



Factors affecting the performance of the Canadian minerals and metals industry

By Dale L Hull

The collapse of real prices for minerals and metals during the 1980s has had a major impact on the Canadian minerals and metals industry.

Dale L Hull analyzes the factors that have contributed to this development and how they will affect the future of the industry in Canada.

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INTRODUCTION

The past 15 years have been a turbulent time for the Canadian minerals and metals industry. This period, characterized by sharp price swings in response to shifts in supply and demand, contrasts with the stable, gradually rising minerals and metals prices of the 1950s and 1960s.

In these circumstances, it is appropriate to review the Canadian industry's performance over this period in order to appreciate those initiatives that have already been taken to maintain its international competitive position and the factors that are likely to shape its future development.

THE INTERNATIONAL CONTEXT

Mineral prices

Much of the volatility in international minerals and metals prices during the 1970s and 1980s can be attributed to the exaggerated economic cycles experienced during this period. Figure 1 shows the real price trends for Canada's major metals, demonstrating the magnitude of the cycles that have hit the industry. Early in the 1970s, concerns about the scarcity of resources and security of supplies, linked with the energy crisis, boosted mineral prices and promoted greater mineral investment during 1973-74, both in Canada and abroad. The subsequent downturn in international economic activity and continuing slower growth in the major industrialized countries substantially reduced demand for minerals and metals, resulting in an excess supply and lower prices. This cycle was largely repeated beginning in 1979-80, but economic policies to bring down inflation in the western world plunged the international economy into a major recession during 1981-83, from which minerals and metals prices have yet to recover.

Although not shown here, the prices for nonmetallic minerals have a similar history. For example, potash prices also

peaked in 1980 and have declined since then as well. By year-end 1985, potash prices in the United States (which absorbs about 70 per cent of Canadian producers entered the market in 1962, and recovered only slightly during 1986. Prices for export coal held up longer than those for other minerals, peaking in 1982. However, several price cuts in recent years have reduced average 1986 export prices to levels 20 per cent below those of 1982.

The outstanding exception to this trend, of course, has been gold. Gold prices have consistently outperformed those of other minerals and metals, showing a sustained increase in real terms over the period shown in Figure 1. Taken together with other commodities, real prices received by Canadian producers during 1986 were at the same level as in the mid-1950s, indicating that gold has been able to offset, at least until now, the declining real price for other metals. As a natural consequence, gold has attracted an increasing share of industry exploration and investment.

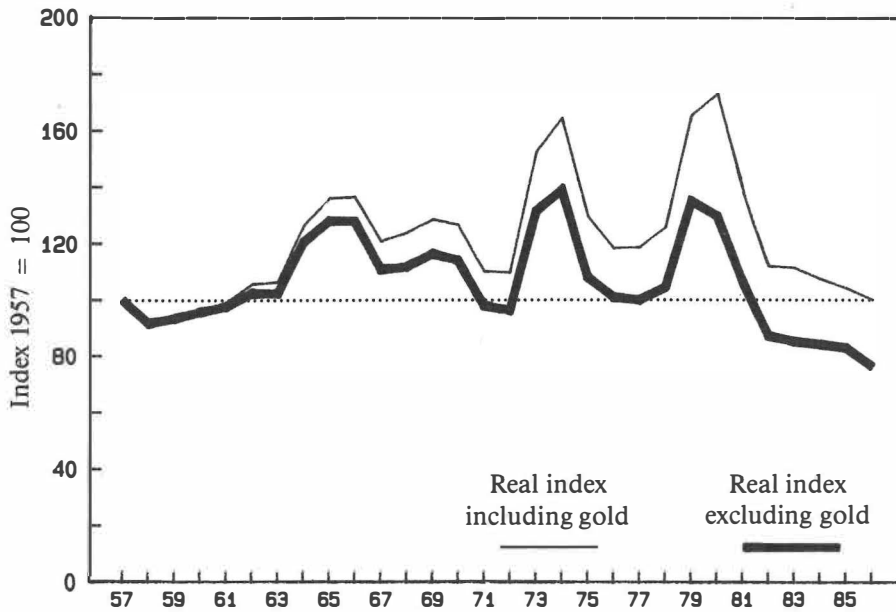
Structural change

Several factors have contributed to the collapse of real prices for minerals and metals during the 1980s. Recent periods of economic instability have tended to mask important structural changes taking place in these markets on both the demand and the supply side. In addition to a slowdown in the rate of world economic growth, which has reduced the rate of growth in world demand for minerals and metals, there has been a significant decline in the quantity of minerals and metals required to produce a given unit of output over the last decade or so. Technological innovation has been a driving force of such change.

This process is captured in the concept of intensity of use, which measures the consumption of a material per unit of national income. For minerals, this has been on the decline in the industrial world for many years. The intensity of use of most metals rises in the early

