UNALLOYED UNWROUGHT COPPER

**Report to the President on
Investigation No. TA-201-32
Under Section 201 of
the Trade Act of 1974**

PUBLICATION 905

AUGUST 1978

United States International Trade Commission / Washington, D.C. 20436

UNITED STATES INTERNATIONAL TRADE COMMISSION

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FOR RELEASE
August 23, 1978

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USITC 78-097

USITC FINDS U.S. INDUSTRY SERIOUSLY INJURED BY IMPORTS OF UNALLOYED UNWROUGHT COPPER

The United States International Trade Commission today reported to the President its determination by a 4-to-1 vote that the domestic industry is being seriously injured or threatened with serious injury by imports of unalloyed unwrought copper.

Chairman Joseph O. Parker, Vice Chairman Bill Alberger, and Commissioners Catherine Bedell and Daniel Minchew made the affirmative injury determination, while Commissioner Italo H. Ablondi found in the negative. Commissioner George M. Moore did not participate in the determination.

To prevent or remedy the serious injury or threat thereof to the domestic injury, four Commissioners--Parker, Alberger, Bedell, and Minchew--voted to recommend a yearly quota of 300,000 short tons on refined copper imports for a 5-year period beginning January 1, 1978. Commissioners Moore and Ablondi did not participate in the remedy recommendation vote.

On March 17, 1978, the USITC instituted an investigation following receipt of a petition filed on behalf of the Anaconda Co., ASARCO, Inc., Cities Service Co. (Minerals Group), Copper Range Co., Cyprus Mines Corp., Duval Corp., Hecla Mining Co.,

more

Inspiration Consolidated Copper Co., Kennecott Copper Corp., Magma Copper Co., Phelps Dodge Corp., and Ranchers Exploration and Development Corp. A public hearing in connection with the investigation was held in Tucson, Ariz., on May 22-24, 1978.

Copper is a major primary metal with applications in electrical and electronics products, building construction, consumer goods, industrial machinery and equipment, and many other areas.

The United States has been the leading copper-producing country since 1883, except for 1934, when economic conditions adversely affected domestic production. In 1977, 25 mines accounted for 93 percent of U.S. mine output.

Copper-producing States are Arizona (61 percent of total U.S. production in 1977), Utah (13 percent), New Mexico (11 percent), Montana (6 percent), Nevada (4 percent), and Michigan (3 percent). Virtually all copper-bearing ore is treated at concentrators near the mines (the beneficiation process). Ore concentrates were smelted by 9 companies which operated 17 primary smelters. The Smelters are located in the principal mining States, except for one each in Texas, Washington, and Tennessee. About 19 firms refined copper in 25 plants that are located chiefly in Texas, the Middle Atlantic States and near the primary smelters.

Annual fluctuations in refined-copper consumption in the United States closely paralleled fluctuations in the aggregate level of economic activity during 1973-77. After reaching an all-

time high of 2.4 million short tons in 1973, consumption fell to a 15-year low of 1.5 million short tons during the recession in 1975 and then rebounded during the next 2 years as a result of the increased demand generated by the growing momentum of the U.S. economic recovery.

With the exception of 1975, refined-copper imports increased throughout 1973-77, reaching a peak of 387,000 short tons in 1977. The ratio of imports to consumption fluctuated during the first 3 years of this period and then jumped sharply to 19.1 percent before falling back slightly to 17.7 percent in 1977.

Canada has been the leading source of refined-copper imports during the past 5 years, but three other suppliers, Chile, Zambia, and Peru, have steadily increased their share of the U.S. market.

After producing a record output of nearly 2.3 million short tons of refined copper in 1973 and recording high profits in 1973 and 1974, the domestic industry suffered losses in 1975. Following a modest recovery in 1976, output declined again in 1977; industry losses were worse than those recorded in 1975.

U.S. employment of production workers engaged in coppermining and copper-milling operations amounted to 29,165 workers in 1973 and 29,719 in 1974, but declined to 23,887 in 1977. Domestic mine production totaled 1.7 million short tons in 1973 and dropped to 1.5 million short tons last year. In 1977, U.S. consumption of

refined copper amounted to $2.7 billion, and domestic producers' shipments of refined copper were valued at more than $2.2 billion. Copper imports, which totaled 387,000 short tons in 1977, have been running at an annual rate of 650,000 short tons so far this year.

The Commission's report, Unalloyed Unwrought Copper (USITC Publication 905), contains the views of the Commissioners and information developed during the investigation (No. TA-201-32). Copies may be obtained by calling (202) 523-5178 or from the Office of the Secretary, 701 E Street NW., Washington, D.C. 20436.

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Note.--The whole of the Commission's report to the President may not be made public since it contains certain information that would result in the disclosure of the operations of individual concerns. This published report is the same as the report to the President, except that the above-mentioned information has been omitted. Such omissions are indicated by asterisks.

REPORT TO THE PRESIDENT

United States International Trade Commission

August 23, 1978

To the President:

In accordance with section 201(d)(1) of the Trade Act of 1974 (19 U.S.C. 2251(d)(1), 88 Stat. 1978), the United States International Trade Commission herein reports the results of an investigation relating to unalloyed unwrought copper.

The investigation to which this report relates (No. TA-201-32) was undertaken to determine whether unwrought copper, other than alloyed, provided for in item 612.06 of the Tariff Schedules of the United States, is being imported into the United States in such increased quantities as to be a substantial cause of serious injury, or the threat thereof, to the domestic industry producing an article like or directly competitive with the imported article.

The Commission instituted the investigation under the authority of section 201(b)(1) of the Trade Act on March 17, 1978, following receipt on February 23, 1978, of a petition filed by the Anaconda Co., Asarco, Inc., Cities Service Co. (Minerals Group), Copper Range Co., Cyprus Mines Corp., Duval Corp., Hecla Mining Co., Inspiration Consolidated Copper Co., Kennecott Copper Corp., Magma Copper Co., Phelps Dodge Corp., and Ranchers Exploration and Development Corp.

Notice of the investigation and hearing were duly given by publishing the original notice in the Federal Register of March 23, 1978 (43 F.R. 12130). Announcement of the time and place of the public hearing was subsequently

published in the Federal Register of April 7, 1978 (43 F.R. 14748).

A public hearing in connection with the investigation was held in Tucson, Ariz., on May 22-24, 1978. All interested persons were afforded the opportunity to be present, to produce evidence, and to be heard. A transcript of the hearing and copies of briefs submitted by interested parties in connection with the investigation are attached. 1/

The information contained in this report was obtained from fieldwork, from questionnaires sent to domestic manufacturers, importers, and consumers, and from the Commission's files, other Government agencies, and information presented at the hearing and in briefs filed by interested parties.

1/ Attached to the original report sent to the President, and available for inspection at the U.S. International Trade Commission, except for material submitted in confidence.

Determination, Finding, and Recommendation of the Commission

Determination

On the basis of its investigation, the Commission 1/ determines that unwrought copper, other than alloyed, provided for in item 612.06 of the Tariff Schedules of the United States (TSUS), is being imported into the United States in such increased quantities as to be a substantial cause of serious injury, or the threat thereof, 2/ to the domestic industry producing an article like or directly competitive with the imported article.

Finding and recommendation

The Commission 3/ finds and recommends that, to remedy the serious injury found to exist, it is necessary to impose quantitative restrictions on imports of unwrought copper, other than alloyed, provided for in item 612.06 of the TSUS, in the amount of 300,000 short tons per year for the 5-year period beginning January 1, 1978, with no more than 25 percent of such annual amount to be entered, or withdrawn from warehouse, for consumption within any calendar quarter.

1/ Commissioner Ablondi dissenting, Commissioner Moore not participating.
2/ Commissioner Minchew finds serious injury only.
3/ Commissioners Moore and Ablondi not participating.

Views of Chairman Joseph O. Parker and Commissioner Catherine Bedell

On March 17, 1978, the United States International Trade Commission instituted an investigation under section 201 of the Trade Act of 1974 to determine whether unwrought copper, other than alloyed, provided for in item 612.06 of the Tariff Schedules of the United States, is being imported into the United States in such increased quantities as to be a substantial cause of serious injury, or the threat thereof, to the domestic industry producing an article like or directly competitive with the imported article. The investigation was instituted on the basis of a petition filed by counsel representing 12 domestic producers of copper. Generally speaking, the petitioners are integrated producers of copper engaged in the mining, smelting and refining of copper.

On the basis of the Commission's investigation, we have determined that copper of the type covered by this investigation is being imported into the United States in such increased quantities as to be a substantial cause of serious injury, or the threat thereof, to the domestic industry producing an article like or directly competitive with the imported article.

Domestic industry

In this investigation, we have concluded that the domestic industry producing an article like or directly competitive with the imported article consists of the facilities in the United States used in the production of refined copper. These include refineries, smelters and mining operations.

Increased imports

There is no question that imports of copper have increased within the meaning of section 201. With the exception of 1975, such imports increased each year during the period 1969-77. In 1973, imports of copper totaled 206,000 short tons and thereafter increased at an average annual rate of 17 percent through 1977 when they totaled 387,000 short tons. In the first 5 months of 1978, imports of copper increased to 272,000 short tons, an annualized rate of 652,000 short tons. The ratio of imports to production of refined copper also increased in each year during the period 1973-77, except in 1975. In 1973, the ratio of imports to production was 8.8 percent; by 1977, the ratio increased to 20.7 percent, and in the first 5 months of 1978, the ratio of imports to production reached 33.9 percent.

Serious injury, or the threat thereof, to the domestic industry

A brief review of the events in the domestic copper industry during the last several years puts into perspective the present situation of the domestic copper industry. During 1973 and the first half of 1974, the domestic copper industry experienced high demand, high productivity, and high capacity utilization. In the second half of 1974, however, demand for copper began to decline. As a result, apparent domestic consumption of copper, which had been increasing annually during the early 1970's, declined in 1974.

In 1975, production of copper at U.S. mining, smelting, and refining facilities all fell below 1973-74 levels. With the exception of an increase in U.S. copper mine production in 1976, production of mines, smelters, and refineries engaged in the production of copper during 1976 and 1977 was below 1973 and 1974 levels. As a result of the decline in production at these facilities, capacity utilization rates during the period 1975-77 have remained below those achieved in 1973 and 1974.

Employment and man-hours worked in the domestic copper industry declined by approximately 10 percent from 1974 to 1975. This decline in employment and man-hours worked continued throughout the first 3 months of 1978. At the end of March 1978, there were almost 12,000 fewer workers, a decrease of over 20 percent, engaged in producing copper than at the end of 1974.

Year-end inventories of refined copper increased from 19 percent of consumption in 1974 to 28 percent of consumption in 1975. In 1976, there was a further increase to 37 percent of consumption; this level continued throughout 1977.

The decline in prices which occurred after 1974, combined with a decline in actual shipments, resulted in a 30 percent decrease in the value of U.S. producers' shipments from 1974 to 1975. Although the value of such shipments increased in 1976, it remained below 1973 and 1974 levels. In 1977, the value of U.S. producers' shipments declined again.

From 1974 to 1975, there was a sharp reversal in the profitability of the domestic industry. Information derived from Commission questionnaires

shows that in 1974, the net profit before income taxes of the domestic industry totaled $632 million, or about 23 percent of net sales. In 1975, the domestic industry suffered a net loss of $52 million. In 1976, the domestic industry recovered somewhat, with a profit of $91 million or 3.7 percent of net sales. In 1977, the domestic industry lost more than $100 million. As is evident from the factors discussed above, there is no doubt that the domestic industry is seriously injured or threatened with further serious injury.

Increased imports are a substantial cause of serious injury or the threat thereof

In order to make an affirmative determination, the Commission must find that increased imports are a substantial cause of serious injury, or the threat thereof. The term "substantial cause" is defined as "a cause which is important and not less than any other cause." 1/ The information developed by the Commission's investigation establishes that increased imports are an important cause and not less than any other cause of the serious injury and threat of further serious injury to the domestic industry.

Following the decline in apparent domestic consumption of refined copper in 1975, there was an increase in apparent consumption of about 450,000 short tons in 1976. In the same year, imports of refined copper increased by approximately 240,000 short tons. Thus, the increase in imports accounted for more than one-half of the increase in apparent consumption in 1976, and the ratio of imports to domestic production increased from about 8 percent in 1975 to about 20 percent in 1976. In 1977, domestic production declined by approximately 50,000 short tons while imports increased slightly. The ratio of imports to production increased

1/ 19 U.S.C. 2251(b)(2)(C).

to about 21 percent in 1977. In the first 5 months of 1978, the ratio of imports to domestic consumption reached about 27 percent, or approximately 3 times the ratio of imports to consumption in 1975.

These increased imports since 1975 have been at depressed world prices, which have prevented U.S. producers from achieving a price level necessary to achieve a satisfactory operating margin. During 1973, and for most of the first half of 1974, when worldwide demand for copper was strong, the domestic copper industry was subject to price controls and, for the most part, imported copper was priced well above domestically produced copper. In 1974, however, the world price of copper, as reported on the London Metal Exchange, fell sharply and since that time, the world price has remained below U.S. producers' prices. Through 1977, both the world price and domestic producers' prices have generally remained below 1974 prices, and this trend continued in 1978. During January-March 1978, the weighted average net prices received by domestic producers and importers for electrolytic copper wirebar were 61.6 cents per pound and 59.3 cents per pound, respectively. In comparison, in January-March 1974, these prices were 69.2 cents per pound and 91.7 cents per pound, respectively. The continued importation of increasing supplies of copper from excess world stocks threatens the domestic industry with further serious injury.

Other factors besides increased imports were presented during the Commission's investigation as causes of the present condition of the domestic industry. These included, among others, a decrease in consumption of copper, substitution of other products for copper and environmental and safety costs. While each of these factors may have contributed to the

serious injury, or the threat thereof, to the domestic industry, none is a more important cause of such injury than increasing, lower priced imports. Furthermore, such factors make the domestic industry more vulnerable to lower priced imports. Apparent consumption of copper increased in both 1976 and 1977 and in the latter year was at about the same level as 1974. The impact of increased imports is also more severe because the domestic industry is incurring the added costs of environmental and safety regulations. In our judgment, the Commission's investigation has established that the increased imports are a substantial cause of serious injury, or the threat thereof, within the meaning of the statute to the domestic industry.

Views of Chairman Joseph O. Parker and Commissioner Catherine Bedell on remedy

Having found serious injury, or the threat thereof, in this investigation, section 201(d)(1) requires the Commission to find and recommend the amount of the increase in, or imposition of, any duty or import restriction which is necessary to prevent or remedy such injury or to recommend adjustment assistance if it is found that the provision of such assistance can effectively remedy such injury. The firms and workers in the domestic copper industry may apply for adjustment assistance under sections 221 and 251, respectively, of the Trade Act regardless of any action which is taken with respect to the import relief recommended herein. We do not believe that adjustment assistance, by itself, can effectively remedy the injury to the domestic industry found to exist.

The plight of the domestic industry is substantially the result of increased imports of lower priced copper entering the United States primarily as a result of excess supplies of refined copper on world markets. As long as domestic prices remain above world prices plus the cost of the duty, freight, and insurance necessary to enter imported copper into the United States, increased imports are likely to continue to injure the domestic industry. Thus, while adjustment assistance might be of some benefit, particularly to workers, it cannot effectively prevent or remedy the serious injury and threat of future serious injury which we have found to exist. To prevent or remedy such injury by the use of any of the alternative remedies available to the Commission under the statute, it is necessary to recommend an increase in duties that will improve the competitive position of the domestic industry or to recommend a restriction on the quantity of imports to a level which will permit the domestic industry to restore its viability and adjust to import competition.

Petitioners in this investigation proposed a quota of 198,000 short tons for the balance of 1978 and 1979. In each year after that, they proposed a 2½-percent increase in the quota. This will mean an increase to 219,000 short tons in 1983, the fifth year of such quota.

We have joined with two of our collegues in recommending a quota of 300,000 short tons per year for a 5-year period beginning January 1, 1978, with no more than a total of 25 percent of such annual amount to enter the United States or be withdrawn from warehouses in the United States for consumption in any calendar quarter. The quota has been made retroactive to January 1, 1978, to take into consideration the recent surge in imports. This recommendation, if adopted, would cause the cessation of imports for 1978 if they have equaled or exceeded 300,000 short tons on the date when the quota is imposed. Under the requirements of section 203(d)(2) of the Trade Act of 1974, any quantitative restriction must permit the importation of a quantity or value of the article which is not less than the quantity or value imported during the most recent period which is determined to be representative of imports of such article. The quota recommended approximates the average quantity entered during 1973-77 and, in our opinion, complies with the requirements of the statute.

A gradual elimination of the import restriction has not been recommended. There were substantial supplies of copper overhanging the domestic market at the end of 1977, contributing to a downward pressure on domestic copper prices. This oversupply situation has been exacerbated by the substantial increase in imports which has occurred so far in 1978. Since it is likely to take some time for the conditions created by the oversupply to be corrected by the imposition of an import restriction, the

industry, in our opinion, will need the benefit of the import restriction at the recommended level during the 5-year period to provide the opportunity for it to restore its competitiveness.

VIEWS OF COMMISSIONERS BILL ALBERGER AND DANIEL MINCHEW

On the basis of information developed by the Commission in this investigation, we determine that unwrought copper, other than alloyed, of the type described in the notice is being imported into the United States in such increased quantities as to be a substantial cause of serious injury, or the threat thereof, to the domestic industry producing the like or directly competitive products.

The Trade Act of 1974 (section 201(b)(1)) requires that each of the following conditions be met before any affirmative determination can be made:

(1) There are increased imports (either actual or relative to domestic production) of an article in the United States;

(2) A domestic industry producing an article like or directly competitive with the imported article is seriously injured, or threatened with serious injury; and

(3) Such increased imports of an article are a substantial cause of serious injury, or the threat thereof, to the domestic industry producing an article like or directly competitive with the imported article.

The Domestic Industry

In this investigation, we have concluded that the relevant domestic industry consists of the facilities in the United States used in the production of unalloyed unwrought copper (refined copper). Nineteen firms operated 25 primary refineries and electrowinning plants in 1977, and about 40 secondary smelters and refineries were involved in the recovery of copper from scrap. The producers of primary copper also account for the bulk of the domestic production of refined copper from scrap.

Increased Imports

With the exception of a downturn in 1975, imports of refined copper rose steadily at an average annual rate of 17% during 1973-77. Imports were 206,000 short tons in 1973, 304,000 short tons in 1974, 142,000 short tons in 1975, 381,000 short tons in 1976, and 387,000 short tons in 1977. The ratio of imports to domestic production increased from 8.8% in 1973 to 20.7% in 1977. Imports continued to increase during January-May 1978 amounting to 272,000 tons (equivalent to an annual rate of 652,000 tons); the ratio of imports to domestic production rose to 34% during this period.

Serious Injury

The Trade Act does not define the term "serious injury" but does provide guidelines in the form of economic factors. Under section 201(b)(2) the Commission is to take into account "all economic factors which it considers relevant, including (but not limited to)--"...the significant idling of productive facilities in the industry, the inability of a significant number of firms to operate at a reasonable level of profit, and significant unemployment or underemployment within the industry...."

We have also considered and analyzed other economic developments in the industry to determine whether serious injury exists. These include: (1) production and shipments; (2) inventory levels; (3) price levels; and (4) market share.

Idle facilities.--Domestic refining capacity has expanded regularly, although slowly, during the last 20 years, from 2.1 million tons in 1958 to 2.9 million tons in 1977. Refining capacity is substantially greater than smelter or mine capacity, both of which are about 2.1 million tons.

Refining capacity utilization fell from 80% in 1973 to 74% in 1974, 65% in 1975, increased to 71% in 1976, but fell again in 1977 to 66%. Capacity utilization of smelters was 94% in 1973, 84% in 1974, 81% in 1975, 80% in 1976 and 74% in 1977. Mine capacity utilization was 71% in 1975 and 80% in 1976.

Profits.--A significant number of firms in the industry are unable to operate at a reasonable level of profit. Net operating income of U.S. producers in their domestic copper mining, smelting, and refining operations fell from profits of $658 million in 1973, $620 million in 1974, to losses of $70 million in 1975 and $123 million in 1977. Probably the bulk of the losses in 1975 and 1977 were incurred in connection with mining and milling operations. The ratio of net income before income taxes to net sales fell from profits of 25.6% in 1973, 23.3% in 1974, a loss of 2.7% in 1975, a profit of 3.7% in 1976, and to another loss of 5.0% in 1977. In both 1975 and 1977, 13 producers reported net operating losses in their copper operations. In 1976, 8 producers reported net losses. There can be no doubt that this industry is experiencing serious financial problems.

Employment.--The total number of persons employed in firms producing copper declined from 52,610 in 1973 to 44,620 in 1977. The average number of production workers employed in refining operations fell from 6,612 in 1974 to 4,734 in 1977, but rose to 4,874 during January-March 1978. Man-hours worked by production workers in producing copper fell from 91 million in 1974 to 71 million in 1977. Man-hours worked in refining operations fell from 14.3 million in 1973 to 9.7 million in 1977. Part of this drop in employment and the number of man-hours worked can be

attributed to improved technology (as evidenced by an increase in productivity in all copper operations except smelting), labor strikes in 1974 and 1977, the closure of three older refineries in 1975-76, and natural attrition.

Average hourly wages of workers mining and milling copper have risen more rapidly during 1973-77 than those received by workers in the total private sector, manufacturing, or other mining from $4.88 in 1973 to $7.48 in 1977. However, total wages paid to such workers have increased much less because of the declines in employment and man-hours worked.

Production and shipments.--U.S. mine, smelter, and refinery production of copper all fell from record or near-record levels in 1973 to 1975, recovered somewhat in 1976, but decreased again in 1977. Domestic production of refined copper in 1977 was 1,868,000 tons, representing a decline of 2.5% from the previous year and 20% less than production in 1973. Average annual rates of decline for the 5-year period were 2.5% for mine production, 4.5% for smelting production, and 5.7% for refinery production. Shipments by domestic producers declined similarly from 2,299,000 tons in 1973 to * * * tons in 1977. U.S. producers' export shipments of refined copper fell from 165,000 tons in 1975 to * * * tons in 1977. Apparently, much of the exports of refined copper in earlier years was the result of refining imported blister copper, and imports of blister have declined sharply as more foreign refineries have opened.

Inventories.--Year-end stocks of refined copper held by domestic producers rose from 79,000 tons in 1973 to 316,000 tons in 1977. Total inventories held in the United States likewise rose from 177,000 tons in 1973 to 774,000 tons in 1977. Producers have reported further increases in such stocks during the first quarter of 1978.

Prices.--U.S. producers' prices for refined copper were less than those received by importers during 1973 and the first three quarters of 1974, but the reverse has since been true. During 1977, for example, domestic prices for electrolytic wirebar averaged 5% more than prices received by importers for comparable merchandise. Prices received by both domestic producers and importers since 1974 have been substantially less than those prevailing in 1973 and 1974 apparently due to a generally weak level of demand and the reluctance of many producing countries to trim output in line with demand.

Market share.--The overall market share of imported refined copper increased steadily in 1973-77, with the exception of a downturn in 1975. Imports represented 9% of total consumption in 1973, 13% in 1974, 7% in 1975, 16% in 1976, and 18% in 1977. 1/

Considering all of these eoonomic factors, it is apparent that facilities, particularly refineries, are not operating at acceptable levels of capacity, profits have substantially declined far below reasonable levels, there has generally been a decrease in employment, although it turned upward again early in 1978, production and shipments have shown a downward trend, inventories of refined copper in the United States have risen without interruption, and domestic prices have not been competitive with the imported product. On

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1/ The figures were computed in the following manner: to obtain market share for 1973, for example, total imports for 1973 were added to importers' inventory for 1972. The sum of these figures approximates the overall quantity of imported refined copper actually present in the United States in 1973. When importers' stocks remaining at the end of 1973 are subtracted from the total, the result is the amount of imported refined copper consumed in 1973. This amount is then divided by total 1973 reported consumption to determine the market share of imported refined copper for that year. Figures for subsequent years were computed in the same fashion. While some inventories of imported copper were obviously held by distributors, it is not possible to determine the quantities.

balance, the domestic industry is being injured and we conclude that the injury is serious within the meaning of the Trade Act.

Substantial Cause

Section 201(b)(4) of the Trade Act defines the term "substantial cause" to mean "a cause which is important and not less than any other cause." Thus, increased imports must be both an "important" cause of injury or the threat thereof and "not less than any other cause." Section 201(b)(2) further directs that in determining "substantial cause" the Commission "shall take into account all economic factors which it considers relevant, including (but not limited to)...an increase in imports (either actual or relative to domestic production) and a decline in the proportion of the domestic market supplied by domestic producers."

There are several factors other than increased imports which may have contributed to the serious injury we have found. They are as follows:

(1) Domestic consumption has fallen in the highly cyclical market. Since 1973, U.S. consumption of refined copper has trended downward. Consumption dropped by over one-third in a 2-year period, from a peak of 2,437 thousand tons in 1973 to a 15-year low of 1,534 thousand tons in 1975. The reduced level of consumption in 1975 was a reflection of a serious slump in the economy. Consumption has increased since 1975, but in 1977 was still below the level reached in 1973 and about at the level in 1974. The trend line over the past 15 years is upward slightly.

