THE RELEVANCE OF THE OPEC EXPERIENCE TO MANIPULATION OF OTHER PRIMARY COMMODITY PRICES

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THE RELEVANCE OF THE OPEC EXPERIENCE TO MANIPULATION OF OTHER PRIMARY COMMODITY PRICES*

By Mike Gerling

I. Introduction

In early 1973 a previously little known producer's group, OPEC, was thrown into the forefront of international politics. By controlling their supplies of crude oil, the twelve members of the Organization of Petroleum Exporting Countries (OPEC) were able, within a few months time, to shift their importance in the world economy. The intent of this paper is to examine how powerful a tool the control of the productive capacity is in the control of the world market of a primary commodity. More specifically, has OPEC opened the way for other producer groups to gain control of a market and thus enhance their position in the world economy?

II. Organization of Petroleum Exporting Countries

Formation of OPEC

Historically, oil had been developed and controlled by large multinational petroleum firms. The producing countries had little input into the production and pricing decisions. Rather, the governments of these nations simply collected the revenues which the multinationals felt were justified by the resources which were tapped within that country. The multinationals controlled the revenues that these countries received in the form of royalties and taxes through the control of the "posted price" upon which these payments were based.

The stimulus for the formation of OPEC came in August of 1960 when Standard Oil of New Jersey (now EXXON) led a wave of "posted price" reductions of four to fourteen cents per barrel. This meant hundreds of thousands of dollars of lost revenues to the producing countries. Venezuela was the leader in the fight to maintain the "posted price" and on September 14, 1960 she was the first to sign the OPEC charter.1/

The intent of OPEC was clear from the beginning, the first resolution of the charter clearly stated its objectives (27, p. 248):

> The members can no longer remain indifferent to the attitude heretofore adopted by the oil companies in effecting price modifications; that members shall demand that the oil companies maintain their price steady and free from all unnecessary fluctuations; that members shall endeavor, by all means available to them, to restore present prices to the levels prevailing before the reduction . . .

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* In slightly modified form this paper was first submitted as part of the requirements for Agricultural Economics 660: Food, Population, and Employment, Fall Term 1975.

1/ The other signing nations were Iran, Iraq, Kuwait and Saudi Arabia. These five nations accounted for an estimated 65 percent of the world's petroleum reserves and 90 percent of the world's trade in crude petroleum (27, p. 77).

The multinationals immediately reacted to this apparent cohesive show of power on the part of the five diverse signatories. The "posted price" was increased to its previous level and the producing nations were for the time being content. The decade of the 1960s, with its worldwide glut of oil production, lent little opportunity for the OPEC nations to further control the petroleum situation. However, by the early 1970s the political situation allowed OPEC to exert its control through increases in the posted price of crude oil. In early 1973 the posted price of petroleum doubled and since that time there have been periods when the price of oil has been more than five times the price in 1972. These increases in the posted prices have meant tremendous increases in the earnings of producing nations. Total oil income to the OPEC countries, which was fifteen billion dollars in 1972, increased to over one hundred billion dollars in 1974.[2/]

Implications of OPEC Action

The recent success of OPEC would lead one to believe that a consortium of less developed countries (LDCs) could indeed gain prominence in the world economy through the control of their primary commodity production. The concentration of the productive capacity of primary commodities is not unusual. Many mineral commodities are unevenly distributed throughout the world, with deposits frequently being concentrated in LDCs. For example, gold deposits are found primarily in South Africa; bauxite in Ghana, Jamaica and Surinam; and copper in Rhodesia, Zambia and Chile. In addition to mineral resources, the production of specialty agricultural commodities is frequently centered in a few LDCs. Rubber is produced primarily in Indonesia, Thailand and Malaysia; tea in Ceylon and India; and coffee in Brazil, Columbia and Uganda. The trade of these commodities amounts to billions of dollars annually. If the producing nations could control these markets, they could effectively control the world price. The increase in foreign earnings which would result would allow for capital expansion within these countries, something which the LDCs must have if they are to meet the challenges of development.

III. The Potential for Cartels

This paper investigates the cartel activity in two widely traded commodity markets, copper and coffee, and examines the long-run impact which these cartelization attempts have had on production. By examining the long-run price and production trends in context of these various control attempts and examining what has occurred in the market during these attempts, the difficulties and consequences of cartels become apparent. By analyzing the long-range impact of several cartel attempts, the success of OPEC or any other cartel attempt may be evaluated.

2/ In 1972 OPEC consisted of 12 members: Algeria, Ecuador, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates and Venezuela. These countries have within their boundaries approximately 80 percent of the world's reserves (28, p. 37).

These commodities were chosen because several characteristics of their production and consumption appear to make them prime targets for any cartel attempt. First, both of these commodities have traditionally been produced in a few regions of the world. It would appear that the success of a cartel would be correlated with the number of producers involved, in that it would be easier to get agreement and collusion within a small group. Second, both of these commodities (like petroleum) have had their major demand in areas other than those where they are produced. In all cases the major world consumers of these goods have been the United States and Western Europe. Third, both of these products have demands which are relatively price inelastic; therefore, a producer would manipulate production and price without dramatically affecting the quantities consumed of these products in the short run. Finally, both of these products have their major productive capacity concentrated in less developed countries.

It would appear that if cartels have been unsuccessful in these two commodity markets which possess several characteristics which would allow for easy control, then there would appear to be little long-run possibility for the control of markets which are organized in a manner which would make them less susceptible to cartelization. Turning to a historic analysis of the copper and coffee markets we find that a few fundamental economic principles have traditionally kept cartels from being highly successful for a prolonged period of time.