Figure 1

Canadian real metal price index, 1957—1986

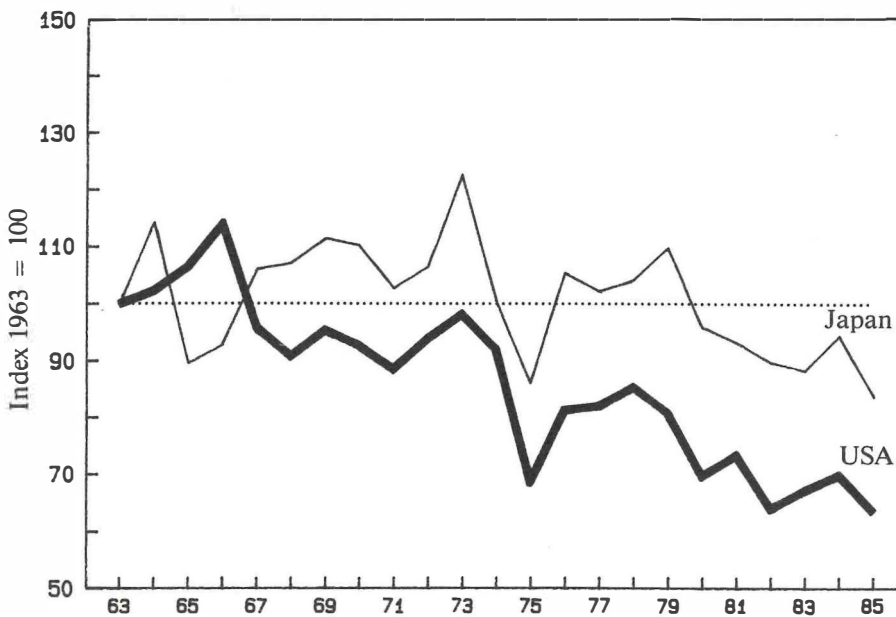


Note:
Index adjusted using the GNE deflator.
Index weighted by production including copper, iron ore, zinc, gold, nickel, silver, lead and molybdenum.

Source:
Mineral Policy Sector, Energy, Mines and Resources Canada.

Figure 2

Base metal consumption as a share of US and Japanese GNP (constant 1980 currencies)



Note:
Index based on consumption of Cu, Pb, Ni and Zn in constant currency as a percentage of real GNP.

Source:
Mineral Policy Sector calculations based on data from World Bureau of Metal Statistics, *World Metal Statistics*; Metallgesellschaft, *Metal Statistics*; and INCO Limited 10-K Report For Fiscal Year Ended 1983-12-31.

stages of an economy's industrialization and then falls as this process continues. There is now some concern, however, that this relationship may not hold to the same extent for newly industrializing countries. Technological change and new materials may permit a country to partially 'skip' the more metal-intensive stages of the development process, contributing to a more pessimistic outlook for growth in mineral and metal demand.

Two forces have contributed to this declining intensity of use for minerals and metals; one product related and the other related to changing industrial structure. On the product side, improved technology has enabled mineral-consuming industries to cut costs and to maintain or improve performance by reducing the metal content of products. This has been achieved through downsizing, more efficient use of minerals and metals, and the application of newly developed substitutes. Second, the mix of goods demanded in mature industrialized economies has shifted away from material-intensive products in favor of knowledge-based industries and services. Heavy industry and infrastructure development have been replaced by service and high-technology industries as the major sources of growth in developed countries.

As an indication of the decline in intensity of use for minerals and metals in recent years, Figure 2 shows physical base metal consumption, using constant 1980 values as weights, as a proportion of real Gross National Product (GNP) in the United States and Japan since 1963. Consumption as a share of GNP has clearly been on the decline in the United States since 1966 and in Japan since 1973. These trends capture the effect of declining intensity of use in these two important consuming markets. Thus, although total mineral consumption is increasing in these economies, it is not keeping pace with overall economic growth. These trends are expected to continue and possibly

accelerate as further technological advances are made.

Important structural changes have also been evident on the supply side. Relatively high mineral prices during the 1960s and 1970s encouraged mineral production in many countries. As a consequence, a much larger share of world mineral and metal production is now undertaken in countries like Australia and Brazil and in the developing world. In some cases, mineral development was seen as a means of promoting and financing economic development.

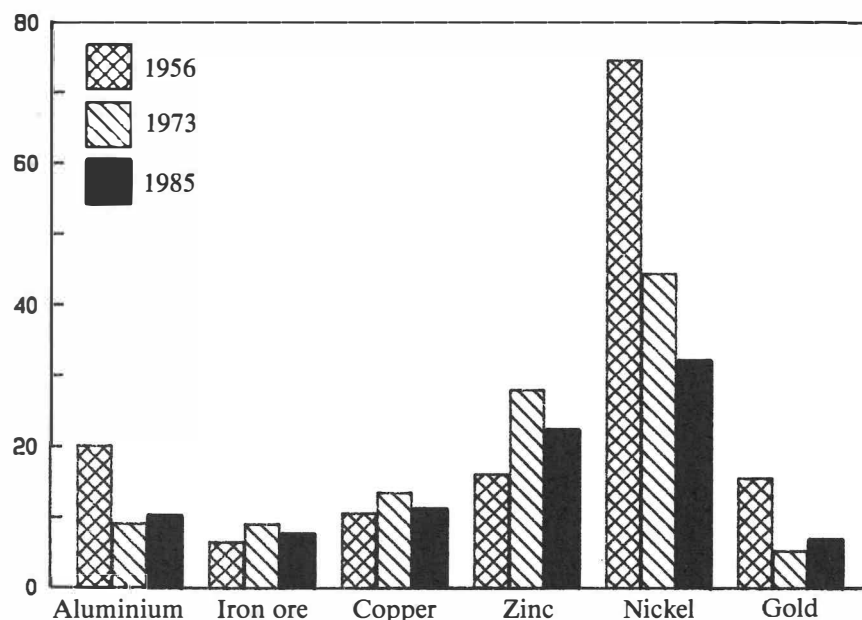
As Figure 3 shows, Canada's share of world mineral and metal production has changed substantially, primarily because of the increase in mineral production in other countries. Canada's share of nickel production has fallen sharply. Zinc, copper and iron ore have also declined slightly, after reaching a peak in the early 1970s. On the other hand, the earlier fall in the share of gold and aluminium production has been arrested, and investment in Canada is increasing.