(2) A portion of the decreased consumption of refined copper can be attributed to a loss of market to substitute products such as aluminum. Aluminum has made substantial inroads in electrical conductor and heat exchanger applications in the past 10 years. About 90% of bare conductor wire now utilizes aluminum. However, most of these conversions were made

by 1972. A number of econometric studies of the copper industry indicate that a 1% increase in the price of refined copper relative to that of aluminum, if sustained, would eventually lead to an approximately equal percentage decrease in the demand for copper. Currently, however, aluminum is not priced at a level competitive with copper prices, due in part to increased costs for bauxite and energy in the aluminum industry.

In studying various measures of U.S. industrial production, in comparison with refined copper consumption during the same time, it would appear that industrial production has increased from 1973 to 1977. Production of durable manufactures, transportation equipment, electrical machinery, and electric utilities all use copper, yet as production increased, copper consumption did not increase proportionately. This suggests that substitute products have made inroads in the copper market. And that clearly has happened, but not precisely in the time period of injury.

(3) Capital expenditures resulting from efforts to comply with environmental regulations have added 4 cents per pound in 1973, 4.7 cents in 1974, 6.4 cents in 1975, 4.5 cents in 1976, but only 3.6 cents in 1977 to the cost of producing refined copper. The spiralling costs of production in 1975 undoubtedly did not help, at a time of depressed demand and prices. In fact, the weighted average unit cost of producing a pound of refined copper jumped from 43.5 cents in 1973 to 62.7 cents in 1975, an increase of 44% in just two years. From 1975, costs rose only 5% in two years to 66 cents in 1977. Environmental capital expenditures, as shown above, decreased over this two year period, and were at the lowest level in five years in 1977, when the

serious injury began to occur. There were allegations that production at several smelters was reduced in 1976 and 1977 due to periodic failures to comply with governmental air quality standards. The evidence available to the Commission indicates this occurred only rarely, and smelter production was down because demand for blister copper was down.

(4) Average hourly wages paid to production workers engaged in mining and milling copper ores have risen more rapidly since 1973 than those paid to most workers. Such wages rose from $4.88 per hour in 1973 to $7.48 in 1977. Similar average wages for all manufacturing workers rose from $4.08 in 1973 to $5.63 in 1977. Labor contracts expire every three years, and the last new contracts were signed in 1977. Average weekly wages of copper workers did not rise as quickly as all metal workers. Total wage bills of the industry really have not increased much at all, due to smaller number of employees in 1977 and 1978.

(5) During 1977, labor strikes did occur at most U.S. copper producing facilities. It was anticipated that the strikes would last much longer than they did, based upon earlier experience when strikes were quite extensive. Settlements came quickly last year, and while it can be alleged some production was lost, most domestic producers were curtailing production anyway either before or after the strikes due to sluggish sales. The loss of production would have occurred anyway.

(6) The copper content of U.S. ores has declined in recent years, and appears to be less than the content in most major exporting nations. This can mean higher costs in processing more ore to get the needed amounts of copper. Prior to 1943, the yield was more than 20 pounds per ton. By 1960, this was down to 14 pounds and to 10 pounds in 1976. Some copper deposits currently being developed have an average yield of only 8 pounds

of copper with a cut-off grade of 4 pounds. Grade of ore is certainly a factor in decisions as to efficiencies of continuing to operate particular mines. Statistics show increasing productivity in the United States, and efficiency obtained in the processing of the ores so that costs have not been significantly affected by the lower content of our ores.

(7) From 1973 to 1977, imports of blister copper, the feedstock for refineries, declined significantly. Since U.S. refinery capacity significantly exceeds smelter or mining capacity, it has been alleged that refineries operated below capacity because smelters could not produce enough to keep the refineries operating. Developing countries have increased their capacity to refine their own smelter output, and this has curtailed exports of blister copper to the U.S. Most of this imported blister copper was in recent years reexported after refining. The problem with this argument is that U.S. smelters, operating well below capacity in 1977, cut back production because refineries could not use the output.

We do not consider declining consumption, expenditures to comply with environmental regulations, increasing hourly wage rates, or labor strikes to be important causes. It seems to us that the substitution of other metals, the declining grade of the U.S. ores, and the loss of imports of blister copper might constitute important causes of the serious injury. However, we do not believe any of them is as important a cause as increased imports. Therefore, increased imports are the substantial cause of the serious injury.

Domestic consumption has rebounded strongly following the slump in 1975; in 1977, consumption was 42% greater than in 1975, and at almost the same level as in 1974. Domestic production in 1977 was less than 5% greater than in 1975, while imports were almost 3 times as large as those in 1975. This

resulted in a decline in the proportion of the domestic market supplied by domestic producers from 93% in 1975 to 84% in 1977 and to 73% during January - May 1978.

The large buildup of stocks of refined copper in the United States, a substantial portion of which consist of imported merchandise, has exerted continual and increasing pressure in forcing domestic producers to reduce their prices--in many instances to less than the cost of production. It is our view that the growing unsold inventories and subsequent price depression caused by increased imports resulted in the serious injury suffered by the domestic industry.

Imports by domestic producers or exports to the United States by foreign subsidiaries of the domestic producers have accounted for a portion of the increase in imports. The domestic producers are vertically integrated to varying degrees from mining, smelting, and refining to fabricating. In addition, several domestic producers, through subsidiaries or stock holdings, have interests in copper producing facilities in Canada, Peru, Mexico, the Republic of South Africa, Indonesia, Papua, New Guinea and other countries.

As a percent of total imports, consumption of imported refined copper by petitioners' fabricating affiliates was 10.7% in 1973, 8.9% in 1974, 8.5% in 1975, 4.6% in 1976, and 5.8% in 1977. These figures should be regarded as minimum consumption by these affiliates. Several also reported purchasing refined copper from U.S. metal dealers who deal primarily in imported merchandise.

Two domestic producers, who did not join the petition, Amax, Inc. and the Cerro-Marmon Corporation reported importing large amounts of refined copper. Amax is one of the largest domestic producers. In 1977, imports

by these two firms alone were more than *** of U.S. imports. First quarter figures for 1978 indicate that Amax may be importing even more this year.

It disturbs us that portions of a domestic industry can, in effect, bring injury on the entire industry by increasing imports themselves. That hardly seems fair. Yet, a domestic entity having difficulty competing with imports may make an economic decision to import in order to remain in a commodity. Large diversified corporations have greater luxuries in this regard, and when faced with the need to gain better return on investment, must rationalize problems that occur in particular product lines in the short run.

Substantial investments have been made in the U.S. copper industry. It is a major national industry, and should at least return to a healthy condition. It seems unlikely to us, however, that a reasonable rate of return on this massive investment can be obtained too quickly, if at all, so one hopes for patience on the part of corporate executives. The industry, particularly as it affects small towns in Western States, should not give up and turn to imports merely because copper is not as profitable as some other products.

The entire question of the economic impact of imports by domestic producers needs further review and analysis, both within the Commission and without. The broader economic picture in industries having significant worldwide markets, such as copper, also should be more thoroughly considered.

While we find some troubling aspects in this case, we have found that the statutory guidelines for an affirmative finding are satisfied.

REMEDY VIEWS OF COMMISSIONERS BILL ALBERGER AND DANIEL MINCHEW

Under Section 201(d)(1), if the Commission finds the serious injury or threat thereof, it shall

> "(A) find the amount of the increase in, or imposition of, any duty or import restriction on such article which is necessary to prevent or remedy such injury, or
>
> (B) if it determines that adjustment assistance under chapters 2, 3, and 4 can effectively remedy such injury, recommend the provision of such assistance,"

The Commission having found in the affirmative under Section 201(b), we have considered the alternative remedies available to us. Adjustment assistance does not offer sufficient relief to this industry. Workers have already qualified for benefits, and the limitations in the relief provisions for firms are much too low to provide any meaningful assistance to copper refiners. Loans to individual companies cannot exceed $1 million and loan guarantees are limited to $3 million per firm. Copper refineries are large, capital-intensive establishments. The new Asarco refinery cost almost $200 million in 1975. The adjustment assistance program for firms would not even be a drop in the bucket.

Tariffs or tariff-rate quotas were considered as well, but our concern with the expected rapid rise in domestic refined copper prices over the next few years and the uncertain response of some foreign suppliers (particularly those countries with state controlled industries) led us to conclude tariffs might not be effective.

Looking at quantitative restrictions, we determined that the level

requested by petitioners (198,000 short tons) was just too low. We feel such restrictions would lead to sharply increased prices, thus unreasonably high consumer costs, the likelihood of additional substitution of aluminum and plastics for copper, and incentives for both imports of feedstocks and fabricated copper products.

During the 1973-77 period, (chosen as the representative period since no single year or pair of years adequately reflect any long range trends in the industry) imports averaged 284,000 short tons per year. Imports appear to be much higher in 1978 -- the five month total projected for 12 months would put imports at 652,000 short tons. We believe a quota level of 300,000 short tons for five years will allow the industry to achieve reasonable levels of capacity utilization in the final three years of the quota, and we believe it is not feasible to phase the quota upward due to the tremendous inventory overhang that needs to be worked off during the period. This level of relief should allow the industry to adjust to import competition and prepare adequately, with two or three healthy years in 1980-82, for the end of the quotas.

We recommend that the quotas be applied quarterly and that the starting date be retroactive to January 1, 1978, because of the tremendous inventory problem. At the end of 1977, inventories were 774,000 short tons which our staff estimates is about 268,000 short tons too high. The high level of imports in 1978 has undoubtedly increased these inventories, but accurate figures are not available. Imports should be stopped promptly this year, rather than allowing inventories to build up to such untenable levels as to render the quotas meaningless in future years. The

domestic industry would be additionally harmed if all refined copper imports entered at one time, as could occur under an annual quota.

We have concluded that the quota of 300,000 short tons of refined copper applied quarterly for the five year period begun January 1, 1978, will provide the domestic industry refining copper the opportunity to meet higher costs of production, compete effectively with imports, restore its profitability, and adjust in order to compete without protection at the end of the period of relief.

We are concerned that imports from Canada should not be unduly constrained. Over the years, Canadian producers have been historically reliable suppliers, participating in the U.S. market almost as domestic producers. Imports from Canada have decreased in the past five years, and thus have not contributed to the serious injury we have found.

Because of this concern, we considered proposing country-by-country quotas as follows: in short tons per year

Canada	108,000
Chile	57,000
Zambia	45,000
Peru	21,000
Yugoslavia	21,000
Japan	18,000
All other	30,000
Total	300,000

This would provide Canada with more than it exported to the United States in any of the last three years, but less than in 1973 and 1974. It would also cut back Chile, Zambia, and Peru below their sharply rising levels in the last two years.

We find great merit in this approach, but we were certain it was not going to receive majority support. Recognizing the importance of having at least three Commissioners join on the same remedy, we found grounds for general agreement and have formally recommended the quarterly quota system. The annual level is the same as our country-by-country proposals, and we would hope that Canada, being the closest nation to our borders, would not lose out under a global quota. We know the President will carefully consider this Canadian situation in any final remedy.

It would have been our initial preference to remove the quotas after four years, but since the beginning year of our recommended quota is 1978, we feel our concerns are well addressed.

Views of Commissioner Italo H. Ablondi

On February 23, 1978, the United States International Trade Commission received a petition requesting an investigation under section 201(b)(1) of the Trade Act of 1974 with respect to imports of refined copper. On March 17, 1978, the Commission instituted an investigation to determine whether unwrought copper, other than alloyed, provided for in item 612.06 of the Tariff Schedules of the United States (TSUS), is being imported into the United States in such increased quantities as to be a substantial cause of serious injury, or the threat thereof, to the domestic industry producing an article like or directly competitive with the imported article.

Section 201(b)(1) of the Trade Act requires that each of the following criteria be met if the Commission is to make an affirmative determination in this investigation and thus find a domestic industry eligible for import relief:

(1) Imports of the article concerned are entering the United States in increased quantities (either actual or relative to domestic production);

(2) The domestic industry producing an article like or directly competitive with the imported article is being seriously injured or threatened with serious injury; and

(3) Increased imports are a substantial cause of the serious injury, or the threat thereof, to the domestic industry producing an article like or directly competitive with the imported article concerned.

Determination

On the basis of the information before the Commission in this investigation, I have determined that unwrought copper, other than alloyed, provided for in item 612.06 of the TSUS, is not being imported into the United States in such increased quantities as to be a substantial cause of serious injury, or the threat thereof, to the domestic industry producing an article like or directly

competitive with the imported article. Specifically, I find that the third criterion has not been satisfied, i.e., that increased imports are not a substantial cause of such injury or threat thereof.

The domestic industry

In this investigation I have concluded that the domestic industry producing an article like or directly competitive with the imported article which is the subject of this investigation consists of the domestic facilities employed in the production of unalloyed unwrought copper (hereinafter "refined copper"). Nineteen firms operated 25 primary refineries and electrowinning plants in 1977; about 40 secondary smelters and refineries were involved in the recovery of copper from scrap. The producers of primary copper also account for the bulk of the domestic production of refined copper from scrap.

Increased imports

Imports of refined copper rose from 206,000 tons in 1973 to 304,000 tons in 1974, fell to 142,000 tons in 1975, and subsequently again increased--to 381,000 tons in 1976 and 387,000 tons in 1977. A 5-year trend line, using the least-squares method, shows an average annual increase of 17 percent over the period. The ratio of imports to domestic production showed a similar irregular increase over the period, rising from 8.8 percent in 1973 to 20.7 percent in 1977. Imports during January-May 1978 amounted to 272,000 tons (equivalent to an annual rate of 652,000 tons); the ratio of imports to domestic production rose to 34 percent during this period.

Serious injury

The second criterion requires a finding of whether the domestic industry is being seriously injured, or threatened with serious injury. The Trade Act

does not expressly define the term "serious injury," but instead sets forth certain guidelines in the form of economic factors to be used in determining whether the criterion is satisfied. Thus, section 201(b)(2) provides that the Commission, in determining whether "serious injury" exists, should take into account all economic factors which it considers relevant, including but not limited to--

(1) the significant idling of productive facilities in the industry;

(2) the inability of a significant number of firms to operate at a reasonable level of profit; and

(3) significant unemployment or underemployment within the industry.

Capacity and production data reported by domestic producers to the Commission indicate that refinery capacity utilization fell from 80 percent in 1973 to 65 percent in 1975, increased to 71 percent in 1976, but then fell to 76 percent in 1977. Domestic refining capacity has expanded by one-third in the last 20 years, increasing from 2.1 million tons in 1958 to 2.9 million tons in 1977. U.S. refining capacity is substantially greater than smelter or mine capacity (both about 2.1 million tons). In the past this "excess" refining capacity relied on scrap and imported blister copper.

U.S. producers suffered operating losses of $70 million in 1975 and $123 million in 1977 on their domestic copper mining, smelting, and refining operations; a profit of $78 million was realized in 1976. As a share of net sales, net profit or loss before income taxes showed a loss of 2.7 percent in 1975, a profit of 3.7 percent in 1976, and a loss of 5.0 percent in 1977.

The average number of production workers employed in refining operations fell without interruption during 1975-77, averaging 4,734 workers during 1977. Average employment in January-March 1978 was 4,874 workers, or about 3 percent

more than during 1977. Man-hours worked in refining operations showed a steady decline from 14.3 million in 1973 to 9.7 million in 1977.

I conclude from the above economic factors, as well as others that I have considered (e.g., production, shipments, inventories, and prices), that the domestic industry is being injured within the meaning of the statute. However, it should be noted that the injury did not occur continuously throughout the years analyzed, but rather in two distinct periods--i.e., in 1975 and again in 1977 and the first part of 1978. All economic indicators revealed the domestic industry to be profitable in 1976 and recovering from losses suffered during 1975; however, the domestic industry again posted losses in 1977.

Substantial cause

The Trade Act contains both a definition of the term "substantial cause" and certain criteria to be considered by the Commission in determining whether increased imports are a substantial cause of the requisite serious injury. Section 201(b)(4) of the Trade Act defines the term "substantial cause" to mean "a cause which is important and not less than any other cause." The guidelines to be considered by the Commission with regard to substantial cause are contained in section 201(b)(2)(c), which states that in making its determination the Commission shall take into account all economic factors which it considers relevant, including (but not limited to)--

> An increase in imports (either actual or relative to domestic production) and a decline in the proportion of the domestic market supplied by domestic producers.

The Committee on Finance report on the bill which was to become the Trade Act with respect to the question of substantial cause states:

> The Committee recognizes that "weighing" causes in a dynamic economy is not always possible. It is not intended that a mathematical test be applied by the Commission. The

> Commissioners will have to assure themselves that imports represent a substantial cause or threat of injury, and not just one of a multitude of equal causes or threats of injury. 1/

After considering all of the relevant economic factors, I find that increased imports, even if an important cause of any injury or threat thereof, are a less important cause than at least one other cause. Hence, I find that the "substantial cause" criterion is not satisfied.

The injury suffered by the domestic industry occurred in two separate and distinct periods, and in my opinion it is necessary to consider any causal relationship between such injury and increased imports separately during those two periods in question. As indicated previously, 1975 was the first year analyzed in which the domestic industry suffered serious injury. However, it is obvious that this injury was not caused by increased imports, inasmuch as imports of refined copper in that year amounted to only 142,000 tons--the lowest quantity since 1970.

The next year, 1976, was one in which the domestic industry evidenced recovery from the nonimport-related injury suffered during 1975. It should be noted that this recovery occurred despite a large increase in imports of refined copper--from 142,000 tons in 1975 to 381,000 tons in 1976.

The second period in which the domestic industry suffered serious injury encompasses 1977 and the first few months of 1978. However, I am again unable to find evidence that increased imports are the substantial cause of this injury. Despite an increase in imports of only 6,000 tons in 1977, the industry went from an operating profit of $78 million in 1976 to an operating loss of $123 million in 1977. Certainly this changing profitability cannot be attributable to the

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1/ Trade Reform Act of 1974: Report of the Committee on Finance . . ., S. Rept. No. 93-1298 (93d Cong., 2d sess.), 1974, p. 120.

small increase in imports, but to the overall cyclical nature of the industry aggravated by labor strikes occurring at most U.S. copper-producing facilities during 1977, and an apparent lack of feedstocks at certain refineries whose operations have depended in large measure on imported blister copper. In my opinion, the small increase in imports was less important in causing injury to the domestic industry than the cyclical nature of the industry.

The cyclical nature of the domestic market for refined copper has been recognized in past actions of the Federal Government designed to combat shortages and rising prices in the United States. For example, a series of public laws temporarily suspending the column 1-a import duty on unalloyed unwrought copper (as well as duties on copper-bearing ores, concentrates, precipitates, and blister copper) expired on June 30, 1975. With the exception of the period July 1972 to June 1973, the duty had been suspended since 1966. A second example was the disposal in 1974 of virtually all refined copper held in the national stockpile.

Estimates of the loss of domestic output of copper attributable to the effect of strikes in mid-1977, which typically lasted about 2 months, vary considerable. However, even if only 1 week's output of refined copper was lost because of these strikes--about 36,000 tons based on aggregate refinery production of 1,868,000 tons in 1977--this lost output would still have been six times as large as the increase in imports in 1977.

In addition, there has been a decline in the availability of imported feedstocks, principally blister copper, for use by domestic refineries. As indicated earlier, U.S. refining capacity is substantially greater than domestic smelting or mining capacity. In the past, imports of copper-bearing ores, concentrates, and blister copper have been used by certain domestic refineries to supplement materials of domestic origin. However, the increase in recent years

in the capability of developing countries to refine their own mine and smelter output has led to a shortage of feedstocks at such domestic refineries.

U.S. imports of blister copper fell from 208,000 tons in 1974 to 45,000 tons in 1977. This drop in imported materials for refining at domestic facilities was almost twice as large as the increase in U.S. imports of refined copper during the same period. Although U.S. production of refined copper from domestic primary materials remained virtually unchanged in 1977 from the level in 1974 and 1976 (1.4 million tons), refinery output from imported primary materials fell steadily from 234,000 tons in 1974 to 85,000 tons in 1977.

Domestic producers have played a significant role in accounting for increased imports. Increased imports by domestic producers or their affiliates accounted for a substantial and growing portion of total U.S. imports of unalloyed unwrought copper during 1973-77. Such captive imports rose from * * * * in 1973 (equivalent to ** percent of total imports) to * * * * in 1977 (equivalent to almost ** percent of total imports).

Since the worldwide recession in 1975, supplies of refined copper have been relatively abundant, and prices--both in the United States and abroad--have tended to be below levels that would permit "normal" profits. However, this condition is not unusual for a highly cyclical industry recovering from a severe recession. The record shows that domestic prices reflect worldwide market conditions; if a significant difference in U.S. producers' prices and world prices persists, the U.S. producers' price tends to move toward the world level.

It would appear that the domestic industry would recover during the 5-year period for which the Commission has recommended quantitative restrictions. Prices of copper are stable and show signs of increasing shortly. Domestic shipments are likely to recover with the overall recovery in the economy. In my opinion,

even aside from the Commission's recommendation, copper prices should rise substantially and the domestic industry should again return to profitability during the period covered by the Commission's recommendation.

On the basis of the factors set forth above, I have determined that increased imports are not a substantial cause of serious injury or the threat thereof to the domestic industry within the meaning of section 201 of the Trade Act of 1974.

INFORMATION OBTAINED IN THE INVESTIGATION

Summary

Investigation No. TA-201-32 was instituted by the Commission following receipt on February 23, 1978, of a petition filed by counsel on behalf of 12 domestic producers of copper. The petitioners allege that "increased quantities of refined copper being imported into the United States are causing and threatening serious injury to the domestic copper mining, smelting and refining industry." The term "refined copper," which is not defined in the Tariff Schedules of the United States (TSUS), is the generally accepted commercial term for unalloyed copper having a purity of about 99.9 percent or greater in such unwrought forms as cathodes, wirebars, ingots, cakes, and billets. The imported article covered in the scope of this investigation is unwrought copper, other than alloyed, provided for in TSUS item 612.06.

About four-fifths of the domestic supply of refined copper in recent years has been from primary sources and the remainder from scrap. The production of primary refined copper generally involves four basic steps: Mining ore typically containing less than 1 percent copper from open-pit mines; milling the ore to remove a substantial part of the waste material and produce a concentrate containing about 25 percent copper; smelting the concentrates to produce 98 to 99 percent pure blister copper; and refining blister copper to yield 99.9 percent pure refined copper. Copper's greatest use--accounting for about half of U.S. consumption--is in electrical applications such as motors, generators, transformers, switchgear, industrial controls, communication equipment, and house wiring. Other uses include building construction, heat exchangers, ordnance, chemicals and inorganic pigments, coinage, watches and clocks, jewelry, and a host of miscellaneous uses.

Copper-bearing ores are mined in 17 States; Arizona produced 61 percent of the domestic mine output of recoverable copper in 1977. In that year the largest 25 mines, operated by 12 firms, produced 93 percent of aggregate mine output. Concentrates were processed by 9 firms operating 17 primary smelters. Nineteen firms operated 25 refineries and electrowinning plants. All of the leading domestic copper producers are integrated from mining through refining, and also have their own fabricating facilities and marketing organizations. Some smaller firms mine and mill ore and then sell the concentrates to other producers for custom smelting and refining, or ship the concentrates to certain producers that process materials for a fee (toll) and then return the resulting product to its owner for further processing or marketing.

With the exception of 1975, U.S. imports of unalloyed unwrought copper have increased each year since 1969, reaching a 9-year high of 387,000 tons in 1977. During 1973-77, imports rose at an average annual rate of 17 percent. The ratio of imports to domestic production increased irregularly from 8.8 percent in 1973 to 20.7 percent in 1977. Three major suppliers accounted for 70 percent of total imports during 1973-77--Canada (36 percent), Chile (19 percent), and Zambia (15 percent). Other important suppliers included Peru, Yugoslavia, Japan, Belgium, Netherlands, and West Germany.

U.S. mine, smelter, and refinery production of copper exhibited similar downward trends during 1973-77, falling from record or near-record levels from 1973 to 1975, recovering somewhat in 1976, but then again declining in 1977. Production of refined copper in 1977 was 1.9 million tons, a decline of about 2.5 percent from the previous year; three-quarters of the total was produced from domestic primary materials, 5 percent from imported primary materials and the remaining 20 percent from scrap.

The rate of utilization of domestic capacity to produce refined copper fell from 80 percent in 1973 to 65 percent in 1975, rose to 71 percent in 1976, but then fell again in 1977 to 66 percent. U.S. producers' shipments followed the same trend as production, falling from 1973 to 1975, rising in 1976 to a level about the same as 2 years earlier, but then slipping again in 1977. U.S. producers' shipments of refined copper in 1977 were valued at about $2.2 billion, a decline of 12 percent from the previous year.

U.S. exports of refined copper have fallen off sharply in the past few years; exports dropped from 186,000 tons in 1973 to 52,000 tons in 1977. Exports in the latter year were equivalent to less than 3 percent of domestic production. U.S. producers' yearend inventories of refined copper rose without interruption from 1973 to 1977, reaching 316,000 tons by the end of the latter year. Total yearend inventories of refined copper held in the United States likewise increased during 1973-77, reaching 774,000 tons by the end of the period.

The total number of employees engaged in producing copper--from mining through refining--declined without interruption from 60,200 in 1974 to 48,200 in 1977. The average number of production workers employed in refining operations fell from 6,612 in 1974 to 4,734 in 1977, but recovered somewhat to 4,874 in January-March 1978. The trend in the number of man-hours worked by such employees was similar. Since January 1, 1975, the U.S. Department of Labor has certified some 14,000 workers engaged in copper mining, smelting, and refining operations eligible to apply for adjustment assistance under chapter 2 of the Trade Act of 1974.