IV. The World Copper Market

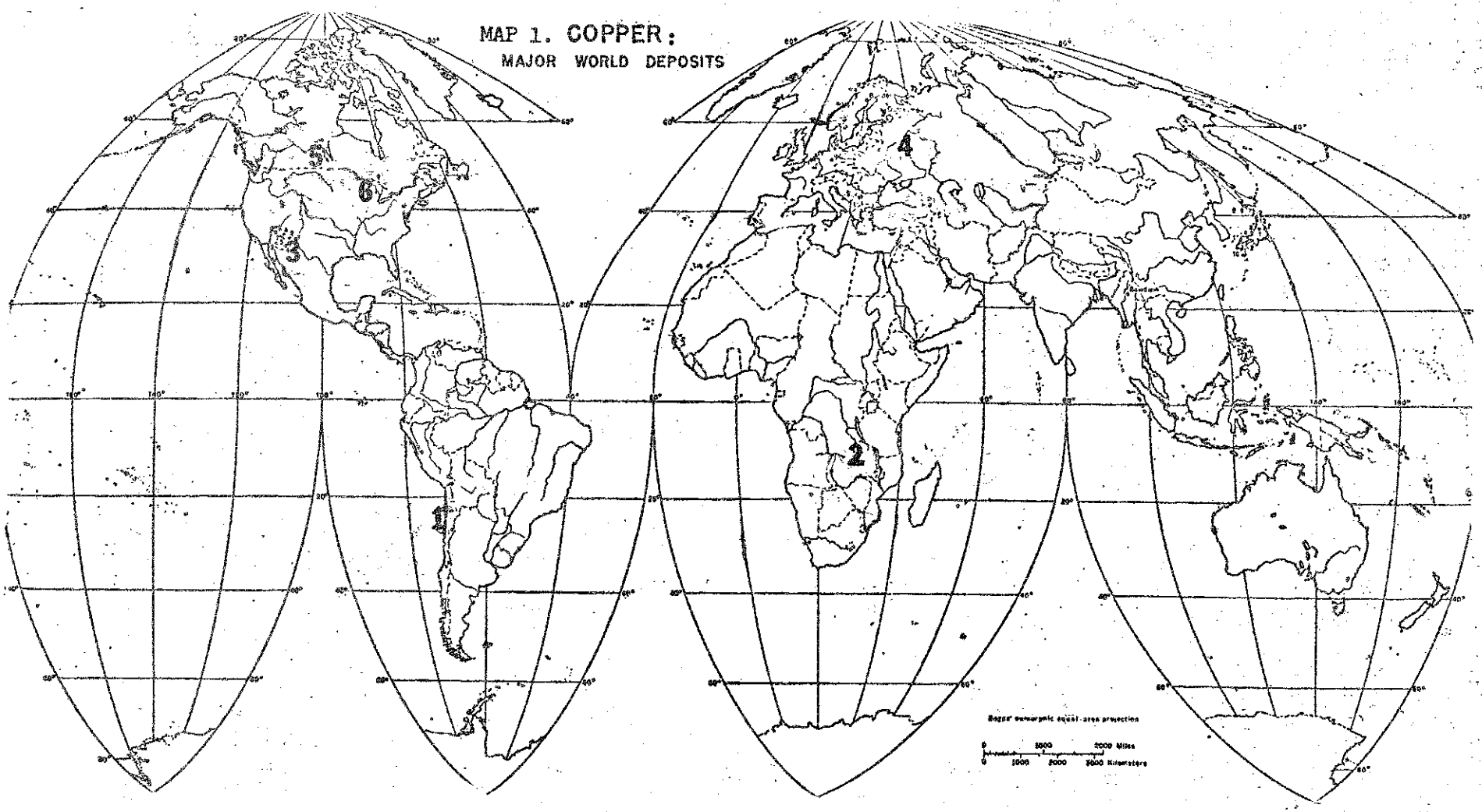
Characteristics

A historical look at the copper market reveals that the industry has been subject to several cartel attempts. No less than seven attempts at cartelization have occurred within the last 80 years. The characteristics of the market have encouraged the control attempts in copper.

First, the known reserves of copper are concentrated in a few geographic areas. Eighty-five percent of the world's reserves (which are estimated at 212 million metric tons) are located in six principal areas (see Map 1). These areas, in magnitude of content are: 1) the western slope of the Andes Mountains in South America, 2) the central African copper belt, primarily in Zambia and Zaire, 3) the southwestern United States, 4) the Ural Mountains of the Union of Soviet Socialist Republics, 5) central Canada, and 6) the Lake Superior region of North America (20, p. 263). With the nationalization of the copper industries in Chile and Zambia in the late 1960s almost one-half of the world's known copper reserves are under the control of the governments of less developed countries (1, p. 537).

Second, the United States and a few nations of Western Europe have traditionally placed the greatest demand on the world's copper. The sectors of these nations which use copper are relatively "locked into" their needs for copper in the short run. This leads to the situation of relative price inelasticity of demand for copper. However, evidence

MAP 1. COPPER:
MAJOR WORLD DEPOSITS



suggests that the relative inelasticity of demand has not guaranteed control of the price in the marketplace. There have been adjustments in the market in response to price increases which the relative price inelasticity would not suggest.

Third, the movement of copper into the market should be relatively easy to control. There is little uncertainty associated with the amount of copper which could be produced. Also, once the ore is mined there is no problem in the storage of the partially refined metal as it passes through the refining process. The copper may easily be stored at several stages of production (i.e., in the mine, at the smelter, at the refiner or at the fabricator) with little risk of loss. Although copper possesses the ability to be stored over long periods, evidence suggests that the storage of this mineral may have been more of a detriment than an aid to the various control attempts.

Cartelization Attempts

Although the attempts at cartelization were numerous, they were less than successful in developing continued control of the market. Charts 1 and 2 summarize the world's copper production and prices during the period of these control attempts. The years of influence of each cartel is indicated by shading on the graphs.