The emergence of major new sources of supply has substantially increased price competition on world mineral markets. One manifestation of this process has been the collapse of producer prying systems for nickel and aluminium and their replacement by a more open market system based on commodity exchanges. This has meant a dramatic reduction in the ability of producers of these commodities to influence the price of their products.

The impact of these structural changes has been compounded by a range of noncommercial practices. These have become more important determinants of the nature and structure of world mineral markets. For example, foreign exchange considerations have promoted greater use of barter and countertrade. Security of supply and diversification policies in resource-deficient countries have also limited the scope for increased sales by major mineral producers. Tariff and nontariff

Figure 3

Canadian share of western world production of selected minerals and metals, 1956, 1973, 1985 (in %)



Note: Smelter production for aluminum; mine production for remaining commodities.

Source: Mineral Policy Sector calculations based on data from World Bureau of Metal Statistics, *World Metal Statistics*; Metallgesellschaft, *Metal Statistics*; UNCTAD (United Nations conference on Trade & Development), *Yearbook of International Commodity Statistics*; APEF (Association of Iron Ore Exporting Countries), *Iron Ore Statistics*; and Bureau of Mines, *US Minerals Yearbook*.

barriers, often increasing with the degree of processing undertaken, continue to distort the pattern of world mineral trade. As a consequence, being the lowest cost supplier is not necessarily a guarantee of market access.

These changes in the structure of mineral markets have coincided with significant changes in international financial markets, following the collapse of the Bretton Woods system of fixed exchange rates in the early 1970s. The move to a flexible system of exchange rates has been accompanied by the progressive deregulation and inter-

nationalization of financial markets in OECD countries. As a consequence, short-term capital movements have become an important, and at times more significant, factor than trade flows in determining the relative values of the currencies of industrial countries.

In contrast, the exchange rates of mineral-producing countries in the developing world are still largely determined by trade flows, and thus ultimately by the prices of their major export products. Even in the trade area, the exchange rates of industrialized countries such as Canada are influenced by a

larger basket of goods and services. Unlike many of our mineral competitors, therefore Canada's exchange rate does not necessarily adjust to changing mineral prices. Canadian producers can be faced with falling US dollar mineral prices and an appreciating Canadian dollar, both of which depress the value of export receipts in Canadian dollar terms.

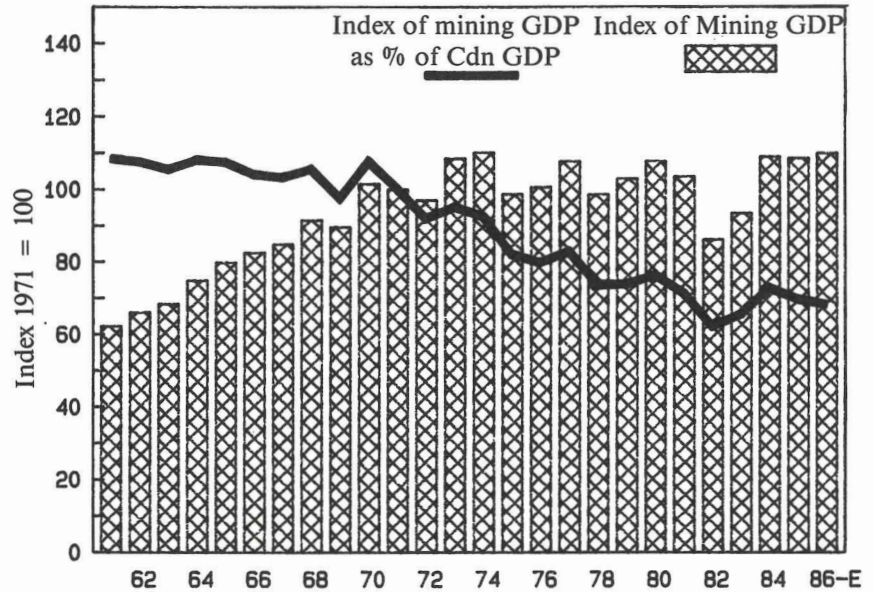
THE CANADIAN MINERALS AND METALS INDUSTRY PERFORMANCE, 1963-1986

The changing position of the industry in the Canadian economy

On the basis of aggregate mine output, the Canadian minerals and metals industry has gone through two distinct phases since the early 1960s. Real value added in this industry increased steadily between 1960 and 1970 from 1.9 billion Canadian dollars (G CAD) to 3.1 G CAD (in 1971 dollars). this accounted for a fairly constant 4 per cent of total Canadian GDP, meaning that the industry as able to keep pace with growth in the Canadian economy. However, following the initial downturn in mineral prices early in the 1970s and the subsequent volatility in commodity markets, the situation has changed. Real value added in the industry has remained at roughly the same level since 1970, while other sectors of the economy have continued to experience relatively strong growth (Figure 4). As a consequence, the industry's share of real GDP had fallen to about 2.6 per cent by 1985. this represents a reduction of some 35 per cent in the industry's share of total Canadian GDP since 1970.

