billets 4 inches square and 16 feet long, which have been heated white-hot, can be passed through 12 stands and reduced to 1-inch bars 250 feet long in less than 2 minutes, and 70 tons of bars can be produced in an hour. The bars speed from the last stand onto the cooling beds, and when 6 to 12 are lined up side by side heavy knives cut them into lengths of approximately 15 feet, after which they are bundled for shipping.

Plates, sheets and strip steel are all flat-rolled products of different thicknesses and widths, and it is difficult to define exactly where one product stops and the other begins. Conventionally, plate is a flat product 6 to 48 inches wide and at least ¼ of an inch in thickness, or more than 48 inches wide and over 3/16 of an inch in thickness. Generally speaking, thin flat-rolled steel is called a sheet if it is produced in sheared form and strip if it is produced as a continuous coil, though there are sometimes also distinctions in width and in metallurgical specifications. Plates may be rolled on a type of mill which has two stands, one for roughing and one for finishing, each consisting of three rolls placed one above the other, the white-hot slab being passed between the lower and centre rolls, then raised and passed back between the centre and upper rolls and so on until the desired thickness is obtained. Plates may also be rolled in a single stand consisting of four rolls placed one above the other, the two smaller reversible centre rolls doing the work of reducing a slab to plate as it is passed back and forth between them, while the two larger and heavier outer rolls exert the pressure necessary to keep the work rolls from bending while the slab is passing through. Lighter plates may be rolled on a continuous mill in which the stands are placed in tandem so that the slab goes through one set of rolls after another, gradually being reduced in thickness.

Most of the sheets and strip now rolled on this continent are rolled on *continuous wide-strip mills*. Slabs up to 8 inches thick and as long as 18 feet are passed, after heating through the *roughing train,* four big stands each housing four rolls placed one above the other—two small-diameter centre or work rolls backed up by two large-diameter outer rolls. From the roughing train, which squeezes the heated slab down to about one-fourth its original thickness, the steel passes to the finishing stands, each of which further reduces and elongates it. At the end, it is either cut into sheets by flying shears as it moves out of the last stand or rolled into coils. The thickness of the slabs and the time required to roll them into sheets or strip vary, depending on the thickness of the finished steel produced. However, in a typical mill, a slab 5 inches thick by 30 inches wide and 210 inches long weighing 9,000 lbs. becomes strip 1/16 of an inch thick and approximately 1,400 feet long in a period of three minutes.

Hot-rolled sheets and strip may be shipped as they are or further processed by *cold reduction*. In the latter case, the coil is unrolled and processed to remove scale: it is passed through a series of tanks which contain acid (this process is called *pickling*), then into a cold-water rinse tank, a hot-water rinse tank and a drier, after which it is oiled. After this preparation, it is fed into a train of heavy rolls, each stand again consisting of four rolls, the inner ones about 16 inches in diameter, the outer ones about 64 inches in diameter. The rolling equipment described up to this point works on hot malleable steel, but the cold-reduction stands have to be powerful enough to reduce steel which is cold. They are not only enormously powerful and fast, but are capable of very fine adjustment. The slab mentioned above, which was reduced in the continuous hot mill to a coil of steel 1/16 of an inch thick by 30 inches wide by 1,400 feet long in three minutes, can be reduced in a modern five-stand cold-reduction mill to about 0.011 inch in thickness and 7,600 feet in length in less than five minutes. This drastic reduction in thickness hardens the steel to a degree that tends to make it brittle. The next step in making cold-rolled steel is therefore *annealing* or softening it by applying heat once more. The cold-rolled coils are either uncoiled and passed continuously through an annealing furnace or are put, still coiled, into a batch type of furnace for the heat treatment. The final step is that of *temper rolling*. The annealed coil is passed continuously through one or two stands each consisting of four rolls placed one above the other, the centre or work rolls hardening the surface to the degree of temper required in the finished product.

Cold-rolled steel is the basis of *tinplate* and *galvanized sheets*. To make tinplate by *hot dipping*, lengths of cold-rolled steel are dipped into a bath of molten tin. In the *electrolytic tinning* process a coil is unrolled and passed through a bath in which plates of pig tin are suspended, an electric current causing the tin from the pigs to be deposited on the steel as it passes through the bath. To make *galvanized sheets*, lengths of cold-rolled steel are similarly dipped into a bath of zinc at a temperature of about 850° F, or the coil is passed continuously through the zinc bath.

Even as cursory a description as this of the principal steel processes would be incomplete without a reference to the enormous use of *water*. About 150 tons of water are used for each ton of steel produced. About four-fifths of this is for cooling purposes. For instance, a typical blast furnace with a daily capacity of 1,000 tons of iron uses 11 million gallons of water each day to cool certain parts of the furnace. In the rolling mills also water is used for cooling. In addition it is used for rinsing the steel at certain stages, and "hydraulic" water, or water under high pressure, is used to remove scale from hot steel as well as for such mechanical purposes as operating valves, doors, etc. One of the largest users of water is the continuous strip mill, which uses a little more than 21,000 gallons per minute to cool rolls, de-scale hot steel, flush scale, and operate the manipulators which turn the slabs during rolling. There is, of course, some loss by evaporation, and water used, for example, to quench coke is disposed of; but, as a general rule, 80% of the industrial water used in a steel mill is recirculated.

A GLOSSARY OF TERMS USED IN THE STEEL INDUSTRY

alloy steel: A steel to which elements not present in carbon steel (q.v.) have been added or in which the content of manganese or silicon is increased above that in carbon steels.

angle: A steel bar rolled to the cross-section of the letter L, much used for light structural work.

bar: A length of steel of uniform cross-section, with diameter from as little as ¼″ to about 8″. It may be round, square, rectangular, hexagonal, etc. (see Appendix A).

base box: A unit of measurement for tinplate. It is 31,360 square inches of tinplate, equivalent to 112 sheets of 14 inches by 20 inches and weighing approximately 100 pounds.

Bessemer process: A process of making steel by blowing air through molten pig iron and thus oxidizing the carbon, manganese, silicon and phosphorus. *Acid process*—furnace is lined with siliceous refractory. Pig iron low in phosphorus is required, as this element is not removed in the acid process. *Basic process*—furnace is lined with a basic refractory, phosphorus is removed and a slag rich in lime is formed.

billet: A semi-finished product in the rolling of steel, made in a blooming mill or a billet mill, and intermediate between a bloom and a bar (see Appendix A).

blast furnace: For description see Appendix A.

bloom: A semi-finished product in the rolling of steel made in a blooming mill. It is the first stage in the reduction of the ingot, square or rectangular in shape and more than 36 square inches in cross-sectional area (see Appendix A).

carbon steel: A steel whose properties are determined primarily by the percentage of carbon present. Besides iron and carbon, carbon steels contain manganese (up to 1%), silicon (up to 0.2%), sulphur and phosphorus (up to 0.1%), but no chromium, nickel, molybdenum, etc.

castings: Iron or steel formed by pouring the molten metals into sand or metal moulds in which they solidify in their final shape.

channel: A standard form of structural shape (q.v.), consisting of three sides at right angles, in channel form (⊔).

coated sheets: Steel with an adherent layer of some other material. The most common types are galvanized steel, terneplate and tinplate but steel may also be coated with paint, tar, asphaltum, etc.

coke breeze: The smaller grades of coke from coke ovens or gasworks.

coking coal: The higher carbon grades of coal with capacity to leave the residue coke in large firm lumps.

cold drawing: The process of pulling a hot-rolled bar through a die of similar shape but smaller dimensions, without pre-heating. Cold drawing improves machinability and makes for accuracy of size and economical manufacture of precision parts. (See also cold-reduction).

cold reduction: The process of reducing the thickness of steel by cold rolling or cold drawing, i.e. without pre-heating the steel. This method adds strength, toughness and a smooth bright finish.

cold rolling: The process of making from hot-rolled sheets and strip a very thin, high quality steel by rolling it without pre-heating. (See also cold reduction.)

continuous casting: A process in which molten metal is cast into a continuous slab from a ladle into which it is poured from the furnace, and then cut to the desired length by oxygen torches after it solidifies. This process does away with pouring individual ingots, stripping them from the moulds, reheating them, and reducing them to blooms or slabs since the section cast is much smaller than a typical ingot section.

continuous wide-strip mill: A mill in which slabs are reduced to sheets or strip by passing through one set of rolls after another in a rapid, continuous, automatic process.

fabricated steel: Steel made up into a final product such as pipe, wire, fencing, nails.

finished steel: Steel which is fully processed and ready for use outside the primary steel industry, e.g. in the manufacture of final products or in construction.

ferro-alloys: Alloys of iron and some other element or elements (carbon excepted) made especially for use as raw material in the manufacture of steel. Used because many of the pure metals are costly and hard to extract from their ores.

flue dust: Dust which is "air borne" in the exit gas stream of a blast furnace and which is collected in the dust catcher and the gas washer system. Usually it is reclaimed by sintering with ore and in this form is recharged to the blast furnace.

forging: The operation of shaping hot steel by means of hammers or presses.

galvanizing: The coating of iron or steel with zinc (see Appendix A).

gauge: A measurement of thickness.

grinding balls, rods: Steel balls or rods for use in processing ore at gold or base metal mines. They are used in a rotating vessel like a cement mixer into which the ore is fed continuously, the tumbling balls or rods acting to grind up the ore.

H beam: A steel beam with a cross section shaped like the letter H.

heat: A colloquial term defining the period of time required to make an individual batch of steel in a steel furnace, *or* the batch of steel itself.

high-silicon sheets and strip: Carbon steel to which 0.75-4.0% silicon has been added. Used in the cores of electrical transformers and in laminations for other electrical apparatus. Typical composition: silicon 3%, manganese under 0.2%, phosphorus 0.02%, sulphur 0.02%, carbon 0.02%.

hot-rolled steel: Steel brought to white heat, passed through a series of rolls which reduce the cross-section and increase the length, then cooled, and cut or coiled (see Appendix A).

I beam: A steel beam with a cross section shaped like the letter I.

ingot steel: The first solid form of steel. A large casting of a shape suitable for subsequent rolling or forging (see Appendix A).

ingot mould: The steel or sand mould into which molten steel is cast to form an ingot.

ingot stripping: Process of extracting ingots from ingot-moulds.

iron tailings: The rejected or waste portion of an iron ore, or iron found in small quantities in ore which is primarily mined for the extraction of some other metal, e.g., lead- or zinc-bearing ore.

mill scale: The deposit of iron oxide which forms on the surface of unprotected steel in the heating and rolling operation.

open hearth: For description see Appendix A.

oxygen converter or furnace: For description see Appendix A.

planetary hot-strip mill: A mill in which a thick steel slab can be reduced to a comparatively thin hot-rolled strip in one pass through the rolls, a 90% reduction being achieved as against a 20-30% reduction per pass with an ordinary set of rolls. The reduction is carried out by a relatively large number of small-diameter work rolls equally spaced about the circumference of each of two heavy back-up rolls, the arrangement of the small rolls around the big ones giving rise to the name "planetary".

plate: A flat-rolled steel product ¼″ or thicker when from 6 through 48″ wide, and over 3/16″ thick when more than 48″ wide (see Appendix A).

reversing mill: A type of rolling mill in which the stock being rolled passes backwards and forwards between the same pair of rolls, which are reversed between the passes.

scrap: "Plant" or "home" scrap consists of croppings, clippings, etc. left over in the steel-making process. "Purchased" scrap usually comes from obsolete or worn out capital goods such as railway tracks or rolling stock, automobiles, and machinery. Scrap is now used in roughly equal proportions with pig iron in the open-hearth furnace and is the basic material used in the electric furnace; it is carefully graded according to quality and chemical composition.

semis: Any form of semi-finished steel, such as blooms, billets, and slabs.

sheet: A thin flat-rolled piece of steel usually over 12″ wide and limited in length.

sheet piling: A type of structural steel shape resembling a shallow trough in cross section. In use it is supported in a vertical position by guide piles, and serves to resist lateral pressures.

short or net ton: A ton of 2,000 lbs. as compared with a *long or gross* ton of 2,240 lbs. or a *metric* ton of 2,204.6 lbs.

sintering: A fusion process which agglomerates fine material such as ore "fines", flue dust and mill scale using either finely ground coal or coke which is added to the charge or sulphur contained in the ore as the fuel to obtain a fusion heat. A low-grade ore treated by sintering has its sulphur content reduced and its iron content raised. *Algoma sinter* is a premium agglomerated ore produced by this method.

skelp: Steel strip or plate from which pipes or tubes are made by welding.

slab: A semi-finished form of steel rolled from an ingot. It is rectangular in shape and always more than twice as wide as it is thick (see Appendix A).

slag: The waste material which comes to the top of the two-layer melt formed during smelting and refining operations. In iron and steel processing the key ingredient of the slag is lime (calcium oxide).

sponge iron: Iron made from a ferrous concentrate (sometimes pressed into briquettes) which can be charged directly into steel furnaces instead of steel scrap. Sponge iron to replace scrap in steel making is also made from low-grade ores after concentration by reducing the ore with carbon monoxide or hydrogen or a mixture of both obtained from coke-oven gas or natural gas by a special cracking process. It is very low in carbon and is valuable for making high-grade alloy steels because of the absence of tramp or residual elements.

stainless steel: Corrosion-resistant steel of a wide variety of compositions, but commonly containing a high percentage of chromium and nickel (8-25%).

strip: Thin flat-rolled steel in long continuous strip form.

structural shapes: Steel for use in construction, made by passing blooms through grooved rolls. The most important types are angles, beams, channels, tees, zees and piling.

terneplate: Steel sheet having on each side a thin coating of an alloy of 20% tin and 80% lead, though other proportions may be used. Made by the dip process. Replaces the more expensive tinplate for some uses.

Thomas steel: Steel made by the basic Bessemer process (q.v.), often used in Europe where much of the iron ore has a high phosphorus content.

tinplate: Thin sheet steel covered with an adherent layer of tin. In the *hot-dip* process steel sheets are dipped into a bath of molten tin. In the continuous *electrolytic* process tin is deposited on cold-reduced steel strip by means of an electric current passing through a solution (see Appendix A).

tube round: A high-quality round billet of steel used to make seamless pipe.

universal beam mill: A mill for making wide-flange beams (q.v.). It has vertical as well as horizontal rolls, so that the edges of the product are rolled straight and parallel.

wide-flange beams: Large beams shaped like the letter H. They cannot be rolled on conventional mills because the deep narrow grooves necessary in the rolls to produce the flanges would weaken the rolls too much, and because the metal would be so thin that it would cool too quickly and would not flow properly. A mill to make wide-flange beams has vertical rolls as well as horizontal ones so that both the web (or cross-bar of the H) and the flanges (or parallel sides of the H) can be rolled at the same time.