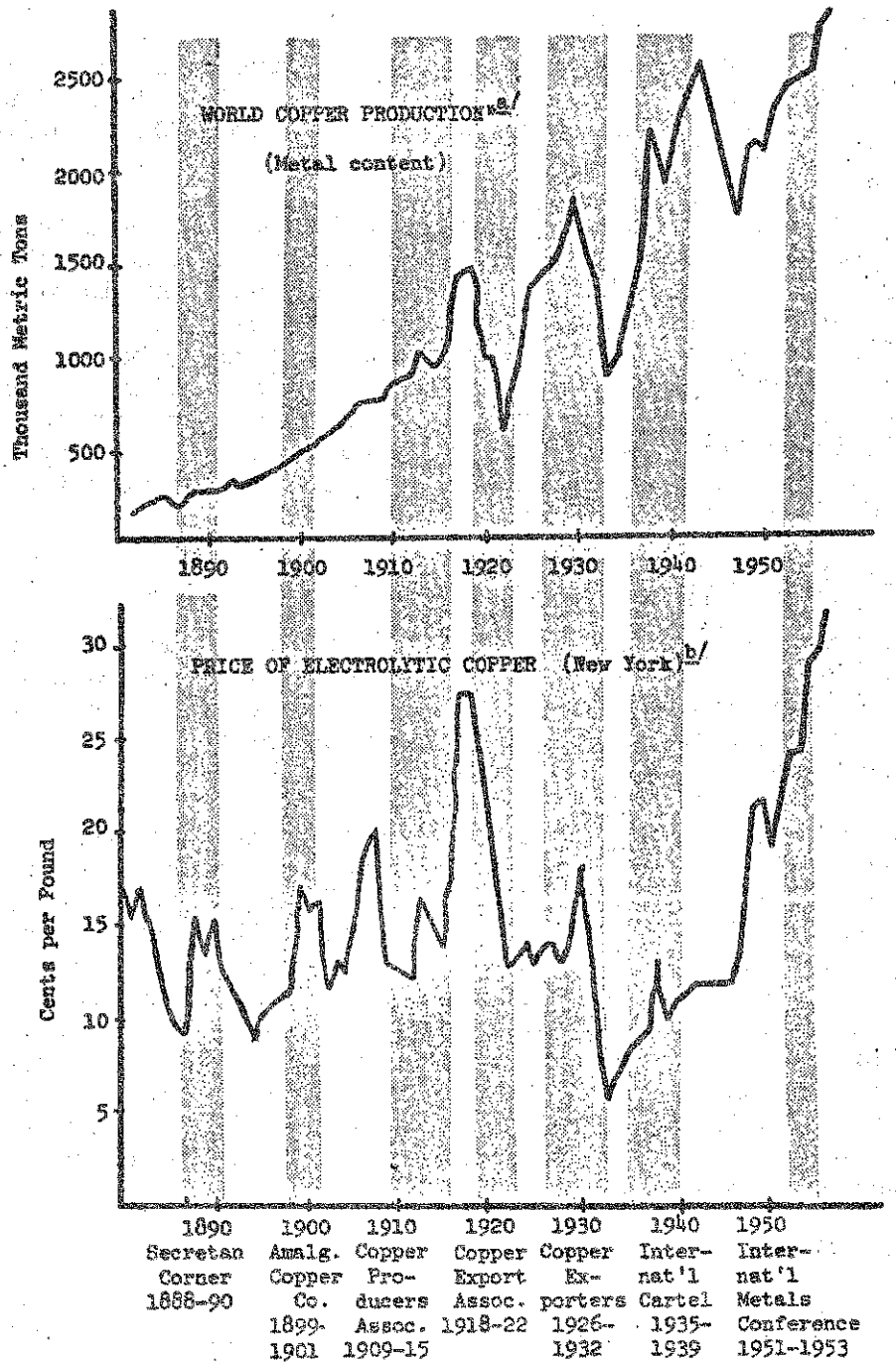
As chart 1 indicates, prices and production have typically moved together. This movement does not indicate that there have been periods of production cutbacks which caused the bidding up of the price of copper in the market. One can see from the graph of the various cartel attempts that they were typically short lived, the longest lasting but six years. Evidence suggests that these short-term cartels, rather than developing continued control over the market, were instrumental in encouraging new production of copper ores and in causing a movement of the concentration of the production from one area to another. It has also been suggested that these cartels encouraged the development of alternatives for copper and stimulated the use of these substitutes (i.e., aluminum, plastic, etc.) wherever possible.

The Copper Cartels

Societe Industrielle

The first international attempt at control of the copper market came in late 1887 when the Societe Industrielle et Commercial des Metaux attempted to halt the price increases which were taking place at the time (8, p. 73). The Societe, which was the largest consumer of refined copper in Europe attempted to gain control of the market and thus dictate price through the control of the movement of the finished metal into the market. The Societe negotiated a series of three-year contracts with the world's leading producers to purchase all of their output at a fixed price. By 1888 the Societe had control, through three-year purchase agreements, of approximately 75 percent of the world's copper production (4, p. 184).

CHART 1. WORLD COPPER PRODUCTION; AND
THE PRICE OF ELECTROLYTIC COPPER IN NEW YORK



* Excludes the USSR and China.

a/ Sources: C. E. Julian, et al., Summarized Data of Copper Production (U. S. Dept. of Commerce, Bureau of Mines Econ. Paper No. 1, GPO, 1928).

