

Appendix C.-- Conservation and Shortages: 1946-77

INTRODUCTION

In analyzing whether the occurrence of materials shortages should affect the conservation of materials, one needs to look at all types of materials shortages, both general and specific. As most materials experts will agree, there have only been two major materials shortages of any duration from the end of World War II through 1977: the Korean War and the materials shortages occurring during 1973-74 (see figure C-1). However, at the same time, experts in both the public and private sectors note that interruptions in supply are constantly occurring on a short-term basis. As a result, indus-

tries are constantly having to adjust their supply decisions regarding production needs, etc., due to such factors as cartels, environmental regulations, fiscal and monetary policies, capacity limitations, and domestic and international demand pressures.

As illustrative of the types of materials shortages that have occurred in the United States, the following discussion¹ examines the supply of seven metals from 1946 to 1977. The metals that are examined include: aluminum, chromium, copper, nickel, scrap, steel, and tungsten.

SHORTAGES IN ALUMINUM SUPPLY

1. Aluminum Supply in 1950-53. Aluminum was in tight supply during this period as a result of the Department of Defense (DOD) requirements for the Korean War. Restrictions were placed on civilian use of aluminum until 1953, and the percentage of aluminum use by the military increased from 5 percent in 1950 to 28 percent in 1952.

During this period, the Government offered the aluminum industry financial incentives to increase production capacity. Under this program, 613,000 tons of new capacity were added between 1951 and 1954.

2. Aluminum Supply in 1966. During late 1965 and early 1966, aluminum supply was again in tight supply due to an increase in military activities as a result of the Vietnam War. The DOD requirements for aluminum increased from 2 percent in the second quarter of 1965 to 11 percent

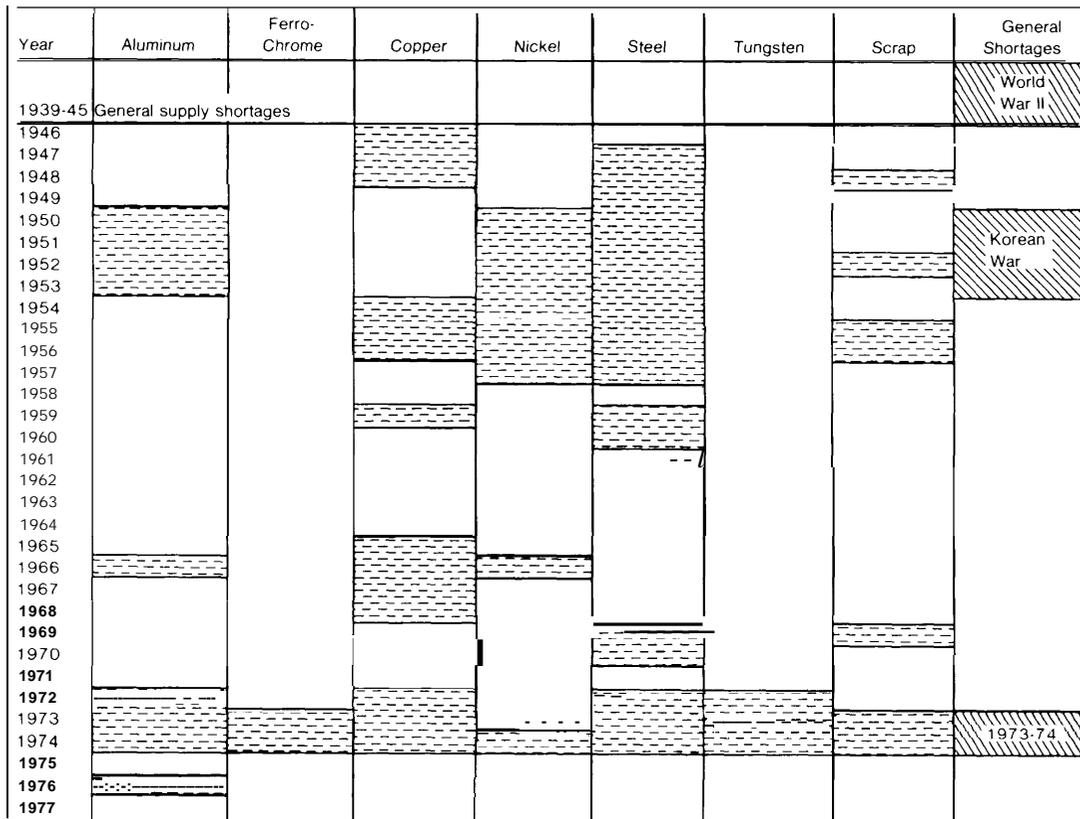
during the third period of 1966. A shortage situation was avoided by the release of aluminum from the Government stockpile.