Appendix C

GENERAL NOTES TO TABLES AND CHARTS

1. Because of rounding, items in these Tables do not necessarily add to totals.
2. In general, percentages have been calculated on unrounded figures.
3. Where U.S. and Canadian prices and freight rates are compared, they are given in the respective national currencies, no account being taken of the exchange rate.
4. Abbreviations: n.a. = not available
   neg. = negligible
5. In connection with these Charts and Tables, it should be borne in that there are grave statistical difficulties in dealing with this industry:

   (a) Steel prices are not regularly published in Canada. There is no source such as *The Iron Age* or *Steel* in the United States from which an historical price series can be obtained. D.B.S. publishes various indexes of steel prices, but few of the actual steel prices are published as are the prices of most other commodities.

   (b) The legislation under which D.B.S. operates prevents it from publishing any material which might reveal the operations of a particular firm. Since the primary steel industry consists mainly of four large producers and since a number of its products are made by only one or two of them, this limitation means that production statistics for many items are published only in "basket" groups, which moreover may change from year to year. It is thus difficult, if not impossible, to get a complete breakdown of production by items over any significant period of time. This limitation applies even to periods now long past.

   (c) There are also problems of definition and classification. The definitions used in the production statistics differ from those used in the trade statistics. Moreover, in the official production statistics, changes of definition from time to time make it impossible to get comparable series for certain products over a period of any length. And in the trade statistics, the problem of segregating classes of products is complicated by the fact that certain trade items cover several groups of products (e.g. plates, sheets and strip) and that steel in various forms for use by a particular industry may be lumped together in one trade item because it corresponds to a tariff item (e.g. ship steel).

   (d) Finally there is the great difficulty of selecting representative years to show trends, since the industry is affected by so many special factors, both domestic and external.

Table 1

ACTIVE PLANTS IN THE CANADIAN PRIMARY IRON AND STEEL INDUSTRY, BY PROVINCES, 1955

Source: D.B.S. *The Primary Iron and Steel Industry, 1955.*

Province	Number of firms	Pig iron: Number of plants	Pig iron: Number of blast furnaces	Steel ingots and castings: Number of plants	Steel ingots and castings: Number of steel furnaces	Rolling and drawing mills	Ferro-alloys[1]
Nova Scotia......	3	1	3	2	7	2	—
Quebec..........	15	—	—	12	24	2	2
Ontario..........	18	4	13	11	75	9	2
Manitoba........	2	—	—	2	6	1	—
Alberta..........	3	—	—	3	3	1	—
British Columbia..	9	—	—	8	12	1	—
CANADA.......	50[2]	5	16	38	127	16	4

[1]Not including artificial abrasive plants which make ferrosilicon as a by-product.

[2]Only 48 separate firms were included in this industry in 1955; however, two of these operated plants in both Ontario and Quebec.

Table 2

MATERIALS CHARGED TO IRON BLAST FURNACES IN CANADA, 1945-1955

Source: D.B.S. *The Primary Iron and Steel Industry, 1955.*

Year	Iron ore	Mill cinder, scale, etc.	Iron and steel scrap	Coke	Limestone	Dolomite
	(Thousands of net tons)					
1945...	3,033	281	37	1,632	757	39
1946...	2,526	162	23	1,321	623	21
1947...	3,673	155	39	1,903	781	100
1948...	3,911	274	44	2,075	887	115
1949...	3,846	299	58	2,012	827	122
1950...	4,174	287	43	2,140	865	149
1951...	4,645	345	65	2,378	955	172
1952...	4,882	320	107	2,494	981	212
1953...	5,236	674	86	2,805	1,080	296
1954...	3,749	578	82	1,970	778	258
1955...	5,311	706	126	2,817	1,068	286

Table 3

MATERIALS CHARGED TO STEEL FURNACES IN CANADA, 1945-1955

Source: D.B.S. *The Primary Iron and Steel Industry, 1955.*

Year	Pig iron	Ferro-manganese alloys[1]	Other ferro-alloys	Scrap iron and steel	Iron ore	Lime-stone	Dolo-mite	Fluor-spar
	(Thousands of net tons)							
1945......	1,416	31	15	1,742	107	217	77	19
1946......	1,085	22	11	1,517	133	181	70	14
1947......	1,542	27	12	1,672	156	232	96	19
1948......	1,696	30	11	1,834	171	244	119	21
1949......	1,737	31	12	1,771	184	254	120	21
1950......	1,668	33	12	1,995	245	266	137	22
1951......	1,838	34	15	2,107	304	258	151	23
1952......	1,958	36	17	2,122	278	276	149	23
1953......	2,311	39	15	2,201	276	301	172	23
1954......	1,767	30	12	1,630	203	183	136	16
1955......	2,554	40	17	2,366	406	219	183	19

[1]Including spiegeleisen, silicospiegeleisen, ferromanganese (all grades) and silicomanganese.

Table 4

PRINCIPAL STATISTICS OF THE CANADIAN PRIMARY IRON AND STEEL INDUSTRY, SELECTED YEARS 1929-1955 AND BY PROVINCES 1953, 1954 AND 1955

Source: D.B.S. *The Primary Iron and Steel Industry, 1954 and 1955.*

Year and province	Employees	Earnings	Cost of fuel and electricity at plant	Cost of materials at plant	Value added by manufacture[1]	Gross selling value of products at works
	No.			(Millions of dollars)		
1929	11,218	18.5	6.7	32.5	33.0	72.2
1933	5,200	6.0	2.7	7.6	8.2	18.5
1937	14,054	19.9	6.9	33.8	33.8	74.6
1939	13,827	20.4	6.1	29.6	40.2	75.9
1942	33,245	60.9	18.7	110.6	102.8	232.1
1945	29,378	57.9	16.0	86.4	89.9	192.3
1949	29,097	83.0	22.4	147.2	136.2	305.7
1950	29,051	85.4	26.7	159.3	154.5	340.5
1951	33,393	108.6	32.1	223.0	209.5	464.6
1952	35,001	124.4	31.4	239.0	233.6	504.0
1953						
Nova Scotia	4,916	15.7	3.4	23.7	13.8	40.9
Quebec	4,157	14.8	2.7	21.3	25.9	49.8
Ontario	24,383	93.9	22.5	162.6	167.3	352.4
Manitoba	980	3.4	0.6	2.8	6.6	10.0
Alberta / British Columbia	520	2.0	0.3	2.0	3.4	5.7
CANADA	34,956	129.7	29.6	212.4	217.0	459.0
1954						
Nova Scotia	3,925	12.7	2.9	15.7	14.5	32.3
Quebec	3,509	13.0	2.3	14.0	25.5	41.5
Ontario	20,166	78.5	17.7	111.6	168.9	295.9
Manitoba	772	2.8	0.4	2.3	5.1	8.0
Alberta / British Columbia	489	1.8	0.3	1.6	3.5	5.4
CANADA	28,861	108.8	23.7	145.1	217.5	383.2[2]

1955						
Nova Scotia	4,089	14.5	2.4	18.8	17.9	43.6
Quebec	3,689	14.4	3.0	16.7	34.0	53.6
Ontario	23,369	102.9	24.8	171.6	228.7	412.0
Manitoba	797	3.0	0.6	3.3	6.0	10.0
Alberta / British Columbia	563	2.0	0.4	1.9	5.1	7.2
CANADA	32,507	136.9	31.2	212.3	291.8	526.3

[1]Figures for value added by manufacture shown in this Table prior to 1953 were obtained by subtracting the cost of materials used, including fuel and electricity, from the gross selling value of products. In 1954, information not previously available on the value of year-end inventory holdings at plant and plant warehouses was taken into account in calculating the value added figure.

[2]Prior to 1954, shipments of wire rods transferred to makers' own fabricating plants were considered as "shipments for own use" and, therefore, not included in "Factory Sales". For the most part these shipments were made to makers' fabricating plants which are classified to the Wire and Wire Goods Industry. The normal practice for statistical purposes has been to consider shipments of this kind from one industry group to another as part of the total sales of the producing industry and as materials of the consuming industry. The treatment of wire rods constituted an exception which has affected the calculation of "value added" for these two industries. Therefore, in order to bring the treatment of wire rods in line with usual statistical procedures, producers in 1954 were asked to consider the sales of wire rods to own fabricating plants as "Factory Sales". For this reason the value of products shown for 1954 and 1955 in this Table is higher by the value applied to these shipments. In 1954 the value of these shipments was estimated to be about $16,000,000.

Table 5

PRINCIPAL STATISTICS OF CANADA'S TWENTY-FIVE LEADING MANUFACTURING INDUSTRIES, RANKED ACCORDING TO THE SELLING VALUE OF PRODUCTS, 1953

Source: D.B.S. *General Review of the Manufacturing Industries of Canada, 1953.*

No.	Industries	Employees	Earnings	Cost at plant of materials used	Value added by manufacture	Selling value of factory shipments[1]
		No.	(Millions of dollars)			
1.	Pulp and paper	58,194	235.7	499.4	599.9	1,179.7
2.	Non-ferrous metal smelting and refining	25,115	94.5	508.1	310.2	870.9
3.	Motor vehicles	32,973	131.3	557.7	273.6	835.6
4.	Slaughtering and meat packing	22,887	74.4	672.8	152.0	829.5
5.	Petroleum products	11,858	48.6	507.2	159.6	695.0
6.	Sawmills	60,933	142.1	304.6	269.1	580.7
7.	Primary iron and steel	34,956	129.7	212.4	217.0	458.9
8.	Aircraft and parts	38,048	142.4	135.8	260.5	398.7
9.	Butter and cheese	20,697	52.5	293.9	95.8	397.0
10.	Railway rolling stock	35,447	118.0	179.9	153.7	338.3
11.	Motor vehicle parts	23,335	81.2	162.3	141.3	307.7
12.	Rubber goods, incl. footwear	22,600	71.0	114.3	172.7	290.7
13.	Miscellaneous food preparations	9,757	26.0	200.4	80.9	284.4
14.	Bread and other bakery products	33,540	80.9	129.2	140.0	278.0
15.	Clothing, men's, factory	35,119	74.7	147.3	125.8	273.9
16.	Flour mills	4,962	14.9	224.5	40.3	266.4
17.	Miscellaneous electrical apparatus and supplies	22,671	74.6	109.3	141.8	253.7
18.	Machinery, heavy, electrical	25,454	88.4	87.7	154.6	244.3
19.	Printing and publishing	28,499	93.8	66.8	174.9	243.9
20.	Furniture	29,768	75.8	107.7	121.5	231.6
21.	Machinery, industrial	22,163	75.3	78.4	145.2	226.0
22.	Sheet metal products	18,275	58.8	119.2	103.8	225.4
23.	Clothing, women's factory	28,277	61.8	116.2	103.7	220.4
24.	Cotton yarn and cloth	23,178	55.0	132.9	73.3	210.2
25.	Fruit and vegetable preparations	15,385	32.8	119.9	82.5	205.1

[1]See footnote 2 to Table 6.

Table 6

RANK OF THE PRIMARY IRON AND STEEL INDUSTRY AMONG CANADA'S LEADING MANUFACTURING INDUSTRIES,[1] 1925-1954, AS MEASURED BY VALUE OF PRODUCTION[2]

Sources: Various issues of *The Canada Year Book* and D.B.S. *General Review of the Manufacturing Industries of Canada.*

Year	Rank	Year	Rank	Year	Rank
1925	26	1935	22	1945	12
1926	26	1936	18	1946	13
1927	25	1937	12	1947	10
1928	18	1938	15	1948	10
1929	17	1939	11	1949	8
1930	22	1940	10	1950	7
1931	24	1941	7	1951	7
1932	38	1942	7	1952	7
1933	33	1943	10	1953	7
1934	29	1944	13	1954	8

[1]The unusually wide fluctuations to which this industry is subject are suggested by the sharp drop in its rank during the depression and the sharp rise during the war.

[2]In 1952, selling value of factory shipments superseded gross selling value of products at the plant as the measure of industries' production, but some industries, including primary iron and steel, continued on the old basis in 1953 and 1954.

Table 7

WORLD PRODUCTION OF CRUDE STEEL

(Ingots and steel for castings—millions of net tons).

Sources: Annual Review issues of *The Iron Age* and for 1935-39 averages *Commodity Year Book 1956.*

	1935-39 Average	1945	1950	1953	1954	1955 (prelim.)
United States	46.6	79.7	96.8	111.6	88.3	117.0
U.S.S.R.[1]	18.4	12.3	29.8	41.8	45.2	49.6
Germany—Western	22.5	5.5	13.4	17.0	19.2	23.2
—Eastern			—	2.7	2.5	2.8
United Kingdom	13.0	13.2	18.2	19.7	20.7	22.1
France	7.7	1.8	9.5	11.0	11.3	13.7
Japan	6.4	1.2	5.3	8.4	8.5	9.1
Belgium	3.4	0.8	4.2	5.0	5.5	6.3
Italy	2.4	0.4	2.6	3.9	4.6	5.9
Czechoslovakia[1]	2.0	1.0	3.2	4.9	4.9	5.5
Poland[1]	1.4	0.5	2.7	4.0	4.4	5.1
Canada	1.3	2.8	3.4	4.1	3.2	4.5
Luxembourg	2.1	0.3	2.7	2.9	3.1	3.5
Saar	2.5	—	2.1	3.0	3.1	3.5
Other Countries	4.0	6.4	10.4	18.7	20.5	22.1[2]
World Total	133.7	125.9	204.3	258.7	245.0	293.9

[1]Estimates for the U.S.S.R., Czechoslovakia and Poland by *The Iron Age.*

[2]Countries included in this total which are estimated to have had a production of over a million tons of steel in 1955 are as follows (in million tons): China 2.8, Australia 2.4, Sweden 2.2, Austria and India 1.9 each, South Africa 1.7, Hungary 1.6, Spain 1.4, Brazil 1.2 and the Netherlands 1.1.