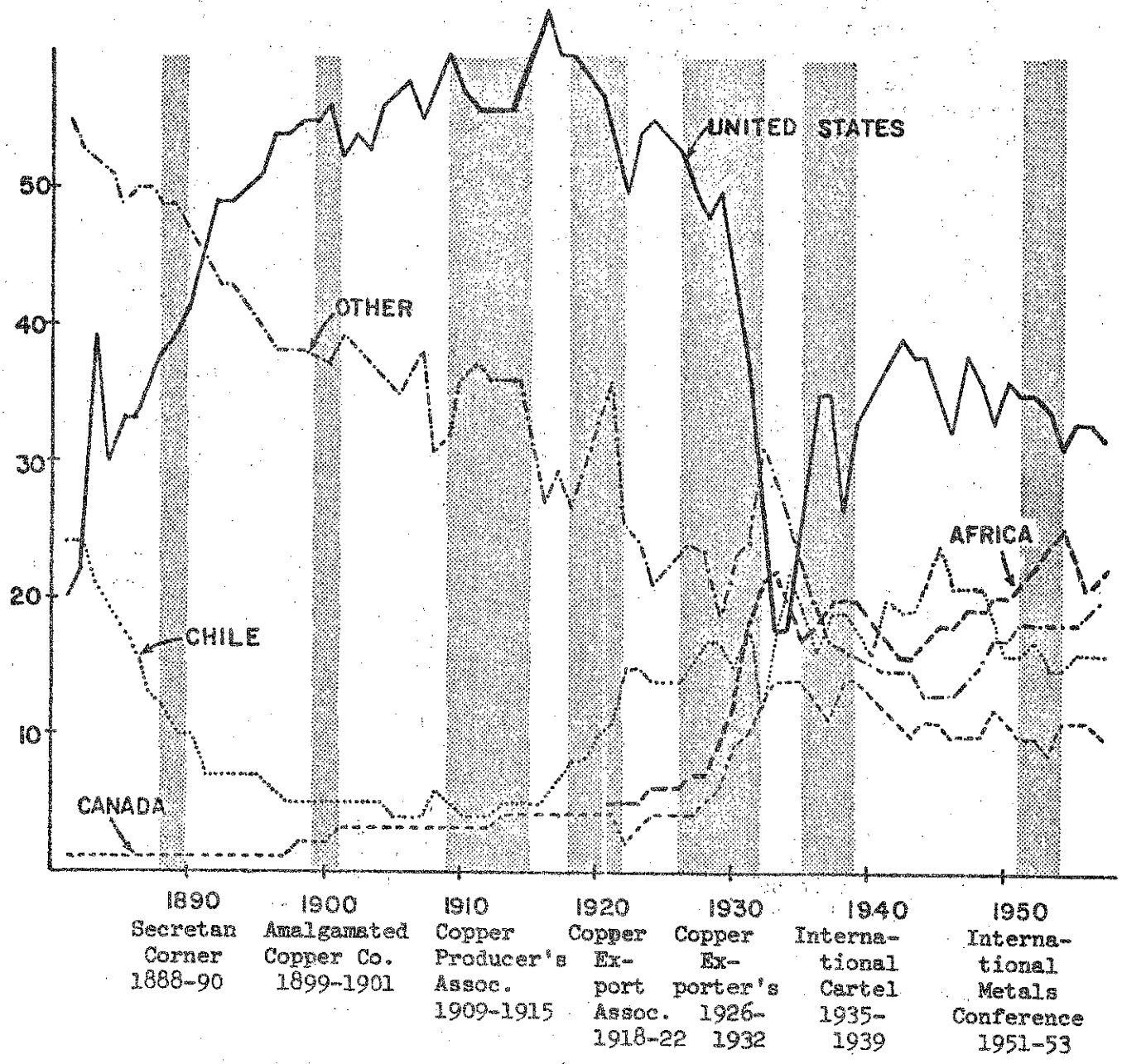
League of Nations Economic Intelligence Service, Statistical Yearbook of the League of Nations 1930/31 (Geneva, 1931).

United Nations, Statistical Yearbook 1948, 1958 (New York, 1949, 1959).

b/ Series shows the undeflated price per pound of 99.99 percent pure electrlytic copper FOB New York. Several different price quotations are available worldwide for copper including the London Metal Exchange price, the U.S. Producer's export price, the Katanga Quotation and the New York Commodity Exchange price. Traditionally over 60 percent of the world's copper has been sold at the N.Y. Exchange price or its equivalent.

Source: Neal Potter and Francis Chrisity, Trends in Mineral Resource Commodities (John Hopkins Press, Baltimore, Md., 1962).

CHART 2. PERCENT OF THE WORLD's COPPER PRODUCTION BY AREA*



* Excludes the USSR and China.

Sources: U. S. Department of Commerce, Bureau of Mines Economic Paper No. 1, 1928.

League of Nations Economic Intelligence Service, Statistical Yearbook (Geneva, 1931).

United Nations, Statistical Yearbook (New York, 1949, 1959).

Due to the belief that the Societe had developed a rather strong monopoly control in the copper market, the price of copper almost doubled from 9.5 cents per pound in 1887 to 15.8 cents per pound in 1888. With the increase in price, demand began to slump as many consumers were hesitant to accept the long-run power of the Societe's operation. The increase in price stimulated increased flows of metal into the copper market. With the maximum production levels in the Societe's contracts being well above the actual 1887 production, the guaranteed price of 14.2 cents per pound encouraged producers to increase their supplies to the market. In addition, new mines were started and old mines were brought back into production by companies which did not hold contracts with the Societe. In addition to the increases in the supply of mined copper, the higher prices encouraged increases in the supply of scrap copper which entered the refining process (8, p. 74).

The decrease in consumption of copper coupled with the increase in supplies caused substantial surpluses to develop within the market. In order for the Societe to maintain its position in the market it was necessary for it to accumulate large stocks of copper metal. By early 1889 the stocks held by the Societe were equivalent to about nine months of the world's consumption needs (typical stock levels have been estimated at about two months consumption needs) (3, p. 184). In March of 1889 the Societe's holdings were liquidated because it failed to make payment on its short-term notes and it was unable to obtain additional financing for its stockpiling operations (8, p. 76). The stocks which had been accumulated by the Societe were sold, the flood of supply of copper metal caused an immediate decrease in the price (see Chart 1).

This first attempt at international control of the copper market failed because the initiators were consumers rather than producers. The Societe's operation had no control over the level of production. In fact its policies brought about activities which were in direct conflict with its goals. Its guaranteed price policy stimulated supplies which threatened to drive prices down. If the Societe was to profit from its market control it had to hold back supplies to maintain a high price. Its inability to control the flow of copper into the market led to its demise.

Amalgamated Copper Company

The next attempt at market control was directed at the production level rather than at some intermediate level in the market. Through a series of acquisitions, Standard Oil and the National City Bank gained control of about 20 percent of the world's productive capacity. The purchase of the Anaconda, Butte and Boston, and the Boston and Montana Copper Companies led to the eventual development of the Amalgamated Copper Company by late 1899 (4, p. 184). This combination was created in an effort to maintain the high prices which had developed during the 1890s (see Chart 1).