This stagnation in mineral and metal industry growth and the decline in its share of Canadian GDP is mirrored in the level of capital expenditures in the industry over this period. The pattern of expenditures shown in Figure 5 is generally consistent with the price trends portrayed in Figure 1. Over the late 1970s and early 1980s, coal and

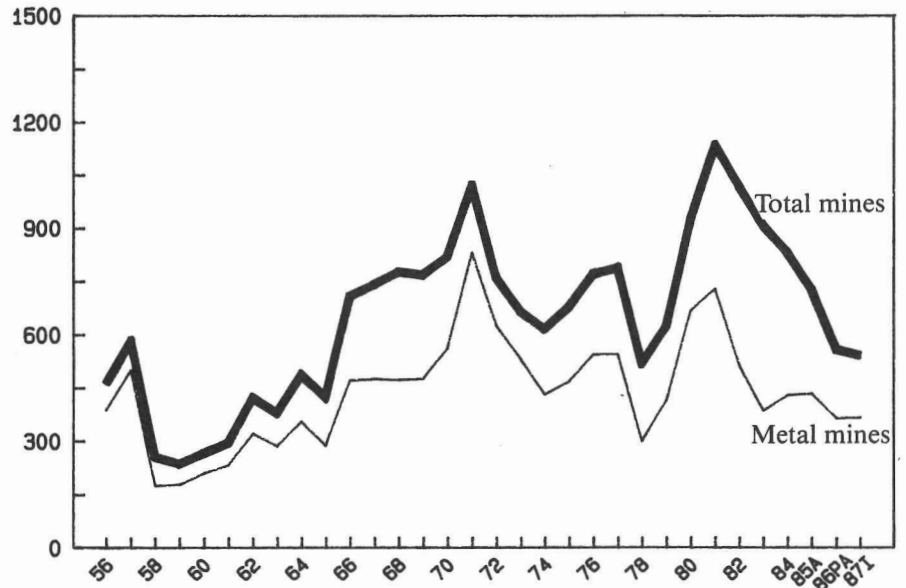
Figure 4
Canadian minerals and metals industry gross domestic product (constant 1971 CAD)



Note:
Includes metallic and nonmetallic minerals to the refined stage.
E = Estimate.

Source:
Mineral Policy Sector calculations based on data from Statistics Canada, *Gross Domestic Product by Industry*, Catalogue 61—213.

Figure 5
Canadian minerals and metals industry capital expenditures (constant 1971 M CAD)

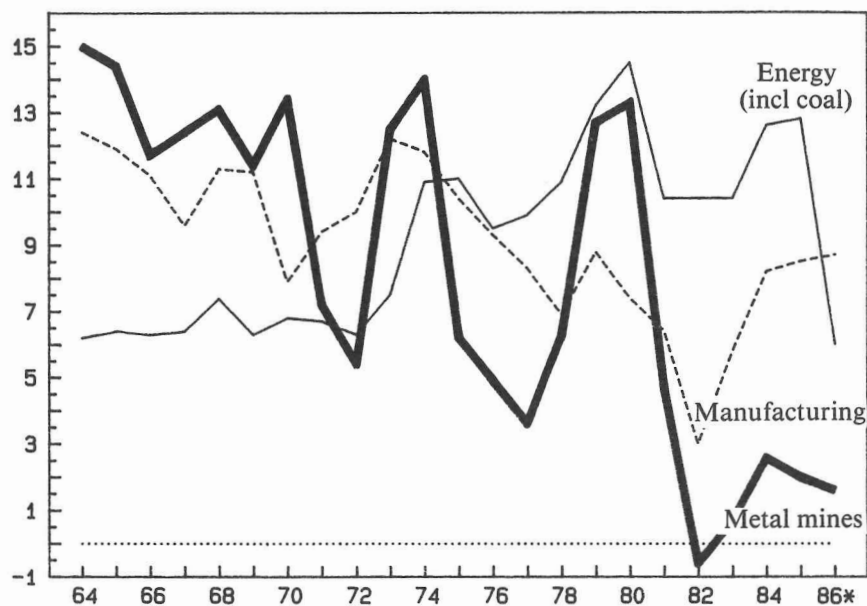


Note:
EMR composite capital cost index used as deflator.
A = Actual; PA = Preliminary actual; I = Intentions.

Source:
Mineral Policy Sector calculations based on data from Statistics Canada, *Private and Public Investment in Canada*, Catalogue 61—205.

Figure 6

Return on capital (inflation adjusted) before tax: mining, manufacturing and energy, 1964—1986 (in %)



Note:

Crown Royalties treated as a cot.

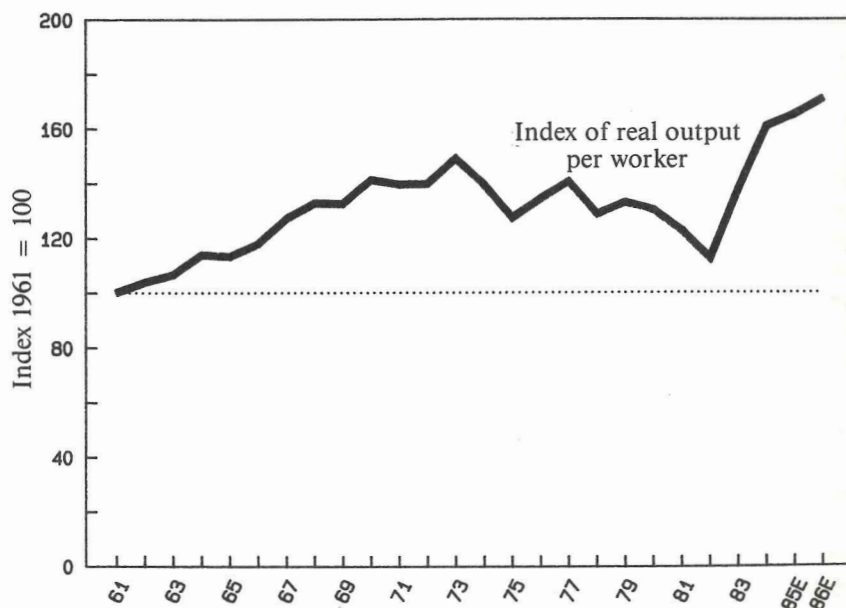
* = Estimate based on first two quarters of 1986.