Table 8

APPARENT PER CAPITA CONSUMPTION OF CRUDE STEEL[1]
(Pounds)

Source: *United Nations Statistical Yearbook 1954.*

	Average 1936-38	1950	1951	1952	1953 (prelim.)
United States	701	1,250	1,347	1,142	1,376
Canada	333	668	805	789	774
United Kingdom	500	617	611	699	710
Sweden	481	646	710	778	705
Germany[2]	580				
West Germany		452	483	637	628
Belgium-Luxembourg	397	547	553	584	542
Australia	395	604	633	558	529
France[2]	291	344	408	538	437
Netherlands	300	364	395	381	430
U.S.S.R.[3]	227	n.a.	353	375	408
Norway	300	315	388	388	403

[1]Apparent consumption derived by subtracting exports from production plus imports. No account taken of changes in stocks.

[2]Saar included with Germany in 1936-38 and with France from 1950 on.

[3]Figures for the U.S.S.R. 1951-53 based on estimates of total steel consumption by the United Nations Economic Commission for Europe.

Table 9

PRODUCTION OF PIG IRON AND STEEL[1] IN CANADA, 1900-1955

(Thousands of net tons)

Source: Various issues of D.B.S. *Iron and Steel and Their Products in Canada* and *The Primary Iron and Steel Industry.*

Year	Pig Iron	Steel	Year	Pig Iron	Steel	Year	Pig Iron	Steel
1900	97	26	1919	918	1,030	1938	790	1,294
1901	274	29	1920	1,090	1,233	1939	846	1,551
1902	358	204	1921	665	748	1940	1,309	2,254
1903	298	203	1922	429	538	1941	1,528	2,712
1904	303	166	1923	985	987	1942	1,975	3,110
1905	525	452	1924	664	739	1943	1,758	3,004
1906	598	639	1925	639	843	1944	1,853	3,016
1907	652	707	1926	848	869	1945	1,778	2,878
1908	631	589	1927	795	1,017	1946	1,406	2,327
1909	757	755	1928	1,162	1,383	1947	1,963[2]	2,946
1910	801	822	1929	1,210	1,543	1948	2,126	3,200
1911	918	882	1930	837	1,131	1949	2,154	3,190
1912	1,015	958	1931	470	753	1950	2,317[3]	3,384
1913	1,129	1,169	1932	161	380	1951	2,553	3,569
1914	783	829	1933	255	459	1952	2,682	3,703
1915	914	1,021	1934	454	849	1953	3,012	4,116
1916	1,169	1,428	1935	672	1,055	1954	2,211	3,195
1917	1,170	1,746	1936	760	1,250	1955	3,215	4,535
1918	1,196	1,874	1937	1,007	1,571			

[1]Steel ingots and direct steel castings.

[2]Includes 1,272 tons produced in B.C. by an electric furnace process.

[3]From here on includes silvery pig iron, formerly included with ferro-alloys.

Table 10

STEEL FURNACE CAPACITY[1] AND STEEL PRODUCTION IN THE UNITED STATES, 1915-1956

(Capacity and production in thousands of net tons and production as percent of capacity)

Sources: American Iron and Steel Institute *Annual Statistical Report 1954* and for 1955 and 1956 *The Iron Age* Jan. 5 and Feb. 2, 1956.

Year	Capacity	Production	Production as % of Capacity[2]	Year	Capacity	Production	Production as % of Capacity[2]
1915......	46,249	36,009	77.9	1936......	78,164	53,500	68.4
1916......	51,282	47,907	93.4	1937......	78,148	56,637	72.5
1917......	55,568	50,468	90.8	1938......	80,186	31,752	39.6
1918......	58,846	49,798	84.6	1939......	81,829	52,799	64.5
1919......	61,021	38,832	63.6	1940......	81,619	66,983	82.1
1920......	62,314	47,189	75.7	1941......	85,158	82,839	97.3
1921......	64,262	22,158	34.5	1942......	88,887	86,032	96.8
1922......	65,427	39,875	60.9	1943......	90,589	88,837	98.1
1923......	65,682	50,337	76.6	1944......	93,854	89,642	95.5
1924......	66,564	42,484	63.8	1945......	95,505	79,702	83.5
1925......	68,473	50,841	74.2	1946......	91,891	66,603	72.5
1926......	64,750	54,089	83.5	1947......	91,241	84,894	93.0
1927......	67,236	50,327	74.9	1948......	94,233	88,640	94.1
1928......	68,841	57,729	83.9	1949......	96,121	77,978	81.1
1929......	71,439	63,205	88.5	1950......	99,983	96,836	96.9
1930......	72,985	45,583	62.5	1951......	104,230	105,200	100.9
1931......	77,258	29,059	37.6	1952......	108,588	93,168	85.8
1932......	78,781	15,323	19.5	1953......	117,547	111,610	94.9
1933......	78,614	26,020	33.1	1954......	124,330	88,312	71.0
1934[3].....	78,128	29,182	37.4	1955......	125,828	117,000	93.0
1935......	78,452	38,184	48.7	1956......	128,363		

[1]As of January 1 each year.
[2]Percentages calculated on unrounded figures.
[3]Figures from 1934 include steel for casting only as used by foundries operated by companies making ingots.

Table 11

STEEL FURNACE CAPACITY IN CANADA, 1939-1956[1]

(Capacity in thousands of net tons and production as percent of capacity).

Sources: Department of Mines and Technical Surveys *Metallurgical Works in Canada: Part I, Primary Iron and Steel*, 1956, D.B.S. *The Primary Iron and Steel Industry in Canada*, various issues, and individual companies.

	Steel Ingots						
	Basic Open-hearth	Electric	Oxygen Converter	Total	Steel Castings	Total Ingots and Castings	Production of Ingots and castings as % of capacity[2]
1939	—	—	—	—	—	2,229	69.6
1940	—	—	—	—	—	2,303	97.8
1941	—	—	—	—	—	2,784	97.4
1942	—	—	—	—	—	3,196	97.3
1943	2,765	431	—	3,196	262	3,458	86.9
1944	2,813	492	—	3,306	313	3,619	83.3
1945	2,829	495	—	3,325	355	3,680	78.2
1946	2,745	461	—	3,206	354	3,561	65.4
1947	2,745	471	—	3,216	343	3,559	82.8
1948	2,750	464	—	3,214	345	3,559	90.0
1949	3,024	528	—	3,552	300	3,852	82.9
1950	3,024	667	—	3,691	312	4,003	84.5
1951	2,949	682	—	3,631	305	3,936	90.7
1952	2,949	729	—	3,678	318	3,996	92.7
1953	3,757	714	—	4,472	312	4,784	86.0
1954	3,919	738	—	4,657	334	4,992	64.0
1955	3,813	720	365	4,898	322	5,220	86.7
1956	4,078	764	365	5,207	333	5,540	

[1]As of January 1 each year.

[2]Percentages calculated on unrounded figures.

Table 12

CAPITAL EXPENDITURES IN THE CANADIAN PRIMARY IRON AND STEEL INDUSTRY, 1948-1956

(Thousands of dollars)

Source: General Assignments Division, Dominion Bureau of Statistics.

	Construction	Machinery and Equipment	Total
1948........	7,282	12,011	19,293
1949........	2,435	9,201	11,636
1950........	1,704	5,225	6,929
1951........	28,945	21,366	50,311
1952........	20,520	52,394	72,914
1953........	11,914	38,011	49,925
1954........	6,239	27,300	33,539
1955[1]........	6,754	27,727	34,481
1956[2]........	15,807	40,511	56,318

[1]Preliminary.
[2]Forecast.

Table 13

COKE OVENS, IRON BLAST FURNACES AND STEEL FURNACES OF THE BASIC STEEL PRODUCERS IN CANADA AS OF JANUARY 1956[1]

(Number, and annual capacity in thousands of net tons)

Sources: Department of Mines and Technical Surveys *Metallurgical Works in Canada, Part I, Primary Iron and Steel*, 1956, and individual companies.

	Algoma	Dofasco	Dosco	Stelco	Total
Coke Ovens					
Number................	251	60	114	191	616
Capacity, thous. net tons..	1,340	400	675	1,151	3,566
Iron Blast Furnaces					
Number................	7[2]	1[3]	3	4	15
Capacity, thous. net tons..	1,553[2]	328[3]	544[4]	1,241	3,666
Open-hearth Steel Furnaces					
Number................	14	2	5[5]	13	34
Capacity, thous. net tons..	1,120	100	700[5]	2,040	3,960
Electric Steel Furnaces					
Number................	—	5	4[6]	1	10
Capacity, thous. net tons..	—	185	116[6]	110	411
Oxygen Steel Furnaces					
Number................	—	2[7]	—	—	2
Capacity, thous. net tons..	—	365	—	—	365
Total Steel Furnace Capacity, thous. net tons..........	1,120[8]	650	816	2,150	4,736

[1]Equipment considered obsolete, or not in use for some other reason, not included.
[2]Including 2 blast furnaces at Canadian Furnace Co., annual capacity 273,000 net tons.
[3]Another blast furnace now being installed which will increase capacity to 656,000 net tons.
[4]Capacity currently being increased to 680,000 net tons.
[5]Another open-hearth furnace being installed which will increase capacity by 130,000 net tons.
[6]Includes 2 electric furnaces at a Montreal subsidiary, annual capacity 82,800 net tons.
[7]A third oxygen vessel now being installed.
[8]Algoma also has two Bessemer converters not now in use, annual capacity 120,000 net tons.

Table 14

CANADIAN IMPORTS AND EXPORTS OF PIG IRON, 1945-1955

Source: D.B.S. *The Primary Iron and Steel Industry 1954* and *Trade of Canada, Imports and Exports*, Dec. 1955.

	Imports		Exports	
	Net tons (thous.)	Value ($ thous.)	Net tons (thous.)	Value ($ thous.)
1945......	7.6	231.1	21.9	493.2
1946......	12.1	344.5	0.9	23.7
1947......	8.9	252.1	1.5	55.6
1948......	7.4	233.2	0.7	29.2
1949......	20.5	936.3	12.5	548.0
1950......	29.6	1,116.4	194.5	8,357.9
1951......	22.1	1,000.9	223.6	12,303.7
1952......	1.7	99.2	376.0	19,167.5
1953......	25.5	1,246.4	345.4	16,984.3
1954......	20.0	1,044.1	202.6	10,021.7
1955......	14.5	989.7	254.5	13,272.6

Table 15

CANADIAN EXPORTS OF PRIMARY STEEL, 1945-1955

(Thousands of net tons)

Source: D.B.S. Trade of Canada.

	1945	1946	1947	1948	1949	1950
Ingots, blooms and billets..	44.9	79.3	85.0	35.8	68.2	170.5
Bars....................	16.3	11.2	34.3	46.8	22.7	15.3
Rods....................	7.6	4.9	1.4	2.2	0.3	0.3
Plates, sheets and strip....	1.9	2.8	2.8	14.2	31.8	29.2
Rails....................	97.6	78.7	55.4	159.4	77.4	12.4
Structural shapes.........	9.3	7.8	4.4	10.5	10.3	2.2
Total..................	177.6	184.7	183.4	268.9	210.6	229.8

	1951	1952	1953	1954	1955
Ingots, blooms and billets...........	39.0	56.3	127.0	5.3	266.5
Bars............................	13.7	30.1	20.3	4.6	10.8
Rods............................	0.3	0.5	1.1	0.6	8.7
Plates, sheets and strip..............	28.4	33.1	86.3	28.2	71.4
Rails............................	—	2.6	3.4	1.5	71.6
Structural shapes..................	3.3	6.6	4.8	1.0	2.8
Total...........................	84.8	129.1	242.9	41.3	431.7

Table 16

PERCENTAGE COMPOSITION OF PRIMARY STEEL IMPORTS INTO CANADA, SELECTED YEARS

Source of basic data: D.B.S. *Trade of Canada.*

	1939	1948	1950	1953	1954	1955
Total Imports[1] (thous. net tons)....	479	815	863	1,043	795	968
Of which:	%	%	%	%	%	%
Ingots, blooms and billets.........	2.2	6.4	3.0	2.7	0.7	0.4
Bars and rods....................	7.6	12.3	8.1	10.2	8.0	8.6
Rails..........................	1.3	1.0	3.7	1.8	2.5	2.7
Structurals......................	12.2	22.3	19.9	26.8	40.4	35.1
Skelp..........................	21.0	7.5	19.4	10.9	7.6	8.8
Plates......................	6.4	6.3	10.6	8.6	9.8	8.6
Coated sheets and strip......	23.2	9.8	5.1	4.9	5.9	6.0
Uncoated sheets and strip...	25.4	32.9	28.8	31.7	23.3	28.2
Miscellaneous[2]..................	0.8	1.4	1.4	2.4	2.1	1.4

[1]Discrepancies between these figures and those in Table 17 are accounted for by minor differences in classification.

[2]Mainly steel for ships, all of which, whether it is structural steel, plate, sheet or some other type, appears under a single item in the trade returns, the reason being that it enters duty free under tariff item 440f. This illustrates one of the difficulties of segregating steel imports according to type.

Table 17

APPARENT CONSUMPTION OF STEEL ROLLING-MILL PRODUCTS IN CANADA, 1953

(Thousands of net tons)

Source: Economics Branch, Department of Trade and Commerce.