Amalgamated adopted a policy of "not attempting to force upon the market more than was actually needed for consumption, and to maintain a firm price" (19, p. 502). Amalgamated's policy effected an almost immediate price increase from 11 cents per pound to 16.5 cents per pound (see Chart 1). While 20 percent of the world's productive capacity was a sizeable portion, it was not sufficient to maintain market control. Producers who were not cooperating with the Amalgamated producers consistently undersold them (7, p. 88). As indicated in Chart 2, the Amalgamated episode succeeded in stimulating copper production in both Mexico and Canada. The Amalgamated interests in the United States experienced a loss in the percentage of the world's copper production as they cut back in an attempt to limit supplies. In addition to the increases in production by nonmembers, the high prices which Amalgamated maintained caused a decline in consumption, particularly in the foreign sector. Once again the flow of scrap metal into the refining process increased as scrap dealers took advantage of the prices Amalgamated supported. As the Societe of France had found ten years earlier, the Amalgamated interests found it necessary to not only cut back on their production but to also accumulate stocks of finished metal equivalent to eleven months consumption needs. It became apparent that Amalgamated, which controlled 20 percent of the world's productive capacity, could not maintain the world price. In January 1902 Amalgamated ceased its operations of price control with the result of an immediate decline in the price of copper to 11 cents per pound (8, p. 82).

Amalgamated's lack of success centered on the less than full cooperation of all the world's copper producers. As in the Societe's attempt of the 1890s, the high prices which Amalgamated supported encouraged producers to increase output. The short-run economic incentives of profits promised by the high prices were more powerful in shaping production decisions than was the possibility of long-term control of the market.

The period from 1903 to 1913 was characterized by continued increases in demand coupled with increases in production, primarily in the United States. A strong seller's market resulted in steadily increasing prices during this period. It was within this framework that a loose cooperative effort, the Copper Producer's Association was formed. This group was primarily an information collection and dissemination organization. There were no outward attempts at collusion initiated by this group and most writers agree that this association had little impact on the market.

Copper Export Association

The outbreak of World War I placed strong demands on the copper industry. The high demand and prices during the war years set the stage for the development of new copper reserves, primarily in Chile (see Chart 2). However, the high prices and production during the war led to the accumulation of large stocks by both producers and the various governments (16, p. 40). At the end of the war, these large stocks threatened the price of copper, which had reached levels of 27.5 cents per pound. The Copper Export Association (CEA) was formed in 1918 to

help liquidate the stocks which had accumulated (4, p. 187). The production of member mines was immediately restricted under the charter of the CEA in an attempt to limit the flow of copper into the market. The CEA established an exclusive sales agent for the members for the sale of export copper. The copper was purchased from the members, the association specifying the price to be paid and setting the "export capacity" used as the basis for apportioning the purchases made to fill the orders taken by the association. The export price which was "maintained" by the CEA stimulated production by nonmember mines and by 1921 the proportion of output by nonmembers had risen substantially (see Chart 3) (16, p. 40). While the Association's membership accounted for two-thirds of the world's production, its attempt to support world prices required the CEA to accumulate stocks in excess of 190,000 metric tons (the equivalent of seven months consumption needs).

One of the most significant results of the CEA's activities was the development of the vast copper reserves of the Katanga province of Africa by nonmember mining companies as well as the expansion of the productive capacity in Chile (see Chart 2).

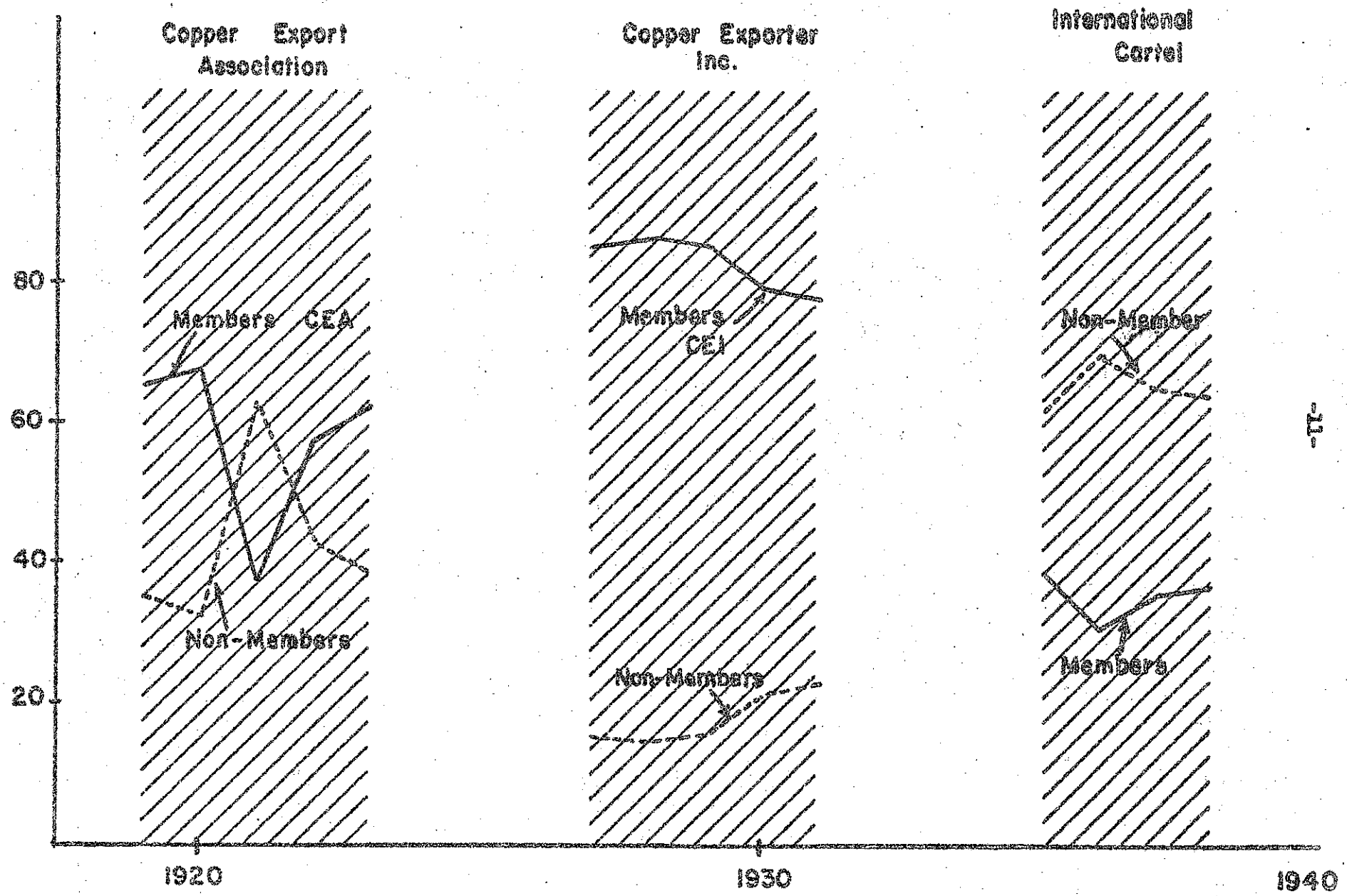
Copper Exporters, Inc.