3. Aluminum Supply in 1972-74. During the period 1972-74, aluminum was reported as being one of the major metal shortages. In the survey undertaken by the Senate Government Operations Committee regarding the industry perceptions of the materials shortages, 74 companies indicated that they had experienced aluminum supply problems. The survey indicated that aluminum mill products, for example, sheet, plate, rod, bar, tube, extrusions, casting, foil, forgings, etc., were all in short supply. The major problem the industries were facing was an increase in demand and a static supply of aluminum. An additional factor that affected production capacity was an electric power shortage which occurred in the Pacific Northwest in 1973. This shortage was responsible for reducing aluminum production capacity by 9.5 percent.

Other factors that aggravated aluminum production were: (a) the difficulties encountered in obtaining aluminum scrap and alumina catalysts from foreign markets (due to very high prices); (b) the unavailability of adequate metal and rolling capacity to produce aluminum foil; (c) the costs of compliance with environmental protection regulations; and (d) price controls.

¹The data for this appendix is based on the following sources: (1) literature survey in the *New York Times*, *Wall Street Journal*, and *American Metal Market* newspapers; (2) working paper prepared by the Department of Commerce for the National Commission on Supplies and Shortages on "Shortages and Surpluses in Selected Commodities-1976;" (3) report prepared by A. D. Little for the Department of Commerce entitled, *Material Shortage Study*; and (4) hearings held by the Senate Government Operations Committee, August 1974, on *Materials Shortages, The Industry Perception*.

Figure C-1.— Metal Shortages 1939-77



 Shortages, specific
 General shortage periods

SOURCE: OTA based on data from references cited in footnote 1 p 118

It was found that independent fabricators and smaller customers were hit the hardest by the increase in prices, the shortages of selected types of aluminum products, and the allocations instituted by some producers and suppliers.

4. Aluminum Supply in 1975-77. At the beginning of 1975, the demand for aluminum dropped off due to the reduction of construction jobs. In response to this reduction in demand, aluminum producers began to curb their output. In addition, the General Services Administration further aggravated the situation by releasing 15 million lbs of aluminum from the Government stockpile. Thus, both the United States and Canada further limited their production of aluminum.

In late 1975 and early 1976, demand for alumi-

num was on the rise. The construction industry began to pick up, and the Ford Motor Company decided to expand its output of cars. As a result of these two factors, demand and increased supplies began to tighten (a result of reduced capacity during 1975). The tight aluminum supply situation was eased to a certain degree by the recycling of aluminum cans during 1976.

Articles indicate that while some spot shortages of aluminum occurred on the east coast due to unusually severe winter weather conditions, the overall outlook for aluminum supplies remained positive. However, it is possible that due to capacity limitations the production of aluminum might have been bottlenecked as economic recovery continued.

SHORTAGES IN CHROMIUM SUPPLY

The United States is dependent on foreign sources for its chromium requirements, either as chromite or as ferrochromium. Up until 1968, the United States imported a large amount of chromite. However, in 1968, the United States shifted its importation of chromite to the importation of ferrochrome. One reason for this shift was the United Nations sanction against Southern Rhodesia, which was the U.S. principal supplier of chromite. As a result, the United States shifted its dependence to the Soviet Union. While many companies expressed the fear that raw materials might be cut off from either Rhodesia or Russia—thus limiting production—such a shortage did not materialize.

At the same time, however, another type of shortage did occur during 1972-74. This shortage related to the ability of the United States to produce ferrochromium alloys at peak steel demand. Peak demand was reached in 1973-74 and could be reached again in any type of national emergency. Thus, the shortage in regard to chromium results not from the unavailability of the raw materials, but rather from the inability to convert the ore to ferrochromium alloys.²

²The conversion problem stems from the availability of electric furnaces. Apparently, industry switched its electric furnaces from the production of ferrochromium alloys to silicon ferroalloys, which are more profitable.

SHORTAGES IN COPPER SUPPLY

1. Copper Supply in 1946-71. Table C-1 illustrates the periods of surplus and tight supply in regard to copper and the major factors influencing the supply from 1946-71.

Table C-1.—Copper Supply

Period	Incident	Influencing Factors
1946-49 ..	Tight supply	Strong post-World War II demand and Government action.
1949	Excess supply	Weak demand.
1950-53 ..	Relative balance	Strong demand and production. Government price controls.
1954-56 ..	Tight supply	Strong demand and copper strike.
1957-58 . .	Excess supply	Weak demand due to recession.
1959	Tight supply	Strike reduces available supply.
1960-64 ..	Relative balance	Demand and supply increase.
1965-68 ..	Tight supply	Strong demand. Government actions including Vietnam War and 8-month copper strike.
1969-71 ..	Relative balance	Supply able to keep pace with demand.