U.S. producers' prices for refined copper were less than world prices (i.e., those prevailing on the London Metal Exchange, or LME) during 1973 and the first half of 1974, but the reverse has since been true. Sharp increases in prices in 1973 and the first half of 1974 resulted chiefly from a combination of worldwide economic growth and supply shortages occasioned by strikes and political instability in some supplying countries. The generally weak level of demand that has persisted since mid-1974, plus the failure of some producing countries to trim output in line with demand, led to record levels of world stocks by the end of 1977. The buildup of stocks during 1975-77 consequently exerted pressure in forcing down prices, both in the United States and abroad, to levels substantially less than those prevailing during 1973 and 1974.

U.S. producers realized net operating profits on their domestic copper mining, smelting, and refining operations of $658 million in 1973 and $620 million in 1974, faring quite well in both years in comparison with the financial performance of most domestic firms engaged in mining and manufacturing.

During 1975-77, however, domestic producers did much worse on such operations on copper than most mining and manufacturing firms, reporting operating losses in both 1975 ($70 million) and 1977 ($123 million). As a percentage of net sales, net profit or (loss) before income taxes was: 1973--25.6 percent, 1974--23.3 percent, 1975--(2.7) percent, 1976--3.7 percent, and 1977--(5.0) percent.

U.S. consumption of refined copper dropped by over one-third in a 2-year span, from a peak of 2.4 million tons in 1973 to a 15-year low of 1.5 million tons in 1975. The reduced level of consumption in the latter year reflected the slump in building construction, automobile production, production of electrical and electronic items, and activity in other principal industries that consume refined copper. Since 1975, consumption has again risen and in 1977 amounted to 2.2 million tons, approximately the same as in 1974. The ratio of imports to consumption rose irregularly from 8.4 percent in 1973 to 17.7 percent in 1977.

In addition to imports, a number of other possible substantial causes of any serious injury, or threat thereof, that the domestic industry may have suffered have been frequently mentioned. Most prominent of these are cyclical fluctuations in economic activity, the impact of U.S. environmental regulations on the domestic industry, the substitution of various other materials (e.g., aluminum) for copper, and increased domestic production costs occasioned by declining ore bodies and rapidly increasing labor costs.

Introduction

Following receipt on February 23, 1978, of a petition filed on behalf of the Anaconda Co., Asarco, Inc., Cities Service Co. (Minerals Group), Copper Range Co., Cyprus Mines Corp., Duval Corp., Hecla Mining Co., Inspiration Consolidated Copper Co., Kennecott Copper Corp., Magma Copper Co., Phelps Dodge Corp., and Ranchers Exploration and Development Corp., the United States International Trade Commission, on March 17, 1978, instituted an investigation under section 201(b) of the Trade Act of 1974 to determine whether unwrought copper, other than alloyed, provided for in item 612.06 of the Tariff Schedules of the United States, is being imported into the United States in such increased quantities as to be a substantial cause of serious injury, or the threat thereof, to the domestic industry producing an article like or directly competitive with the imported article.

Notice of the institution of the investigation and of the public hearing to be held in connection therewith was posted at the Commission's offices in Washington, D.C., and New York City and published in the Federal Register of March 23, 1978 (43 F.R. 12130). 1/ Announcement of the time and place of the public hearing was subsequently published in the Federal Register of April 7, 1978 (43 F.R. 14748). The hearing was held in Tucson, Ariz., on May 22-24, 1978. The information in this report was obtained from fieldwork; questionnaires sent to domestic producers, importers, and consumers; the Commission's files; information obtained at the public hearing; briefs submitted by interested parties; and from other Government agencies.

Description and Uses

The petitioners in this investigation allege that "increased quantities of refined copper being imported into the United States are causing and threatening serious injury to the domestic copper mining, smelting and refining industry." 2/ The term "refined copper," which is not defined in the TSUS, is the generally accepted commercial term for unalloyed copper having a purity of about 99.9 percent or greater in such unwrought forms as cathodes, wirebars, ingots, cakes, and billets. It does not include copper that has been rolled, drawn, forged, extruded, or otherwise processed into fabricated (wrought) forms such as rod, wire, sheet, strip, pipe, or tube.

The broadest commercial classification of refined copper is related to the refining method used. Electrolytic copper is obtained by electrolytic deposition, fire-refined copper is obtained from smelter copper using only a pyrometallurgical process, and electrowon copper is deposited directly as a

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1/ Copies of the Commission's notices concerning the investigation and hearing are presented in app. A.

2/ "Petition on behalf of the principal domestic copper producers under section 201 of the Trade Act of 1974 and subpart b of part 206 of the Rules of Practice and Procedure of the United States International Trade Commission for temporary import relief from serious injury substantially caused and threatened by increased imports of refined copper," Feb. 23, 1978, p. 1.

cathode from copper-bearing solutions obtained by leaching copper-bearing material and then increasing the copper concentration by ion exchange. Refined copper may also be classified according to its source, that is, primary or secondary. Primary copper refers to that obtained from copper-bearing ores or virgin sources, and secondary copper refers to that obtained from scrap. About four-fifths of the domestic supply of refined copper in recent years has been from primary sources and the remainder from scrap.

Primary copper

The production of primary refined copper generally involves four basic steps: Mining ore typically containing less than 1 percent copper, milling the ore to remove a substantial part of the waste material and produce a concentrate containing about 25 percent copper, smelting the concentrates to produce 98 to 99 percent pure blister copper, and refining blister copper pyrometallurgically or electrolytically to yield 99.9 percent pure copper (fig. 1). A minor portion of the refined copper is produced by hydrometallurgical processes that eliminate the smelting step.

Mining.--In recent years, open-pit mines have accounted for about 90 percent of the copper-bearing ore mined in the United States and 80 percent of the copper recovered from the ore. Open-pit ore excavation consists of drilling, blasting, loading, and transporting the ore to the mill. Most of the underground mining of copper is done using caving or supported-stope techniques. There are two main types of copper-bearing ores, sulfides and oxides, and each requires a different metallurgical extraction process. A third type of ore--native copper, in which the copper occurs in metallic form--accounts for only a very small portion of U.S. mine production.

Milling.--Since the ore obtained from most mines is quite low in copper content, currently about 0.5 percent in the United States, it is treated to remove a portion of the waste materials before further processing. This operation, called milling or beneficiation, first involves crushing, grinding, and sizing the ore. Most ores produced, both domestically and abroad, are sulfides which, after sizing, are passed through a series of aerated water cells to which a frothing agent and chemical reagent (collector) are added. Air circulated continuously through the flotation cell creates a froth to which the copper sulfide adheres. Waste material (gangue) settles to the bottom of the cell, while the copper-containing froth is removed and dried to yield a concentrate containing from 10 to 35 percent copper. Oxide ores not amenable to flotation are leached with dilute sulfuric acid to dissolve the copper. The copper is then recovered in metallic form from the pregnant leach solution by the addition of scrap iron, which causes the chemical precipitation of the copper (cementation), or by electrolytic precipitation of copper from copper sulfate leach solutions using insoluble anodes (direct electrowinning). Mill facilities are normally located near mines, and concentrates and precipitates are considered mine production and measured in terms of their recoverable copper content.

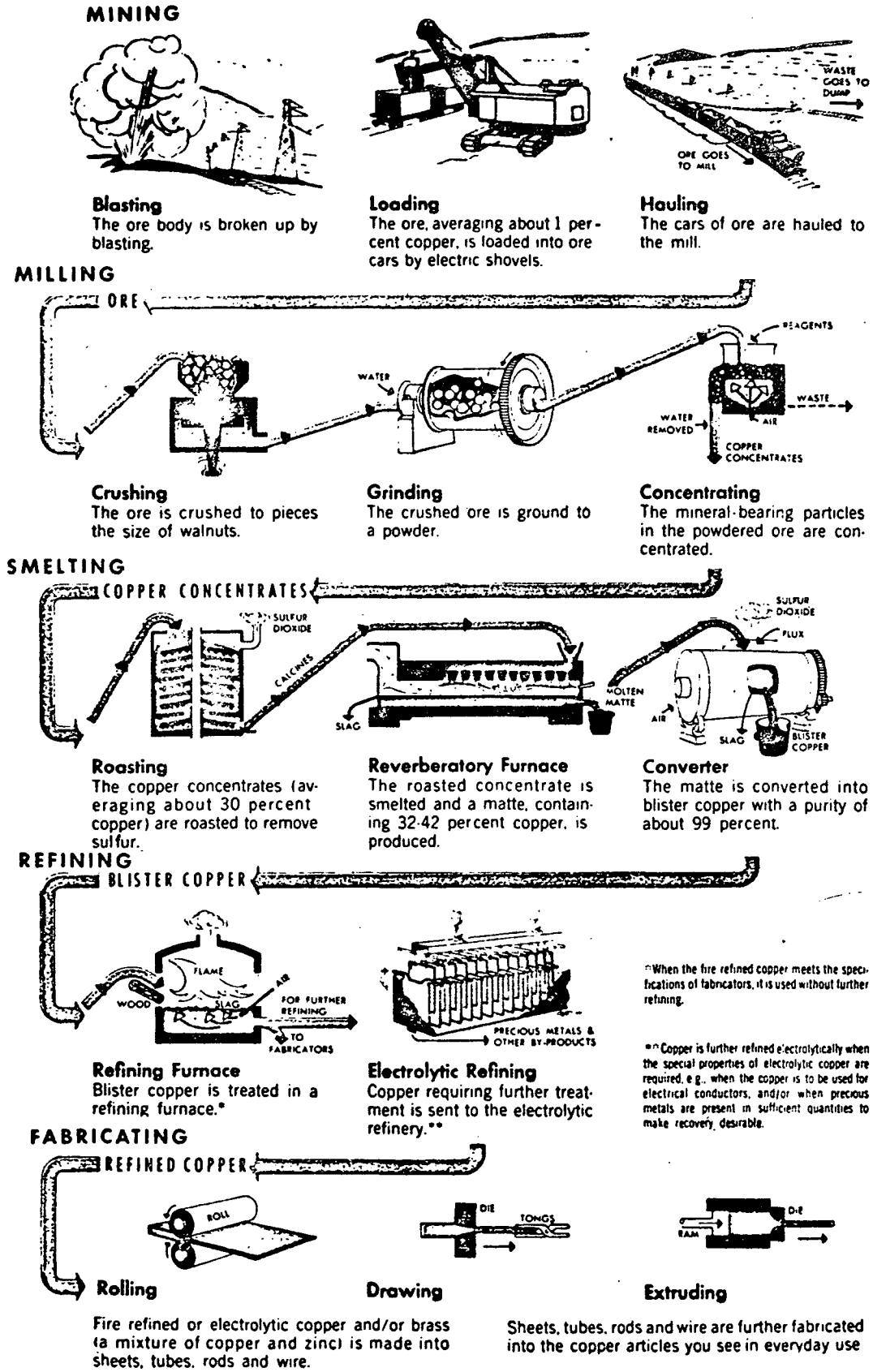


FIGURE 1.—Basic Steps—Copper Ore to Finished Product.

(Courtesy, Kennecot Copper Corp.)

Smelting.--Smelting, which is concerned with the substantial removal of unwanted sulfur and metallic impurities from the concentrated ore, is generally accomplished by melting the concentrates and suitable fluxes in a reverberatory furnace. Some domestic smelters, chiefly custom or toll smelters whose feed materials can vary widely in composition, roast the concentrates prior to charging into the furnace in order to eliminate some of the sulfur and other impurities such as arsenic. In the reverberatory furnace the lighter impurities float to the top and are skimmed off as slag, while the copper and heavier impurities form a matte which is drawn off the lower part of the furnace. The molten matte, typically containing 35 to 45 percent copper, is transferred to a converter where air flowing through the matte burns off the sulfur, oxidizes the iron for removal as slag, and yields 98 to 99 percent pure blister copper. Blister copper is then removed from the converter and either subjected to additional fire refining or, more generally, cast into copper anodes for electrolytic refining.

Refining.--The blister or anode copper produced by smelting is too impure for most uses and requires refining before use. The great bulk of the U.S. output of blister copper is electrolytically refined. The copper anodes and thin copper starting sheets (functioning as cathodes) are suspended alternately in tanks containing a solution of copper sulfate and sulfuric acid. When an electric current is applied, copper in the anodes dissolves and is deposited in refined form on the cathodes. The impurities in the anode copper remain in the electrolytic solution or fall to the bottom and form a sludge from which any valuable constituents can subsequently be recovered. After the plating cycle is complete, the 99.9 percent pure copper cathodes are removed from the tank and either sold as such or cast into commercial refinery shapes--chiefly wirebars, but also billets, cakes, and ingots--and shipped to fabricating mills for conversion into rod, wire, pipe and tube, sheet and strip, or other semi-manufactured products.

About 99 percent of the domestic production of copper is from ore mined primarily for its copper content. However, the production process yields significant quantities of byproducts, such as molybdenum (during concentration), arsenic and sulfur (during smelting), and gold, silver, platinum, palladium, selenium, and tellurium (during electrolytic refining). The production process also generates large quantities of solid wastes--as strippings at the mine, tailings at the concentrator, and slag at the smelter. Moreover, if not captured, sulfur compounds and particulate matter escape into the atmosphere during smelting.

Secondary copper

Copper recovered from copper scrap, copper-alloy scrap, and other copper-bearing scrap materials as refined metal, as copper alloys without separation of the copper (e.g., brass ingots), or as copper compounds (e.g., copper sulfate) is known as secondary copper. Secondary refined copper is physically equivalent to a corresponding grade of primary refined copper. Secondary copper is recovered from both old and new scrap. However, only copper recovered from old scrap--consisting of metal articles that have been discarded after serving a useful purpose--is considered part of the total supply. As noted by the U.S. Bureau of Mines: 1/

1/ U.S. Department of the Interior, Bureau of Mines, Copper, A Materials Survey, by A. D. McMahon, IC 8225, 1965, p. 75.

> The new scrap generated in fabricating and manufacturing semifinished and finished products from primary copper and copper-base-alloy forms does not form a reservoir supply to supplement production of primary copper. . . . Such scrap represents a circulating quantity of copper previously accounted for as supply of primary copper and returned to the fabricating process without reaching the product stage.

Uses

About 98 percent of the domestic output of refined copper is consumed by rod and wire mills (69 percent) and brass mills (29 percent) in the fabrication of other copper and copper-base alloy products. Other major consumers include foundries, secondary smelters, and chemical plants. Copper is used both in unalloyed form, predominantly for drawing wire, and in alloyed form--chiefly for rolling, extruding, and forging brass and bronze products.

The principal end-use markets for copper are electrical and electronic products, building construction, consumer and general products, industrial machinery and equipment, and transportation. Because of copper's high electrical conductivity, its greatest use--accounting for about half of domestic consumption--is in electrical applications such as motors, generators, transformers, switchgear, industrial controls, communication equipment, weapons systems, and house wiring. Copper is widely used in underground power transmission lines and still dominates the smaller gage wire market, but aluminum has replaced copper in high-voltage overhead power transmission lines.

Because of their resistance to corrosion, copper and its alloys are used extensively in building construction applications such as roofing, plumbing pipe and fixtures, hardware, and functional decorative uses. Copper is also used for tubing and valves in distillation plants for seawater desalination, and in condensers of power-generating stations. It is used in producing consumer appliances such as washing machines, air conditioners, refrigerators, record players, radios, and television sets. Copper is also widely used in nonelectrical industrial machinery, farm machinery, and tubing for heat exchangers in commercial air conditioners, refrigerators, and freezers.

Copper is used by the transportation industry in producing such items as air conditioners, power equipment (windows, seats, brakes, and steering), radiators, heaters and defrosters, bearings, bushings, oil lines, wiring, and switches. It is also used in aircraft, marine equipment, diesel locomotives, railroad passenger cars, and switching and signal devices.

Other uses include ordnance applications (shell casings, fuse components, and fire-control equipment), chemicals and inorganic pigments, watches, clocks, microscopes, gages, and projectors. Conversion of U.S. coins from silver alloy to silver-clad copper has increased consumption of copper. Copper and its alloys brass and bronze are used in utensils, jewelry, furnishings, and decorative items.

U.S. Tariff Treatment

U.S. imports of refined copper are entered under TSUS item 612.06, which provides for unwrought copper, other than cement copper and copper precipitates (TSUS item 612.02), black copper, blister copper, and anode copper (item 612.03), and nickel silver (item 612.05). 1/ In schedule 6, part 2, subpart C of the TSUS--which provides for copper--rate-of-duty column 1 has been divided into two columns, viz., 1-a and 1-b. The rates of duty in column 1-a apply when the market price of copper is 24 cents or more per pound, and the rates of duty in column 1-b apply when the market price of copper is under 24 cents per pound. 2/ The current column 1 rates of duty on imports of refined copper are 0.8 cent per pound (1-a) and 1 cent per pound (1-b) on the copper content; the column 2 rate of duty is 4 cents per pound on the copper content.

The column 1 rates of duty have been in effect since January 1, 1972, when the final stage of the concessions granted in the Kennedy round under the General Agreement on Tariffs and Trade became effective; the rates of duty prior to 1968 were 1.7 cents per pound (1-a) and 2 cents per pound (1-b) on the copper content. Inasmuch as the market price for refined copper has not been under 24 cents per pound for more than 25 years, the effective column 1 rate of duty is 0.8 cent per pound on the copper content. This was equivalent in 1977 to an ad valorem rate of duty of 1.3 percent.

A series of public laws temporarily suspending the column 1-a import duty on unwrought copper (as well as those on copper-bearing ores, concentrates and precipitates, and blister copper) expired on June 30, 1975. With the exception of the period July 1972-June 1973, the duty had been suspended since January 1966. This series of duty suspension also incorporated provisions for automatically revoking the suspension if the market price of copper exceeded certain levels, for example, 51 cents per pound during the latest suspension period. A series of similar suspensions of the duty on copper waste and scrap was extended until June 30, 1978.

On January 1, 1976, copper classifiable under TSUS item 612.06 from countries designated as beneficiary developing countries for the purposes of the Generalized System of Preferences (GSP) became eligible for duty-free treatment. Effective March 1, 1978, imports of such copper from Chile, Peru, and Zambia were not eligible for GSP treatment, having exceeded the maximum value allowed for imports under any one item during the previous year. 3/

1/ Item 612.06 is divided for statistical purposes into 3 numbers; 612.0610 and 612.0630 are for alloyed copper, and 612.0640 is for other copper (i.e., unalloyed unwrought copper).

2/ The market price of copper is "the average market price per pound for one calendar month of electrolytic copper in standard shapes and sizes, delivered Connecticut Valley, as determined by the United States International Trade Commission and reported to the Secretary of the Treasury in accordance with procedures set forth" in the TSUS.

3/ During Jan. 1, 1976-Feb. 28, 1976, imports from Chile and Yugoslavia were excluded from GSP treatment; during Feb. 29, 1976-Feb. 28, 1977, only Chile was excluded; and during Mar. 1, 1977-Feb. 28, 1978, Chile, Peru, Zambia, and Yugoslavia were excluded.

Several bills aimed at assisting domestic producers of copper by increasing the tariffs on copper and excluding copper from GSP treatment have been introduced in Congress within the past year, but no legislation has been passed. A summary of the various bills introduced is contained in appendix B.

U.S. Producers

The domestic copper industry is generally segmented into primary and secondary sectors on the basis of whether the copper produced has originated from mined copper or from scrap. Firms in the primary sector would include those which mine copper-bearing ores and process them into concentrates and precipitates, smelt concentrates and precipitates into blister copper, and produce refined copper either from blister copper or directly from precipitates. Firms in the secondary sector would include those which obtain blister and refined copper predominantly from scrap, or process scrap copper into alloyed forms such as brass and bronze ingots, castings, and brass mill products. A number of primary producers have the capability to produce secondary copper, but few of the secondary producers have the capability to produce primary copper. 1/

Primary sector

By the above criterion, based on the copper's source, the primary sector consists principally of the 12 petitioners, which are vertically integrated to different degrees from mining to refining and further into fabricating, plus a larger number of relatively small mining firms. The following list shows, by stages of processing, the activities of each of the petitioners and several other firms in the primary sector:

1/ The principal exception is Amax, Inc. Although Amax has integrated backward into domestic mining in recent years and currently produces copper concentrates and electrowon copper through Anamax Mining Co. (in equal partnership with the Anaconda Co.), it can be considered a secondary producer because most of its smelter inputs are believed to be in the form of scrap. Cerro-Marmon Corp. and a few other copper refiners can also be classified in the secondary sector on the basis that their inputs are mostly in the form of scrap and, in some cases, imported blister.

Firm	Mining	Smelting	Refining	Fabricating
Petitioners:				
Anaconda	Yes	Yes	Yes	Yes
Asarco	Yes	Yes	Yes	Yes
Cities Service	Yes	Yes	Yes	Yes
Copper Range	Yes	Yes	Yes	Yes
Cyprus	Yes	No	Yes	Yes
Duval	Yes	Yes 1/	No	No
Hecla	Yes	No	Yes	No
Inspiration	Yes	Yes	Yes	Yes
Kennecott	Yes	Yes	Yes	Yes
Magma	Yes	Yes	Yes	Yes
Phelps Dodge	Yes	Yes	Yes	Yes
Ranchers	Yes	No	Yes	No
Others:				
Anamax Mining Co	Yes	No	Yes	No
Eagle Picher Industries	Yes 2/	No	No	No
Earth Resources Co	Yes 2/	No	No	No
Federal Resources Co	Yes 2/	No	No	No
McAlester Fuel Co	Yes 2/	No	No	No
Southwire Co	No	Yes	Yes	Yes
U.V. Industries, Inc	Yes	No	No	Yes

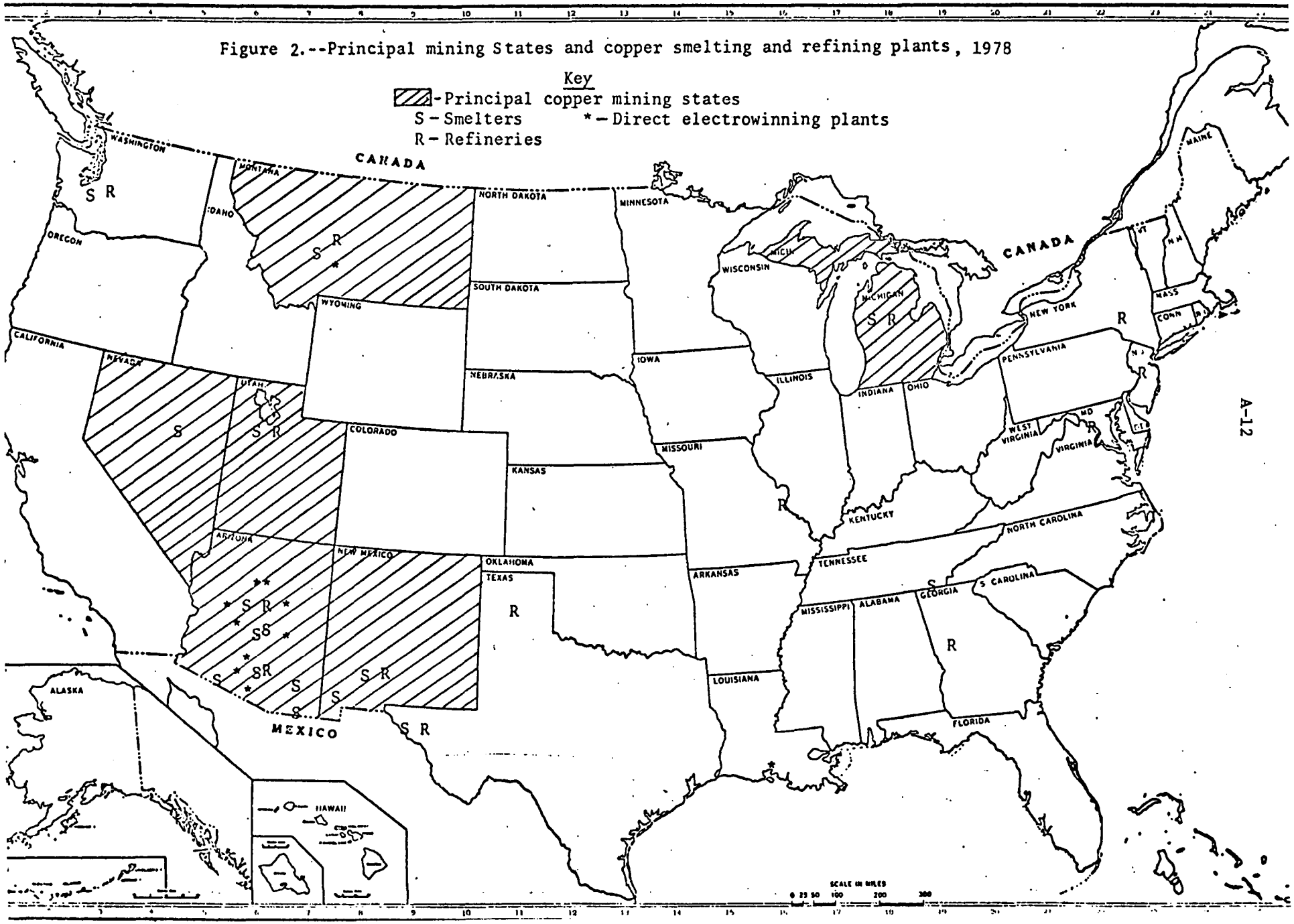
1/ High-grade blister copper produced by a hydrometallurgical process.
2/ Currently not producing copper.