The inability of the Copper Export Association to control the price of copper was due primarily to increased foreign production which was beyond its control. As the CEA fell into inactivity in 1924, efforts were directed at devising an association with a broader scope of authority. These efforts led to the creation of the Copper Exporters, Inc. in late 1926 in which interests from both the American and foreign producers were represented.

The Copper Exporters, Inc. (CEI) through its American members and foreign associates had control over 80 percent of the world's copper production. However, the CEI's control over its foreign associates was limited by the concessions which it had to make in order to gain acceptance of the cartel's plans by the associates. The inability of the CEI to strictly control its foreign associates' production accounts for the change in the relative market position of the groups of members and nonmembers as supply and demand conditions shifted throughout the period (see Table 1). As the demand for copper fell (especially during the early depression years) it was the American members which were forced to curtail production. While the American members were cutting production and building their stocks, the foreign associates were expanding production to take advantage of the relatively high price which existed in the marketplace. The loose control of the foreign associates necessitated the accumulation of stocks which had to be sold at depressed prices later. This led to the eventual downfall of the CEI operation.

As Chart 2 indicates, the CEI brought about an extreme shift in the relative market position of the various copper producers. The United States members of the CEI lost their position as the number one producer and the reserves of Canada, Chile, Rhodesia and Katanga were developed to a level so that they rivalled the United States' production.

CHART 3. PERCENT OF THE WORLD'S TOTAL COPPER PRODUCTION



Source: Federal Trade Commission, Report on the Copper Industry, 1947, p.

TABLE 1. SHARE OF THE WORLD'S COPPER PRODUCTION CONTROLLED BY COPPER EXPORTERS, INC., 1927-31*

(percent of total)

	1927	1928	1929	1930	1931
CONTROLLED BY CEI					
American members, foreign subsidiaries:					
U.S. Production	47.3	46.6	45.7	37.3	32.2
Foreign Production	19.8	21.3	20.8	18.4	21.7
TOTAL U.S. Companies	67.1	67.9	66.5	55.7	53.9
Foreign Associates	17.7	17.9	18.6	23.8	23.8
TOTAL Cartel Production	84.8	85.8	85.1	79.5	77.7
NOT IN CARTEL:					
U.S. Companies	3.1	2.7	2.8	3.7	3.0
Foreign Companies	12.1	11.5	12.1	16.8	19.3
TOTAL Not in Cartel	15.2	14.2	14.9	20.5	22.3

* Source: Federal Trade Commission, Report on the Copper Industry (1947).

International Copper Cartel

As the world economy was recovering in the mid-1930s, these four producers developed the International Copper Cartel in 1935. The cartel's objective was to "adjust" production of its members in order to better meet the consumption requirements outside of the United States (4, p. 241). The participants in this cartel controlled a little less than 50 percent of the world's production. Upon the formation of the cartel, the members' production quotas were cut by 20 percent. An additional cut of 15 percent was later made (4, p. 191). These cuts in production of the members were immediately met with increases in production by nonmembers (see Chart 3). When the demand for copper began to slump in 1938 there was evidence of weakening of the cartel as members began covert price competition in order to increase sales. The eventual end of the cartel came with the outbreak

of World War II when the British government took control of the production and distribution of copper within the United Kingdom (4, p. 193).

During the International Cartel attempt, the U.S. firms regained their position as the world's largest producers as the production in the foreign countries declined (see Chart 2). The International Cartel exhibited sufficient cohesiveness to control the foreign sector of the copper market for a short time during a period of expanding demand. It is doubtful, however, that such cohesiveness would have continued for a prolonged period. Cartels controlling in excess of 80 percent of the world's production had failed in the past and it is unreasonable to assume that the International Cartel would have prospered had its existence not been cut short by World War II. At the time of its breakup, the cartel showed signs of weakening. The members' loss of market position and the reported covert sales activity are indications that the cartel was losing its strength and position.

The post World War II period was a period of much adjustment and limited collusive efforts within the copper industry. Price movement was apparently due to factors affecting supply other than calculated attempts to limit production. There were many strikes in the mines both abroad and in the United States. Chile faced a series of transportation difficulties which hampered production. The African producers were plagued by both energy shortages and shipping problems. Though price controls remained in effect in the United States until late 1946, worldwide market price experienced rapid fluctuation. United States stockpiling efforts under the authority of the Strategic and Critical Metals Stockpiling Act of 1946 became a major demand factor within the copper industry.

International Metals Conference

Such was the basic condition of the world copper market until the early 1950s. In early 1951 two supply plans were instituted in an attempt to organize the flow of copper between producers and consumers. Within the United States this plan was part of the Controlled Materials Plan. Internationally, copper movement was controlled by the International Metals Conference (IMC), which first introduced quotas in the first quarter of 1951 (8, p. 130). The price difference of copper within the United States and in the foreign market continued to spread apart as the U.S. price was fixed and the international price was not. It was the existence of this price differential which caused Chile and other foreign producers to ignore their production and price quotas as set by the IMC in late 1952 (8, p. 132). In a very short time the disagreement over international prices and production quotas brought about the end of the authority of the International Metals Conference.