Source:

Based on data from Statistics Canada, *Industrial corporations Financial Statistics*, Catalogue 61-003; and as adjusted by the Mineral Policy Sector Inflation Accounting Model.

Figure 7

Canadian primary mineral production trends in productivity, 1961—1986



Note:

E = Estimate.

Source:

Mineral Policy Sector calculations based on data from Statistics Canada, *Gross Domestic Product by Industry*, Catalogue 61-213; and *General Review of the Mineral Industries; Mines, Quarries and Oil Wells*, Catalogue 26-201.

precious metal projects accounted for the major proportion of this investment. With the completion of the major coal projects around the turn of the decade, investment has been on the decline. The year 1987 marks the seventh straight year for declining mining investment in Canada, the longest uninterrupted decline in the industry's post — World War II history. It is noteworthy that much of the current investment is in the gold sector.

Industry profitability

One of the main reasons for the decline in capital expenditures in the minerals and metals sector is apparent in Figure 6. During the 1960s, the real return on capital for metal mines in Canada was strong and, in fact, better than that for the manufacturing or energy sectors. These high rates of profitability were associated with steadily rising real capital expenditures, which increased mining GDP and maintained its share of the expanding Canadian economy. Since 1970, however, the industry's real return on capital has been highly variable, with the predictable consequences for investment in the minerals industry. Notwithstanding the two major cyclical fluctuations, which temporarily restored industry returns to 1960 levels, industry profitability has been on a downward trend since the early 1970s. Indeed in 1982, the industry's real return on capital was negative for the first time since World War II. This is in marked contrast to the less volatile trends for energy and manufacturing.

The real return on capital for the nonmetal mining sector (not shown) has been lower than that for metal mining since the late 1970s, and has been negative since 1982. This has been largely due to the situation in the asbestos and potash sectors. The profitability of the asbestos industry has been severely affected by health and environmental concerns in Western Europe and the United States.

An important factor in the industry's

declining profitability during the 1970s was falling productivity. The trends in real output per worker shown in Figure 7 reflect the impact of all those inputs into the production process that affect the productivity of labor: age of plant and equipment, ore grades, waste-to-ore ratios and mining methods, as well as the quantity and quality of labor. Changes in technology and mining methods lead to different relationships between capital and labor, and ultimately to changes in output per worker.

Between 1973 and 1982 total industry employment rose steadily while real output stagnated so that real output per worker fell by some 30 per cent. The effect of this decline in productivity was compounded by a 30 per cent increase in real weekly earnings, mostly between 1973 and 1976. The result of these developments was an increase in the industry's unit labor costs. This additional cost pressure whittled away much of the benefit resulting from the higher prices prevailing from 1974 to 1976 and from 1979 to 1981.

Industry rationalization

The Canadian industry has responded to the collapse of world mineral prices during the 1980s with sustained cost cutting, productivity improvements and corporate restructurings. High-cost mines have been closed, less profitable operations sold off and new mining plans and methods adopted with the aim of lowering costs and expanding output. In some cases, the closing of high-cost operations has been accompanied by a pooling of remaining facilities in a given area into a single operating partnership. This has enabled companies to reduce unit operating costs significantly by concentrating production at the highest grade ore-bodies and by using the most efficient processing plants within their combined properties. Along with the rationalization of existing operations, the industry has increasingly focused its exploration efforts and capital investment on expand-

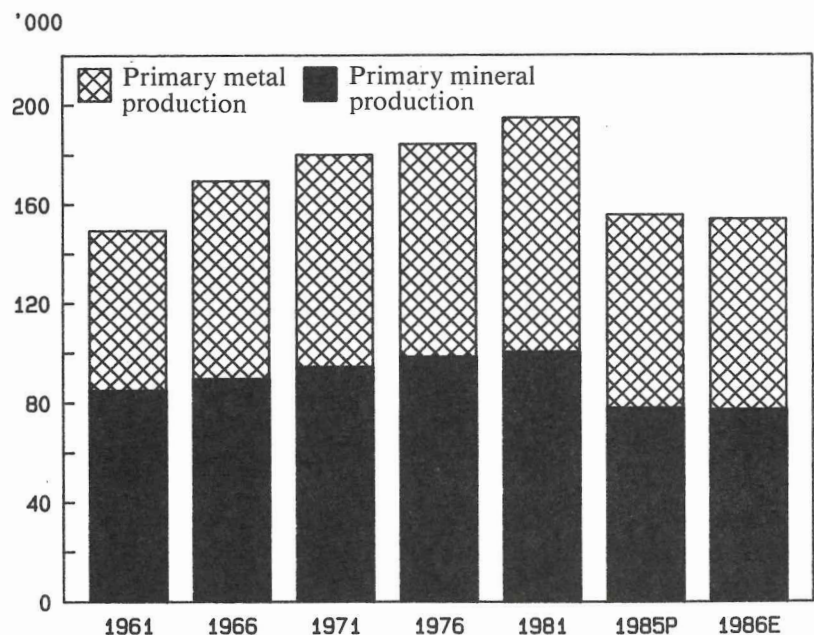
ing the production and capital investment on expanding the production of gold, the one major mineral where margins are still healthy.