According to the 1972 Census of Mineral Industries, 110 firms operating 181 establishments were primarily engaged in mining, milling, or otherwise preparing copper ores in that year (the latest for which such data are available). In 1977 the largest 25 mines, operated by 12 firms, produced 93 percent of the domestic mine output of recoverable copper; all but 2 of these mines were operated by 10 of the petitioners. Five mines accounted for 40 percent of aggregate mine output; four firms produced 58 percent of the total.

Copper-bearing ores are mined in 17 States, the largest producers being Arizona, Utah, New Mexico, Montana, Nevada, and Michigan. Arizona produced 61 percent of the domestic mine output of recoverable copper in 1977.

Concentrates were processed in 1977 by 9 firms operating 17 primary smelters. Nineteen firms operated 25 refineries and electrowinning plants. As shown in figure 2, smelters are in the principal mining States except for one each in Texas, Washington, and Tennessee. Almost 40 percent of refining capacity is near primary smelters, with most of the remainder divided between refineries in Texas and the Middle Atlantic States. Virtually all copper-bearing ores are treated by the mine operators at facilities located adjacent to, or near, the mines in order to minimize transportation costs. The value of concentrates is sufficiently high to allow some flexibility in smelter

Figure 2.--Principal mining States and copper smelting and refining plants, 1978



location, but most are near their supplying mills or have ready access to rail or water transportation facilities. Refineries tend to be located anywhere between smelters and fabricators, since the transportation costs for blister and refined copper are about equal.

All of the leading domestic primary copper producers are integrated from mining through refining, and also have their own fabricating facilities and marketing organizations. Some smaller firms mine and mill their ore and then ship the concentrates to other producers for custom and/or toll smelting and refining. Some firms (e.g., Asarco, Phelps Dodge, and Inspiration) purchase ores, concentrates or blister copper for their own-account (custom) smelting and refining, and/or process other producers' materials for a fee (toll) and then return the resulting product to its owner for further processing or marketing.

The production of copper in the United States is relatively highly concentrated, especially at the smelting level. The 12 petitioners account for more than 90 percent of the primary copper mined and smelted in the United States and for about 85 percent of domestic production of refined copper. Three firms (Kennecott, Phelps Dodge, and Asarco) have about 60 percent of U.S. smelting and refining capacity. Five firms (the above three plus Magma and Anaconda) have about 81 percent and 76 percent, respectively, of domestic smelting and refining capacity.

Several domestic producers, through subsidiaries or stock holdings, have interests in copper-producing facilities in Canada, Mexico, Indonesia, Papua New Guinea, Peru, the Republic of South Africa and other countries. In addition to copper and its usual byproducts, some firms also produce aluminum, cadmium, chromium, germanium, vanadium, lead, zinc, asbestos, fluorspar, and fuels.

Secondary sector

About 40 secondary smelters and refineries are involved in the recovery of copper from scrap. The production of refined copper is a relatively minor part of most such firms' overall operations, in comparison with their production of brass and other copper-alloy products. The producers of primary copper are also the principal producers of refined copper from scrap, accounting for about 70 percent of the total. 1/

Channels of Distribution

Although some trading occurs at each stage of the production process, most commercial transactions in copper are conducted between the refining and fabricating stages. As indicated earlier, some 98 percent of the refined

1/ This percentage includes refinery output by Amax, Inc., and the Cerro-Marmon Corp.

copper is processed by the principal fabricators--rod and brass mills. 1/ Other buyers include redraw mills that purchase refined copper and have it processed on toll by the principal fabricators into such products as rod and heavy wire for further fabrication.

A substantial share of the domestic production of refined copper, about 30 percent in 1977, is distributed to rod and brass mills owned by or affiliated with the primary producers. Nine of the 12 petitioners have such fabricating facilities. However, even the large integrated producers with fabricating facilities also sell refined copper--predominantly either directly or through affiliated sales corporations--to independent fabricators and compete actively for business from all buyers. Although most affiliated fabricators obtain the bulk of their requirements from their associated primary producer, they--as well as the independent fabricators--also obtain refined copper from other domestic primary producers, from secondary refiners, from importers, and from metal traders or merchants. These latter firms purchase copper from both foreign and domestic sources and sell either to fabricators or other traders as market conditions warrant. Metal merchants are, in effect, traders that deal in all types of copper products, as well as other metals, and arrange for the refining of numerous small lots of material (e.g., scrap, secondary blister, and the output of small domestic independent mines).

Imported refined copper is marketed through brokers, sales agents, domestic affiliates of foreign producers, some domestic primary and secondary producers, and metal dealers. Imports are not confined to any region of the United States, but are marketed on a nationwide basis. According to import entry documents filed with the U.S. Customs Service, some 90 firms imported unalloyed unwrought copper in 1976 and 1977; however, a substantial number of these firms acted only in the capacity of import brokers. The great bulk of the importations were made by metal traders. Some importations were made by consumers of refined copper, such as wire drawers and coinage manufacturers.

In certain circumstances, refined copper produced by different domestic refiners or held by different metal traders will be "swapped" in order to save shipping costs. For example, a metal trader with copper in the East and a customer in California may arrange with another trader (or even a domestic producer) for the latter to ship its copper to the California customer. In return, the first trader will supply the needs of one of the second trader's (or producer's) customers in the East. This is apparently not a normal practice between importers and domestic producers, but appears to be quite common among metal dealers when both parties can benefit.

1/ Some 60 firms in the United States operate a somewhat larger number of establishments principally engaged in producing wire and brass products from copper.

The Question of Increased Imports

With the exception of 1975, U.S. imports of unalloyed unwrought copper have increased each year since 1969, reaching a 9-year high of 387,000 tons in 1977 (fig. 3). During 1973-77, imports rose at an average annual rate (trend) of growth of 17 percent (see table 1, app. C). 1/ Imports were received from some 36 countries during the last 5 years. However, three major suppliers accounted for 70 percent of the total in this period: Canada (36 percent), Chile (19 percent), and Zambia (15 percent). Other important suppliers included Peru, Yugoslavia, Japan, Belgium, Netherlands, and West Germany (table 2).

Not only has there been an increase in the quantity of imports of unalloyed unwrought copper in recent years, but there has also been an increase relative to domestic production of such copper. As indicated below and in figure 4, the ratio of imports to domestic production increased irregularly from 8.8 percent in 1973 to 20.7 percent in 1977.

Unalloyed unwrought copper: U.S. imports for consumption and production, 1973-77

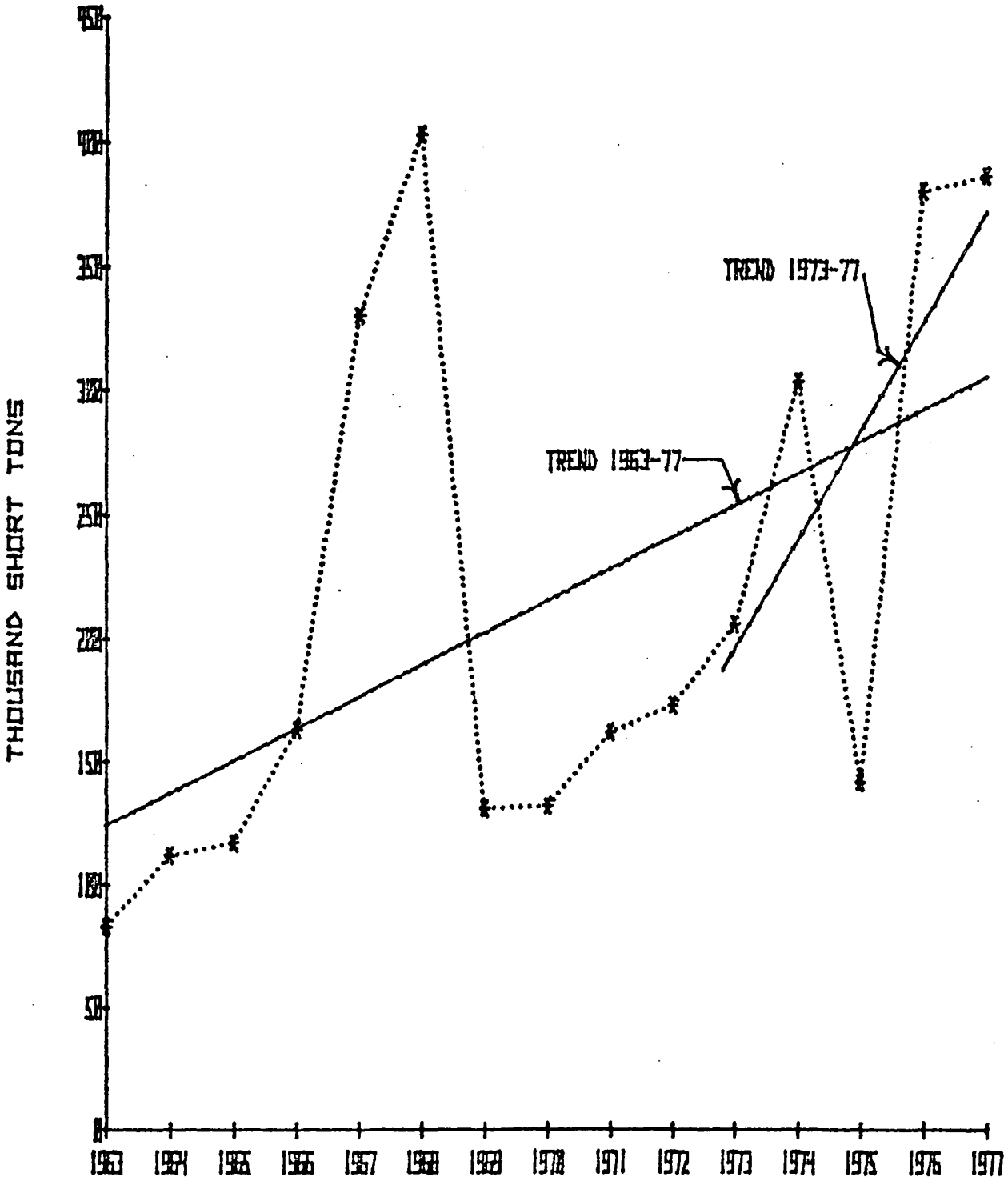
Year	Imports	Production	Ratio of imports to production
	1,000 short tons	1,000 short tons	Percent
1973	206	2,333	8.8
1974	304	2,152	14.1
1975	142	1,787	7.9
1976	381	1,917	19.9
1977	387	1,868	20.7

Source: Compiled from official statistics of the U.S. Department of Commerce and the U.S. Bureau of Mines.

Imports of unalloyed unwrought copper continued to increase during January-May 1978, amounting to 272,000 tons (equivalent to an annual rate of 652,000 tons). The ratio of imports to domestic production rose to 34 percent during this period.

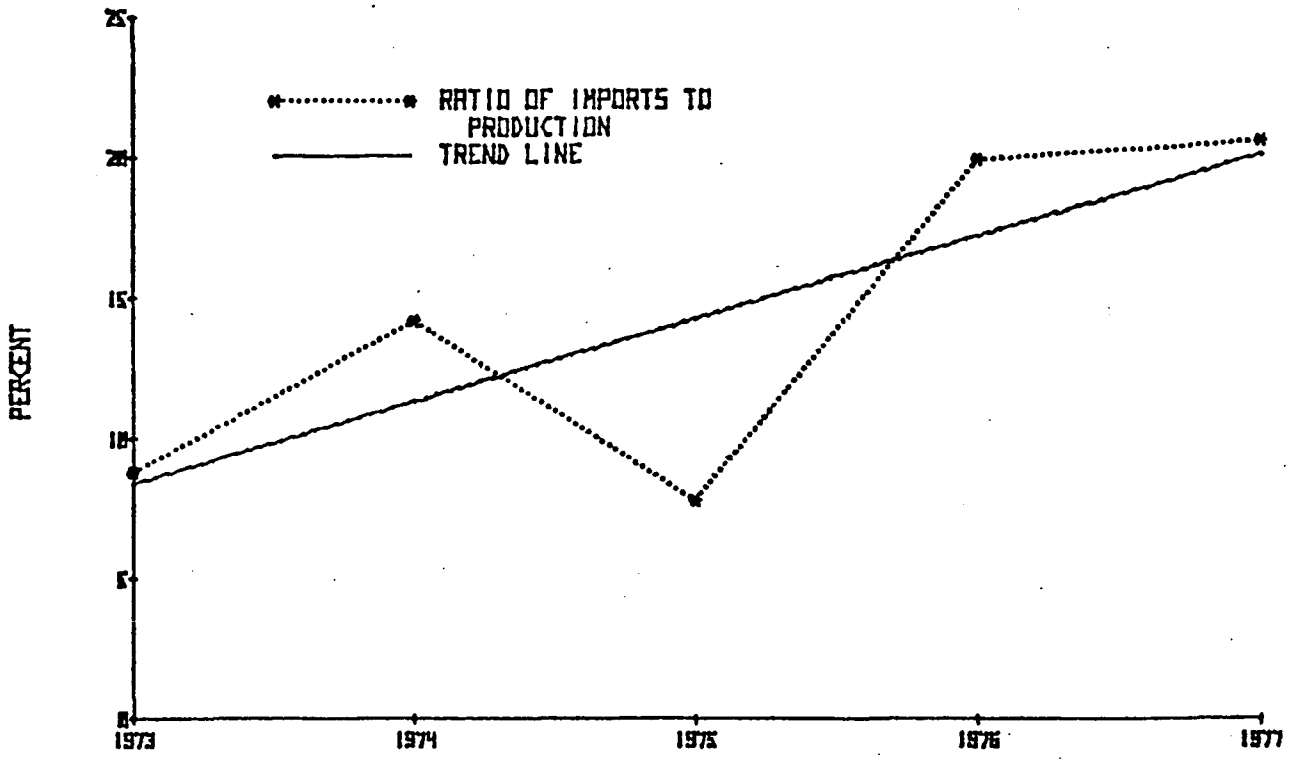
1/ All trend lines shown in this report were fitted by OLS regression. Trend lines fitted over a period encompassing large fluctuations such as those shown in fig. 3 are, of course, crucially dependent upon the period selected. The trend line for 1973-77 shown in fig. 3 is not statistically significant (at the 95-percent confidence level). However, a trend line fitted over the 1969-77 period (not shown) is highly significant ("t" statistic = 3.645); this also corresponds to an average annual rate of growth of 17 percent.

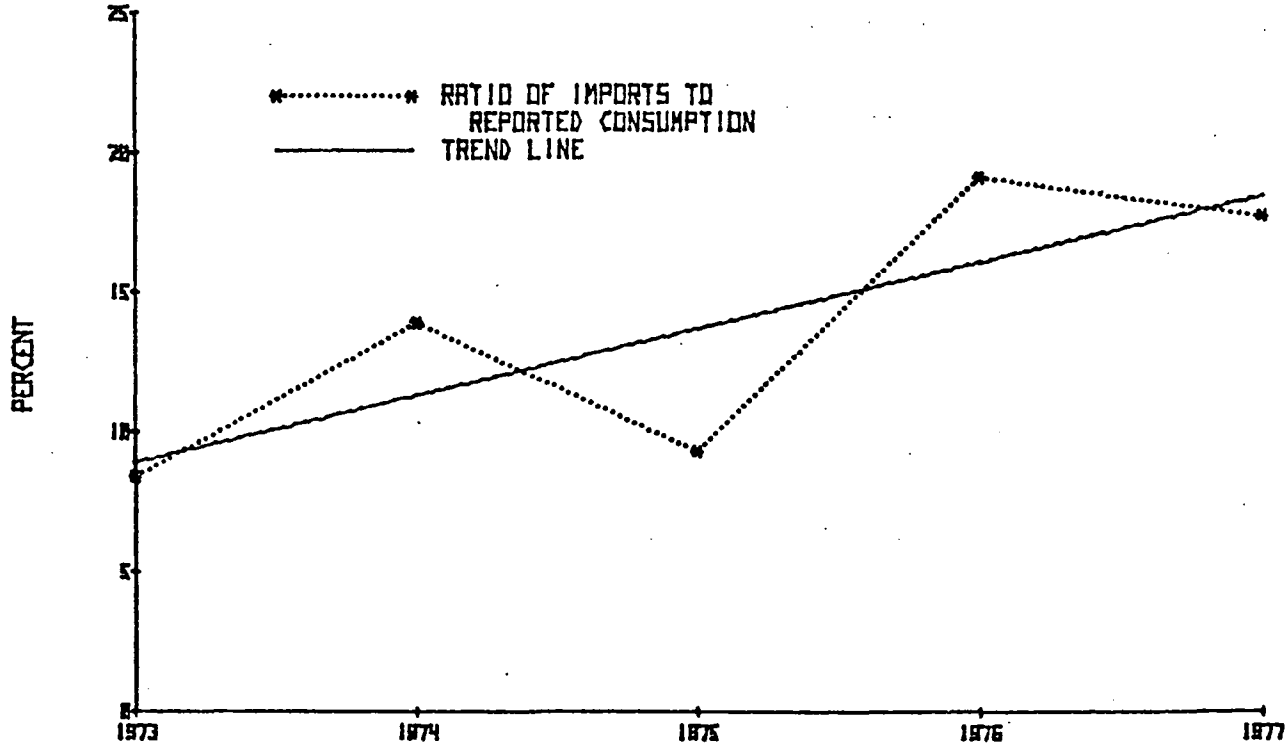
FIGURE 3.—UNALLOYED UNWROUGHT COPPER: U.S. IMPORTS FOR CONSUMPTION, 1963-77



SOURCE: COMPILED FROM OFFICIAL STATISTICS OF THE U.S. DEPARTMENT OF COMMERCE.

FIGURE 4.--UNALLOYED UNWROUGHT COPPER: RATIO OF IMPORTS TO PRODUCTION AND REPORTED CONSUMPTION, 1973-77





SOURCE: TABLE 1.

It was alleged at the Commission's public hearing that a perhaps substantial portion of U.S. imports of unalloyed unwrought copper are entered by, or for the account of, domestic producers or their affiliates that fabricate refined copper into rod, wire, and brass products. In responses to the Commission's questionnaires, the petitioners themselves reported no imports of refined copper during the 1973-77 period. However, consumption of imported unalloyed unwrought copper by petitioners' fabricating affiliates was as follows:

Year	1,000 short tons	Percent of total imports
1973	22	10.7
1974	27	8.9
1975	12	8.5
1976	17	4.6
1977	22	5.8

Several such affiliates also reported purchasing refined copper from U.S. metal dealers, but added that they had no records indicating whether such copper was of domestic or foreign origin. Inasmuch as sales by metal dealers largely involved imported merchandise, however, the quantities shown above should be regarded as minimum consumption of imported unalloyed unwrought copper by affiliates of domestic petitioning producers.

In addition to the above use of imported refined copper by petitioners in their own or their affiliates' fabricating operations, substantial imports were reported by two firms--Amax, Inc., and the Cerro-Marmon Corp.--that, although they did not join the petition, produce refined copper in the United States. As indicated earlier, both firms can be considered as secondary producers, although they produce some primary refined copper from blister. 1/

* * * * * * *

1/ In 1977, Amax, Inc., was the sixth largest domestic producer of refined copper. Including output from its interest in Anamax and toll operations, Amax reported production of about 155,000 short tons of refined copper. Most of its output of refined copper is produced at its refinery in New Jersey, which is believed to use chiefly scrap as a feed source. Production by the Cerro Copper Products Co.'s (a member of the Cerro-Marmon group) refinery in Illinois is considerably smaller--its capacity is about 44,000 tons per year; its intake consists of copper scrap, some refined copper (from both U.S. and foreign producers), and imported blister copper.

* * * * * * *

The Question of Serious Injury to the Domestic Industry

U.S. production

U.S. mine, smelter, and refinery production of copper exhibited similar downward trends during 1973-77, as shown in figure 5. All fell from record or near-record levels from 1973 to 1975, recovered somewhat in 1976, but then decreased again in 1977. Average annual rates of decline for the 5-year period were: Mine production--2.5 percent, smelter production--4.5 percent, and refinery production--5.7 percent. 1/

An alternative method of analyzing U.S. production trends is by comparing output during recent years with the trend over a longer period. Figure 5 shows that, although domestic output of unalloyed unwrought copper (refinery production) showed a trend of slight growth during the 15-year period 1963-77, production during the last 3 years has been substantially below the trend line. 2/ The following tabulation shows production data for that period.

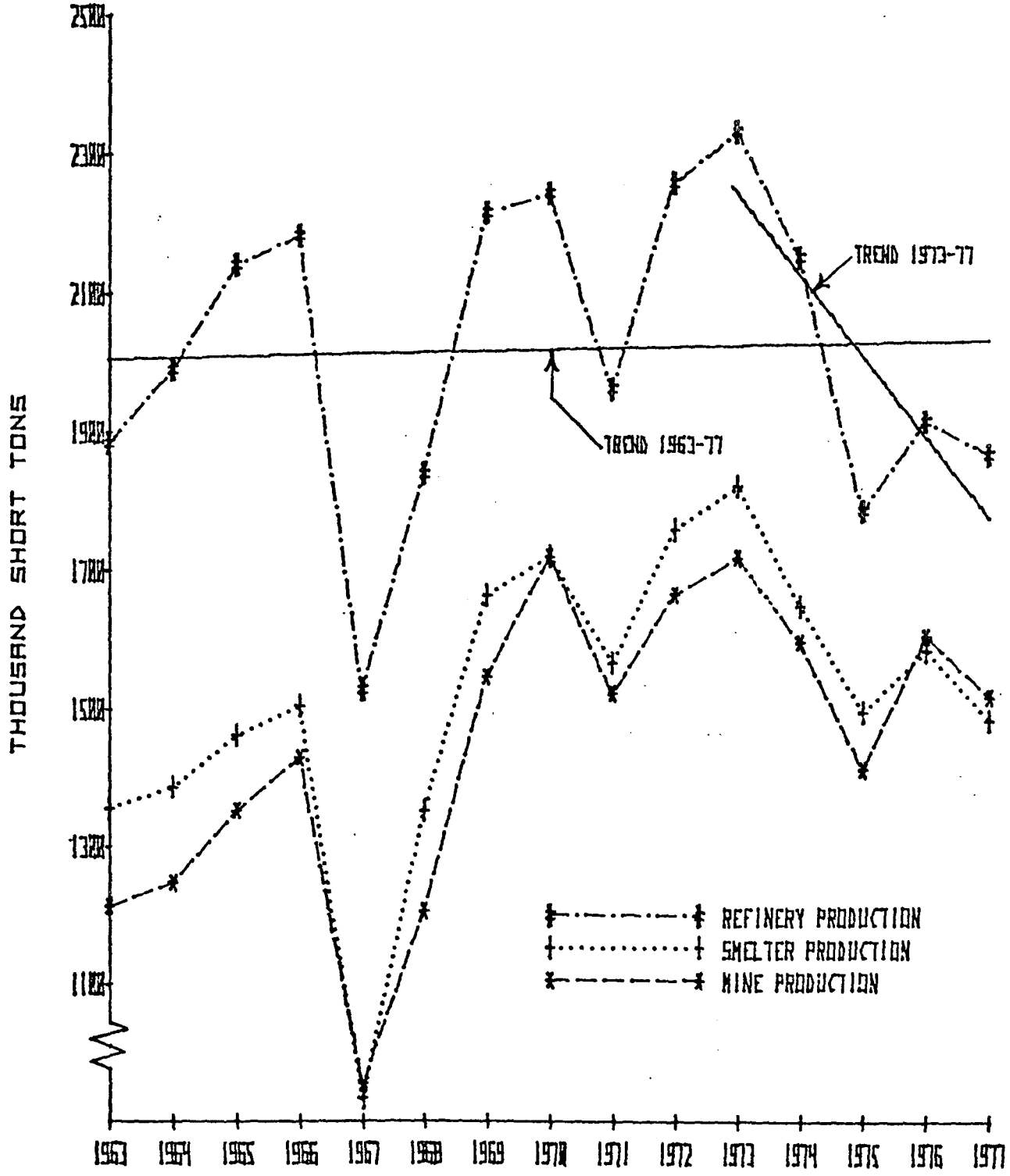
(In thousands of short tons)

Period	Mine	Smelter	Refinery
Annual average:			
1963-67	1,239	1,328	1,945
1968-72	1,531	1,612	2,103
1973-77	1,570	1,607	2,011
Annual:			
1973	1,718	1,822	2,333
1974	1,597	1,649	2,152
1975	1,413	1,496	1,787
1976	1,606	1,585	1,917
1977	1,518	1,484	1,868

1/ Only the trend for smelter production was statistically significant.

2/ Average annual rates of growth for 1963-77 were: Mine production--2.1 percent (statistically highly significant), smelter production--1.5 percent (not significant), and refinery production--0.2 percent (not significant).

FIGURE 5.--COPPER: U.S. PRODUCTION, BY STAGES OF PROCESSING, 1963-77



SOURCE: OFFICIAL STATISTICS OF THE U.S. BUREAU OF MINES.

Mine.--Domestic mine production of recoverable copper in 1977 was 1.5 million tons, 5 percent less than in 1976. The reduced output resulted from a number of relatively short strikes starting at the end of June, and also from subsequent production curtailments caused by weak demand. 1/ As shown in table 3, six States accounted for 98 percent of total production: Arizona (61 percent), Utah (13 percent), New Mexico (11 percent), Montana (6 percent), Nevada (4 percent), and Michigan (3 percent). Open-pit mines accounted for about four-fifths of mine output, with underground mines producing the remainder.

Smelter.--Output of recoverable copper at primary smelters in 1977 was 1.5 million tons, the smallest quantity since 1968. Ninety-four percent of that total was produced from primary domestic materials, and the remainder was about equally divided between primary imported materials and scrap (table 1).