Source/Type	B.C.	Prairies	Ontario	Quebec	Atlantic	Totals
FROM DOMESTIC SOURCES:	85.5	171.0	1,758.0	751.5	167.0	2,932.9
Billets	neg.	0.6	43.4	11.5	40.1	95.6
Structurals	2.0	11.4	137.6	113.9	24.0	289.0
Plates and Skelp	6.5	9.3	236.1	65.3	23.8	340.9
Rails	0.4	24.6	153.1	90.2	33.4	301.7
Track Material	0.2	27.0	29.4	16.7	10.2	83.5
Bars and Rods	40.8	63.1	560.8	309.1	27.9	1,001.7
Hot Rolled Sheet, Strip	4.1	15.9	196.8	27.4	2.1	246.3
Cold Rolled Sheet, Strip	2.5	4.1	204.6	45.1	2.3	258.5
Other Sheet, Strip	29.0	15.1	196.2	72.2	3.3	315.7
FROM FOREIGN SOURCES:	90.0	60.0	559.9	287.5	20.6	1,018.0
Billets	neg.	—	1.8	neg.	—	1.9
Structurals	31.1	22.2	130.8	115.3	10.3	309.8
Plates and Skelp	17.7	14.5	94.1	75.0	1.6	203.0
Rails	5.6	0.9	3.0	0.4	0.1	9.9
Track Material	1.7	0.2	5.6	0.7	0.8	9.0
Bars and Rods	9.2	2.0	71.8	18.8	0.5	102.4
Hot Rolled Sheet, Strip	18.1	16.1	166.0	55.9	3.4	259.5
Cold Rolled Sheet, Strip	0.5	1.2	74.1	13.9	1.0	90.7
Other Sheet, Strip	6.0	2.9	12.7	7.4	2.8	31.9
GRAND TOTALS:	175.5	231.1	2,317.8	1,039.0	187.6	3,950.9
Billets	0.1	0.6	45.2	11.5	40.1	97.5
Structurals	33.1	33.7	268.5	229.2	34.3	598.7
Plates and Skelp	24.2	23.9	333.2	140.3	25.3	543.9
Rails	6.1	25.4	156.0	90.6	33.5	311.6
Track Material	1.9	27.2	35.0	17.4	11.0	92.5
Bars and Rods	50.1	65.0	632.5	328.0	28.5	1,104.1
Hot Rolled Sheet, Strip	22.2	32.0	362.8	83.3	5.5	505.8
Cold Rolled Sheet, Strip	3.0	5.2	278.7	59.0	3.3	349.2
Other Sheet, Strip	35.0	18.1	208.9	79.5	6.1	347.6

Table 17 (Continued)

APPARENT CONSUMPTION OF STEEL ROLLING-MILL PRODUCTS IN CANADA, 1954

(Thousands of net tons)

Source/Type	B.C.	Prairies	Ontario	Quebec	Atlantic	Totals
FROM DOMESTIC SOURCES:	79.3	158.6	1,493.7	574.2	119.4	2,425.2
Billets	—	0.4	29.7	16.6	22.6	69.2
Structurals	0.8	8.2	93.6	79.3	12.6	194.4
Plates and Skelp	3.4	9.0	252.2	54.9	12.9	332.3
Rails	0.2	33.8	134.2	31.7	26.2	226.1
Track Material	0.1	26.6	22.5	5.6	10.3	65.1
Bars and Rods	38.0	55.0	448.1	245.0	26.6	812.7
Hot Rolled Sheet, Strip	4.5	9.1	127.6	19.1	0.9	161.3
Cold Rolled Sheet, Strip	2.9	2.8	179.5	44.8	2.3	232.3
Other Sheet, Strip	29.5	13.7	206.3	77.3	5.1	331.9
FROM FOREIGN SOURCES:	123.5	67.7	360.1	220.4	23.3	795.0
Billets	neg.	—	1.0	neg.	—	1.1
Structurals	42.6	35.5	145.0	106.7	15.0	344.8
Plates and Skelp	32.2	12.6	33.4	58.2	1.1	137.5
Rails	12.2	0.2	1.9	0.4	0.2	15.0
Track Material	3.2	0.2	0.2	0.2	0.9	4.8
Bars and Rods	11.0	2.5	31.5	14.1	1.4	60.5
Hot Rolled Sheet, Strip	11.0	11.5	90.1	25.8	2.7	141.1
Cold Rolled Sheet, Strip	0.3	0.9	46.0	11.0	0.5	58.6
Other Sheet, Strip	10.9	4.2	11.0	4.0	1.6	31.6
GRAND TOTALS:	202.9	226.3	1,853.8	794.5	142.7	3,220.3
Billets	neg.	0.4	30.7	16.6	22.6	70.3
Structurals	43.4	43.7	238.6	186.0	27.6	539.3
Plates and Skelp	35.6	21.6	285.6	113.1	14.0	469.8
Rails	12.4	34.1	136.1	32.1	26.4	241.0
Track Material	3.3	26.8	22.8	5.8	11.2	69.8
Bars and Rods	49.0	57.6	479.6	259.1	28.0	873.2
Hot Rolled Sheet, Strip	15.6	20.6	217.8	44.9	3.6	302.4
Cold Rolled Sheet, Strip	3.3	3.7	225.4	55.8	2.8	290.9
Other Sheet, Strip	40.3	17.9	217.2	81.3	6.7	363.5

Table 18

MEASURES OF PRODUCTIVITY IN THE CANADIAN PRIMARY IRON AND STEEL INDUSTRY, 1938-1955

	Production of Ingots and Castings per Man hour[1] (annual averages)		Net Value Added Indexes 1949=100		
	Net tons	Index 1949=100	Total Net Value Added[2]	Total Man hours Paid For[3]	Net Value Added per Man hour
1938........	.0472	90.1	36.8	45.1	81.6
1939........	.0500	95.4	43.8	51.0	85.9
1940........	.0516	98.5	65.0	71.9	90.4
1941........	.0396	75.6	88.0	112.6	78.2
1942........	.0376	71.7	121.6	136.0	89.4
1943........	.0353	67.4	117.9	140.0	84.2
1944........	.0422	80.5	104.3	117.5	88.8
1945........	.0436	83.2	96.7	108.6	89.0
1946........	.0447	85.3	71.7	85.7	83.7
1947........	.0546	104.2	93.9	88.6	106.0
1948........	.0513	97.9	99.1	102.5	96.7
1949........	.0524	100.0	100.0	100.0	100.0
1950........	.0590	112.6	109.4	94.3	116.0
1951........	.0549	104.8	129.0	106.8	120.8
1952........	.0556	106.1	125.8	109.5	114.9
1953........	.0638	121.8	122.3	106.0	115.4
1954........	.0627	119.6	97.5	83.8	116.3
1955........	.0719	137.2	136.3	103.7	131.4

[1]Derived by dividing total production of all firms producing steel ingots and castings by total man-hours paid for (see footnote 3). Source: Dominion Bureau of Statistics, *The Primary Iron and Steel Industry*, annual issues 1945-55.

[2]Indexes for 1938-45 obtained from D.B.S., *Industrial Production Index, Revised Index, 1935-51*, Reference Paper No. 34, p. 85; indexes for 1946-51 are of estimated value of net output; those for 1952-1955 are of estimated value of gross output.

[3]Total payrolls of production workers in primary iron and steel industry divided by average weekly earnings multiplied by average hours worked per week, converted to index 1949=100. Sources: D.B.S., *The Primary Iron and Steel Industry*, annual issues 1945-1955 and D.B.S. *Annual Review of Man Hours and Hourly Earnings*, 1945-1955. Figures for 1938-1944 derived from annual D.B.S. publications *Weekly Earnings and Hours of Work . . . in the Manufacturing Industries of Canada.*

Table 19

AVERAGE HOURLY EARNINGS[1] IN THE U.S. AND CANADIAN PRIMARY IRON AND STEEL INDUSTRIES, 1939-1956

Source: U.S. Department of Commerce *Survey of Current Business* and D.B.S. *Man-Hours and Hourly Earnings*, annual and monthly issues, and for 1939 *Weekly Earnings and Hours of Work of Male and Female Wage-Earners Employed in the Manufacturing Industries of Canada 1939.*

Average of 1st of month figures	UNITED STATES[2]	CANADA[3]
1939	$0.84	$0.56[4]
1946	1.28	0.83
1947	1.44	0.96
1948	1.58	1.08
1949	1.65	1.18
1950	1.69	1.27
1951	1.89	1.41
1952	1.99	1.58
1953	2.16	1.70

	United States 1954	United States 1955	United States 1956	Canada 1954	Canada 1955	Canada 1956
Jan.	$2.18	$2.27	$2.47	$1.71	$1.73	$1.89
Feb.	2.15	2.26	2.46	1.70	1.75	1.89
Mar.	2.15	2.27	2.46	1.70	1.76	1.90
Apr.	2.14	2.28	2.47	1.69	1.76	1.91
May	2.16	2.29	2.48	1.71	1.77	1.90
June	2.19	2.32	2.48	1.71	1.79	1.93
July	2.24	2.46	2.48	1.71	1.79	1.90
Aug.	2.21	2.43	2.51	1.71	1.80	1.94
Sept.	2.27	2.51	2.58	1.71	1.85	2.03
Oct.	2.24	2.44		1.74	1.86	
Nov.	2.25	2.45		1.73	1.86	
Dec.	2.25	2.46		1.73	1.89	

[1]As at beginning of each month.
[2]Blast furnaces, steel works and rolling mills.
[3]Primary iron and steel.
[4]Figure for male employees only during one week in the month of highest employment in 1939.

Table 20

SELECTED AGGREGATE FINANCIAL FIGURES FOR FIVE CANADIAN STEEL COMPANIES, 1946-1955[1]

(Millions of dollars)

Source of basic data: Annual Reports of the Companies.

	Net Operating Income[2]	Net Income before Depreciation and Taxes[3]	Income Taxes Payable	Dividends Paid Out	Income Retained in the Business
1946	16.3	16.8	4.5	3.5	8.8
1947	28.4	28.6	9.5	4.0	15.2
1948	42.6	42.0	13.1	5.4	23.6
1949	49.2	48.7	15.4	6.2	27.0
1950	67.7	67.5	23.2	6.8	37.5
1951	89.9	89.3	31.9	7.9	49.4
1952	92.4	91.3	19.6	8.5	63.1
1953	93.9	92.8	16.6	8.9	67.2
1954	76.7	75.1	14.1	8.9	52.1
1955	112.5	111.1	26.0	10.0	75.1

[1]Calendar years throughout except for Algoma, whose fiscal year ended at April 30th in 1946-52 and at Dec. 31st thereafter, the 1953 Annual Report covering the 20-month period from May 1, 1952 to Dec. 31, 1953. For purposes of this Table, Algoma's figures for 1946 to 1951 are for fiscal years beginning May 1st of year stated, those for 1952 were derived by taking 4/12 of the figures for the fiscal year ended April 30, 1952 and 8/20 of those for the 20-month period ended Dec. 31, 1953, and those for 1953 by taking 12/20 of the figures for the 20-month period.

[2]These figures are to be taken as approximate only, since they are subject to numerous qualifications resulting from the adjustment noted in footnote 1, from changes in the consolidation of operating results of subsidiaries and from other variations in accounting practices.

[3]Net operating earnings plus miscellaneous non-operating income less bond interest.

Table 21

COMPARATIVE PROFITS OF U.S. AND CANADIAN STEEL COMPANIES, 1955

Sources: For U.S. figures, *Steel*, April 2, 1956; for Canadian figures, Company reports.

	Rated Capacity[1] thous. net tons	Net Sales $ mill.	Net Profit[2] $ mill.	Net Profit as % of Net Sales[3]
United States Steel Corp.	39,215	4,097.7	370.1	9.0
Bethlehem Steel Corp.	19,100	2,114.6	180.2	8.5
Republic Steel Corp.	10,262	1,188.6	86.3	7.3
Jones & Laughlin Steel Corp.	6,166	696.5	50.1	7.2
National Steel Corp.	6,000	622.0	48.3	7.8
Youngstown Sheet & Tube Co.	5,750	626.2	41.7	6.7
Armco Steel Corp.	5,150	692.7	64.4	9.3
Inland Steel Co.	5,000	663.3	52.5	7.9
Colorado Fuel & Iron Corp.	2,471	257.5	10.9	4.2
Wheeling Steel Corp.	2,130	249.4	17.3	6.9
The Steel Company of Canada, Ltd.	1,990	227.0	21.8	9.6
Sharon Steel Corp.	1,550	173.1	8.0	4.6
Kaiser Steel Corp.	1,536	136.3	5.7	4.2
McLouth Steel Corp.	1,380	145.0	8.1	5.6
Crucible Steel Co. of America	1,351	237.7	13.2	5.6
Pittsburgh Steel Co.	1,320	177.7	7.5	4.2
Detroit Steel Corp.	1,290	101.8	6.3	6.2
Algoma Steel Corp., Ltd.	1,120	114.0	10.4	9.2
Granite City Steel Co.	1,080	116.3	12.6	10.8
Barium Steel Corp.	893	75.1	0.7	0.9
Allegheny Ludlum Steel Corp.	864	255.6	15.0	5.9
Northwestern Steel & Wire Co.	825	51.4	4.1	8.0
Lukens Steel Co.	750	97.6	2.7	2.7
Newport Steel Corp.	709	36.9	0.9	2.5
Dominion Foundries and Steel, Ltd.	650	n.a.	5.5	n.a.
Dominion Steel and Coal Corp., Ltd.	630	n.a.	2.9	n.a.

Alan Wood Steel Co.	625	58.4	2.6	4.4
Copperweld Steel Co.	618	78.5	2.4	3.0
Lone Star Steel Co.	550	74.5	4.8	6.4
Laclede Steel Co.	500	58.2	4.0	6.9
Keystone Steel & Wire Co.	425	62.0	8.8	14.1
Continental Steel Corp.	394	44.9	3.0	6.7
Atlantic Steel Co.	325	28.7	1.1	3.8
Rotary Electric Steel Co.	300	54.4	3.8	6.9
Atlas Steels, Ltd.	170	29.0	2.1	7.2
Carpenter Steel Co.	77	44.0	3.5	7.9
Vanadium-Alloys Steel Co.	42	14.3	1.5	10.3

[1]As of January 1, 1955.
[2]Figures as reported. Comparisons based on these figures are at best only approximate because of differences in accounting practices and other factors.
[3]Percentages calculated on unrounded figures.