SOURCE: Department of Commerce

2. Copper Supply in 1972-74. Copper was considered to be in short supply during 1972-74. Sixty-two companies, as reported by the survey undertaken by the Senate Government Operations Committee on industry perceptions, indicated supply shortages. The reason most cited for the apparent shortage was an increase in world demand combined with limited production capacity.

Other factors that were mentioned as producing a tight supply situation included: (a) the exportation of domestic copper to foreign countries due to higher prices overseas, (b) price controls, and (c) the possibility of formation of a copper cartel that would restrict the sale of copper to the United States.

3. Copper Supply in 1975-77. Demand for copper began to fall during the first quarter of 1974 and plunged in 1975 due to a worldwide recession. As a result, copper production was cut back and prices fell. However, by early 1977 an oversupply of copper existed due to the very low level of demand.

SHORTAGES IN NICKEL SUPPLY

1. Nickel Supply in 1946-71. A primary nickel shortage was experienced in the United States from 1950 to 1957. This shortage was the result of rationing by Canadian producers, from which the United States imports about two-thirds of its nickel. This rationing caused U.S. steel producers (nickel is used in the production of stainless steel) to revert to the production of low-nickel steels. The Government continued to buy metal for defense stockpiles and placed nickel under allocation from August 15, 1951, to November 1953. The nickel shortage was less severe in 1955 due to the diversion of nickel, scheduled to be stockpiled, to the consumer sector.

In 1958, supply exceeded demand and nickel producers reduced operating capacity. As a result, the Government terminated all contracts for nickel delivery, and DOD lifted all restrictions on the use of nickel.

During 1964, a nickel shortage would have occurred, due to an increase in demand for stainless

steel, except for the fact that the Government released nickel from the strategic stockpile.

2. Nickel Supply in 1972-74. Nickel operations were fairly normal from 1972 through 1973. However, in early 1974, the nickel supply began to tighten due to a record consumption. In response to the tight market, many companies began to import additional nickel from the U.S.S.R. Additional responses to the demand/supply situation were the allocation of metal by nickel producers and the resistance by nickel producers to accept defense-related orders from new customers. The major industry that was adversely affected by the tightened supply of nickel during 1974 was the steel industry, that is, in the production of stainless steel.

3. Nickel Supply in 1975-77. Nickel was in excess during this period due to weakened demand.

SHORTAGES IN SCRAP SUPPLY

Ferrous Scrap Supply From 1946 to 1971

1. Ferrous Scrap Supply From 1946 to 1949. Steel production steadily increased from 1946 through 1948, thus increasing the demand for ferrous scrap. By 1948, ferrous scrap was in short supply. Also, price controls were lifted on November 10, 1946, thus allowing prices to rise.

A drive was begun by the Secretary of Commerce in November 1948 to assist in increasing the flow of scrap. The program was terminated in May 1949 as a result of an improved scrap situation. Also, imports of scrap during this period helped to ease overall scrap supply.

(b) Ferrous Scrap Supply During 1950-53. The demand for scrap increased during the Korean War due to increased steel production. Purchased

scrap receipts increased between 1949 and 1950 by about 35 percent. Some spot shortages of scrap caused the closing of some open-hearth furnaces in early 1952. However, widespread closings of furnaces were averted due to the National Production Authority allocation program and by the maintenance of adequate flow of scrap from processors.

(c) Ferrous Scrap Supply During 1955-57. Ferrous scrap was in tight supply due to a record increase in the production of steel during this period. Also, scrap demand was especially high due to large export volumes.

(d) Ferrous Scrap Supply During 1969-70. Ferrous scrap again moved into a tight supply situation due to an increase in steel production. While steel production started to ease in 1970, exports increased the total scrap demand.

Scrap Supply From 1972 to 1974

(a) **Ferrous Scrap.** Tight supply of ferrous scrap is usually associated with a rising demand for steel. When steel demand increases, so does the price of scrap. Scrap prices are constantly changing, up and down, in response to changes in demand. A second factor that affects the supply and price of ferrous scrap is export demand. And in 1973-74, a rapid increase in scrap exports took place.

During 1972 and early 1973, the steel industry began to recover from the severe recession of 1971. The demand for domestic steel increased due to: (1) a lesser availability of foreign steel as a result of the devaluation of the dollar,⁴ and (2) the overall increase in worldwide demand. Thus, the demand for U.S. domestic-steel and scrap sharply increased both domestically and internationally during this period.