Refinery.--Production of refined copper in 1977 was 1.9 million tons, a decline of about 2.5 percent from the previous year. Three-quarters of the total was produced from domestic primary materials, 5 percent from imported primary materials, and the remaining 20 percent from scrap.

Capacity utilization

Table 4 shows the estimated capacity of the United States to mine, smelt, and refine copper in 1975, 1976, and projected for 1980. Figure 6, from a Bureau of Mines publication, 2/ shows primary smelter and refinery capacities of U.S. producers and their feed sources in 1976. No new production facilities were brought on stream in 1977. Several projects under development or in the planning stages were postponed until an improvement in market conditions occurs.

Data published by the American Bureau of Metal Statistics and the Bureau of Mines show that U.S. copper-smelting capacity has fluctuated but little in recent years, remaining at about 9 million tons in terms of the quantity of feed materials processed, estimated to represent 2.1 million tons of smelter

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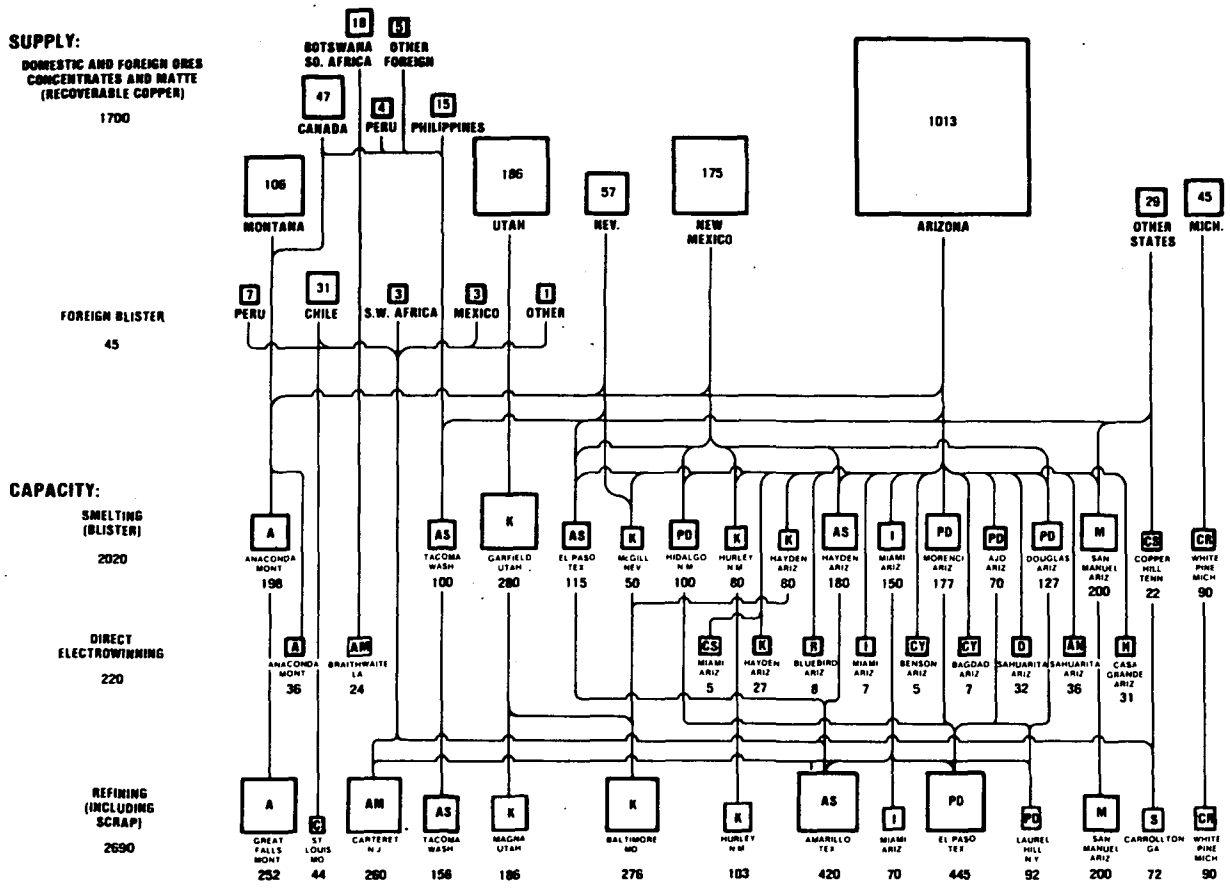
1/ The effects of labor strikes, which tend to occur every 3 years in U.S. copper operations, on domestic output of copper are clearly discernible in fig. 5. Most noticeable is the prolonged series of strikes that closed most domestic copper mining, milling, smelting, and refining operations from July 1967 to March 1968. Other strikes, with less severe production curtailments, occurred in 1964, 1971, 1974, and 1977.

2/ Copper-1977, U.S. Department of the Interior, Bureau of Mines, MCP-3, June 1977. The Bureau of Mines includes the output of refined copper by Amax and Cerro as production by primary producers, even though both firms use substantial quantities of scrap as refinery input.

Figure 6

PRIMARY COPPER SMELTER AND REFINERY CAPACITIES AND THEIR FEED SOURCES IN THE UNITED STATES, 1976

(THOUSAND SHORT TONS OF COPPER CONTENT)



SCALE OF SMELTER AND REFINERY CAPACITIES IN THE UNITED STATES, 1976

>300	250-300	200-250	150-200	100-150	<100

KEY:

- AM: AMAX, INC.
- A: THE ANACONDA COMPANY
- AR: ANAMAX MINING CO.
- AS: ASARCO INCORPORATED
- C: CERRO CORP.
- CR: COPPER RANGE CO.
- CS: CITIES SERVICE CO.
- CT: CYPRUS MINES CORP.
- D: DUVAL CORP.
- H: HECLA MINING CO.
- I: INSPIRATION CONSOLIDATED COPPER CO.
- K: KENNECOTT COPPER CORP.
- M: MAGMA COPPER CO.
- PD: PHELPS DODGE CORP.
- R: RANCHERS EXPLORATION AND DEVELOPMENT CO.
- S: SOUTHWIRE COMPANY

BUREAU OF MINES
U.S. DEPARTMENT OF THE INTERIOR

product. 1/ As noted by Arthur D. Little, Inc., in its report to the Environmental Protection Agency (EPA): 2/

> smelting capacity essentially represents the "bottleneck" in primary refined copper production . . . the currently promulgated environmental regulations will effectively constrain domestic capacity growth until 1985 and would require major expenditures for capacity maintenance between 1983 and 1988 . . . Hence . . . the supply of refined copper domestically will be constrained over the next decade because of the constraints on domestic smelter capacity growth.

Domestic refinery capacity has expanded regularly, albeit slowly, during the last 20 years, from 2.1 million tons in 1958 to 2.9 million tons in 1977. The geographical distribution of U.S. refinery capacity changed noticeably during 1975 and 1976, as three plants in the Middle Atlantic States closed, but the lost capacity was replaced by a new refinery coming on stream in Texas and expansion of capacity at already-existing plants.

Based on capacity and production data reported by domestic producers in response to the Commission's questionnaires, the following tabulation shows the rates of utilization of U.S. capacity to produce copper concentrates, blister copper, and refined copper during 1973-77 (in percent):

Year	Ratio of production to capacity to produce--		
	Copper concentrates	Blister copper	Refined copper
1973	89.0	94.4	79.7
1974	83.5	83.6	73.5
1975	67.4	80.9	64.6
1976	76.0	79.7	71.0
1977	73.4	73.9	65.5

1/ Smelters are usually rated in terms of their capacity to process feed stocks. Although a smelter's output can be increased by increasing the copper content of the charge materials, technical problems inherent in smelting operations tend to limit the total quantity of feed materials that can be processed.

2/ Economic Impact of Environmental Regulations on the United States Copper Industry, submitted to United States Environmental Protection Agency under contract No. 68-01-2842, January 1978, p. I-8.

U.S. producers' shipments

Data on the quantity and value of U.S. producers' shipments of copper concentrates and precipitates, blister copper, and refined copper, as reported in response to the Commission's questionnaires, are shown in table 5. Such data were developed for (1) domestic market shipments, that is, shipments to nonrelated customers in the United States, (2) domestic captive shipments, or those to subsidiaries and affiliated firms, and (3) export shipments. As indicated earlier, most commercial transactions in copper are conducted between the refining and the fabricating stages. The following table, which summarizes the data in table 5 on refined copper, shows that U.S. producers' shipments followed the same trend as production, falling from 1973 to 1975, recovering in 1976 to a level about the same as 2 years earlier, but then slipping again in 1977.

Refined copper: U.S. producers' shipments, 1973-77 and January-March 1978

Item	1973	1974	1975	1976	1977	Jan.-Mar. 1978
	Quantity (1,000 short tons)					
Domestic shipments:						
Market	1,655	1,310	1,114	1,360	1,230	312
Captive	482	468	467	504	539	151
Export shipments	162	155	165	111	***	***
Total	2,299	1,934	1,747	1,975	***	***
	Value (Million dollars)					
Domestic shipments:						
Market	1,791	1,784	1,221	1,741	1,547	361
Captive	523	652	500	645	584	172
Export shipments	261	285	180	137	***	***
Total	2,576	2,721	1,901	2,522	***	***

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

U.S. exports

U.S. exports of refined copper have fallen off sharply in the past few years. After averaging 242,000 tons during the previous decade, exports dropped from 186,000 tons in 1973 to 52,000 tons in 1977. 1/ Exports in the latter year were equivalent to less than 3 percent of domestic production, as shown in the following tabulation:

1/ Annual exports as reported by the U.S. Department of Commerce differ somewhat from those reported by U.S. producers in response to the Commission's questionnaires. Presumably this results from a difference in timing, as the totals reported during 1973-77 are almost the same.

Year	1,000 short tons	Percent of U.S. production
1973	186	8.0
1974	125	5.8
1975	170	9.5
1976	112	5.8
1977	52	2.8

Table 6 shows the principal markets for U.S. exports of refined copper during 1973-77. During that period, about two-thirds of the total went to members of the European Communities, chiefly Italy, West Germany, France, and the United Kingdom. Additional important export markets included Canada, Japan, and Brazil.

The United States enjoyed a trade surplus in its foreign trade in refined copper in 8 of the 10 years prior to 1973, the only exceptions being 1967 and 1968, years in which U.S. output was greatly curtailed by lengthy labor strikes. During 1973-77, however, the United States had a deficit in its foreign trade in refined copper in each year except 1975. In 1977, the volume of exports was only one-seventh that of imports (fig. 7 and table 7).

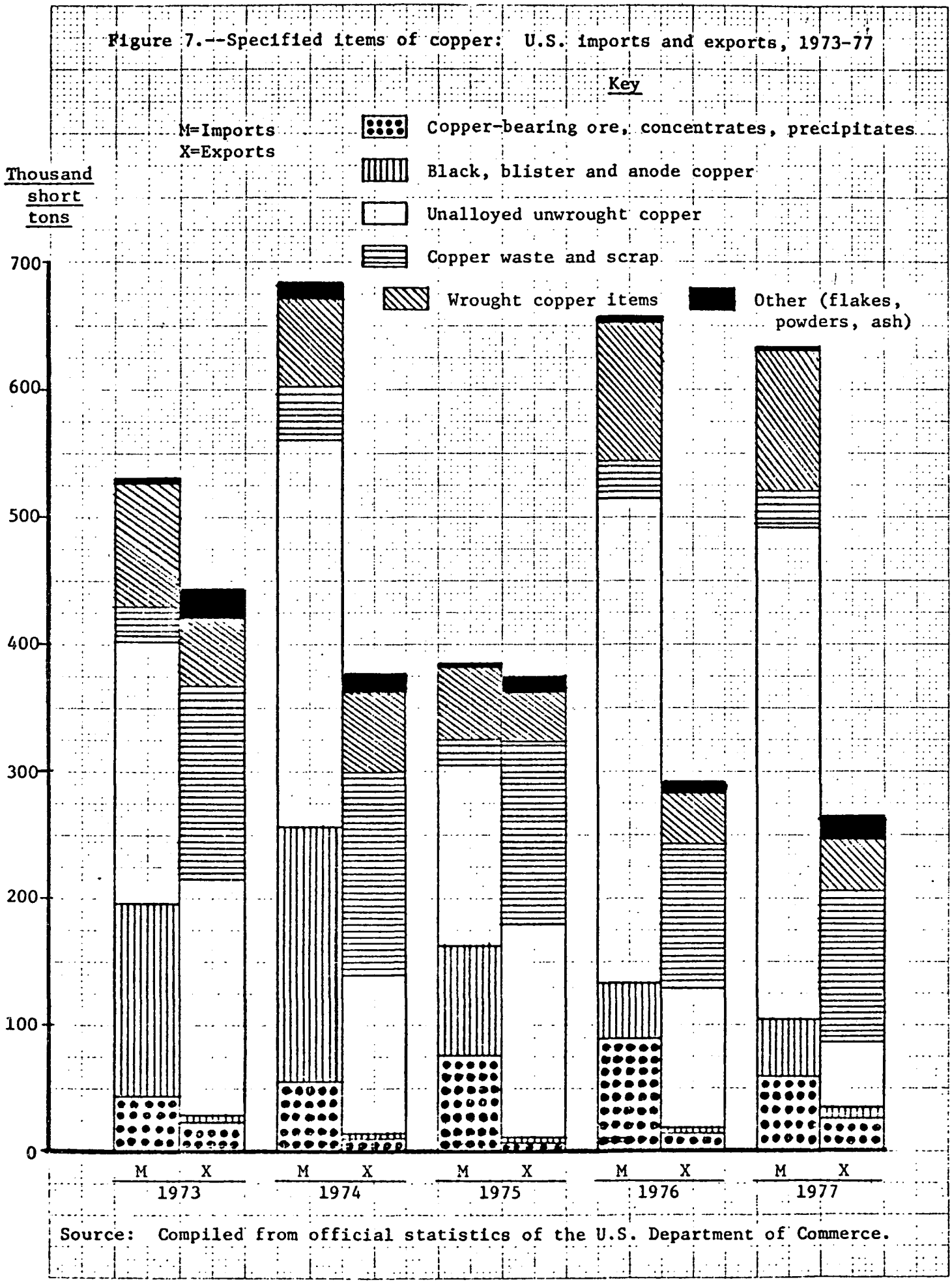
U.S. inventories

Commercial stocks.--Yearend inventories of refined copper held in the United States, as reported by the U.S. Bureau of Mines and in response to the Commission's questionnaires, are shown in table 8. Stocks held by domestic producers rose without interruption from 1973 to 1977, while those held by importers and the New York Commodity Exchange (Comex) showed a slight decline in the latter year. 1/ As summarized in the following tabulation, total stocks at the end of 1977 were over four times those held 4 years earlier and were equivalent to 37 percent of average annual U.S. consumption of refined copper in 1973-77:

Dec. 31--	1,000 short tons	Percent of consumption
1972	262	13
1973	177	9
1974	390	19
1975	588	28
1976	771	37
1977	774	37

1/ Data reported by other sources (e.g., The American Bureau of Metal Statistics and the U.S. Department of Commerce) on yearend U.S. stocks are consistently higher for 1972-77 than those reported by the Bureau of Mines (chiefly because of differences in producers' stocks). The trends are the same, however, with a decline in 1973 being followed by uninterrupted increases.

Figure 7.--Specified items of copper: U.S. imports and exports, 1973-77



Source: Compiled from official statistics of the U.S. Department of Commerce.

U.S. Government stockpile program.--Shortages experienced by the United States during World War II led to enactment of the Strategic and Critical Materials Stock Piling Act of 1946, which provided for acquisition and retention of materials for use during a national emergency. Postwar surplus transfers and purchases under that act resulted in building a strategic stockpile of 1 million tons of copper by 1958. Additional copper was purchased incident to supply-expansion projects through authority of the Defense Production Act of 1950 (DPA stocks), and by exchange of surplus agricultural commodities for copper of foreign origin through the Agricultural Trade Development and Assistance Act of 1954 (supplemental stockpile). The combined strategic, DPA, and supplemental stockpiles form the national stockpile, which by 1960 totaled 1.15 million tons.

Subsequent legislation resulted in reducing, by stages, the quantity of copper in the national stockpile to 258,659 tons--one-third of the goal at that time of 775,000 tons--by January 1, 1973. In March 1973 the copper stockpile objective was reduced to zero. Subsequent sales and transfers reduced stocks to 489 tons by the end of 1974, and to zero by August 1976.

On October 1, 1976, the Federal Preparedness Agency of the General Services Administration (GSA) announced new national policies and goals concerning the U.S. stockpile of strategic and critical materials, including a goal of 1,299,000 tons of refined copper. Initial purchases against this new goal have not yet been scheduled. However, 20,261 tons from the previous stockpile that remained unused from transfers to other Government agencies were transferred back into the new stockpile. Various bills have been introduced in the Congress to authorize additional purchases of copper for the national stockpile; appendix B contains a summary of these bills.

Employment

The average number of employees engaged in various operations on copper and the number of man-hours worked by such employees are shown in the following table.

Average number of employees, total and production and related workers engaged in the production of copper, and man-hours worked by the latter, by stages of processing, 1973-77 and January-March 1978

Item	1973	1974	1975	1976	1977	Jan.-Mar. 1978
	Average number of employees					
All persons	52,610	53,826	48,319	47,640	44,620	41,882
Production and related workers engaged in--						
The production of all products	43,266	43,987	38,367	37,978	35,550	33,520
Copper mining	29,165	29,719	25,346	25,234	23,887	21,570
Copper smelting	6,590	6,648	6,338	6,522	6,134	6,291
Copper refining	6,553	6,612	5,726	5,283	4,734	4,874
Copper-associated employees 1/	8,666	9,098	9,054	8,480	8,029	7,538
	Man-hours worked (thousands)					
Production and related workers engaged in--						
The production of all products	92,552	93,746	81,768	79,419	73,742	19,096
Copper mining	61,358	62,507	53,034	51,751	48,498	12,166
Copper smelting	14,037	14,394	13,464	13,968	13,101	3,451
Copper refining	14,302	13,947	12,375	11,072	9,749	2,854
Copper-associated employees 1/	17,792	18,688	18,521	17,323	16,589	4,204

1/ Copper-associated employees include company employees not directly employed in the reporting establishments whose employment is directly related to the firms' domestic copper mining, smelting, and refining operations, including employees involved in relevant research, marketing, and administration functions.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

About two-thirds of the total number of production and related workers engaged in producing copper--from mining through refining--are employed in mining and milling operations, 15 percent in refining, and the remainder in smelting. As shown above, the aggregate number of such workers has fallen by almost one-fourth since 1974--from 43,000 in that year to 32,700 during January-March 1978. The greatest decline in employment, over 8,000 workers, occurred in mining and milling. Man-hours worked by production workers in producing copper showed a similar trend, decreasing without interruption from 91 million in 1974 to 71 million in 1977.

Average employment in copper refining dropped from 6,612 in 1974 to 4,734 in 1977, but recovered somewhat to 4,874 during the first quarter of 1978. The decline in refinery employment was influenced by the closure in 1975 and 1976 of three older plants, even though the capacity lost was largely replaced by a new refinery and expansion of capacity at existing plants. Based in part on data submitted to the Commission following the public hearing, it appears that about half the decline in the number of production workers at copper refineries since 1974 is attributable to nonimport related factors (e.g., the greater efficiency of the new refinery and strikes).

Since January 1, 1975, the U.S. Department of Labor has instituted some 51 investigations in response to petitions from workers engaged in copper mining, smelting, and refining for certification of eligibility to apply for adjustment assistance under chapter 2 of the Trade Act of 1974. In 30 of these cases Labor has certified the workers eligible; the petition was denied in 8 cases, and the remaining 13 cases were still pending as of June 30, 1978. The estimated numbers of workers involved in the concluded investigations are shown in table 9 and in the following tabulation:

Period	Certified	Denied
1975	768	0
1976	2,800	1,675
1977	1,637	1,660
1978 (Jan. 1-June 30)	8,678	680
Total	13,883	4,015

Wages.--The average wages of production workers engaged in mining and milling copper-bearing ores were substantially greater throughout 1973-77 than those received by workers in the total private sector, manufacturing, or other mining. Moreover, wages paid to copper-producing workers rose more rapidly during the period. The average hourly wages of workers mining and milling copper rose from $4.88 in 1973 to $7.48 in 1977; in comparison, average wages paid to workers in manufacturing rose during the period from $4.08 to $5.63 (table 10). Average wages paid to copper workers rose particularly rapidly in the third quarters of 1974 and 1977; both sharp increases were the result of new labor agreements reached in those years.

Productivity.--Mine, smelter, and refinery output of copper per man-hour worked by production and related workers is shown in the following table.

Copper: Productivity, by stages of processing, 1973-77 and January-March 1978

	Pounds produced per man-hour			
	Mining 1/	Smelting 2/	Refining 3/	All operations 4/
1973	73	274	302	40
1974	68	233	286	36
1975	69	241	293	37
1976	84	248	360	42
1977	87	247	374	41
January-March 1978	88	230	338	42

1/ Production of concentrates and precipitates per man-hour worked in mining and milling operations.
2/ Production of blister copper per man-hour worked in smelting operations.
3/ Production of refined copper per man-hour worked in refining operations.
4/ Production of refined copper per man-hour worked by production and related workers in mining, smelting, and refining operations and by associated employees.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Productivity in all operations except smelting showed a marked increase in 1976 over the 3 previous years. As indicated earlier, the increase in refining productivity is largely attributable to the closure of three older plants in 1975 and 1976, coupled with the initiation of production at a new large, more efficient plant.

Prices

Refined copper has historically been, and still is to a considerable extent, sold at prices based on a number of different systems. However, two basic pricing mechanisms can be distinguished--U.S. producers' prices and prices based on metal or commodity exchange quotations. A third pricing method used in the United States, chiefly by the major secondary refiners, is based on the price (cost) of scrap plus operating margins. Since the price of copper scrap tends to closely follow movements in metal exchange quotations, there are essentially only two basic systems. It is believed that about three-fourths of the refined copper sold in the United States in recent years has been marketed at domestic producers' prices and the remainder on the basis of metal exchange quotations.

U.S. producers' prices consist of a set of nearly identical price quotations used by the major domestic primary producers of refined copper. Prices are quoted delivered, to any destination within the continental United States. The standard item priced, at least until the last 2 years, has been

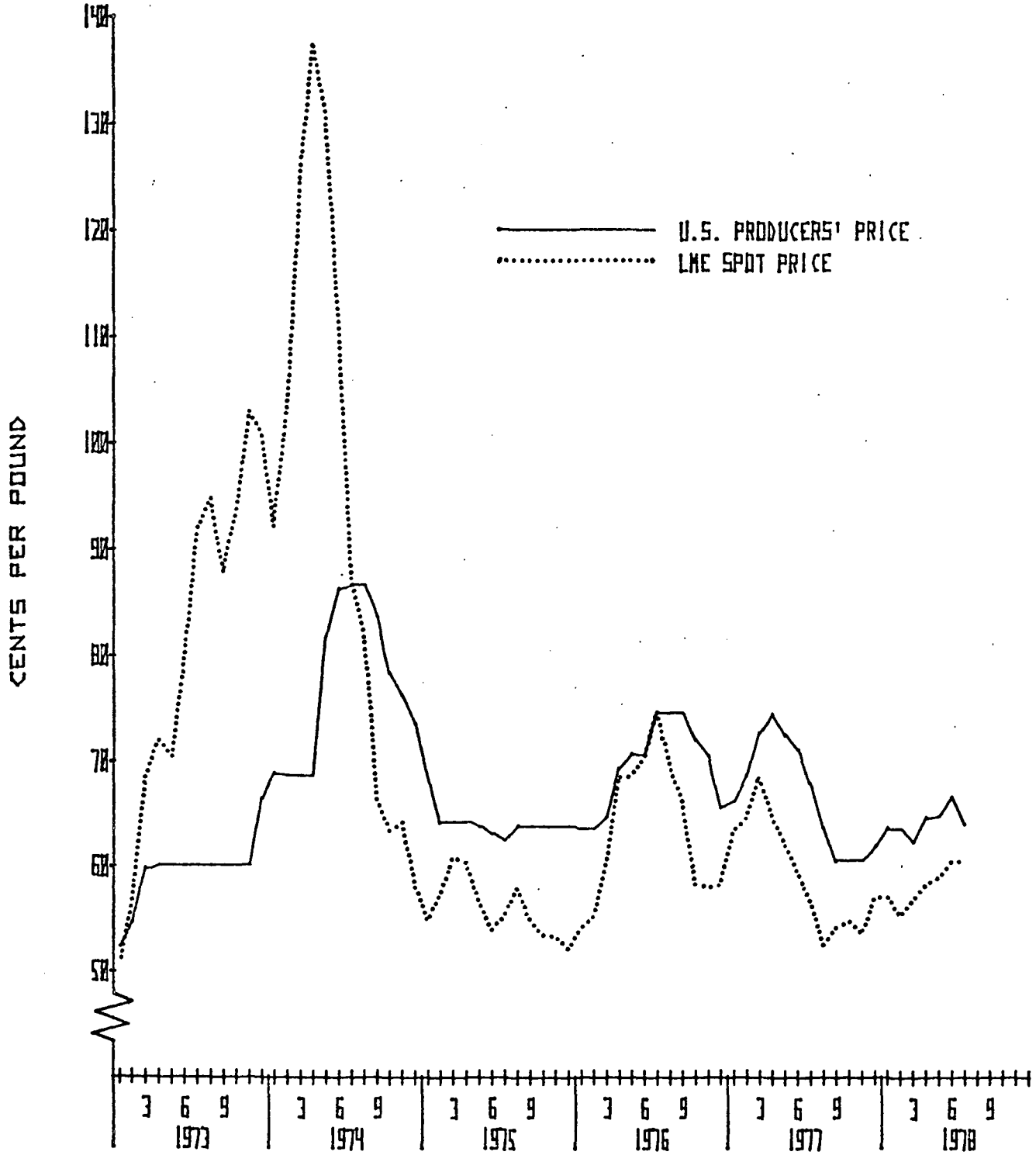
electrolytic wirebar; since early 1976, some producers have switched to electrolytic grade cathode as the standard item. Cathodes are priced at a slight discount from the wirebar price, reflecting the absence of remelting and casting costs. Other primary shapes, such as cakes, ingots, and billets, are sold at premiums over the wirebar price to cover the additional casting costs involved. Domestic producers usually sell on the basis of the price prevailing on the date of shipment, although some sales are made at prices prevailing on the date of sale, and still others are based on average weekly or monthly producer price quotations as shown in certain trade publications.