Table 22

U.S. AND CANADIAN BASE PRICES OF SELECTED STEEL PRODUCTS

(Prices in dollars at Canadian mills and at compararable eastern U.S. mills as of January 1 each year)

Sources: The Canadian industry and annual review issues of *The Iron Age.*

	1934	1939	1949	1954	1955	1956
Heavy rails (net tons)						
U.S.A.[1]	32.48	35.71	64.00	86.50	89.00	94.50
Canada[1]	37.50	39.29	70.00	90.00	90.00	94.50
% above or below U.S. price	+15.5	+10.0	+9.4	+4.0	+1.1	0
Heavy structurals (net tons)						
U.S.A.			66.00	83.00	86.00	93.00
Canada	[2]	[2]	69.00	93.50[3]	92.00[3]	96.00[3]
% above or below U.S. price			+4.5	+12.6	+7.0	+3.2
Wire rods (100 lbs.)						
U.S.A.	1.61	1.92	3.40	4.525	4.675	5.025
Canada	1.785	2.21	3.20	4.625	4.625	4.925
% above or below U.S. price	+10.9	+15.1	—5.9	+2.2	—1.1	—2.0
Carbon bars (100 lbs.)						
U.S.A.	1.75	2.25	3.35	4.15	4.30	4.65
Canada	2.25	2.55	3.50	4.725	4.60	4.80
% above or below U.S. price	+28.6	+13.3	+4.5	+13.9	+7.0	+3.2
Steel plates (100 lbs.)						
U.S.A.	1.70[4]	2.10	3.40	4.10	4.225	4.50
Canada	1.95	2.25	3.95	4.725	4.70	4.85
% above or below U.S. price	+14.7	+7.1	+16.2	+15.2	+11.2	+7.8
Hot-rolled sheets (100 lbs.)						
U.S.A.	1.75	2.15	3.25	3.925	4.05	4.325
Canada	2.40	2.45	3.65	4.575	4.35	4.50
% above or below U.S. price	+37.1	+14.0	+12.3	+16.6	+7.4	+4.0
Cold-rolled sheets (100 lbs.)						
U.S.A.			4.00	4.775	4.95	5.325
Canada	—	—	4.60	5.475	5.50	5.45
% above or below U.S. price			+15.0	+14.7	+11.1	+2.3
Galvanized sheets 24 gauge (100 lbs.)						
U.S.A.	2.85	3.50	6.03	6.86	7.22	7.69
Canada	3.40	4.00	6.30	6.40	7.87	7.89
% above or below U.S. price	+19.3	+14.3	+4.5	—6.7	+9.0	+2.6

Tinplate 1.25 lb. hot-dipped (base box)						
U.S.A.		4.75	7.50	8.70	8.80	9.20
Canada	—	5.35	8.30	9.70	9.70	9.70
% above or below U.S. price		+12.6	+10.7	+11.5	+10.2	+5.4
Tinplate .25 lb. electrolytic (base box)						
U.S.A.			6.45	7.40	7.50	7.90
Canada	—	—	7.25	8.20	8.20	8.20
% above or below U.S. price			+12.4	+10.8	+9.3	+3.8

[1]Prices for 1934 are net ton equivalents of gross ton prices.
[2]Only delivered prices available.
[3]With freight absorbed to meet U.S. competition to most consuming points.
[4]Average for first quarter of year.

Table 23

COMPARATIVE RAIL FREIGHT RATES ON SELECTED STEEL PRODUCTS TO VARIOUS EASTERN CANADIAN CONSUMING CENTRES, AS OF JANUARY 1956

To:	From:	Product	Rate ($ per 100 lbs.)	Minimum Shipment (lbs.)
Toronto				
	Hamilton	Bars, sheets, etc.	.13	140,000
	Sault Ste. Marie		.55	60,000
	Buffalo		.43	40,000
	Pittsburgh		.77	40,000
St. Catharines				
	Hamilton	Bars	.15	40,000
	Sault Ste. Marie		.57	60,000
	Buffalo		.34	40,000
Oshawa				
	Hamilton	Sheets and strip	.21	50,000
	Sault Ste. Marie		.55	60,000
	Buffalo		.55	40,000
	Detroit		.62	40,000
	Pittsburgh		.81	40,000
Windsor				
	Hamilton	Sheets and strip	.29	40,000
	Sault Ste. Marie		.70	60,000
	Detroit		.14	40,000
Halifax				
	Hamilton	Sheets and strip	1.14	40,000
	Sault Ste. Marie		1.28	40,000
	Fairless		1.24	40,000
	Sparrow's Point		1.31	40,000
Halifax				
	Sydney	Bars	.26	60,000
	Hamilton		1.14	40,000
	Sault Ste. Marie		1.28	40,000
	Fairless		1.24	40,000
	Buffalo		1.30	40,000
Montreal				
	Sydney	Bars	.59	60,000
	Hamilton		.45[1]	60,000
	Sault Ste. Marie		.66	60,000
	Buffalo		.83	40,000
	Fairless		.90	40,000
	Sparrow's Point		.99	40,000
	Pittsburgh		1.00	40,000
Quebec City				
	Sydney	Bars	.50	60,000
	Hamilton		.72½[2]	40,000
	Sault Ste. Marie		.93½	60,000
	Buffalo		.97	40,000
	Fairless		1.00	40,000

[1]During the period of open navigation on the Great Lakes, generally April 15 to November 30, a water-competitive rate of 37¢ per 100 lbs. on a minimum of 100,000 lbs. is in effect.

[2]This is a combination rate arrived at by shipping the goods to Montreal at the rate of 45¢ per 100 lbs. and having the car re-billed to Quebec at the regular rate of 27½¢. The corresponding summer rate is 64½¢ (37¢ plus 27½¢). The regular through rates from Hamilton to Quebec are 93¢ and, in summer, 87¢.

Table 24

SELECTED ITEMS FROM THE CANADIAN PRIMARY IRON AND STEEL TARIFF

Source: Canada *The Customs Tariff and Amendments.*

SCHEDULE "A"—Goods Subject to Duty and Free Goods.

Tariff Item			British Preferential Tariff	Most-Favoured-Nation Tariff	General Tariff
378	Bars and rods, of iron or steel; billets of iron or steel, weighing less than 60 pounds per lineal yard:—				
	(a) Not further processed than hot rolled, n.o.p.	per ton	$4.25	$7.00	$7.00
	(d) Hot rolled, valued at not less than 4 cents per pound, n.o.p.		Free	12½ p.c.	15 p.c.
380	Plates of iron or steel, hot or cold rolled:—				
	(a) Not more than 66 inches in width, n.o.p.	per ton	$4.25	$8.00	$8.00
	(b) More than 66 inches in width, n.o.p.	per ton	Free	$6.00	$6.00
381	Sheets, of iron or steel, hot or cold rolled:—				
	(a) .080 inch or less in thickness, n.o.p.		7½ p.c.	20 p.c.	20 p.c.
	(b) More than .080 inch in thickness, n.o.p.	per ton	$4.25	$6.00	$7.00
382	Hoop, band or strip, of iron or steel:—				
	(d) Cold rolled or cold drawn, more than .080 inch in thickness, n.o.p.		12½ p.c.	22½ p.c.	30 p.c.
383	Sheets, plates, hoop, band or strip, of iron or steel:—				
	(a) Coated with tin, of a class or kind not made in Canada, n.o.p.		Free	10 p.c.	15 p.c.
	(b) Coated with tin, n.o.p.		15 p.c.	15 p.c.	20 p.c.
	(c) Coated with zinc, n.o.p.		7½ p.c.	17½ p.c.	20 p.c.
384	Skelp of iron or steel, hot rolled, when imported by manufacturers of pipes and tubes for use exclusively in the manufacture of pipes and tubes, in their own factories, under regulations prescribed by the Minister		Free	5 p.c.	5 p.c.
385	Sheets, plates, hoop, band or strip, of iron or steel, hot rolled, valued at not less than five cents per pound, n.o.p.		Free	12½ p.c.	15 p.c.
386	Sheets, plates, hoop, band or strip, of iron or steel, as hereunder defined, under regulations prescribed by the Minister				
	(a) Plates, when imported by manufacturers for use exclusively in the manufacture or repair of the pressure parts of boilers, pulp digesters, steam accumulators and vessels for the refining of oil, in their own factories	per ton	Free	$5.00	$5.00
	(c) Sheets, plates, hoop, band or strip, hot rolled, being mould boards, shares, cultivator or shoe shapes, plough plates, land sides or disc circles, when such rectangles, circles or sketches are cut to shape but not moulded, punched, polished or otherwise manufactured, when imported by manufacturers of agricultural implements for use exclusively in the manufacture of agricultural implements, in their own factories		Free	Free	Free

Table 24 (Cont'd.)

SELECTED ITEMS FROM THE CANADIAN PRIMARY IRON AND STEEL TARIFF (Continued)

Tariff Item		British Preferential Tariff	Most-Favoured-Nation Tariff	General Tariff
386 (Cont'd.)				
	(k) Sheets, hot or cold rolled, when imported by manufacturers of hollow-ware coated with vitreous enamel or of apparatus designed for cooking or for heating buildings, for use exclusively in the manufacture of hollow-ware coated with vitreous enamel or of vitreous-enamelled sheets for apparatus designed for cooking or for heating buildings	Free	10 p.c.	12½ p.c.
388	Iron or steel angles, beams, channels, columns, girders, joists, tees, zees and other shapes or sections, not punched, drilled or further manufactured than hot rolled, weighing not less than 35 pounds per lineal yard, n.o.p.; piling of iron or steel, not punched or drilled, weighing not less than 35 pounds per lineal yard, including interlocking sections, if any, used therewith, n.o.p. . . per ton	Free	$3.00	$3.00
388a	Iron or steel shapes or sections, as hereunder defined, not punched, drilled or further manufactured than hot rolled, weighing not less than 35 pounds per lineal yard, viz.: I-beams, up to and including 6 inches in depth, but not to include H sections; channels, up to and including 7 inches in depth; angles, up to and including 6 inches by 6 inches; zees, up to and including 6 inches in depth of web . . . per ton	$4.00	$6.00	$6.00
388b	Iron or steel angles, beams, channels, columns, girders, joists, tees, zees and other shapes or sections, not punched, drilled or further manufactured than hot rolled, n.o.p.; piling of iron or steel, not punched or drilled, including interlocking sections, if any, used therewith, n.o.p. . . . per ton	$4.00	$7.00	$7.00
440f	Iron or steel masts, or parts thereof; iron or steel angles, beams, knees, plates and sheets; cable chain; all the foregoing for ships and vessels, under regulations prescribed by the Minister	Free	Free	Free

SCHEDULE "B"—Goods Subject to Drawback for Home Consumption.

Item No.		Portion of Duty (Not including Special Duty or Dumping Duty) Payable as Drawback
1007	Flat spring steel, steel billets and steel axle bars, when used in the manufacture of springs and axles for vehicles other than railway or tramway vehicles	99 p.c.
1009	Steel, when used in the manufacture of files, augers, auger bits, bit braces, wrenches, hammers or hatchets	60 p.c.
1015	Steel, when used in the manufacture of skates or bicycle chain	40 p.c.
1045	Steel sheets, hot or cold rolled or coated with lead or with lead and tin, .064 inch to .022 inch in thickness, 20 to 42 inches in width, and 50 to 120 inches in length, when used in the manufacture of stampings for automobiles	99 p.c.

Table 25

PERCENTAGE DISTRIBUTION OF CANADIAN PRIMARY STEEL IMPORTS BY COUNTRIES AND AD VALOREM EQUIVALENT OF DUTY COLLECTED, SELECTED YEARS

Source of basic data: D.B.S. *Trade of Canada.*

	Percentage Distribution				
	1939	1948	1950	1953	1954
From:					
United States	78.0	96.6	73.6	79.1	79.3
United Kingdom	16.9	1.3	17.8	11.0	10.0
Other Countries	5.1	2.1	8.6	9.9	10.7
All Countries	100.0	100.0	100.0	100.0	100.0
	Ad Valorem Equivalent of Duty Collected				
	1939	1948	1950	1953	1954
From:					
United States	11.7	8.0	8.4	8.9	8.4
United Kingdom	0.9	1.1	2.8	2.7	3.1
Other Countries	11.7	11.8	14.0	6.9	6.5
All Countries	9.1	7.9	7.9	8.0	7.7

Table 26

CANADIAN PRIMARY STEEL IMPORTS BY GROUPS,[1] WITH AD VALOREM EQUIVALENT OF DUTY COLLECTED, 1953 AND 1954

Source of basic data: D.B.S. *Trade of Canada.*

	1953		1954	
	Imports (thous. net tons)	Ad. Val. Equivalent of Duty	Imports (thous. net tons)	Ad. Val. Equivalent of Duty
Ingots, blooms and billets	28.4	1.0%	5.5	1.3%
Bars and rods	106.1	9.3	63.3	9.7
Rails and track fastenings	18.9	6.3	19.7	5.5
Structurals	279.4	4.4	321.0	4.2
Skelp	113.8	4.8	59.8	5.0
Plates	89.2	7.5	77.6	6.3
Coated sheets and strip	51.0	12.3	46.5	13.3
Uncoated sheets and strip	331.1	10.1	184.9	10.5
Miscellaneous	25.2	neg.	16.7	neg.
Total	1,043.0	8.0	795.1	7.7

[1]Discrepancies between the figures in this Table and those in Table 17 are due to minor differences in classification.

Table 27

COMPARISON OF THEORETICAL LAID-DOWN PRICES[1] AT TORONTO OF SELECTED STEEL PRODUCTS FROM U.S. AND CANADIAN MILLS AS OF JANUARY 1956

(Calculated on base prices only, $ per 100 lbs., carload lots)

Commodity	U.S. Point of Origin	*a.* U.S. Base Price	*b.* Freight to Toronto	*c.* Duty	*d.* a+b+c	Canadian Point of Origin	*e.* Canadian Base Price	*f.* Freight to Toronto	*g.* e+f	*h.* Canadian Laid-down Price below (—) or above (+) U.S.
Bars, carbon	Buffalo	4.65	.43	.58	5.66	Hamilton	4.80	.13	4.93	—.73
Light structurals	Buffalo	4.65	.43	.35	5.43	Hamilton	4.80	.13	4.93	—.50
Heavy structurals	Buffalo	4.65	.43	.15	5.23	Sault Ste. Marie	4.80	.55	5.35	+.12
Plates, not more than 66″	Pittsburgh	4.50	.77	.40	5.67	Hamilton	4.85	.13	4.98	—.69
Plates, more than 66″	Pittsburgh	4.50	.77	.30	5.57	Hamilton	4.85	.13	4.98	—.59
Plates, not less than 5¢. per lb.[2]	Pittsburgh	4.50	.77	.56	5.83	Hamilton	4.85	.13	4.98	—.85
Plates for agric. implements	Pittsburgh	4.50	.77	free	5.27	Hamilton	4.85	.13	4.98	—.29
Sheets, hot-rolled, not less than 5¢. lb.[2]	Buffalo	4.325	.43	.54	5.295	Hamilton	4.50	.13	4.63	—.665
Sheets, hot-rolled, thicker than .080″ n.o.p.	Buffalo	4.325	.43	.30	5.055	Hamilton	4.50	.13	4.63	—.425
Sheets, cold-rolled, .080″ or less n.o.p.	Buffalo	5.325	.43	1.065	6.82	Hamilton	5.45	.13	5.58	—1.24
Sheets, galvanized, 24 gauge	Pittsburgh	7.69	.77	1.345	9.805	Hamilton	7.89	.13	8.02	—1.785
Tinplate .25 lb. electrolytic, base box[3]	Pittsburgh	7.90	.77	1.185	9.855	Hamilton	8.20	.13	8.33	—1.525
Tinplate 1.25 lb. hot-dipped base box[3]	Pittsburgh	9.20	.77	1.38	11.35	Hamilton	9.70	.13	9.83	—1.52

[1]The prices in this Table and the two following ones are not actual delivered prices. They are theoretical prices intended to indicate the competitive position at certain points of products from various destinations by comparing the sum of the published U.S. base price, the freight normally collectible and the duty (if any), with the sum of the Canadian base price for delivery to the Toronto market and the freight normally collectible. They take no account of freight absorption or of cuts in base prices that may be made by either U.S. or Canadian mills to meet competition.