The International Metals Conference failed to provide the desired control in the copper market because it instituted a series of artificial barriers between foreign produced copper and copper produced in the United States. The policies of the IMC were adhered to by the foreign producers only as long as demand was good and prices were high. However,

when the prices for foreign copper slumped and a substantial differential developed between U.S. and foreign copper, the economic incentive to maintain profits took precedence over the long-run stability offered by the IMC.

Conclusions on the Copper Market Cartels

Historically, the various attempts to control the copper market have been hampered by a relatively small number of factors. The ability to control the market is dependent on the ability to control the supply without affecting the demand within the market. In the short run it appears that the demand for copper is relatively inelastic. In the long run, however, the demand for copper is much more elastic. This is due primarily to the substitution of other materials for copper. Aluminum has been one of the primary substitutes for copper, primarily in the electrical industry (20, p. 263).

Scrap copper may be considered on the demand side as a substitute for mined copper, or more appropriately it may be considered as an alternative source of supply. Copper is a resource which may easily be reused once its original function has become obsolete. Over 60 percent of the copper which is produced for ore could be recycled through the refining process if the economic incentives were strong enough (4, p. 39). Scrap becomes an increasingly important source of copper whenever the price rises sufficiently to merit its collection. It has become so in the United States (see Table 2). As such it serves as a major threat to any attempt to maintain high prices through the limitation of the productive capacity. However, no cartel attempt has even begun to take into consideration the control of movement of scrap into the refining process.

TABLE 2. PERCENT OF SCRAP COPPER IN THE UNITED STATES*

Year	Percent	Year	Percent
1910	8.4	1930	23.6
1915	12.4	1935	36.2
1920	16.6	1939	21.5
1925	20.0	1944	20.4

* Source: Federal Trade Commission, Report on the Copper Industry (1947).

Note: Scrap copper refers to all old reclaimed copper and junk copper. It does not include mill trimmings.

Perhaps the most important factor in supply limitation is the cooperation of all the producers in limiting supply. Historically, there has been no collusive effort which has included all of the major producers of copper. As production and prices were controlled by the members of the various associations, the nonmembers repeatedly took advantage of the high prices by expanding production. This necessitated the accumulation of large stocks by the members attempting to control the market. Especially important in this production increase by nonmembers was the incentive to search out and develop new copper reserves in an attempt to take advantage of the high market price. Historically, there has been a shift in the control of the productive capacity from one area to another as the economic incentives have allowed the development of new areas.

While it is likely that the majority of the world's copper reserves have been located and mapped, if a cartel succeeds in supporting copper prices at a high level, it is reasonable to assume that new developments will allow for a greater exploitation of existing reserves which may contain lower grade ores. It would seem therefore, that cartel activity in the copper market will continue to meet with the same type of difficulties which have historically hampered these attempts.

The analysis of the copper market indicates that a cartel of mineral producers has limited chance of long-term success. A similar analysis of the market for an agricultural commodity indicates that many of the same limitations to cartel control are present.

V. The World Coffee Market

Characteristics

As an agricultural commodity, coffee would most probably be more susceptible to cartelization than any other. While the importance of coffee in the world's total production is relatively small, coffee ranks first among all agricultural commodities in world trade. Since 1962 the international trade in coffee has exceeded two billion dollars annually (5, p. 3).

Coffee is produced in relatively few areas of the world. Brazil, Colombia, Uganda and Kenya account for the majority of the world's total production. Historically, the production was even more concentrated with Brazil meeting in excess of three quarters of the world's demand. One of the consequences of the various cartel attempts in the coffee market, however, was the reduction of Brazil's importance as a world producer.

In the countries where coffee is produced, it is of primary importance--the maintenance of the whole national economy of such countries virtually depends on the export of coffee. The rewards for market control through cartelization are obvious: 1) the ability to maximize foreign exchange earnings, 2) the ability to stabilize and predict export earnings from period to period, and 3) the ability to achieve and maintain a relatively large market share.

Historically, however, coffee has not been effectively controlled by any producer group. While several attempts have been made to control the market, these attempts have in retrospect been perhaps more damaging than beneficial. Brazil's dominance in the coffee market was literally destroyed by her attempts to control the market and exert monopoly power in the market. Brazil fell from a position of producing over 75 percent of the world's total coffee in the early 1900s to producing less than 30 percent of the world's exports in 1965. A look at some of the specifics of the various control attempts provides insights into the problems of cartelization associated with an agricultural commodity.

Coffee was first introduced into Brazil in the early 1800s, the availability of large quantities of high-production, low cost land allowed Brazil to gain importance as a world producer. Within half a century Brazil was the world's major supplier of coffee (22, p. 23).

The production of coffee is highly variable, depending not only on the weather conditions in the producing areas but also on the biological cycle of the coffee trees themselves. Coffee demand on the other hand is relatively stable and extremely inelastic, particularly on the short run. The price elasticity of demand for coffee has been estimated to be quite small, between .2 and .3 (5, p. 5). As long as coffee has but one primary use as a beverage there will be narrow limits to the adjustments in consumption that may be achieved through adjustments in price.