Prices based on metal or commodity exchange quotations are those related through various formulas to prices prevailing principally on the London Metal Exchange (LME) or Comex, the two organized metal exchanges dealing in refined copper. Both serve basically hedge and speculative functions rather than acting as marketing mechanisms for actual physical transactions. Thus their principal role is to provide hedging facilities for both seller and buyer against losses resulting from price changes. Arbitrage transactions between the LME and Comex tend to limit the amount of any difference in prices of refined copper that may arise between the two exchanges, although differences of a few cents per pound at any point in time are not unusual. The LME is generally considered to be the more influential in terms of its general influence on the price of copper, the volume of transactions, and physical deliveries; Comex is not generally used for sales outside the United States. The influence of the LME on world copper prices is far greater than would be suggested by the volume of transactions conducted. It is generally acknowledged to be the best barometer of measuring changes in world supply and demand conditions, being quite sensitive (and hence volatile) to supply disruptions, political events, and other factors. Most of the pricing formulas used in long-term supply contracts relate in some manner to the LME price.

Figure 8 and tables 11 through 13 compare U.S. producers' and LME prices for electrolytic wirebar during January 1973-March 1978. As indicated, the LME price movements have been more volatile and sensitive to speculative pressure and short-run shifts in supply and demand. In contrast, the U.S. producers' price showed smaller fluctuations and generally lagged significant trends in LME prices by 1 or 2 months. It is generally acknowledged that if a significant difference in U.S. producers' and LME prices persists, the U.S. producers' price will move toward the LME position. U.S. producers' prices were less than LME prices during 1973 and the first half of 1974, but the reverse has been true since that time. The sharp increase in prices in 1973 and early 1974 resulted chiefly from a combination of general worldwide economic growth coupled with a supply shortage occasioned by strikes and political instability in certain supplier countries. Price controls on refined copper in the United States during 1973 and the first quarter of 1974 were a major factor in explaining the large difference in prices during that period.

Since mid-1974, world economic growth has slowed and world supplies of refined copper have expanded. The generally weak level of demand that has persisted since mid-1974, plus the apparent reluctance of many producing countries to trim output in line with demand, led to record levels of world

FIGURE 8.--UNALLOYED UNWROUGHT COPPER: AVERAGE PRICE QUOTED FOR ELECTROLYTIC WIREBAR BY U.S. PRODUCERS AND AVERAGE SPOT PRICE ON THE LME, BY MONTHS, JANUARY 1973-JULY 1978



SOURCE: METALS WEEK, VARIOUS ISSUES.

stocks by the end of 1977. This consequently has exerted pressure in forcing prices to levels substantially less than those prevailing during 1973 and 1974. Somewhat improved demand and anticipation of strikes in the United States led to an increase in prices in the first half of 1977. The strikes were of relatively short duration, however, and prices again declined.

Profit-and-loss experience of U.S. producers

U.S. producers realized net operating profits on their domestic copper mining, smelting, and refining operations of $658 million in 1973 and $620 million in 1974. As shown in the tables on the next two pages, producers fared quite well in both years in comparison with the financial performance of most domestic firms engaged in mining and manufacturing. For example, the ratio of net profits before income taxes on copper mining, smelting, and refining operations to total assets employed in such operations was 21.5 percent in 1973 and 17.2 percent in 1974. This compares with corresponding ratios in the latter year of 12 percent for all manufacturing, 22 percent for all mining, and 13 percent on the consolidated operations of the copper producers. 1/

During 1975-77, however, domestic copper producers did much worse on their mining, smelting, and refining operations than most mining and manufacturing firms. Producers reported a $70 million operating loss in 1975 on such copper operations, a profit of $78 million in 1976, and a loss of $123 million in 1977. 2/ Returns before income taxes on total assets employed in copper mining, smelting, and refining during 1975-77 were -1.2 percent, 2.0 percent, and -2.4 percent, respectively.

The impact of production costs (including those resulting from environmental and safety regulations) and declining prices on profits on copper mining, smelting, and refining can be seen in the following ratios of cost of goods sold to net sales:

	Percent
1973	70
1974	72
1975	95
1976	90
1977	97

1/ Such consolidated operations include products other than copper, as well as operations of domestic and foreign affiliates and subsidiaries of the domestic firms that produce copper.

2/ In both 1975 and 1977, 13 producers (of the 17 or 18 firms that responded) reported net operating losses on copper operations; in 1976, 8 of the 17 producers reported net losses.

Profit-and-loss experience of U.S. producers on their total operations and on copper mining, smelting, and refining operations, 1973-77

Item	1973	1974	1975	1976	1977
	Total firm operations 1/				
Net sales-------million dollars--	7,530	8,523	6,211	5,705	5,799
Cost of goods sold--------do-----	6,023	6,837	5,357	4,839	4,741
Gross profit--------------do-----	1,507	1,686	854	866	1,058
Interest expense on long-term debt----------do-----	149	167	227	241	229
Net operating income------do-----	917	1,216	256	322	453
Net profit or (loss)--					
Before income taxes-----do-----	1,055	1,471	269	446	69
After income taxes------do-----	770	1,103	271	398	69
	Operations on mining, smelting, and refining copper 2/				
Net sales-------million dollars--	2,596	2,717	1,903	2,478	2,252
Cost of goods sold--------do-----	1,824	1,948	1,800	2,222	2,187
Gross profit--------------do-----	772	769	103	256	64
Administrative, shipping, and selling expenses----do-----	94	114	123	127	126
Interest expense on long-term debt----------do-----	19	35	50	51	61
Net operating profit or (loss)---------------do-----	658	620	(70)	78	(123)
Other income or (expense), net--------------------do-----	7	12	17	13	11
Net profit or (loss) before income taxes-----do-----	665	632	(52)	91	(112)
Book value of assets employed in copper mining, smelting, and refining------million dollars--	3,096	3,672	4,224	4,544	4,745
Ratio of net profit or (loss) before income taxes to--					
Net sales----------percent----	25.6	23.3	(2.7)	3.7	(5.0)
Total assets----------do-------	21.5	17.2	(1.2)	2.0	(2.4)

1/ Consolidated operations of 11 of the 12 petitioners (excluding the Cities Service Co.) plus Amax, Inc., and Federal Resources Corp. Data for Anaconda for 1976 and 1977 are also excluded following that firm's merger with Arco.

2/ Data for the 12 petitioners plus Amax, Inc., McAlester Fuel Co., U.V. Industries, Inc., Eagle-Picher Industries, Inc., Earth Resources Co., and Federal Resources Corp.

Source: Data for consolidated firm operations compiled from public annual reports and forms 10-K; data on operations on copper firms compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Key financial ratios for all manufacturing firms, all mining firms, and all copper-producing firms, 1973-77

Item	1973	1974	1975	1976	1977
	All manufacturing				
Current ratio	2.01	1.97	2.02	2.02	1.98
Quick ratio 1/	.93	.85	.85	.86	.86
Long-term debt/equity ratio	.33	.31	.33	.33	.32
Net profit before income taxes as a percent of --					
Sales	8.00	8.69	7.50	8.72	8.66
Stockholders' equity	21.75	23.33	18.88	22.68	23.18
Total assets	11.40	12.47	10.12	12.20	12.37
Net profit after income taxes as a percent of--					
Sales	4.72	5.54	4.61	5.36	5.29
Stockholders' equity	12.84	14.87	11.60	13.94	14.17
Total assets	6.73	7.95	6.22	7.50	7.56
	All mining				
Current ratio	2/	1.61	1.46	1.58	1.58
Quick ratio 1/	2/	1.04	.92	1.01	1.01
Long-term debt/equity ratio	2/	.34	.35	.43	.48
Net profit before income taxes as a percent of--					
Sales	2/	24.25	20.38	16.02	15.43
Stockholders' equity	2/	40.08	31.51	26.10	23.94
Total assets	2/	22.26	17.22	13.68	11.87
Net profit after income taxes as a percent of--					
Sales	2/	17.51	14.37	11.01	10.66
Stockholders' equity	2/	28.94	22.21	17.93	16.54
Total assets	2/	16.07	12.14	9.40	8.21
	Copper-producing 3/				
Current ratio	2.39	2.06	2.30	2.27	2.09
Quick ratio 1/	.88	.73	.72	.74	.65
Inventory turnover	5.69	5.78	3.83	3.80	2.97
Long-term debt/equity ratio	.28	.26	.38	.43	.44
Times interest earned	6.16	7.27	1.12	1.34	1.98
Net profit before income taxes as a percent of--					
Sales	14.01	17.26	4.34	7.82	1.18
Stockholders' equity	17.08	21.08	3.67	6.92	1.06
Total assets	10.40	12.97	2.12	3.90	.57
Net profit after income taxes as a percent of--					
Sales	10.22	12.94	4.37	6.98	1.19
Stockholders' equity	12.46	15.80	3.70	6.18	1.06
Total assets	7.59	9.72	2.14	3.48	.57

1/ Ratio of cash and accounts receivable to current liabilities.
2/ Not available.
3/ Represents the consolidated operations of 11 of the 12 petitioners (except the Cities Service Co.) plus Amax and Federal Resources Corp. Data for Anaconda for 1976 and 1977 are also excluded following that firm's merger with Arco.

Source: Data for all manufacturing and mining firms from Federal Trade Commission, Quarterly Financial Report for Manufacturing, Mining and Trade Corporations, various issues; data for copper producers compiled from public annual reports and forms 10-K.

Capital expenditures for facilities.--Capital expenditures by U.S. producers for domestic facilities used principally in mining, smelting, and refining copper were as follows (in millions of dollars).

Item	1973	1974	1975	1976	1977
Mining	229	514	318	234	263
Smelting	57	163	66	67	22
Refining	25	103	139	19	6
Nonmanufacturing facilities	11	15	7	5	5
Total	321	795	529	325	297

The large increase in capital expenditures for refining facilites in 1974 and 1975 was predominantly in connection with Asarco's new refinery in Texas, which began prodution in late 1975. The increase in capital expenditures for smelting operations in 1974 was largely for a new Phelps Dodge smelter in New Mexico, while that for mining operations in the same year resulted from expenditures by several firms.

Exploration, research, and development expenditures.--Domestic producers reported the following exploration, research, and development expenses incurred in connection with their mining, smelting, and refining operations in producing copper (in millions of dollars).

Item	1973	1974	1975	1976	1977
Mining:					
Exploration	18	18	18	20	27
Research and development	59	77	71	52	57
Smelting	6	5	6	4	4
Refining	2	2	2	2	2
Total	84	103	98	77	91

These costs were incurred in connection with mine development, product and process development and improvement, equipment development, pure research, market research, and improving customer technology. In the aggregate, exploration, research, and development expenditures ranged from 3 percent to 5 percent of domestic producers' annual net sales of copper during 1973-77.

The Question of Imports as a Substantial Cause of Serious Injury

U.S. consumption and the ratio of imports to consumption

Figure 9 shows that U.S. consumption of refined copper in recent years has been characterized more by cyclical fluctuations than by any strong underlying trend. Consumption has grown at an average annual rate of only 0.5 percent since 1963, and since 1973 has even trended downward. 1/ Consumption dropped by over one-third in a 2-year span, from a peak of 2.4 million tons in 1973 to a 15-year low of 1.5 million tons in 1975. The reduced level of consumption in 1975 was a reflection of the slump in building construction, automobile production, production of electrical and electronic items, and activity in other principal industries that consume refined copper. Since 1975 consumption has again risen, and in 1977 was slightly above the trend line for 1963-77.

The ratio of imports to consumption, as shown in figure 4 (page A-17) and the following table, also fluctuated during 1973-77, but showed an upward trend.

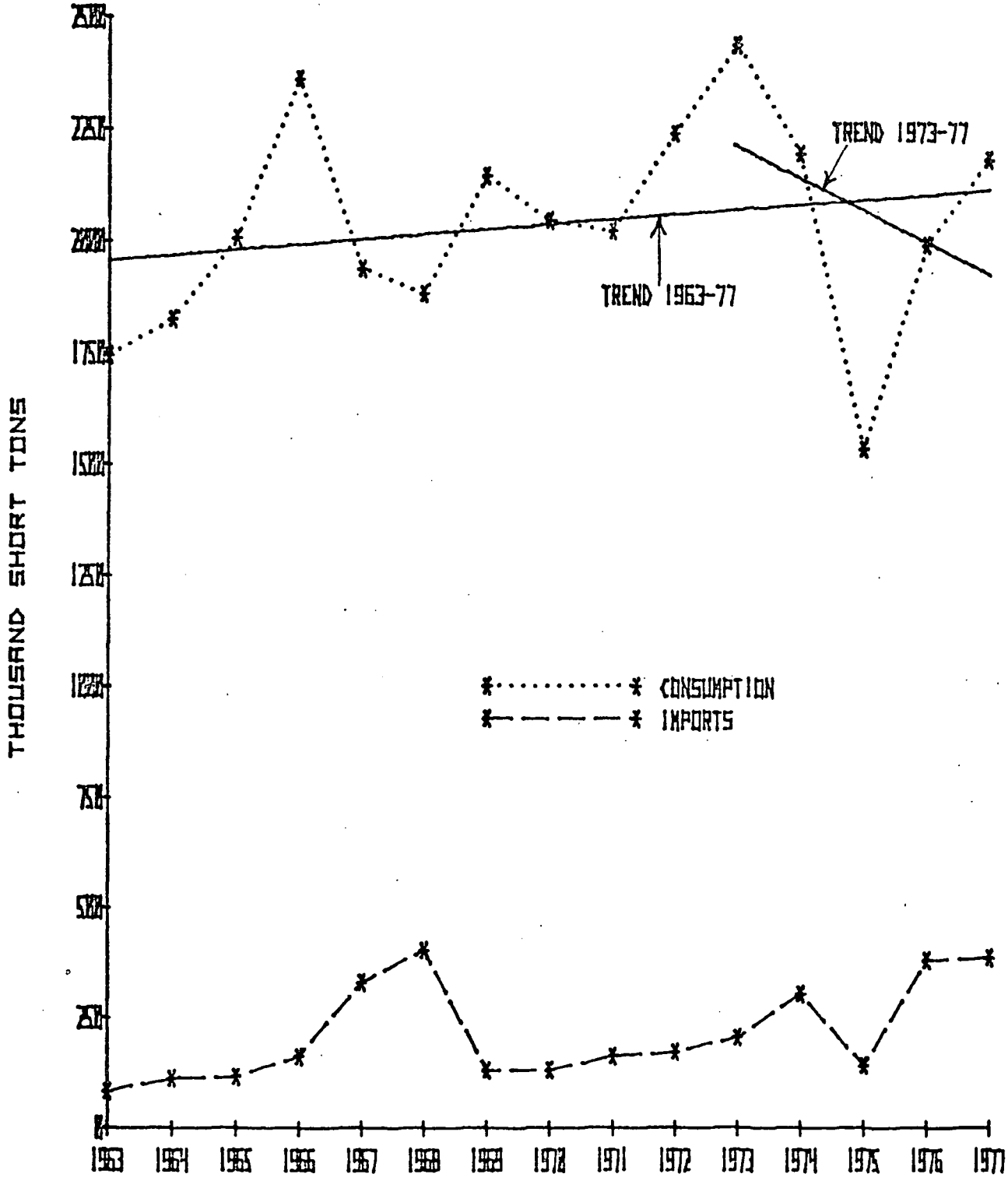
Refined copper: U.S. imports for consumption and consumption, 1973-77

Year	Imports	Consumption	Ratio of imports to consumption
	1,000 short tons	1,000 short tons	Percent
1973	206	2,437	8.4
1974	304	2,194	13.9
1975	142	1,534	9.3
1976	381	1,992	19.1
1977	387	2,182	17.7

Source: Compiled from official statistics of the U.S. Bureau of Mines and the U.S. Department of Commerce.

1/ Neither trend line shown in fig. 9 is statistically significant. The low rate of growth in consumption in 1963-77 was strongly influenced by the very sharp drop in 1975. Consumption over the perhaps more "normal" period of 1963-74 rose at an average rate of 1.9 percent per year; this rate was statistically significant (at the 98-percent confidence level). Thus it could be argued that the slump in consumption in 1975 and 1976 merely represented a particularly sharp cyclical fluctuation from an underlying trend of modest growth.

FIGURE 9.--REFINED COPPER: U.S. IMPORTS FOR CONSUMPTION AND REPORTED CONSUMPTION, 1963-77



SOURCE: OFFICIAL STATISTICS OF THE U.S. BUREAU OF MINES AND U.S. DEPARTMENT OF COMMERCE.

Possible substantial causes of serious injury, or the threat thereof, other than increased imports

In addition to imports, a number of other possible substantial causes of any serious injury, or threat thereof, that the domestic industry may have suffered have been frequently mentioned. Most prominent of these are cyclical fluctuations in economic activity, the impact of U.S. environmental and safety regulations on the domestic industry, the substitution of various other materials (e.g., aluminum) for copper in its end uses, and the increased domestic production costs occasioned by declining ore bodies in the United States and by rapidly increasing labor costs.

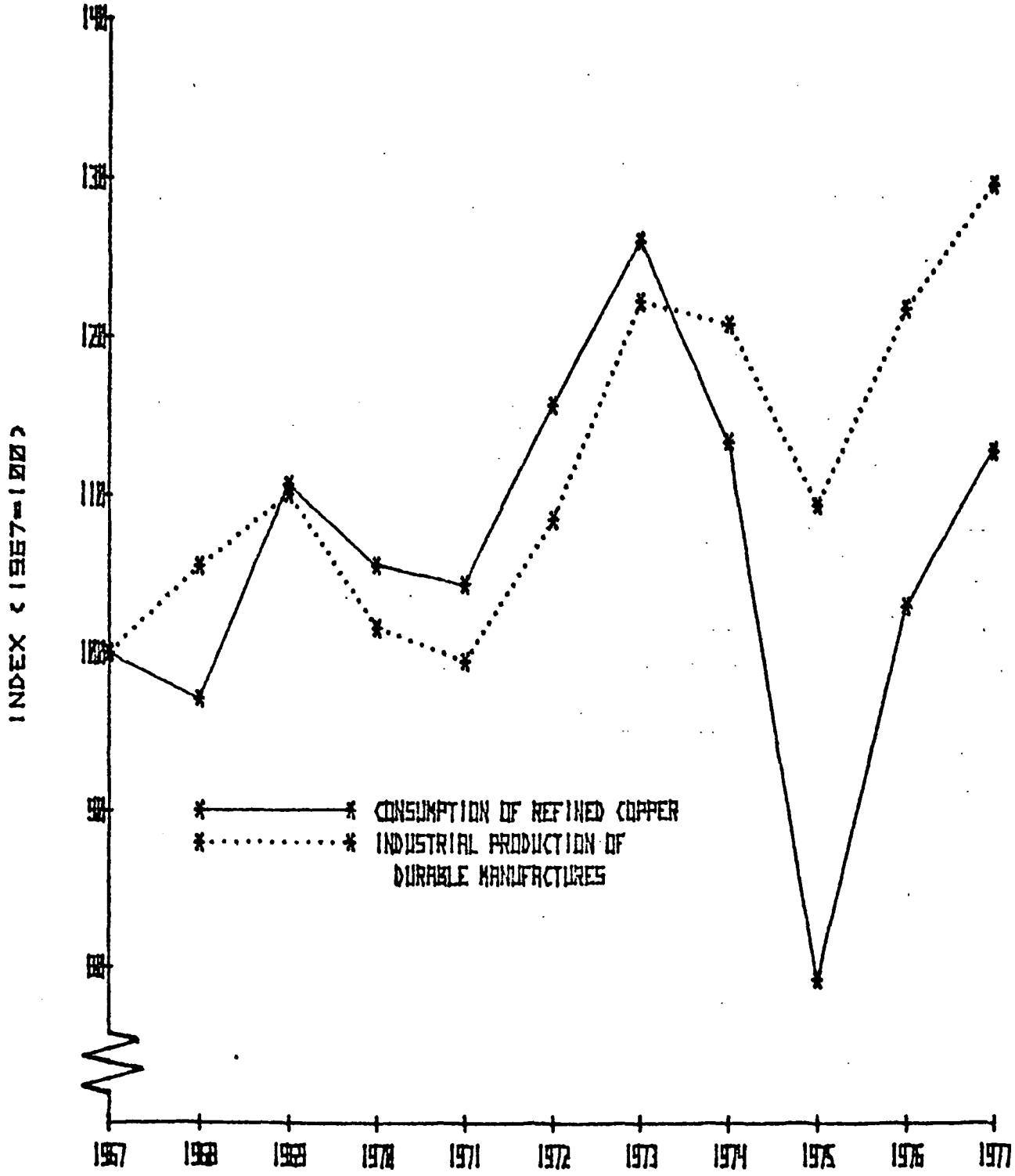
Economic activity.--The demand for refined copper is derived from the demand for its end-product uses. Wire mills accounted for 69 percent of total consumption of refined copper in 1973-77, brass mills for 29 percent, and miscellaneous consumers such as foundries, secondary smelters, and chemical plants for the remaining 2 percent (table 14). Such consumers of refined copper are, in turn, affected by the demand for their products, e.g., copper wire and brass products, which are used to manufacture a host of durable manufactured goods. Data published by the Copper Development Association, Inc., show that the principal end-use markets for copper are, in order of importance: Electrical and electronic products, building construction, consumer and general products, industrial machinery and equipment, and transportation. Figure 10 and table 15 illustrate the relatively high degree of correlation existing between industrial production of durable manufactures and consumption of refined copper. 1/

A number of econometric studies of the copper industry have been made in recent years. In such studies the demand for refined copper is generally made a function of the price of copper, the price of substitute materials (e.g., aluminum), and some "activity" variable, typically the Federal Reserve Board's index of industrial production of durable manufactures. 2/ The studies differ somewhat in methodology, but normally differentiate between short- and long-run elasticities. In general, the results of these studies suggest that, with respect to changes in economic activity, the demand for refined copper is inelastic in the short-run but elastic in the long-run. That is, a 1-percent increase (decrease) in industrial production of durable manufactures would induce a corresponding short-run increase (decrease) in demand for copper of less than 1 percent. In the long-run, however, a 1-percent rise (fall) in industrial production of durable manufactures would increase (decrease) demand for refined copper by more than 1 percent.

1/ The value obtained for r, the coefficient of correlation, was 0.434 for the 1967-77 period. However, r calculated from first differences of the data was 0.853, indicating that changes in levels of industrial production of durable manufactures are highly correlated with changes in consumption of refined copper.

2/ In a normally functioning market, demand for refined copper should be negatively correlated with its own price but positively correlated with the price of substitutes and the level of economic activity.

FIGURE 10.--INDEXES OF U.S. CONSUMPTION OF REFINED COPPER AND U.S. INDUSTRIAL PRODUCTION OF DURABLE MANUFACTURES, 1967-77



SOURCE: COMPILED FROM OFFICIAL STATISTICS OF THE U.S. BUREAU OF MINES AND THE FEDERAL RESERVE BOARD.

Impact of environmental regulations.--All four stages of production of unalloyed unwrought copper--mining, milling, smelting, and refining--are affected by federal environmental regulations. Mining and milling are affected chiefly by water and solid waste regulations, smelting by air pollution regulations, and refining by water regulations. Of these, the impact of air pollution regulations on copper smelters are generally acknowledged to be the most significant.

In its study for the EPA, the Arthur D. Little firm used an econometric model of the domestic copper industry to assess the economic impact of the presently promulgated air and water pollution regulations on domestic copper mining, milling, smelting, and refining operations; the study did not include semifabricating and fabricating operations. 1/ Environmental regulations of the Federal Government considered in the Little report are those implementing the Clean Air Act Amendments of 1970 and 1977 and the Federal Water Pollution Control Act Amendments of 1972. The study estimated that pollution-control costs for the domestic copper industry, in 1974 dollars, totaled $1,460 million in 1970-77; of the total, $1,115 million was for capital expenditures and $345 million for operating and maintenance costs.

The Little report predicted that under full compliance with existing environmental regulations (the reduced-capacity scenario) the price of primary refined copper could be as much as 20 cents (26.1 percent) higher by 1983 and 30 cents (38.7 percent) higher by 1987, compared with baseline projections of prices under conditions of no restraints on domestic smelter capacity. Using the same basis of comparison, the prediction for 1987 is for domestic production of refined copper to be as much as 32.9 percent lower, for net imports to be up 20.7 percent, for consumption to be 10.7 percent lower, and for employment to be as much as 32.9 percent lower than under baseline conditions. Annual fixed and variable costs of pollution abatement and control for the domestic copper industry could be as high as $347 million in 1983 and $389 million in 1987, in 1974 dollars, under the constrained-capacity scenario (assuming a capital-recovery period of 13 years).