This adjustment process has also produced a fundamental realignment of the industry's ownership structure. Many nonmining companies that invested heavily in the industry in the 1970s have since lost enthusiasm for their investments and have sought to sell their mining company holdings. Most of the purchasers have been mining companies with the management expertise, the mining experience and the financial resources necessary to take a longer term view. Second, in an effort to reduce debt loads, mining companies have sold off nonmining assets or minority holdings in other mining companies that were not

providing sufficient cash flow. The result of this reshuffling of Canadian mining assets has been an increase in corporate concentration in the base metals sector of the industry. However, this trend has been moderated by emergence of new mining companies involved in the country's rapidly growing gold production.

Industry productivity, by any of the standards by which it can be measured, has been raised dramatically by the introduction of new mining methods and technologies. Computerization and mechanization of the mining process has substantially increased the amount of ore that can be mined during a given shift. In some cases these measures have been complemented by a redesign of mining plans that has also reduced

Figure 8
Canadian minerals and metals industry employment



Note:

Includes metallic and nonmetallic minerals to the refined stage.
P = Preliminary; E = Estimate.

Source:

Statistics Canada, *General Review of the Mineral Industries: Mines, Quarries and Oil Wells*, catalogue 41-214; and *Iron and Steel Mills*, catalogue 41-203.

waste-to-ore ratios. The result of this process is apparent in Figure 7; between 1982 and 1986 real output per worker in mining increased by more than 50 per cent.

An unfortunate byproduct of this streamlining of operations has been significant cuts in employment. The labor force has been reduced, voluntary retirements and relocations have been actively encouraged, and hiring has virtually ceased. By 1985, total employment in the mining and mineral processing industry had been reduced by some 20 per cent from the 1981 high of 195 000 (Figure 8). Employment levels are now much closer to the levels prevailing in the early 1960s, but real output per worker is 75 per cent higher.

The increase in productivity is also largely responsible for the moderate up-

turn in the industry's return on capital since 1983 (see Figure 6), although clearly the latter is still at relatively low levels. The cost reductions by Canadian producers in recent years have not restored the industry's profitability to healthy levels.

Financial position

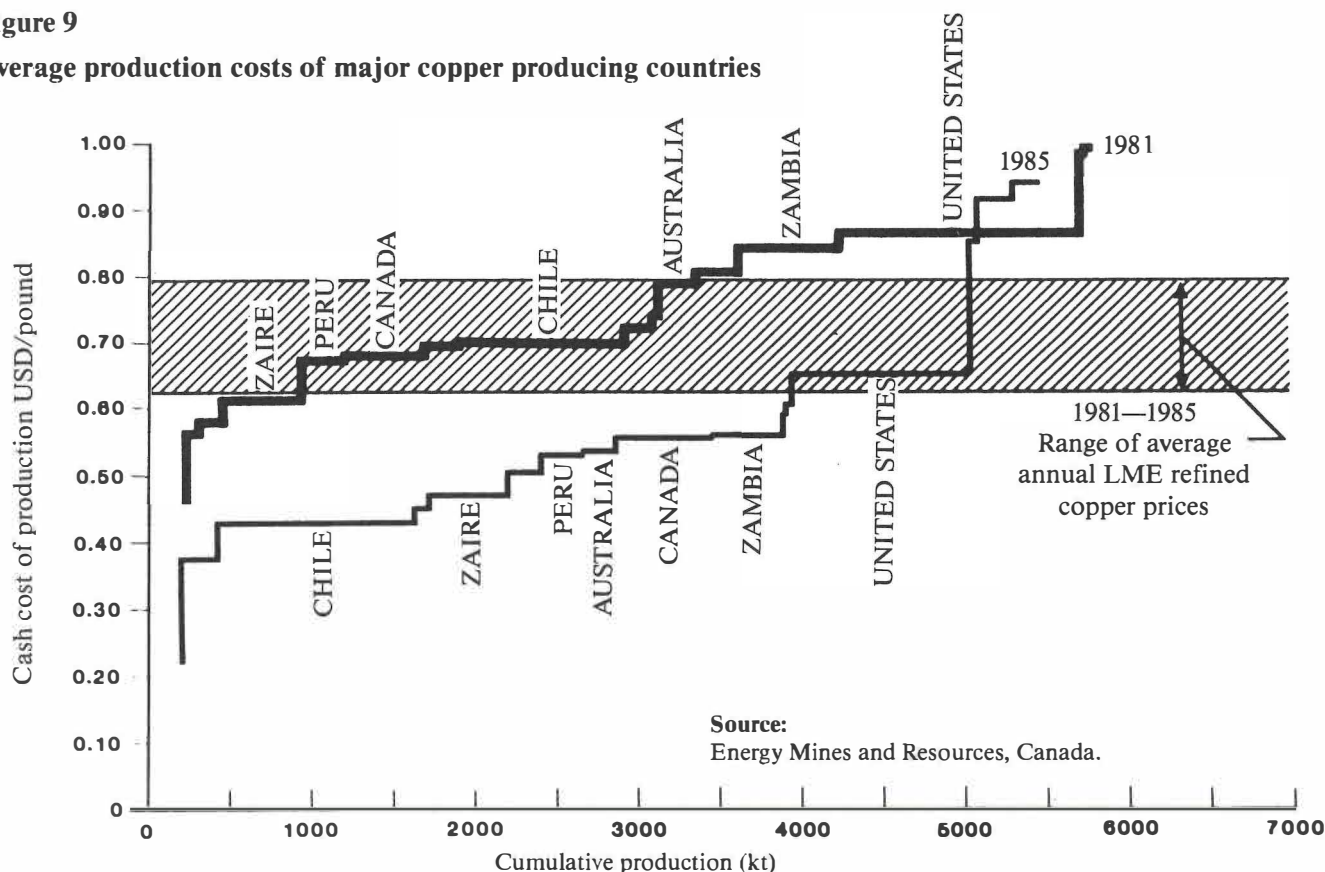
The more difficult market conditions for minerals and metal during the 1980s have also had a profound impact on the industry's financial position. The decline in cashflows during the recession forced the industry to raise large amounts of debt to complete the capital spending programs initiated in 1979—80; industry debt more than doubled between 1979 and 1982. Total debt increased a further 2 G CAD to stand at 10.3 G CAD in 1986, representing about