[2]This rate of duty is applicable only when plates or sheets are valued at not less than 5¢ a lb. Additions of extras to the base price would bring many of the imports under this tariff item.

[3]For the sake of convenience in calculating, a base box (which is a measure of area rather than of weight) is taken as being 100 lbs., though this is not strictly accurate.

Table 28

COMPARISON OF THEORETICAL LAID-DOWN PRICES[1] AT MONTREAL OF SELECTED STEEL PRODUCTS FROM U.S. AND CANADIAN MILLS AS OF JANUARY 1956

(Calculated on base prices only, $ per 100 lbs. carload lots)

		a.	*b.*	*c.*	*d.*		*e.*	*f.*	*g.*	*h.*
Commodity	U.S. Point of Origin	U.S. Base Price	Freight to Montreal	Duty	a+b+c	Canadian Point of Origin	Canadian Base Price	Freight to Montreal	e+f	Canadian Laid-down Price below (—) or above (+) U.S.
Bars, carbon	Buffalo	4.65	.83	.58	6.06	Hamilton	4.80	.45	5.25	—.81
Light structurals	Buffalo	4.65	.83	.35	5.83	Hamilton	4.80	.45	5.25	—.58
Heavy structurals	Buffalo	4.65	.83	.15	5.63	Sault Ste. Marie	4.80	.66	5.46	—.17
Plates, not more than 66″	Sparrow's Pt.	4.50	.99	.40	5.89	Hamilton	4.85	.45	5.30	—.59
Plates, more than 66″	Sparrow's Pt.	4.50	.99	.30	5.79	Hamilton	4.85	.45	5.30	—.49
Plates, not less than 5¢. per lb.[2]	Sparrow's Pt.	4.50	.99	.56	6.05	Hamilton	4.85	.45	5.30	—.75
Plates, for ships	Sparrow's Pt.	4.50	.99	free	5.49	Hamilton	4.85	.45	5.30	—.19
Sheets, hot-rolled, not less than 5¢. per lb.[2]	Buffalo	4.325	.83	.54	5.695	Hamilton	4.50	.45	4.95	—.745
Sheets, hot-rolled, thicker than .080″ n.o.p.	Buffalo	4.325	.83	.30	5.455	Hamilton	4.50	.45	4.95	—.505
Sheets, cold-rolled, .080″ or less, n.o.p.	Buffalo	5.325	.83	1.065	7.22	Hamilton	5.45	.45	5.90	—1.32
Sheets, galvanized, 24 gauge	Sparrow's Pt.	7.69	.99	1.345	10.025	Hamilton	7.89	.45	8.34	—1.685
Tinplate .25 lb. electrolytic, base box[3]	Pittsburgh	7.90	1.00	1.185	10.085	Hamilton	8.20	.37[4]	8.57	—1.515
Tinplate 1.25 lb. hot-dipped, base box[3]	Pittsburgh	9.20	1.00	1.38	11.58	Hamilton	9.70	.37[4]	10.07	—1.51

[1] See footnote 1 to preceding Table.
[2] See footnote 2 to preceding Table.
[3] See footnote to preceding Table.
[4] This is a summer freight rate and would not be in effect in January, but it has been used here since most of the tinplate moves in the summer.

Table 29

COMPARISON OF THEORETICAL LAID-DOWN PRICES[1] IN WESTERN CANADA OF SELECTED STEEL PRODUCTS FROM U.S. AND CANADIAN MILLS AS OF JANUARY 1956

(Calculated on base prices only, $ per 100 lbs. carload lots)

		a.	*b.*	*c.*	*d.*		*e.*	*f.*	*g.*	*h.*
Commodity[2]	U.S. Point of Origin	U.S. Base Price	Freight	Duty[2]	a+b+c	Canadian Point of Origin	Canadian Base Price	Freight	e+f	Canadian Laid-down Price below (—) or above (+) U.S.
Bars, Winnipeg	Chicago	4.65	1.42	.58	6.65	Hamilton	4.80	1.84	6.64	—.01
Calgary	Chicago	4.65	2.12	.58	7.35	Hamilton	4.80	2.35	7.15	—.20
Vancouver	Seattle	5.40	.23	.58	6.21	Hamilton	4.80	1.10	5.90	—.31
Structurals, Winnipeg[3]	Chicago	4.60	1.50	.30	6.40	Sault Ste. Marie	4.80	1.42	6.22	—.18
Winnipeg[3]	Chicago	4.60	1.50	.15	6.25	Sault Ste. Marie	4.80	1.42	6.22	—.03
Calgary	Geneva	4.60	1.63	.30	6.53	Sault Ste. Marie	4.80	2.01	6.81	+.28
Calgary	Geneva	4.60	1.63	.15	6.38	Sault Ste. Marie	4.80	2.01	6.81	+.43
Plates, Edmonton[4,5]	Geneva	4.50	1.92	.56	6.98	Hamilton	4.85	2.23	7.08	+.10
Edmonton[5]	Geneva	4.50	1.92	.30	6.72	Hamilton	4.85	2.23	7.08	+.36
Vancouver[4]	Geneva	4.50	.94	.56	6.00	Hamilton	4.85	1.10	5.95	—.05
Vancouver	Geneva	4.50	.94	.30	5.74	Hamilton	4.85	1.10	5.95	—.21
Vancouver	Geneva	4.50	.94	free	5.44	Hamilton	4.85	1.10	5.95	+.51
Vancouver[6]	Sparrow's Pt.	4.50	1.37	free	5.87	Hamilton	4.85	1.10	5.95	+.08
Vancouver	Fontana	5.15	.99	free	6.14	Hamilton	4.85	1.10	5.95	—.19
H-r. sheets, Winnipeg	Chicago	4.325	1.42	.54	6.285	Hamilton	4.50	1.47	5.97	—.315
Calgary[5]	Chicago	4.325	2.12	.54	6.985	Hamilton	4.50	2.23	6.73	—.255
Vancouver	Geneva	4.425	.94	.54	5.905	Hamilton	4.50	1.10	5.60	—.305
Vancouver[6]	Sparrow's Pt.	4.325	1.37	.54	6.235	Hamilton	4.50	1.10	5.60	—.635
Vancouver	Fontana	5.075	.99	.54	6.605	Hamilton	4.50	1.10	5.60	—1.005
Galvanized sheets, Calgary[5]	Gary	7.69	2.12	1.345	11.155	Hamilton	7.89	2.23	10.12	—1.035
Tinplate[7] Vancouver	Gary	7.90	1.02	1.185	10.105	Hamilton	8.20	1.10	9.30	—.805
Vancouver[8]	Gary	7.90	1.02	.01	8.93	Hamilton	8.20	1.10	9.30	+.37
Vancouver	Pittsburg, Cal.	8.65	.87	1.30	10.82	Hamilton	8.20	1.10	9.30	—1.52
Vancouver[8]	Pittsburg, Cal.	8.65	.87	.01	9.53	Hamilton	8.20	1.10	9.30	—.23

[1]See footnote 1 to Table 27.
[2]Where more than one rate of duty is given for a class of product, reference to Table 27 will in most cases indicate the particular description to which each rate applies.
[3]The U.S. freight rate applies to all structural shapes except angles, the Canadian rate to angles, beams, channels, tees and zees.
[4]See footnote 2 to Table 27.
[5]The Canadian freight rate is for shipments of 120,000 lbs.; for shipments of 80,000 lbs. (which is the minimum for the U.S. rates quoted) the rate would be $2.57.
[6]The U.S. freight rate is a combined rail and water rate.
[7]Tinplate prices are per base box, which for purposes of this Table is taken to be 100 lbs
[8]The duty of 1 cent is after drawback of 99%, applicable when canned products for which the tinplate is used are exported.

POST-WAR AVERAGE BASIC PRICES OF MERCHANT BARS ON MAIN DOMESTIC AND EXPORT MARKETS IN SELECTED COUNTRIES, 1948-1953

(In U.S. dollars per metric ton)

Source: *European Steel Exports and Steel Demand in Non-European Countries*, United Nations, 1953.

	Domestic prices[1]					Export prices[2]			
	Belgium (delivered)	France (ex-works)	Western Germany (basing point Ruhr)	United Kingdom (delivered)	United States (Pittsburgh)	Belgium/Luxembourg[3] Organized Markets	Belgium/Luxembourg[3] Free Markets	United Kingdom	United States
1948									
average	69	72	56	78	68	n.a.	n.a.	n.a.	87
1949									
January	"	79	64	"	74	100	119	103	93
April	"	"	"	86	"	n.a.	102	"	"
July	"	"	"	"	"	96	96	"	"
October[4]	61	59	51	59	"	84	65	72	"
1950									
January	"	"	54	"	76	65	55	"	88
April	"	"	"	"	"	60	50	"	"
July	65	"	"	"	"	"	66	70	"
October	78	"	"	"	"	80	95	76	"
1951									
January	75	"	60	"	82	88	120	"	93
April	"	60	"	"	"	115	145	89	"
July	84	70	71	"	"	125	150	112	"
October	"	86	"	75	"	"	145	126	"
1952									
January	"	"	80	"	"	"	143	"	"
April	"	"	93	86	"	"	130	137	"
July	"	"	"	"	"	113	114	"	"
October	"	"	98	"	87	"	n.a.	"	n.a.
1953									
January	"	"	"	"	82	88	85	126	n.a.

[1] All domestic prices were controlled, except in Belgium, from November 1949 to November 1950, and in the United States before February 1951.

[2] In the United Kingdom, export prices were not controlled, but the industry, in agreement with the Government, adopted a policy of keeping prices reasonably stable, while following the general world trend; in the United States, either the Government regulated export prices through ceiling prices, or the steel industry maintained prices in strict relation to production costs. On the Continent, Belgium and Luxembourg exporters had a leading influence on price levels, which the Western German and French exporters generally followed.

[3] The export quotations from Belgium/Luxembourg are approximate, particularly those in the "free market", where orders were often accepted at lower prices than are shown here. "Organized markets" refers to special trade agreements with The Netherlands and Scandinavia.

[4] The 1949 devaluations were mainly responsible for the apparent drop in European prices, except in the case of Belgium.

Table 31

OWNERSHIP AND CONTROL OF SELECTED CANADIAN MANUFACTURING INDUSTRIES AT END OF 1953

Source: D.B.S. *Canadian International Investment Position 1926-1954.*

	Percentage of Capital Employed Owned by Canadian Residents	Percentage of Capital Employed Controlled by Canadian Residents[1]	Estimated Total Capital Employed ($ million)
Primary iron and steel	83%	96%	355
Textiles	80	84	611
Beverages	73	82	336
Transport equipment (ex autos)	68	65	214
Agricultural machinery	63	66	164
Miscellaneous	58	54	3,796
Pulp and paper	48	45	1,285
Petroleum refining[2]	43	25	868
Mining, smelting and metal refining[3]	41	45	1,624
Chemicals	39	28	572
Electrical apparatus	35	28	386
Rubber	25	8	130
Automobiles and parts	23	5	280

[1]Includes all of the capital employed in companies where effective control is known or believed to be exercised by Canadian residents. In most cases residents held 50% or more of the voting stock in the companies concerned, but there may be a sizeable non-resident minority holding of stock.

[2]Includes petroleum merchandising companies controlled outside Canada and the United States.

[3]Included as a manufacturing industry because much the bigger share of the capital employed is in smelting and refining of minerals, including aluminum.

Table 32

COMPARISON OF VARIATIONS IN STEEL PRODUCTION AND GROSS NATIONAL PRODUCT IN CANADA AND THE UNITED STATES, 1929-1955

Sources of basic data: G.N.P. for Canada, D.B.S. *National Accounts Income and Expenditure,* for U.S.A., Department of Commerce *Survey of Current Business;* steel production as in Tables 9 and 10.