1/ The model simulates the annual growth and evolution of the industry through 1987 under three basic scenarios: (1) Baseline forecasts, which assume nominal industry compliance with air pollution regulations and, consequently, no constraints on capacity growth; (2) constrained capacity, which assumes no existing smelters will close, no increase in smelter capacity will occur before 1983, and only marginal electrowinning (refining) capacity will be introduced during 1983-87; and (3) reduced capacity, which assumes that 3 existing smelters (Phelps Dodge at Douglas, Ariz., Kennecott at McGill, Nev., and Asarco at Tacoma, Wash.), with a combined annual capacity of 268,000 tons, will close in 1983. As in the constrained-capacity scenario, the reduced-capacity version assumes only marginal electrowinning capacity will come on stream in 1983-87. The baseline forecasts thus provide a point of reference from which comparisons can be made in order to assess the relative and absolute magnitude of the economic impact of the constrained- and reduced-capacity scenarios.

The Commission requested data on the cost of compliance with Federal and State environmental and safety requirements. Capital expenditures reported by domestic producers in response to this request are shown in the following table.

Capital expenditures of domestic producers of copper made to comply with environmental and safety requirements, 1973-77

Item	1973	1974	1975	1976	1977
Capital expenditures resulting from efforts to comply with regulations of--					
EPA----------1,000 dollars--	171,609	182,140	220,405	174,258	122,719
OSHA and MESA-----do--------	1,780	5,797	9,571	4,452	6,372
Other----------do--------	548	751	352	351	1,071
Total----------do--------	173,937	188,688	230,328	179,061	130,162
Above expenditures divided by reported production of refined copper					
cents per pound--	4.0	4.7	6.4	4.5	3.6

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Impact of substitution.--Although copper is virtually irreplaceable in certain applications, in most uses it faces competition from aluminum, plastics, steel, and other materials. It is generally agreed that aluminum has provided the most serious competition, having made substantial inroads in electrical conductor and heat exchanger applications. The greatest replacement of copper has been in high voltage overhead electrical-transmission lines, where the lighter aluminum has a distinct advantage over copper. About 40 percent of insulated power cable and over 90 percent of bare conductor wire now utilizes aluminum. Automobile radiators--the largest use of copper in the heat-exchanger area--can also be made of aluminum, although copper retains its predominant share of this market.

The presence of substitution, chiefly by aluminum, has generally been recognized in econometric studies of the demand for copper. Such studies distinguish between short- and long-run substitution effects. Short-run substitution can occur whenever alternative materials can be used without necessitating major changes in product design or production equipment and processes. An example of such short-run substitution is the use of plastic or cast iron for plumbing in residential construction if the relative price of copper pipe becomes too high. In the long run, however, substitution usually requires modification of existing plant and equipment and/or product design and, therefore, requires new capital investment and a significant lead time.

As is the case in the influence of economic activity on demand, the substitution of alternative materials for copper is more responsive to changes in relative prices over the long run than in the short run. For example, elasticities of substitution found typically range from 0.20 to 0.66 in the short run, but from 0.84 to 1.57 and even higher in the long run. Thus, a 1-percent increase in the price of refined copper relative to that of aluminum, if sustained, would eventually induce an approximately equal percentage decrease in the demand for copper.

Impact of increasing U.S. production costs.--The suggestion has often been made that costs of producing copper have risen to such an extent in recent years, and are likely to continue to do so, that a substantial portion of the domestic product is no longer competitive on a cost basis with that produced in a number of other countries. Implicit in this argument is the assumption that in periods of low domestic and world demand and prices, such as in 1975, the less efficient producers are the first to cut back production since they are the least competitive. Among factors frequently cited as contributing to the increase in U.S. production costs (and, hence, the decrease in the competitiveness of U.S.-made refined copper) are the impact of environmental regulations in the United States, the rapid increase in domestic labor costs, the gradual depletion of domestic ore bodies, and the relatively high stripping ratio in the United States.

Data on domestic unit costs of mining, smelting, and refining copper in 1973, 1975, and 1977 were gathered by the Commission's questionnaires. The weighted average unit cost of producing a pound of refined copper jumped from 43.5 cents in 1973 to 62.7 cents in 1975, an increase of 44 percent in 2 years, but then rose by only 5 percent to 66.0 cents in 1977. 1/ The major cost elements in producing refined copper are incurred during mining and milling, which normally account for over half the total unit cost. Refining operations typically added 3 to 8 cents per pound to the total unit cost of 66 cents in 1977.

As noted in an earlier section of this report, average wages paid to production workers engaged in mining and milling copper ores have risen more rapidly since 1973 than those paid to most workers. Such wage increases, which were quite noticeable following the conclusion of new labor agreements in 1974 and 1977, have amounted to over 53 percent since 1973 (table 10). According to trade sources, the 1977 agreements are likely to mean further increases in labor costs of some 27 percent over the next 3 years. As indicated earlier, however, domestic producers reported increased productivity

1/ The influence of the volume of production on unit production costs should be noted. Producers responding to the Commission's questionnaires reported refined production of 2.2 million tons in 1973, but 1.8 million tons in 1975 and 1977. Thus the unit costs reported for 1975 and 1977 resulted from comparable production levels, while the higher level of production in 1973 could be expected to result in lower unit costs. The unit costs reported did not generally include interest expense on long-term debt incurred in connection with efforts to comply with environmental regulations. Such interest expenses could well add another 5 cents per pound to the unit costs reported for 1977.

in mining and refining copper since 1975. Such productivity increases tended to mitigate the effect of rapidly escalating labor costs during the 1973-77 period.

Data from the Bureau of Mines show that the average yield of copper from ore mined in the United States has been declining consistently for many years, from more than 20 pounds of recoverable copper per ton of ore mined prior to 1943 to 14 pounds in 1960, and to 10 pounds in 1976. Some copper deposits currently under development have an average yield of only 8 pounds of copper, with a cutoff grade of 4 pounds. It should be noted, however, that improvements in production technology, such as the development of the massive loaders and ore trucks used in open-pit mining, have largely compensated for the decline in copper content of the ore by making it economically feasible to mine lower grade ore. Open-pit mines, which account for about four-fifths of domestic production, have average ratios of overburden to ore of about 2.5 to 1.

Public statements made by domestic producers

Annual reports to stockholders for 1975-77 and SEC forms 10-K of publicly-held domestic producers of copper were examined to determine what explanations were offered publicly by such firms for the relatively poor financial performance of most U.S. producers of refined copper in the last 3 years. The statements made by these firms were as follows:

(1) Four firms stated that continuing foreign production, without regard to demand, by certain countries--principally Chile, Peru, Zaire, and Zambia--in need of foreign exchange had caused worldwide production to exceed consumption, thereby resulting in an increase in stocks, an increase in exports to the United States, and a depression of prices.

(2) Two firms stated merely that worldwide production exceeded consumption and, therefore, inventories rose and exports to the United States increased.

(3) Four firms indicated that U.S. prices were forced down while costs of producion increased, resulting in copper prices that were lower than costs or below "acceptable " levels.

(4) One firm stated that, in addition to increased total costs of production, unit costs rose even more because of the lower production level when operations were curtailed.

(5) One firm noted that pollution control costs have had an adverse effect on the competitive position of the United States vis-a-vis foreign producers.

Additional Data Relevant to the Question of the Threat of Serious Injury

The United States is the largest producer and consumer of refined copper in the world. As shown in tables 16 through 20, in 1977 it accounted for 17 percent of world mine and smelter output of recoverable copper, 19 percent of refinery production, 22 percent of consumption, and 22 percent of reported stocks (excluding those held by Comex). The United States also has about one-fifth of world reserves of copper. Except for certain years coinciding with military developments or unusually strong domestic demand, it has been nearly self-sufficient in copper. However, the U.S. share of each of the above categories has generally been declining since the end of World War II. Copper has become more diversified geographically as new producing countries have arisen and new firms have entered the industry. Moreover, the nationalization of copper-producing facilities in several developing countries that are major copper exporters has realigned ownership patterns and, at times, led to supply disruptions.

Foreign production and capacity

After the United States and the U.S.S.R., which is estimated to be the second largest producer and consumer of refined copper, the next five largest producers of copper-bearing ores are Chile, Canada, Zambia, Zaire, and Peru. These five together with the United States and the U.S.S.R. produced 72 percent of world mine output of recoverable copper in 1977. Chile, Peru, Zambia, and Zaire, which in 1967 formed the Conseil Intergouvernemental des Pays Exportateurs de Cuivre (Cipec), 1/ together account for almost one-third of total mine production.

Smelter and refinery production of copper (especially the latter) differ somewhat from mine output in geographical distribution by country. Japan, for example, is a relatively small producer of copper-bearing ore but the third largest producer of blister and refined copper. In addition, several European countries (e.g., Belgium, West Germany, and the United Kingdom) are major producers of refined copper from imported blister. On the other hand, the developing countries account for a smaller portion of total production of refined copper than of mine output. For example, in 1977 Cipec members accounted for 32 percent of mine output and 28 percent of smelter output, but only 17 percent of total world production of refined copper.

Table 4 shows data on estimated mine, smelter and refinery capacity for selected areas in 1975, 1976, and projected for 1980. The U.S. share of capacity at all three stages of production is projected to decline; in 1976

1/ Indonesia is also a full member of Cipec, and Australia, Mauritania, Papua New Guinea, and Yugoslavia are associate members. Cipec conducts marketing studies, issues reports on developments affecting supply and demand for copper, and attempts in consultations with its members to avoid extreme fluctuations in prices. It has also attempted in the past, largely ineffectively, to have its members cut back production in an effort to thereby increase world prices.

the United States had 25 percent of world refining capacity, but by 1980 its share should be only 22 percent. The largest increases in refining capacity are projected for countries in South America and Africa.

Projections of supply and demand

The future growth in the supply of refined copper relative to its demand, both in the United States and worldwide, is directly related to the question of whether imports into the United States can be expected to increase in the future. If, for example, world demand outstrips supply it would mean a reduction in stocks, an increase in prices, and a decrease in exports to the United States (since the U.S. producers' price has historically been lower than the LME, or world, price in periods of tight supply). If, on the other hand, world production continues to grow faster than consumption--as it has since 1973--then exports to the United States may logically be expected to continue the increase they have exhibited in recent years. Interwoven in this scenario is the separate but related aspect of domestic supply vis-a-vis demand, and such questions as what, if any, effect environmental regulations will have on U.S. capacity growth and domestic production costs.

Most forecasts of demand for refined copper in the next several years tend to use probable rates of growth that are identical to or slightly lower than those over the past decade. U.S. consumption of refined copper is generally predicted to grow at average annual rates of from 2 to 3 percent, while consumption worldwide will probably rise at rates somewhat (perhaps 1 percentage point) higher.

The following tabulation shows world production and consumption of refined copper during 1973-77 (in thousands of short tons):

Year	Production	Consumption	Change in stocks
1973----------	9,393	9,668	-275
1974----------	9,815	9,262	553
1975----------	9,259	8,251	1,008
1976----------	9,754	9,397	357
1977----------	10,082	9,944	138

As indicated above, world production has exceeded consumption since 1973, but the gap has narrowed greatly in the last 2 years. Although a diversity of opinion exists, it is generally believed that production and consumption over the next 2 or 3 years will be roughly in balance, additions to capacity being largely offset by increased consumption. In this context the cyclical nature of copper production should be noted. Investment made in productive facilities such as mines and smelters require a substantial lead time, the usual figure given being 5 to 7 years. The additions to capacity coming on stream during 1978-80 thus represent investment decisions made during the 1973 and 1974 period of high demand and prices. In contrast, few significant capacity

additions are foreseen for 1980-83 since the investment that would have been required in 1975-77 was not made because of the low prices prevailing in that period.

The growing investment of the U.S. oil industry in copper

Those opposed to the petition have argued that the growing investment of U.S. oil producers in copper is proof that a profitable cyclical recovery in world copper prices is likely despite the current poor financial performance of most domestic copper producers. According to this argument, the new investment would not be made without such a forecast. U.S. oil (and gas) companies own or have major interests in seven of the largest domestic copper producers, as shown below:

1. Amax--Approximately 20 percent owned by Standard Oil of California
2. Anaconda--Owned by Atlantic Richfield Co.
3. Cities Service--Also a primary copper producer.
4. Copper Range--Owned by Louisiana Land and Exploration Co.
5. Cyprus Pima Mining Co.--Union Oil Co. owns 25 percent.
6. Duval--Owned by Pennzoil Co.
7. Hecla--Copper producing facilities owned 50 percent by El Paso Natural Gas Co.

The above copper producers own or control a substantial portion of domestic copper reserves and mine production, and hold about 27 percent of U.S. refining capacity. All except Amax are copetitioners in this investigation. Other oil producers with domestic and foreign investments in copper include Continental Oil Co., Houston Oil and Minerals, Standard Oil of Indiana, and Royal Dutch Shell.

In early 1978, Exxon Corp. announced an investment of $107 million to purchase the Disputada copper mine in Chile, with the possible expansion of this project through an additional investment of $1 billion. The Commission's staff, in seeking to understand the profit rationale of recent copper investments by major oil companies, was permitted to examine the report given to the Exxon managing committee at the time of that firm's decision to undertake the Chilean investment. The presentation showed no evidence of any consideration of the effects of prospective restrictive trade action by the United States. It did, however, predict a substantial price rise for copper by 1982 or 1983, and further forecast the long-term rise of copper prices at slightly more than the trend line of production costs. The Exxon investment decision was part of a long-term commitment to minerals investment and included pricing and cost forecasts through the balance of the century.

The oil companies are believed to regard mineral development generally, and copper development specifically, as an appropriate extension of their knowledge of geology, the management of materiels handling, and the management of large capital projects. The recent acquisitions are easily within the financial means of the oil firms, and are viewed as a source of future profits.

APPENDIX A

UNITED STATES INTERNATIONAL TRADE COMMISSION
NOTICES OF INVESTIGATION AND HEARING

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

UNALLOYED UNWROUGHT COPPER

[TA-201-32]

Notice of Investigation and Hearing

Investigation instituted. Following receipt of a petition on February 23, 1978, filed on behalf of The Anaconda Co., ASARCO, Inc., Cities Service Co. (Minerals Group), Copper Range Co., Cyprus Mines Corp., Duval Corp., Hecla Mining Co., Inspiration Consolidated Copper Co., Kennecott Copper Corp., Magma Copper Co., Phelps Dodge Corp., and Ranchers Exploration and Development Corp., the U.S. International Trade Commission on March 17, 1978, instituted an investigation under section 201(b) of the Trade Act of 1974 to determine whether unwrought copper, other than alloyed, provided for in item 612.06 of the Tariff Schedules of the United States, is being imported into the United States in such increased quantities as to be a substantial cause of serious injury, or the threat thereof, to the domestic industry producing an article like or directly competitive with the imported article.

Public hearing ordered. A public hearing in connection with this investigation will be held in Tucson, Ariz., beginning on Monday, May 22, 1978. The time and place of the hearing will be announced later. Requests for appearances at the hearing should be received in writing by the Secretary of the Commission at his office in Washington, D.C., not later than noon, Monday, May 15, 1978.

A prehearing conference in connection with this investigation will be held in Washington, D.C., at 9:30 a.m., E.D.T., on May 15, 1978, in Room 117, U.S. International Trade Commission Building, 701 E Street, NW.

Inspection of petition. The petition filed in this matter is available for public inspection at the Office of the Secretary, U.S. International Trade Commission and at the New York City office of the U.S. International Trade Commission located at 6 World Trade Center.

By order of the Commission:

Kenneth R. Mason
Secretary

Issued: March 20, 1978

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

[TA-201-32]

UNALLOYED UNWROUGHT COPPER

Time and Place of Public Hearing

Notice is hereby given that the public hearing in this matter scheduled to begin in Tucson, Ariz., on Monday, May 22, 1978, will commence at 9:30 a.m., M.S.T., in the meeting room, Tucson Community Center, 260 South Church Street, Tucson, Ariz. Requests for appearances should be filed with the Secretary of the United States International Trade Commission, in writing, at his office in Washington, D.C., not later than noon, Monday, May 15, 1978.

Notice of the investigation and hearings was published in the Federal Register of March 23, 1978 (43 F.R. 12130).

By order of the Commission.

Kenneth R. Mason
Secretary

Issued: April 4, 1978

APPENDIX B

CERTAIN LEGISLATION RELATED TO COPPER

Within the past year several bills aimed at assisting domestic producers of copper have been introduced in the Congress. Four distinct approaches have been taken in these bills: (1) an increase in the tariffs on copper and exclusion of copper from GSP treatment; (2) an additional tariff on copper to offset domestic producers' costs in meeting U.S. environmental regulations; (3) selling stockpiled tin and tungsten to pay for purchases of copper for the national stockpile; and (4) limitations on financial assistance by the U.S. Government for private investment abroad in copper extraction facilities.

House bill H.R. 8630, dated July 28, 1977 (introduced by Representative Ruppe and referred to the Trade Subcommittee of the Committee on Ways and Means), and the identical (except for the proposed title of the Act) Senate bill S. 2124 of September 21, 1977 (introduced by Senator DeConcini and referred to the Subcommittee on International Trade of the Committee on Finance), would increase tariffs as follows: (1) double the specific rates of duty on copper content for copper-bearing ores and most copper products (including unwrought copper under item 612.06) under columns 1, 1-a, 1-b, and 2 of the TSUS; (2) raise the trigger price for classification of imports at higher rates of duty from 24 cents to 70 cents per pound; and (3) exclude imports of copper from eligibility for duty-free importation pursuant to the GSP.

House bill H.R. 9695 (introduced by Representative Udall and others; referred to the Committee on Ways and Means' Trade Subcommittee) and the identical Senate bill S. 2233 (introduced by Senators DeConcini, Domenici, and Goldwater; referred to the Committee on Finance's Subcommittee on International Trade), both dated October 20, 1977, would offset environmental costs as follows: (1) add a new part 4 to the Appendix of the TSUS entitled "Environmental Equalization Duties," in which provision would be made for a duty of 10 cents per pound on copper content to be collected on copper-bearing ores and materials and most copper products (including unalloyed unwrought copper under item 612.06, in addition to the duties provided for elsewhere in the TSUS; (2) provide a procedure for adjustment of environmental equalization duties; and (3) remove the copper articles provided for in part 4 from GSP eligibility by amending the Trade Act of 1974.

Senate bill S. 2167, dated September 30, 1977 (introduced by Senator Domenici; referred to the Subcommittee on Military Construction and Stockpiles of the Committee on Armed Services; hearings held March 8 and 9, 1978), designed to assist in increasing the price of copper in the United States by authorizing the purchase of copper for the national stockpile, would do so by authorizing the (1) sale of 30,000 tons of tin from the national and/or supplemental stockpiles, and (2) use of the proceeds to purchase no more than 250,000 tons of copper for the national stockpile.

House bill H.R. 11448 (introduced by Representative Udall and others; referred to the Subcommittee on Seapower and Strategic and Critical Materials of the Committee on Armed Services) and Senate bill S. 2702 (introduced by Senators DeConcini, Cannon, Domenici, and Hatfield; referred to the Committee on Armed Services' Subcommittee on Military Construction and Stockpiles; hearings held March 8 and 9, 1978), both dated March 9, 1978, would authorize

the disposal of up to 45,000 long tons of tin from the national and supplemental stockpile and the acquisition of up to 225,000 short tons of copper for the national stockpile with part of the prodeeds of the tin sale. Specifically: (1) up to 26,000 long tons of tin would be used to obtain up to 225,000 short tons of copper, subject to the provisions that the proceeds of the sale of the first 5,000 long tons of tin sold in fiscal year 1978 and 10,000 long tons sold in fiscal year 1979 go to the Treasury as miscellaneous receipts; (2) 4,000 long tons of tin would be used to purchase strategic and critical materials needed on a priority basis to meet stockpile goals; (3) tungsten available for disposal by the General Services Administration is to be used to aid in the acquisition of the copper, except that proceeds from the sale of the first 3 million pounds of tungsten in fiscal year 1978 and in fiscal year 1979 may not be used for such purposes; and (4) the copper acquired would go into the national stockpile.

The administration has supported the bills of March 9, 1978, to authorize disposal of tin to purchase copper. In order for the President to sell stockpiled commodities, the disposal must be authorized by Congress. Likewise, in order for purchases to be made, appropriations must be authorized by Congress.

House bill H.R. 9179, dated September 19, 1977 (introduced by Representatives Bingham, Cavanaugh, Ireland, Solarz, and Whalen; referred to the Committee on International Relations), designed to amend the Foreign Assistance Act of 1961 with respect to the activities of the Overseas Private Investment Corporation (OPIC), was amended by Representative Udall to prohibit financial support of any sort for projects dealing with exploration for or mining of copper deposits, unless previously agreed to by OPIC. The bill, including the copper amendment, was passed by the House and received by the Senate on February 24, 1978. The conference committee adopted the House provision with an amendment providing that OPIC (a) shall not support any new project, or any modification of an existing project which will result in a significant expansion of production, involving the exploration for or the mining of copper if such production is to commence prior to January 1, 1981, and (b) shall not support such a project which would commence production after that date if it will cause injury to the primary U.S. copper industry. The bill became law as P.L. 95-268 on April 24, 1978

APPENDIX C

STATISTICAL TABLES

Table 1.--Copper: U.S. production, by stages of processing, and exports, imports, change in stocks, and consumption of unalloyed unwrought copper, 1973-77 and January-May 1978

Item	1973	1974	1975	1976	1977	Jan.-May 1978
U.S. production:						
Mine 1/----------1,000 short tons---	1,718	1,597	1,413	1,606	1,518	644
Smelter: 1/						
From primary (new) materials:						
Domestic------1,000 short tons---	1,705	1,532	1,374	1,461	1,394	583
Imported----------do---------	39	38	73	73	41	12
From scrap----------do---------	78	79	49	51	49	22
Total----------do---------	1,822	1,649	1,496	1,585	1,484	617
Refinery:						
From primary (new) materials:						
Domestic------1,000 short tons---	1,698	1,421	1,286	1,423	1,411	566
Imported----------do---------	170	234	157	116	85	50
From scrap 2/----------do---------	465	497	344	378	372	187
Total----------do---------	2,333	2,152	1,787	1,917	1,868	803
Unalloyed unwrought copper						
Production----------1,000 short tons---	2,333	2,152	1,787	1,917	1,868	803
Exports----------do---------	186	125	170	112	52	39
Imports for consumption-----do---------	206	304	142	381	387	272
Change in stocks 3/---------do---------	-85	69	198	183	3	4/
Apparent consumption--------do---------	2,438	2,262	1,561	2,003	2,200	1,036
Reported consumption 5/-----do---------	2,437	2,194	1,534	1,992	2,182	1,008
Ratio of imports to--						
Production----------percent------	8.8	14.1	7.9	19.9	20.7	33.9
Reported consumption------do---------	8.4	13.9	9.3	19.1	17.7	27.0

1/ Recoverable copper content.
2/ Secondary copper recovered in refined form; includes minor amounts of copper recovered from new scrap.
3/ Commercial sales of refined copper from GSA stocks (144,000 tons in 1974) were added to the stocks shown in table 8 of this report.
4/ Not available.
5/ By wire mills, brass mills, foundries, smelters, chemical plants, and miscellaneous small users.

Source: Change in stocks from table 8 (see footnote 3 above); other data compiled from official statistics of the U.S. Bureau of Mines and the U.S. Department of Commerce.

Table 2.--Unalloyed unwrought copper: U.S. imports for consumption, by principal sources, 1973-77

Source	1973	1974	1975	1976	1977
	Quantity (1,000 short tons)				
Canada	130	118	71	94	99
Chile	28	61	28	67	88
Zambia	5	3	1/	127	74
Peru	4	7	7	29	46
Yugoslavia	4	14	18	47	17
Belgium	9	8	7	4	14
Netherlands	2	3	0	1/	10
West Germany	9	7	1/	1/	10
Japan	1/	72	8	0	0
All other	15	11	3	13	29
Total	206	304	142	381	387
	Value (million dollars)				
Canada	157	189	88	123	133
Chile	40	107	30	79	101
Zambia	5	5	1/	150	91
Peru	5	12	7	32	53
Yugoslavia	3	27	18	52	20
Belgium	18	15	8	4	17
Netherlands	3	5	-	1/	11
West Germany	16	13	1/	1/	13
Japan	1/	134	10	-	-
All other	16	23	4	13	33
Total	263	530	165	453	472
	Unit value (cents per pound)				
Canada	60	80	63	66	67
Chile	70	88	53	59	58
Zambia	48	91	59	59	62
Peru	57	90	51	56	58
Yugoslavia	29	94	50	55	60
Belgium	88	100	55	52	62
Netherlands	76	86	-	49	52
West Germany	92	93	300	102	63
Japan	44	93	63	-	-
All other	64	100	57	50	58
Average	64	87	58	59	61

1/ Less than 500 short tons or $500,000.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 3.--U.S. mine production of recoverable copper, by States, 1973-77

(In thousands of short tons)

State	1973	1974	1975	1976	1977
Arizona	927	859	813	1,025	932
Utah	257	231	177	186	194
New Mexico	205	197	146	172	167
Montana	132	131	88	91	89
Nevada	94	84	81	58	67
Michigan	72	67	74	44	43
Missouri	10	13	14	11	12
Tennessee	9	6	10	11	6
Idaho	4	3	3	3	4
Colorado	3	3	4	2	2
Maine	1	1	2	2	1
All other 1/	4	2	1	1	1
Total	1,718	1,597	1,413	1,606	1,518

1/ Includes California, Pennsylvania, Oklahoma, Oregon, Washington, and Wisconsin.