70 per cent of equity invested. The combination of increasing debt, falling prices and high real interest rates has significantly increased the industry's interest costs as a percentage of revenue. During the 1970s, net interest costs for the industry as an aggregate were usually between 2 and 3 per cent of revenue; since 1982 this ratio has generally been between 6 and 8 per cent.

Competitive position

The continued deterioration in real commodity prices has led to a worldwide reduction in operating costs; Canadian producers have not been alone in substantially reducing their unit production costs. A good example of this has been in the copper industry (Figure 9). Even though Canadian cop-

Figure 9
Average production costs of major copper producing countries



per producers, cut average cash production costs from 0.68 USD/pound in 1981 to less than 0.56 USD/pound in 1985, their competitive position has been substantially eroded by the more successful cost-cutting efforts of competitor countries. If anything, the Canadian copper industry appears to have lost ground. With the cost structure of copper production reduced throughout the world, copper is now generally available at a lower price. As a result of continuing overcapacity, international prices have been following the downward trend in the costs of production, falling from an average of 0.80 USD/pound in 1981 to 0.65 USD/pound in 1985. This lower price is much closer to the average cash production costs of Canadian producers, reducing the industry's margins.

In some cases, foreign producers have

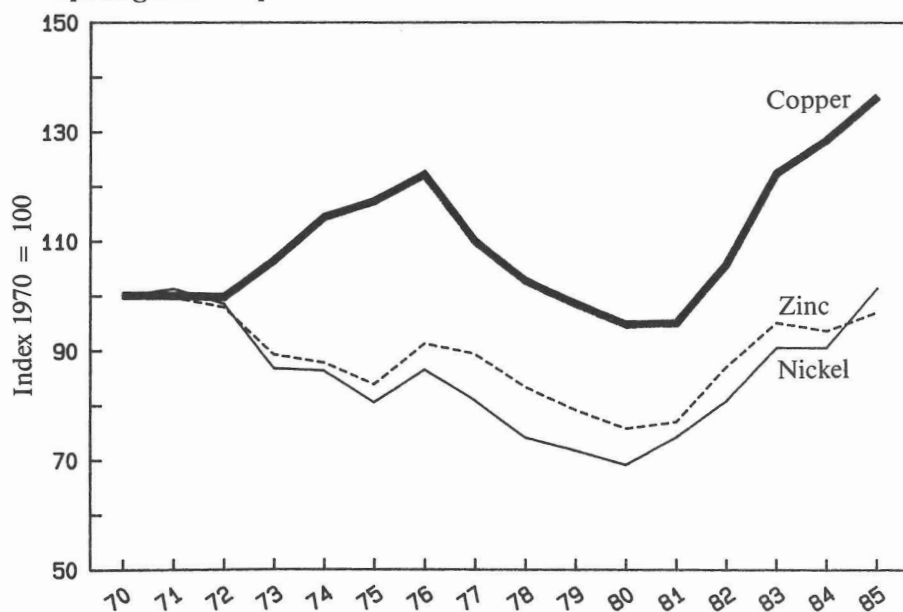
had their competitive position maintained improved by favorable exchange rate movements. This factor has become increasingly important as a determinant of the competitive position of the Canadian industry. As most mineral prices are denominated in US dollars, a decline in the value of a country's currency against the US dollar results in a higher price for these commodities in terms of domestic currency. The immediate effect of this is to increase the producer's margin between cost and price. To the extent that the margins of Canada's competitors have been increased by more than those of Canadian producers through exchange rate shifts, they are in a position to sell at lower prices, which affects the relative competitive position of the Canadian industry.

To capture the implication of exchange rate changes for a country, the concept of real effective exchange rates has evolved. This term means that relative inflation rates in the countries under examination have been removed to produce 'real' exchange rates. When the real rate for the Canadian dollar is compared with a collection of other countries' real exchange rates, the result is a real 'effective' rate. Figure 10 shows the behavior of these rates and the implied change in competitive position for Canadian copper, nickel and zinc producers over the period 1970 to 1985. The countries selected for each commodity are our major competitors for those metals; each country is given a weight in the index equal to its share of the total production of all countries in the basket.¹ The exchange rate here is defined as the number of units of the 'foreign' currency required to buy a unit of Canada's currency; thus an index increasing in value indicates declining competitive position and a falling index indicates the reverse.