Scrap prices began to increase and ranged from \$48 per ton in January 1973 to \$55 at the end of June, to a high of \$81 per ton in November 1973. Also, scrap prices were not only high, but in some

⁴Due to the devaluation of the dollar, domestic steel was priced about 25 to 35 percent lower than foreign steel.

cases the supply of scrap was limited due to the exportation of scrap to foreign markets. Some small scrap companies were able to export their scrap for higher profits due to the fact that they were not affected by the wage/price control constraints. A further factor that aggravated the supply of scrap was the shortage of gondola cars that are used to ship the scrap to markets.

The situation was most serious in regard to the availability of scrap on the west coast. This was due to the large amounts of scrap being exported in proportion to the supply of scrap available for production.

(b) **Aluminum Scrap.** Aluminum scrap is the prime raw material used in the production of secondary aluminum ingot.⁴ During this period, aluminum scrap was in short supply due to a number of factors: (1) as the demand for primary aluminum increased, so did the demand for aluminum scrap; (2) more scrap was exported due to increased worldwide demand and higher prices received for scrap on the foreign market; and (3) scrap that was normally available from fabricating plants of integrated producers was no longer offered for sale.

⁴secondary ingot accounts for approximately 20 percent of the total U.S. aluminum supplied.

SHORTAGES IN STEEL SUPPLY

1. Steel Supply in 1946-71. The period following the end of World War II included periods of peak steel demand with tight supply or shortages of steel and periods of weak demand at the low point of the business cycle, as well as the more normal demand periods. Steel was in tight or short supply three times during 1946-71: (a) 1947-57 when the European and Japanese steel industries were rebuilding, (b) 1959-60 caused by the 116-day steel strike in the United States, and (c) 1969-70 due to a worldwide increase in steel demand.

2. Steel Supply in 1972-74. During the period 1972-74, one of the major shortages of materials experienced by industry was steel. Approximately 106 companies indicated to the Senate Government Operations Committee in their survey on "Industry Perceptions of Materials Shortages" that

they were having difficulty obtaining steel, that is, stainless, castings, forgings, plate, sheet, and steel products.

Major factors to the tight demand/supply situation included: (a) a lack of adequate steel production capacity to meet demand, (b) wage and price controls, (c) a shortage of iron, and (d) an overall increase in worldwide demand for steel.

3. Steel Supply in 1975-77. During the first quarter of 1975, the demand for steel reached an all-time low. As a result, the production of steel was cut back drastically. However, by the end of 1975, the demand for steel began to improve, causing spot shortages to occur in various steel products. By the end of 1976, the demand/supply situation began to balance out.

Spot shortages also occurred in the availability of steel products during the first quarter of 1977 due to severe weather conditions and a lack of ade-

quate fuel to operate the steel mills. However, as weather conditions began to ease, so did the tightened steel supply.

SHORTAGES IN TUNGSTEN SUPPLY

During the materials shortages of 1972-74, two companies indicated to the Senate Committee on Government Operations that tungsten was in short supply. The reason given for such a shortage was

the lack of capacity. Factors influencing capacity, as with other metals, were wage and price controls, environmental protection regulations, and foreign competition.

SUMMARY 1946-77

From 1946 to 1977, interruptions in supply were constantly occurring in regard to the seven metals analyzed in this study. Factors affecting the supply of such metals include: governmental regulations, capacity limitation, direct raw materials shortages, strikes, transportation disruptions, import limitations, unusual demand surges, and acts of nature, for example, severe weather conditions. While a tight supply situation can result solely from the general fluctuations of the business cycle, the occurrence of supply disruptions adversely affecting industry usually involves the combination of several factors, for example, unusual demand surges combined with capacity limitations, and/or demand surges combined with direct raw materials shortages.

Tight supply situations or actual disruptions in supply occurred as follows: 1) aluminum was in tight/short supply in 1950-53, 1966, 1972-74, and

early 1976; 2) ferrochromium alloys were insufficient to meet peak steel demand in 1973-74; 3) copper was in tight/short supply in 1946-48, 1954-56, 1959, 1965-68, and 1972-74; 4) nickel was in short supply during 1950-57, 1966, and 1974; 5) supply shortages were apparent in the supply of scrap in 1948, 1952, 1955-57, 1969, and 1973-74; 6) steel was in short supply in 1947-57, 1959-60, 1969-70, 1972-74, and the first quarter of 1977; and 7) the supply of tungsten was interrupted during 1972-74.

The above facts indicate that tight/shortage situations with regard to the seven metals constantly occurred over the past 38 years. Since the factors that have combined to cause such supply disruptions can reoccur, the probability of specific shortage conditions in the future is quite high. There is less certainty about the reoccurrence of general non-war-related shortages.