	Canada		United States	
	(Indexes 1929=100)			
	G.N.P. (constant dollars)	Steel Production	G.N.P. (constant dollars)	Steel Production
1929..........	100.0	100.0	100.0	100.0
1930..........	96.1	73.3	90.5	72.1
1931..........	83.8	48.8	84.8	46.0
1932..........	76.7	24.6	72.1	24.2
1933..........	70.7	29.7	69.4	41.2
1934..........	78.8	55.0	75.9	46.2
1935..........	84.9	68.3	85.6	60.4
1936..........	88.8	81.0	95.4	84.6
1937..........	97.4	101.8	102.8	89.6
1938..........	98.3	83.8	97.7	50.2
1939..........	106.1	100.5	105.5	83.5
1940..........	121.5	146.0	114.9	106.0
1941..........	140.2	175.7	132.7	131.1
1942..........	167.5	201.5	149.7	136.1
1943..........	175.6	194.6	166.7	140.5
1944..........	182.1	195.4	179.6	141.8
1945..........	174.5	186.5	176.2	126.1
1946..........	169.5	150.8	156.6	105.4
1947..........	171.7	190.9	155.5	134.3
1948..........	176.8	207.4	163.3	140.2
1949..........	182.2	206.7	161.7	123.4
1950..........	193.6	219.2	177.3	153.2
1951..........	204.9	231.2	189.5	166.4
1952..........	218.8	239.9	196.7	147.4
1953..........	227.1	266.7	204.5	176.6
1954..........	221.7	207.0	201.5	139.7
1955..........	241.1	293.5	215.9	185.1

Percentage Changes over Significant Intervals

1929-32.......	—23.3%	—75.4%	—27.9%	—75.8%
1932-39.......	+38.3	+308.1	+46.4	+244.6
1929-39.......	+6.1	+0.5	+5.5	—16.5
1939-44.......	+71.6	+94.5	+70.3	+69.8
1944-46.......	—7.0	—22.8	—12.8	—25.7
1946-49.......	+7.5	+37.1	+3.3	+17.1
1939-49.......	+71.6	+105.7	+53.3	+47.7
1946-55.......	+42.2	+94.6	+37.9	+75.6
1949-55.......	+32.3	+42.0	+33.5	+50.0
1929-55.......	+141.1	+193.5	+115.9	+85.1
1939-55.......	+127.2	+192.0	+104.7	+121.7

Table 33

CANADIAN PRODUCTION AND IMPORTS OF GALVANIZED SHEETS, PREWAR AND POSTWAR

(Thousands of net tons)

Sources: For production, prewar, D.B.S. *Iron and Steel and Their Products in Canada, 1942*, postwar, *Primary Iron and Steel*, Dec. of each year; for imports, *Trade of Canada*.

	Average 1935–39	1948	1949	1950	1951	1952	1953	1954	1955
Production.......	54.5	99.1	97.5	99.1	112.6	111.6	108.9	103.6	160.6
Imports..........	12.8	14.7	21.7	25.8	22.9	19.3	24.7	21.4	24.2
Total..........	67.3	113.8	119.2	124.9	135.5	130.9	133.6	125.1	184.7
Imports as % of Total.......	19%	13%	18%	21%	17%	15%	18%	17%	13%

Table 34

CANADIAN PRODUCTION AND IMPORTS OF TINPLATE, PREWAR AND POSTWAR

(Thousands of net tons)

Sources: For production, International Tin Study Group; for imports, *Trade of Canada*.

	Average 1935–39	1948	1949	1950	1951	1952	1953	1954	1955
Production.......	24.0	157.1	180.9	237.0	275.7	262.5	238.6	239.7	286.2
Imports..........	91.4	48.8	25.8	1.7	1.7	1.4	7.2	10.2	11.1
Total..........	115.3	205.9	206.7	238.7	277.4	264.0	245.8	249.9	297.3
Imports as % of Total.......	79%	24%	12%	¾%	½%	½%	3%	4%	4%

Table 35

CANADIAN PRODUCTION AND IMPORTS OF SKELP, PREWAR AND POSTWAR

(Thousands of net tons)

	Average 1935–39	1948	1949	1950	1951	1952	1953	1954	1955
Production.......	—	66.0	62.1	89.9	101.9	152.1	145.1	182.5	261.9
Imports..........	90.7	61.1	144.4	167.1	147.3	137.7	113.8	59.8	85.0
Total..........	90.7	127.1	206.5	257.0	249.2	289.8	258.9	242.3	346.9
Imports as % of Total.......	100%	48%	70%	65%	59%	48%	44%	25%	25%

Table 36

CANADIAN PRODUCTION AND IMPORTS[1] OF STEEL PLATES, PREWAR AND POSTWAR

(Thousands of net tons)

Sources: For production, D.B.S. *The Primary Iron and Steel Industry, Primary Iron and Steel* Dec. 1955, and the steel industry; for imports, *Trade of Canada.*

	Average 1935–39	1948	1949	1950	1951	1952	1953	1954	1955
Production.......	73.8	229.0	178.4	150.9	184.7	234.1	221.8	201.9	288.4
Imports..........	28.9	51.1	91.6	91.4	110.5	117.9	89.2	77.6	83.7
Total..........	102.7	280.1	270.0	242.3	295.2	352.1	311.0	279.6	372.1
Imports as % of Total.......	28%	18%	34%	38%	37%	34%	29%	28%	22%

[1]The figures of imports must be regarded with some reservation, since they do not include plates entered under such general items as that covering ship steel of all kinds (Tariff item 440f).

Table 37

CANADIAN PRODUCTION AND IMPORTS OF STRUCTURAL STEEL,[1] PREWAR AND POSTWAR

(Thousands of net tons)

Sources: For production, prewar, D.B.S. *Iron and Steel and Their Products in Canada, 1940-1942,* postwar, *Primary Iron and Steel* Dec. of each year; for imports, *Trade of Canada.*

	Average 1935–38	1948	1949	1950	1951	1952	1953	1954	1955
Production.......	60.7	172.8	180.3	158.0	215.4	176.8	202.0	135.0	165.3
Imports..........	48.8	182.0	199.4	171.7	158.0	302.4	279.4	321.0	340.0
Total..........	109.5	354.8	379.7	329.8	373.4	479.2	481.3	455.9	505.2
Imports as % of Total.......	45%	51%	52%	52%	42%	63%	58%	70%	67%

[1]The figures in this Table, like those in the preceding one, must be accepted with some reservations. There are insoluble problems in trying to obtain from the statistics on structural steel issued by D.B.S. a fully comparable production series, since certain kinds of light structurals were in some years reported by the producers as bars and in some years as structurals, and there is now no way of separating them. For this reason. the 1935-38 average was used instead of 1935-39. For the years in this Table the figures of production, consisting of the heavier structurals and sheet piling, should be reasonably comparable. They are not, howevei, fully comparable with the import figures. Hence the total of production and imports and the percentage of the total supplied by imports should be taken only as showing a trend and not as giving an accurate picture.

Table 38

PRODUCERS' SHIPMENTS OF PRIMARY STEEL TO VARIOUS CONSUMING INDUSTRIES, 1946-1955

(Thousands of net tons)

Source: D.B.S. *Primary Iron and Steel,* Dec. of each year.

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
Automotive industries	84.0	138.6	139.7	150.2	200.1	250.1	228.4	289.6	139.9	254.5
Agricultural, including farm machinery	87.4	107.4	119.5	121.2	130.6	147.8	143.3	105.2	74.0	85.9
Building construction	189.8	274.2	295.2	362.8	357.6	384.7	374.3	434.8	354.2	517.7
Containers industry	164.4	172.0	196.8	205.5	262.0	301.5	280.2	269.9	272.1	336.2
Machinery and tools	103.4	164.2	142.4	116.3	116.9	166.5	192.1	158.2	152.4	208.4
Merchant trade products	226.6	250.3	313.3	351.2	358.1	412.2	402.8	358.5	347.5	437.6
Mining, lumbering, etc.	69.7	80.5	79.9	89.9	132.3	132.4	189.8	139.9	137.4	195.6
National defence	2.5	0.9	0.4	2.0	3.7	53.3	70.6	55.2	37.2	23.4
Pressing, forming and stamping	87.8	131.3	137.1	146.0	187.1	178.8	131.2	153.2	160.4	258.9
Public works and utilities	20.3	13.0	15.4	19.3	13.7	27.7	23.0	25.2	18.4	25.1
Railway operating	294.3	298.9	330.4	378.2	429.8	418.2	426.1	423.1	307.5	236.9
Railway cars and locomotives	117.5	163.9	226.2	156.3	70.8	190.8	192.3	205.6	121.0	122.2
Shipbuilding	44.2	45.6	48.6	20.2	23.1	40.3	54.8	29.2	15.8	13.3
Miscellaneous and unclassified	18.7	14.8	12.8	14.8	14.0	19.8	15.1	14.8	15.6	19.4
Wholesalers and warehouses	262.0	331.4	321.8	354.9	314.2	326.4	333.0	423.0	350.7	490.0
Direct export (a) to British Empire	84.6	83.8	157.5	94.0	12.1	8.6	28.2	31.6	7.3	114.0
(b) other countries	60.7	84.6	85.8	125.4	206.7	61.9	53.8	119.3	54.0	288.1
Total shipped for sale	1,918.0	2,355.5	2,622.9	2,708.2	2,832.9	3,121.0	3,139.1	3,236.1	2,565.8	3,627.3

Table 39

PERCENTAGE DISTRIBUTION OF PRODUCERS' SHIPMENTS OF PRIMARY STEEL TO VARIOUS CONSUMING INDUSTRIES, 1946-1955

Source of basic data: D.B.S. *Primary Iron and Steel*, Dec. of each year.

	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
Automotive industries	4.4%	5.9%	5.3%	5.5%	7.1%	8.0%	7.3%	8.9%	5.5%	7.0%
Agricultural, including farm machinery	4.6	4.6	4.6	4.5	4.6	4.7	4.6	3.2	2.9	2.4
Building construction	9.9	11.6	11.3	13.4	12.6	12.3	11.9	13.4	13.8	14.3
Containers industry	8.6	7.3	7.5	7.6	9.2	9.7	8.9	8.3	10.6	9.3
Machinery and tools	5.4	7.0	5.4	4.3	4.1	5.3	6.1	4.9	5.9	5.7
Merchant trade products	11.8	10.6	11.9	13.0	12.6	13.2	12.8	11.1	13.5	12.1
Mining, lumbering, etc.	3.6	3.4	3.0	3.3	4.7	4.2	6.0	4.3	5.4	5.4
National defence	0.1	neg.	neg.	0.1	0.1	1.7	2.2	1.7	1.4	0.6
Pressing, forming and stamping	4.6	5.6	5.2	5.4	6.6	5.7	4.2	4.7	6.2	7.1
Public works and utilities	1.1	0.6	0.6	0.7	0.5	0.9	0.7	0.8	0.7	0.7
Railway operating	15.3	12.7	12.6	14.0	15.2	13.4	13.6	13.1	12.0	6.5
Railway cars and locomotives	6.1	7.0	8.6	5.8	2.5	6.1	6.1	6.4	4.7	3.4
Shipbuilding	2.3	1.9	1.8	0.7	0.8	1.3	1.7	0.9	0.6	0.4
Miscellaneous and unclassified	1.0	0.6	0.5	0.5	0.5	0.6	0.5	0.5	0.6	0.5
Wholesalers and warehouses	13.7	14.1	12.3	13.1	11.1	10.5	10.6	13.1	13.7	13.5
Direct exports (a) to British Empire	4.4	3.6	6.0	3.5	0.4	0.3	0.9	1.0	0.3	3.1
(b) to other countries	3.2	3.6	3.3	4.6	7.3	2.0	1.7	3.7	2.1	7.9

Table 40

PERCENTAGE DISTRIBUTION OF PRIMARY STEEL AMONG THE MAJOR STEEL-USING INDUSTRIES IN CANADA, THE UNITED STATES AND THE UNITED KINGDOM, 1949

Source: *Economics Branch, Department of Trade and Commerce.*

Industry	Canada	U.S.A.	U.K.
Construction	28%	17%	13%
Railway rolling stock and operating	20	8	8
Other machinery and equipment	11	12	23
Mining (including gas and oil)	8	10	8
Containers	8	9	7
Motor vehicles	6	22	10
Electrical machinery and equipment	5	9	6
Shipbuilding	2	1	9
All other	12	12	16
Total	100	100	100