With the exception of the copper industry, the relative weakness of the Canadian dollar against most other competitor currencies during the 1970s had the effect of enhancing the competitive position of the Canadian industry and thus increasing industry returns. Since 1981, however, there has been a sharp appreciation in Canada's real effective exchange rate with our major mineral competitors even though the Canadian dollar has tended to decline against the US dollar.

Much of this turnaround has been due to the relatively greater fall in the value of these competitor currencies against the US dollar. The decline in world commodity prices over the last few years has shifted the terms of trade against resourcedependent economies and forced down the external value of their currencies. As long as mineral prices remain depressed, the terms of trade of developing-country mineral ex-

Figure 10
Canadian real effective exchange rates against competing mineral producers



Note: Inflation-adjusted CAD compared to a basket of inflation-adjusted currencies of major competitors in each metal weighted by production. (For countries involved, see text.) Period average exchange rates were used.

Source: Mineral Policy Sector, Energy, Mines and Resources Canada.

porters will continue to exert downward pressure on their real exchange rates. In the case of commodities by third world suppliers, the effects of exchange rate movements have been more pronounced and the competitive position of the Canadian industry has been seriously eroded. For commodities such as zinc, where the competition to the Canadian industry is more from the industrialized OECD countries, the realignment has been more moderate and the real effective exchange rate has returned to the level of the early 1970s. More recently the decline of North American currencies against those of European countries has improved Canada's competitive position.

WORLD TRADE

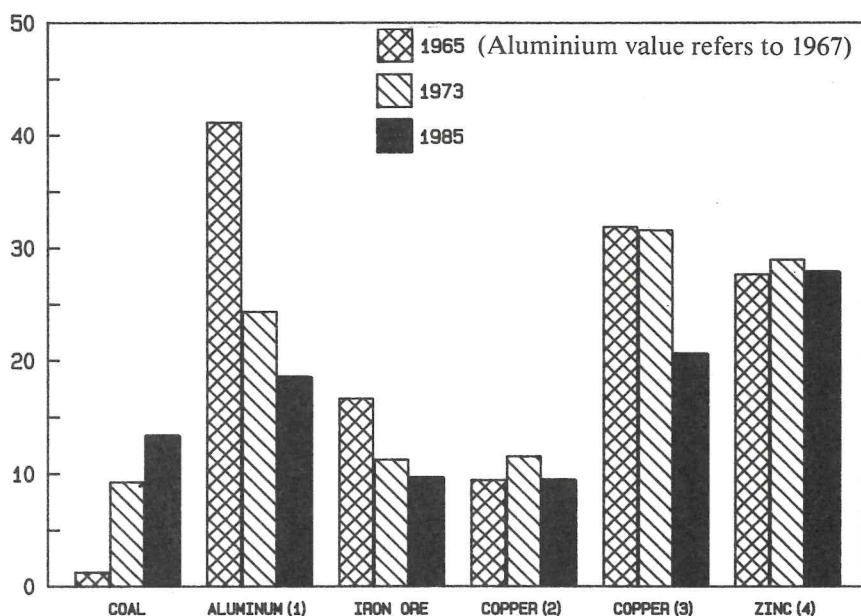
The total effect of these developments on the Canadian minerals and metals industry is illustrated by its changing share of world trade in minerals and metals (Figure 11). Canada has generally been able to hold its share of western world exports in zinc and refined copper. Even with the increase in aluminium production, its share of international trade in this commodity has slipped progressively over the past two decades. So too has its share of the trade in copper concentrate and iron ore. On the other hand, Canada has benefited from recent investment in coal and its proportion of western world coal exports has expanded.

Industry outlook

The failure of world mineral markets to recover fully from the 1981—83 recession is a significant turning point for the Canadian minerals and metals industry. Notwithstanding substantial cost cutting, productivity gains and corporate restructuring, industry profitability has remained low. Significant excess capacity still exists worldwide and international prices have followed the downward trend of production costs. Industry revenues in real terms are lower than those for much of the 1970s. Many of the factors at work over the past few years will continue to influence the future trading environment for minerals and metals and the competitive position of the Canadian industry.

Figure 11

Canadian share of western world trade of selected minerals and metals, 1965, 1973, 1985 (in %)



Note: ¹ Unwrought ² Refined ³ Ores and concentrates ⁴ Slab

Source:

Mineral Policy Sector calculations based on data from World Bureau of Metal Statistics, *World Metal Statistics*; Metallgesellschaft, *Metal Statistics*; UNCTAD (United Nations conference on Trade & Development). *Yearbook of International Commodity Statistics*; APEF (Association of Iron Ore Exporting Countries), *Iron Ore Statistics*; and Bureau of Mines, *US Minerals Yearbook*.

The Canadian minerals and metals industry is faced with strong competitive challenges. The development of new materials and production technologies poses a threat to the existing markets for many minerals and metals. The growth in aggregate demand for minerals and metals will probably remain moderate. On the supply side, the increase in the number of producers and their success to date in containing costs may mean that supplies will remain readily available to the world market. Many developing-country mineral producers possess mineral deposits that are at least equivalent to those now being mined in Canada; having potential exchange rate advantages as well, they represent viable, long-term suppliers of minerals and metals to the world market.

These world market forces will continue to force the Canadian minerals and metals industry to restructure and rationalize its operations. The industry must continue to be resourceful and innovative in its efforts to raise productivity and lower unit costs. More effort must be directed towards research and development into new uses for minerals and metals. The Canadian industry can and will respond to this competitive challenge. ■