Source: Compiled from official statistics of the U.S. Bureau of Mines.

Table 4.--Copper: Estimated mine, smelter, and refinery capacities, by selected areas, 1975, 1976, and projected for 1980

(In thousands of short tons)

Area	1975	1976	1980
North America:			
United States:			
Mine	2,000	2,000	2,150
Smelter	2,000	2,100	2,100
Refinery	2,860	2,900	2,900
Other North America			
Mine	1,090	1,120	1,390
Smelter	820	820	1,150
Refinery	770	770	1,030
South America:			
Mine	1,220	1,380	1,780
Smelter	1,140	1,140	1,440
Refinery	1,130	1,130	1,440
Europe: 1/			
Mine	280	280	300
Smelter	790	790	830
Refinery	1,820	1,820	1,890
Africa:			
Mine	1,820	1,820	2,000
Smelter 2/	1,870	1,870	1,970
Refinery	1,270	1,270	1,820
Asia: 1/			
Mine	550	590	950
Smelter	1,530	1,530	2,000
Refinery	1,510	1,510	1,760
Oceania:			
Mine	480	480	500
Smelter	250	250	250
Refinery	230	230	230
Centrally planned economies:			
Mine	3/ 1,700	3/ 1,800	2,500
Smelter	3/ 1,850	3/ 1,950	2,150
Refinery	3/ 1,850	3/ 1,950	2,150
World total:			
Mine	9,140	9,470	11,570
Smelter	10,250	10,450	11,890
Refinery	11,440	11,580	13,220

1/ Market economy countries.
2/ Includes electrowinning capacity in Zaire and Zambia.
3/ Estimated.

Source: Compiled from official statistics of the U.S. Bureau of Mines.

Table 5.--Copper: U.S. producers' shipments, by types, 1973-77 and January-March 1978

Item	1973	1974	1975	1976	1977	Jan.-Mar. 1978
	Quantity (1,000 short tons)					
Domestic shipments:						
Market:						
Concentrates and precipitates	*****	*****	*****	*****	*****	*****
Blister copper	*****	*****	*****	*****	*****	*****
Refined copper	1,655	1,310	1,114	1,360	1,230	312
Captive:						
Concentrates and precipitates	*****	*****	*****	152	126	25
Blister copper	*****	507	506	587	502	141
Refined copper	482	468	467	504	539	151
Export shipments:						
Concentrates and precipitates	13	*****	*****	0	*****	0
Blister copper	*****	0	0	0	0	0
Refined copper	162	155	165	111	*****	*****
	Value (million dollars)					
Domestic shipments:						
Market:						
Concentrates and precipitates	*****	*****	*****	*****	*****	*****
Blister copper	*****	*****	*****	*****	*****	*****
Refined copper	1,791	1,784	1,221	1,741	1,547	361
Captive shipments of refined copper 1/	523	652	500	645	584	172
Export shipments:						
Concentrates and precipitates	19	*****	*****	0	*****	0
Blister copper	*****	0	0	0	0	0
Refined copper	261	285	180	137	*****	*****

1/ Data were not collected on the value of captive shipments of concentrates, precipitates, or blister copper.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Table 6.--Unalloyed unwrought copper: U.S. exports of domestic merchandise, by principal markets, 1973-77

Market	1973	1974	1975	1976	1977
	Quantity (1,000 short tons)				
West Germany	18	11	34	27	10
France	23	19	23	21	10
Canada	12	11	7	5	8
United Kingdom	12	15	15	20	7
Italy	31	27	22	16	6
Belgium	5	2	13	1	3
Netherlands	3	4	15	5	2
Japan	45	4	3	5	1
Sweden	1	1	1	5	1
Republic of Korea	4	2	1	1/	1/
Brazil	22	24	25	3	1/
Taiwan	6	1	4	1/	1/
Philippines	2	1	1	1/	1/
All other	2	3	6	4	3
Total	186	125	170	112	52
	Value (million dollars)				
West Germany	25	20	40	36	13
France	28	35	32	30	14
Canada	16	18	8	6	11
United Kingdom	14	26	20	27	10
Italy	40	48	31	24	10
Belgium	7	4	16	1	4
Netherlands	4	8	19	7	3
Japan	57	7	4	6	2
Sweden	1	3	1	7	2
Republic of Korea	7	3	1	1/	1/
Brazil	34	43	32	4	1/
Taiwan	9	2	5	1/	1/
Philippines	3	2	2	1/	1/
All other	4	4	9	7	1
Total	250	224	221	156	70

1/ Less than 500 short tons or $500,000

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 7.--Specified items of copper: U.S. imports and exports, 1973-77

(In thousands of short tons)

Item	1973	1974	1975	1976	1977
	Imports 1/				
Copper-bearing ore, concentrates, cement copper and precipitates, and matte 2/	44	56	76	90	60
Black, blister and anode copper 2/	153	208	87	44	45
Alloyed unwrought copper 3/	2	11	1	3	1
Unalloyed unwrought copper	206	304	142	381	387
Copper waste and scrap	27	42	20	29	29
Powders and flakes	1	1	1	1	1
Wrought copper items, total	97	69	58	109	110
Bars, plates, sheet and strip	38	29	28	49	48
Rods	8	6	4	14	17
Wire	4	3	2	12	8
Angles, shapes and sections	1	4/	4/	1	4/
Pipe and tube	46	30	24	34	37
Total imports	530	691	385	657	633
	Exports				
Copper-bearing ore, concentrates, and matte 2/	23	12	8	15	27
Blister and other unrefined copper 2/	7	3	2	3	8
Ash and residue	15	8	7	5	12
Alloyed unwrought copper 3/	4	3	3	2	2
Unalloyed unwrought copper	186	125	170	112	52
Copper waste and scrap	152	160	144	114	120
Powders, flakes, and foil	3	3	1	2	2
Wrought copper items, total	53	63	40	40	40
Plates, sheet and strip	7	8	3	5	6
Rods, unalloyed	5	7	5	4	6
Wire, excluding insulated	6	6	4	5	6
Bars, angles, shapes and sections	11	17	12	8	9
Pipe and tube	25	25	16	17	14
Total exports	443	376	375	292	263

1/ Imports shown are imports for consumption, except those for copper-bearing ore, concentrates, cement copper and precipitates, matte, black copper, blister copper and anode copper; data for these items are general imports.
2/ Copper content.
3/ Includes master alloys.
4/ Less than 500 short tons.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 8.--Refined copper: U.S. yearend inventories, 1972-77

(In thousands of short tons)

Item	Dec. 31--					
	1972	1973	1974	1975	1976	1977
Producers	99	79	163	267	285	316
Importers	1/ 22	15	33	65	130	117
Comex	58	6	43	100	201	184
Wire mills	50	42	108	119	114	116
Brass mills	28	30	36	31	35	34
Miscellaneous consumers 2/	5	5	7	6	6	7
Total	262	177	390	588	771	774

1/ Estimated.

2/ Partly estimated; includes secondary smelters, chemical plants, foundries, and miscellaneous plants.

Source: Stocks held by wire mills, brass mills, and Comex compiled from official statistics of the U.S. Bureau of Mines; other stocks from responses to questionnaires of the U.S. International Trade Commission.

Table 9.--Trade adjustment assistance investigations concluded by the U.S. Department of Labor involving workers engaged in mining, smelting, and refining copper, Jan. 1, 1975-June 30, 1978

Case no. (TA-W-)	Name and location of establishment	Estimated number of workers	Date investigation instituted	Determination		Date of impact
				Date	Decision	
2	Essex International Milford, Utah	68	4/4/75	5/29/75	Certified	10/3/74
19	Anaconda Co. Perth Amboy, N.J.	700	5/1/75	6/27/75	Certified	12/27/74
531	Anaconda Co. Butte, Mont.	1,200	1/9/76	3/31/76	Certified	12/22/74
589	Asarco, Inc. Perth Amboy, N.J.	975	2/6/76	4/19/76	Denied	-
635	Kennecott Copper Corp. McGill, Nev.	700	2/27/76	4/14/76	Denied	-
788	White Pine Copper Co. White Pine, Mich.	1,600	4/9/76	8/6/76	Certified	1/1/76
1,291	U.S. Metals Refining Co. Cartaret, N.J.	1,000	11/11/76	3/25/77	Denied	-
1,299	Asarco, Inc. Perth Amboy, N.J.	530	11/15/76	2/28/77	Denied	-
1,312	Homestake Copper Co. Calumet, Mich.	130	11/30/76	2/17/77	Denied	-
2,235	Anaconda Co. Elko, Nev.	179	8/2/77	10/25/77	Certified	8/1/77
2,409	Anamax Mining Co. Sahuarita, Ariz.	700	10/4/77	2/8/78	Certified	6/1/77
2,410	Asarco, Inc. Silver Bell, Ariz.	250	10/4/77	2/27/78	Certified	9/6/77
2,411	Asarco, Inc. Sauharita, Ariz.	700	10/4/77	2/27/78	Certified	9/6/77
2,412	Inspiration Consolidated Inspiration, Ariz.	200	10/4/77	2/13/78	Certified	8/26/77
2,413	Inspiration Consolidated Miami, Ariz.	871	10/4/77	3/27/78	Certified	8/26/77
2,414	Magma Copper Co. San Manuel, Ariz.	132	10/4/77	12/21/77	Certified	8/1/77
2,415	Magma Copper Co. Superior, Ariz.	44	10/4/77	12/21/77	Certified	9/1/77
2,418	Cyprus Bruce Corp. Bagdad, Ariz.	100	10/5/77	2/28/78	Certified	7/1/77
2,419	Duval Corp. Tucson, Ariz.	225	10/5/77	1/25/78	Certified	6/30/77

Continued on next page.

Table 9.--Trade adjustment assistance investigations concluded by the U.S. Department of Labor involving workers engaged in mining, smelting, and refining copper, Jan. 1, 1975-June 30, 1978

Case no. (TA-W-)	Name and location of establishment	Estimated number of workers	Date investigation instituted	Determination		Date of impact
				Date	Decision	
2,420	Phelps Dodge Corp. Douglas, Ariz.	104	10/5/77	1/11/78	Certified	After 9/20/76 Before 7/1/77
2,421	Phelps Dodge Corp. Ajo, Ariz.	795	10/5/77	1/11/78	Certified	8/12/77
2,422	Phelps Dodge Corp. Bisbee, Ariz.	100	10/5/77	1/13/78	Denied	-
2,423	Phelps Dodge Corp. Morenci, Ariz.	204	10/5/77	1/13/78	Certified	8/12/77
2,424	Phelps Dodge Corp. Tyrone, N. Mex.	550	10/5/77	1/13/78	Denied	-
2,480	Duval Corp. Kingman, Ariz.	275	10/19/77	1/25/78	Certified	6/30/77
2,481	Duval Corp. Tucson, Ariz.	1.200	10/19/77	1/25/78	Certified	5/31/77
2,484	Hecla Mining Co. Casa Grande, Ariz.	1,315	10/19/77	1/10/78	Certified	10/1/76
2,490	Asarco, Inc. Casa Grande, Ariz.	260	10/20/77	2/27/78	Certified	9/6/76
2,575	Anderson Development Miami, Ariz.	30	11/9/77	5/22/78	Certified	9/1/77
2,579	Cities Service Co. Miami, Ariz.	458	11/9/77	12/30/77	Certified	7/26/77
2,580	Cyprus Pima Mining Co. Tucson, Ariz.	824	11/9/77	12/30/77	Certified	1/1/77
2,626	Anaconda Co. Weed Heights, Nev.	400	11/21/77	1/31/78	Certified	10/26/76
2,701	Idarado Mining Co., Inc. Ouray, Colo. (copper, lead, zinc, silver, gold)	100	12/5/77	5/8/78	Certified 1/	9/17/77
2,810	Anaconda Co. Anaconda, Mont.	200	12/27/77	3/10/78	Certified	12/9/77
2,891	Ranchers Exploration and Development Corp. Miami, Ariz.	30	1/9/78	5/22/78	Certified	9/1/77
3,032	Kennecott Copper Corp. Nevada Mines Div.	700	2/6/78	6/27/78	Certified	6/11/77
3,097	Cyprus Mines Corp. Mineral Exploration Div.	9	2/9/78	6/12/78	Certified	3/25/78
3,129	Cities Service Co. Miami, Ariz.	30	2/15/78	5/25/78	Denied	-

1/ Only those workers producing copper and zinc concentrates were certified.

Source: U.S. Department of Labor, Office of Trade Adjustment Assistance.

Table 10.--Average weekly and hourly wages received by U.S. production workers, by sectors, 1973-77

Year	Total private sector	Manufacturing	Mining		
			Total	All metals	Copper
	Average weekly wages				
1973	$145	$166	$201	$200	$206
1974	154	176	221	227	226
1975	164	190	250	251	248
1976	176	208	275	281	281
1977	189	227	303	299	287
	Average hourly wages				
1973	$3.92	$4.08	$4.73	$4.76	$4.88
1974	4.22	4.41	5.21	5.42	5.51
1975	4.54	4.81	5.90	6.13	6.33
1976	4.87	5.19	6.42	6.75	7.00
1977	5.24	5.63	6.87	7.27	7.48
	Index of average hourly wages (1973=100)				
1973	100.0	100.0	100.0	100.0	100.0
1974	107.6	109.4	110.1	113.9	112.9
1975	115.8	119.4	124.7	128.8	129.7
1976	124.2	128.8	135.7	141.8	143.4
1977	133.7	139.7	145.2	152.7	153.3

Source: Compiled from official statistics of the U.S. Department of Labor.

Table 11.--Unalloyed unwrought copper: Average price quoted for electrolytic wirebar by U.S. producers and average spot price on the LME, by quarters, January 1973-June 1978

(Cents per pound)

Period	U.S. producers' delivered price	London Metal Exchange price
1973:		
January-March	55.6	58.5
April-June	60.1	73.9
July-September	60.1	91.4
October-December	62.2	99.1
Average	59.5	80.9
1974:		
January-March	68.7	106.8
April-June	78.8	126.2
July-September	85.6	78.3
October-December	76.1	62.0
Average	77.3	93.1
1975:		
January-March	65.8	57.7
April-June	63.7	57.0
July-September	63.4	56.1
October-December	63.8	53.0
Average	64.2	56.0
1976:		
January-March	64.0	56.6
April-June	70.1	69.1
July-September	74.6	70.2
October-December	69.5	58.2
Average	69.6	63.9
1977:		
January-March	69.1	65.5
April-June	72.7	62.2
July-September	64.1	54.5
October-December	61.0	55.2
Average	66.8	59.4
1978:		
January-March	63.2	56.5
April-June	65.3	59.2

Source: Metals Week, various issues.

Table 12.--Electrolytic copper wirebar: Weighted average lowest net prices 1/ for sales of imported and U.S.-produced products, and weighted average net prices for all such sales, by quarters, January 1973-March 1978

(In cents per pound)

Period	Lowest price		Average price	
	Imported	U.S.-produced	Imported	U.S.-produced
1973:				
January-March	52.7	53.2	53.1	56.0
April-June	60.4	59.9	60.4	60.9
July-September	63.9	59.9	77.5	60.6
October-December	74.0	60.3	85.6	62.2
1974:				
January-March	75.9	63.6	91.7	69.2
April-June	88.4	69.8	106.3	80.0
July-September	83.8	82.4	95.3	86.0
October-December	63.8	73.4	70.2	75.7
1975:				
January-March	61.4	63.6	62.4	64.8
April-June	60.1	63.0	58.7	62.5
July-September	55.5	61.9	56.3	62.3
October-December	53.2	63.4	53.8	62.6
1976:				
January-March	56.8	63.5	60.9	62.2
April-June	51.1	66.5	66.8	69.3
July-September	65.9	74.5	72.3	74.3
October-December	56.2	65.4	59.0	69.1
1977:				
January-March	61.7	65.5	66.3	67.8
April-June	64.0	71.0	67.0	71.7
July-September	60.5	60.3	61.1	63.5
October-December	52.8	60.5	55.7	60.3
1978:				
January-March	56.8	61.2	59.3	61.6

1/ Delivered price to customers in the United States.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Table 13.--Electrolytic copper wirebar: Weighted average net prices 1/ paid by U.S. consumers for imported and U.S.-produced products, by quarters, January 1973-March 1978

(In cents per pound)

Period	Lowest price		Average price	
	Imported	U.S.-produced	Imported	U.S.-produced
1973:				
January-March	51.2	51.4	54.2	52.1
April-June	60.2	58.9	62.5	60.2
July-September	62.8	59.8	68.7	63.1
October-December	75.3	60.7	75.8	68.9
1974:				
January-March	76.7	68.2	86.9	76.2
April-June	74.7	69.5	103.2	89.4
July-September	87.6	75.0	91.3	89.4
October-December	61.0	71.5	69.0	75.9
1975:				
January-March	59.1	57.2	64.5	64.3
April-June	54.6	60.5	59.7	62.4
July-September	59.1	58.0	61.3	62.0
October-December	58.8	60.6	62.3	62.3
1976:				
January-March	56.1	60.4	60.9	63.2
April-June	62.4	63.8	68.1	68.1
July-September	69.2	69.8	71.8	73.0
October-December	58.5	61.2	67.0	69.5
1977:				
January-March	61.0	64.5	68.1	67.1
April-June	68.4	65.1	69.7	71.1
July-September	62.1	59.2	64.9	65.5
October-December	58.6	60.0	60.0	60.2
1978:				
January-March	57.7	58.4	59.9	61.1

1/ Delivered price to customers in the United States.

Source: Compiled from data submitted in response to questionnaires of the U.S. International Trade Commission.

Table 14.--Refined copper: U.S. consumption, by class of consumer, 1973-77

(In thousands of short tons)

Class of consumer	1973	1974	1975	1976	1977
Wire mills	1,672	1,474	1,061	1,364	1,521
Brass mills	714	670	439	585	623
Foundries	15	19	14	1/	2/
Secondary smelters	11	9	4	8	2
Chemical plants	1	1	1	1/	2/
Other 3/	24	21	15	1/	2/
Total	2,437	2,194	1,534	1,992	2,182

1/ Total includes 35,000 tons consumed by chemical plants, foundries, and miscellaneous plants.

2/ Consumption by chemical plants, foundries, and miscellaneous plants not available. Estimate of 36,000 tons included in total.

3/ Includes iron and steel plants, primary smelters producing alloys other than copper, consumers of copper powder and copper shot, and miscellaneous manufacturers.

Source: Compiled from official statistics of the U.S. Bureau of Mines.

Table 15.--Indexes of U.S. consumption of refined copper and various measures of U.S. industrial production, 1968-77

(1967=100)

Year	Consumption of refined copper	U.S. industrial production				
		Total	Durable manufactures	Transportation equipment	Electrical machinery	Electric utilities
1968	97.1	105.7	105.5	108.3	102.8	110.3
1969	110.6	110.7	110.0	105.4	107.6	121.5
1970	105.5	106.7	101.5	90.3	101.4	130.8
1971	104.3	106.8	99.4	92.9	98.3	138.1
1972	115.6	115.2	108.4	99.0	109.6	149.4
1973	125.9	125.6	122.1	109.2	126.8	160.7
1974	113.3	124.8	120.7	96.9	125.2	159.5
1975	79.2	117.8	109.3	97.4	116.5	160.8
1976	102.9	129.8	121.7	110.6	131.6	167.6
1977	112.7	137.0	129.5	121.1	141.9	175.4

Source: Compiled from official statistics of the Bureau of Mines and the Federal Reserve Board.

Table 16.--Mine production of recoverable copper, by selected countries, 1973-77

(In thousands of short tons)

Country	1973	1974	1975	1976	1977
United States	1,718	1,597	1,413	1,606	1,518
U.S.S.R. 1/	1,168	1,168	1,212	1,246	1,256
Chile	811	994	913	1,108	1,164
Canada	908	905	809	806	866
Zambia	779	769	746	781	725
Zaire	539	551	545	490	531
Peru	223	233	208	242	364
Philippine Republic	244	248	249	262	302
Poland	168	204	254	294	295
Australia	243	277	241	236	244
South Africa	194	197	197	217	238
Papua New Guinea	202	203	190	195	201
Peoples Republic of China 2/	148	159	171	182	182
Yugoslavia	123	124	127	151	153
Mexico	89	91	86	98	99
Japan	101	90	94	90	90
Other	611	659	655	704	711
Total	8,269	8,469	8,110	8,708	8,939

1/ Estimated.
2/ Estimated; includes other Asian countries with centrally planned economies.

Source: World Bureau of Metal Statistics, World Metal Statistics, May 1978.

Table 17.--Smelter production of recoverable copper, by selected countries, 1973-77

(In thousands of short tons)

Country	1973	1974	1975	1976	1977
United States	1,822	1,649	1,496	1,585	1,484
U.S.S.R. 1/	1,168	1,168	1,212	1,261	1,268
Japan	1,103	1,112	906	947	1,059
Chile	650	798	799	944	979
Zambia	753	782	726	778	717
Canada	546	568	547	539	551
Zaire	496	500	510	450	499
Peru	194	196	178	208	353
Poland	168	204	254	294	309
West Germany	256	270	238	270	261
South Africa	182	190	184	185	196
Peoples Republic of China 2/	148	181	196	190	193
Australia	183	220	201	188	186
Yugoslavia	114	138	131	149	130
Spain	95	109	116	124	124
Mexico	71	78	68	94	81
Other	554	592	542	639	633
Total	8,503	8,755	8,304	8,845	9,023

1/ Estimated.
2/ Estimated; includes other Asian countries with centrally planned economies.

Source: World Bureau of Metal Statistics, World Metal Statistics, May 1978.

Table 18.--Refined copper: Production, by selected countries, 1973-77

(In thousands of short tons)

Country	1973	1974	1975	1976	1977
United States	2,354	2,138	1,812	1,958	1,921
U.S.S.R. 1/	1,433	1,488	1,565	1,609	1,620
Japan	1,048	1,098	903	953	1,029
Chile	457	593	590	697	745
Zambia	704	746	694	766	706
Belgium	405	417	366	468	590
Canada	549	616	583	563	561
West Germany	448	467	465	492	485
Poland	172	214	274	298	338
Peoples Republic of China 2/	237	260	273	292	298
Peru	43	43	79	154	201
Australia	197	214	212	208	200
Spain	103	136	144	156	176
South Africa	97	94	97	105	147
United Kingdom	188	176	167	151	133
Yugoslavia	152	165	152	150	130
Zaire	254	280	249	73	109
Other	552	670	634	661	694
Total	9,393	9,815	9,259	9,754	10,082

1/ Estimated.
2/ Estimated; includes other Asian countries with centrally planned economies.

Source: U.S. production from official statistics of the U.S. Bureau of Mines (includes minor amounts of secondary copper recovered as alloys); other countries' production from World Bureau of Metal Statistics, World Metal Statistics, May 1978.

Table 19.--Refined copper: Consumption, by selected countries, 1973-77

(In thousands of short tons)

Country	1973	1974	1975	1976	1977
United States	2,437	2,194	1,534	1,992	2,182
U.S.S.R. 1/	1,212	1,268	1,345	1,378	1,378
Japan	1,325	971	912	1,158	1,247
West Germany	802	806	700	821	818
United Kingdom	596	548	497	504	564
France	450	457	402	405	417
Peoples Republic of China 2/	312	324	347	369	386
Italy	331	348	330	355	364
Belgium	181	196	196	251	326
Canada	274	298	216	237	242
Brazil	136	192	171	198	236
Poland	151	154	169	192	193
Spain	154	159	132	144	143
Yugoslavia	93	120	114	143	143
German Democratic Republic	112	115	123	130	130
Australia	134	134	113	123	124
Other	968	978	950	997	1,051
Total	9,668	9,262	8,251	9,397	9,944

1/ Estimated.

2/ Estimated; includes other Asian countries with centrally planned economies.

Source: U.S. consumption from official statistics of the U.S. Bureau of Mines; other countries' consumption from World Bureau of Metal Statistics, World Metal Statistics, May 1978.

Table 20.--Refined copper: End-of-period stocks, by selected countries and by metal exchanges, 1973-77

(In thousands of short tons)

Item	1973	1974	1975	1976	1977
United States	116	296	411	423	437
Japan	113	189	329	283	323
West Germany	63	92	120	116	163
France 1/	57	71	63	58	65
Zambia 2/	6	11	24	22	43
Canada 2/	10	30	62	38	38
United Kingdom 1/	17	29	22	25	32
Australia 2/	6	11	13	7	11
South Africa 2/	1	6	2	5	8
Total	390	735	1,045	977	1,119
Of which:					
Producers	143	358	612	552	630
Merchants	23	32	61	64	76
Consumers	224	345	372	360	413
Metal exchange stocks:					
London Metals Exchange 3/	38	139	548	665	707
Comex	6	43	100	201	184
Total	44	182	648	866	891
Total commercial stocks	434	917	1,693	1,843	2,011

1/ Held by consumers.
2/ Held by producers.
3/ LME stocks are held in Belgium, West Germany, Netherlands, and the United Kingdom.

Source: World Bureau of Metal Statistics, World Metal Statistics, May 1978.

Library Cataloging Data

U.S. International Trade Commission.
Unalloyed unwrought copper. Report to the President on Investigation no. TA-201-32 under section 201 of the Trade act of 1974. Washington, 1978.

illus. 28 cm. (USITC Publication 905)

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