Chart 1

EMPLOYMENT IN THE CANADIAN PRIMARY IRON AND STEEL INDUSTRY, 1923–1956

Indexes: *Base 1949 = 100*

Source: *Dominion Bureau of Statistics*

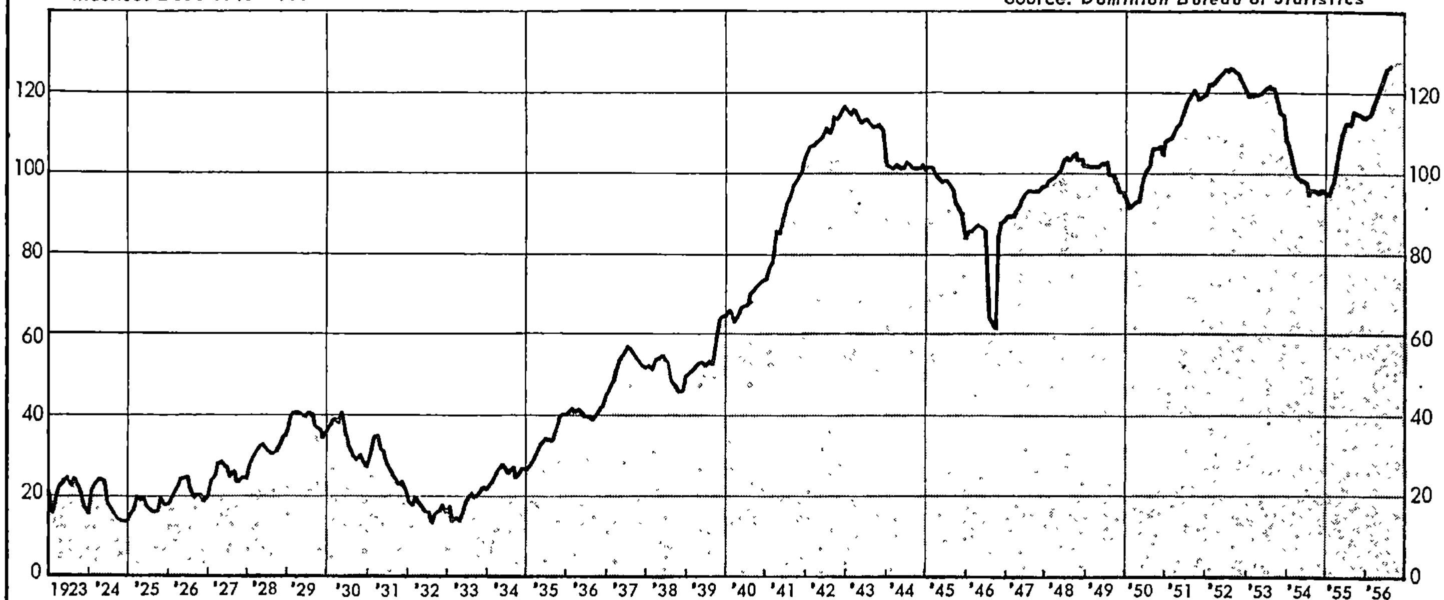
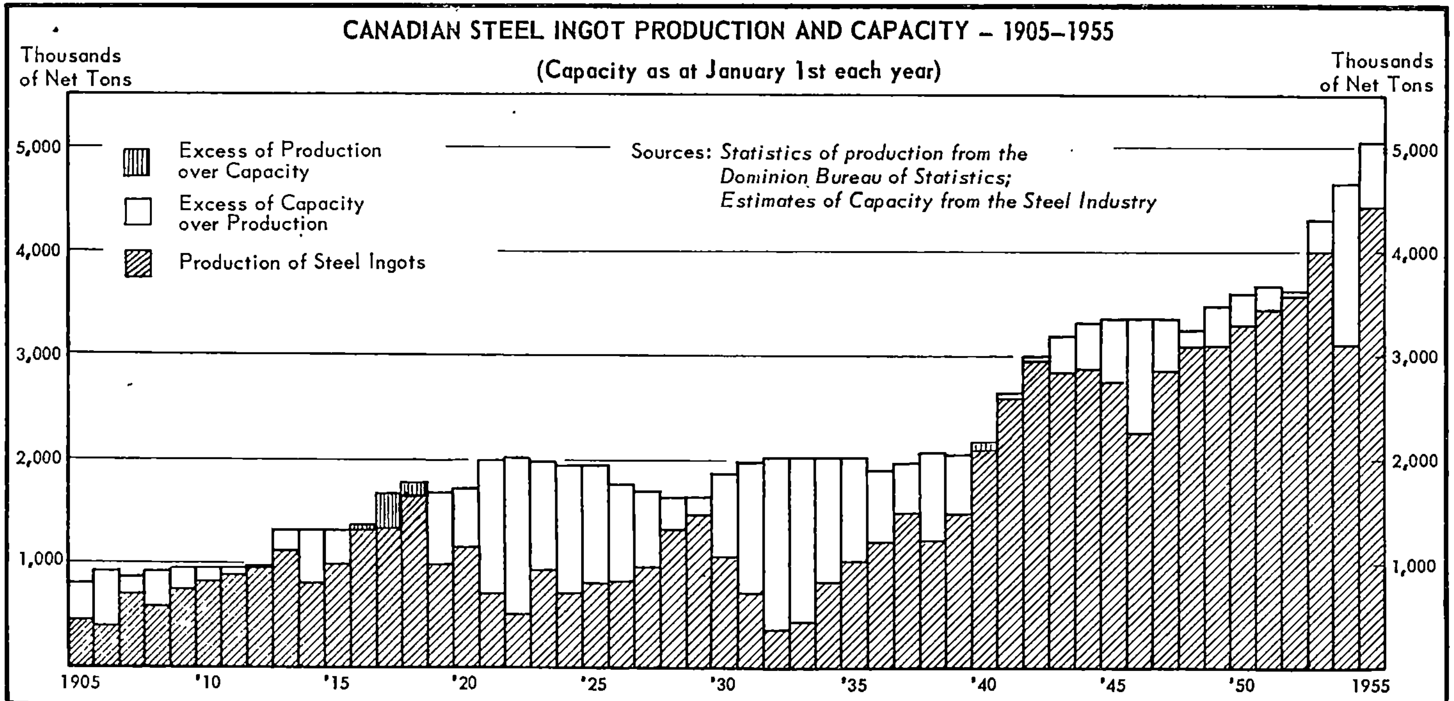
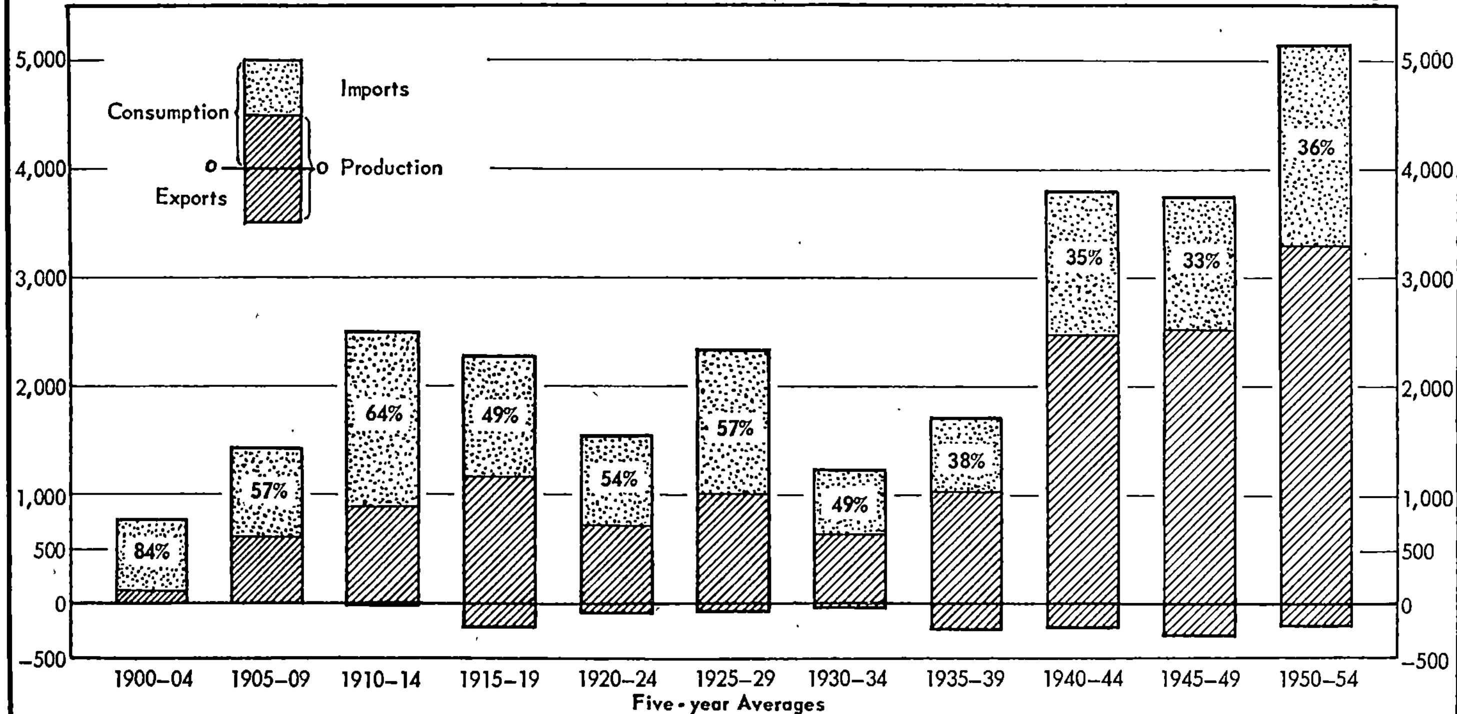


Chart 2

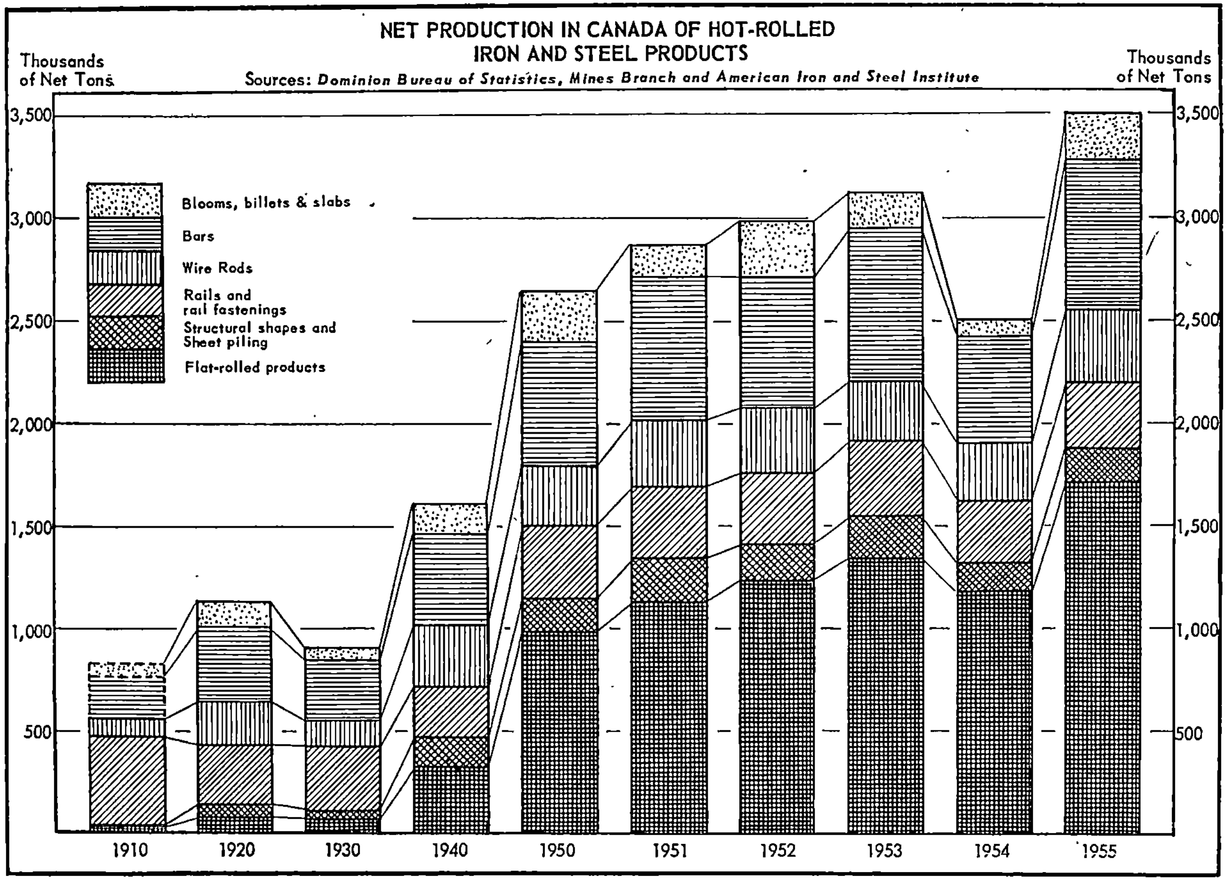

CANADIAN STEEL INGOT PRODUCTION AND CAPACITY – 1905–1955
(Capacity as at January 1st each year)
Thousands of Net Tons
Thousands of Net Tons
5,000
4,000
3,000
2,000
1,000
Excess of Production over Capacity
Excess of Capacity over Production
Production of Steel Ingots
Sources: Statistics of production from the Dominion Bureau of Statistics; Estimates of Capacity from the Steel Industry
1905
'10
'15
'20
'25
'30
'35
'40
'45
'50
1955

PRIMARY STEEL IN CANADA
Showing Production, Exports, Imports, and Imports as Percentage of Consumption



N.B. The data on which this Chart is based were originally prepared for inclusion in the submission of the basic steel producers to the Minister of Finance in 1954 regarding the customs tariff on primary iron and steel. Rolling mill products have been converted to ingot equivalent at a 75% loss ratio.

Chart 4



Net Production means that inter-mill shipments have been excluded.

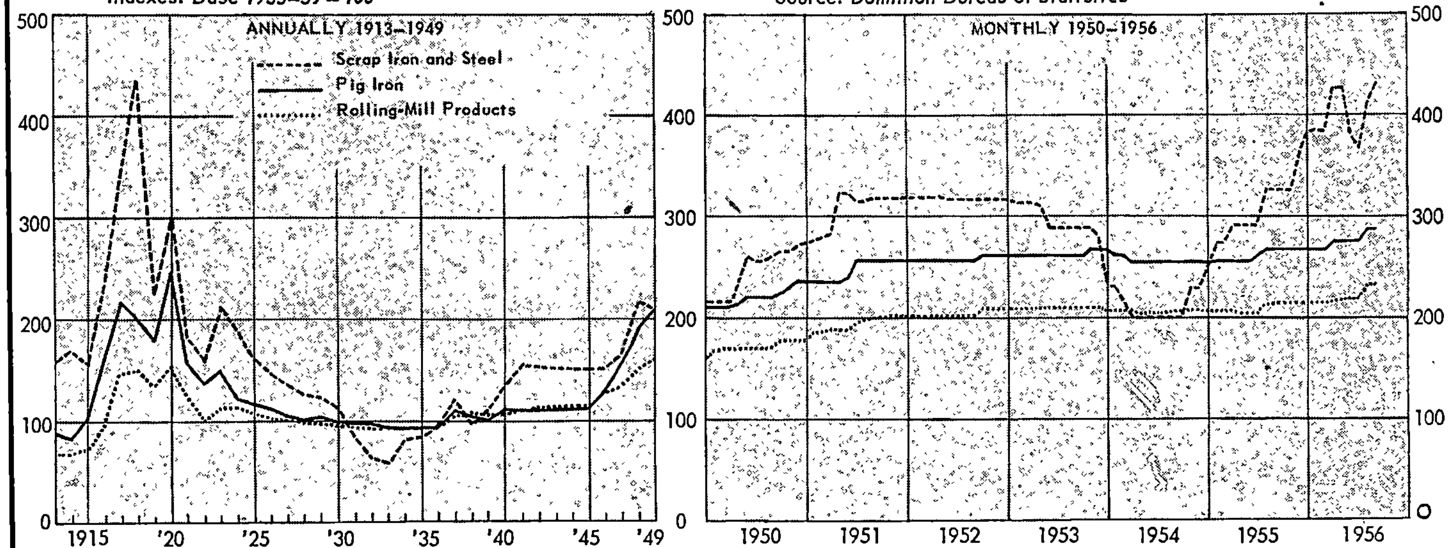
N.B. A certain amount of estimation has been necessary in the figures for this Chart. It is impossible to obtain a fully comparable series of statistics on production of

Chart 5

PRICES OF STEEL SCRAP, PIG IRON AND ROLLING-MILL PRODUCTS IN CANADA 1913–1956

Indexes: *Base 1935–39 = 100*

Source: *Dominion Bureau of Statistics*



Appendix D

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The Nova Scotia Coal Industry —
by Urwick, Currie Limited

Canadian Economic Growth and Development from 1939 to 1955 —
by J. M. Smith

[1]This is one of a series of three studies on Canadian international economic relations prepared under the direction of S. S. Reisman.

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