Coffee Control Schemes

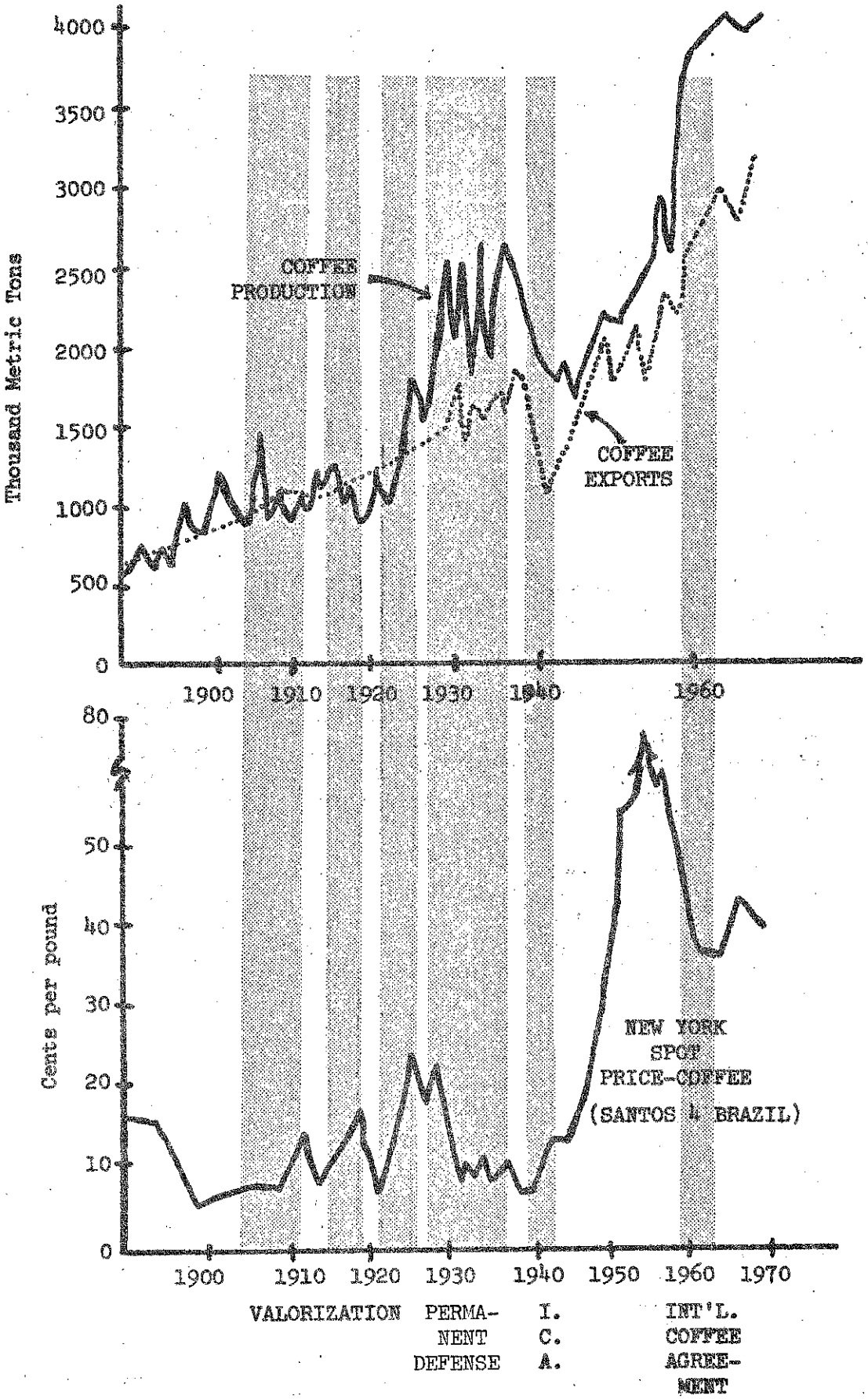
Historically, the relatively stable demand and the fluctuating supply has been translated into a series of surpluses and shortages in the market. Chart 4 summarizes these fluctuations in production and the associated fluctuations in the world price. The various control attempts are indicated by the shaded areas.

Brazilian Valorizations

As the major producer, Brazil, in the early 1900s, exerted her market power in an attempt to stabilize prices and the returns to her producers. This first attempt by the state of São Paulo, Brazil, known as valorization[3/] took place in late 1905. A record crop was produced in a period of generally declining coffee prices. Seventy percent of this production was situated in the single state of São Paulo (21, p. 139). The government of São Paulo determined that the time had come for intervention in the market in order to support world prices. The valorization consisted of four major operations: 1) the purchase by the state of coffee from the plantations at "an acceptable market rate", 2) the storage of coffee in government warehouses, 3) the release of the stored coffee on the world market as demand dictated (in order to keep prices up), 4) the restriction of new plantings of coffee within the state's boundaries (5, p. 13).

3/ The term valorization was introduced into the English language about 1906 from Brazil (Valorizacas). It was applied to measures regulating the marketing of coffee. "The act or process of raising the price of a commodity by governmental interference, above the level regarded as uneconomically low but not above the price that would in the long run be set by free competition" (15, p. 136).

CHART 4. WORLD COFFEE PRODUCTION AND EXPORTS; AND THE SPOT PRICE OF SANTOS 4 COFFEE IN NEW YORK, 1890-1970



Sources: V. D. Wickizer, The World's Coffee Economy, 1943; Bart S. Fisher, The International Coffee Agreement (New York, 1972); and FAO, The World Coffee Economy (Commodity Bulletin Series No. 3, 1961).

The immediate effects of this temporary control over the entry of coffee into the market were evident. The fall of the price of coffee was halted and prices climbed from a low of 6 cents per pound in 1906 to almost 14 cents per pound in 1912. Meanwhile, the weather conditions had not been quite as favorable as in the previous years and the production of coffee began to fall. The first valorization had favorable short-run effects--it allowed for the temporary stabilization of the price and it allowed for the orderly marketing of the large production. However, in addition to these short-run effects, the price support policies may have aided in the stimulation of production outside of the state of São Paulo, which was the only state in which plantings were restricted during this period (5, p. 13).

World War I brought a cutoff of the European coffee market just as production in Brazil was again beginning to expand. The 1917 crop was 180 metric tons greater than the demand was projected to be. Such were the events which led to São Paulo's second valorization attempt to maintain world prices. Demand again grew rapidly at the close of the war and a frost of 1918 limited the supply so that stocks accumulated by São Paulo in the second valorization were quickly disposed of at an acceptable market price.

A third valorization attempt was undertaken in 1921 when once again supplies greatly exceeded demand and the world price of coffee dropped (21, p. 142).

The valorizations tended to give orderly control to coffee marketing during periods of excess supply. Through the central governmental control and coordination of coffee exportation, prices were stabilized and maintained at a higher level than would have existed without valorization. However, as Charts 5 and 6 indicate, these high prices stimulated new coffee plantings in other areas.

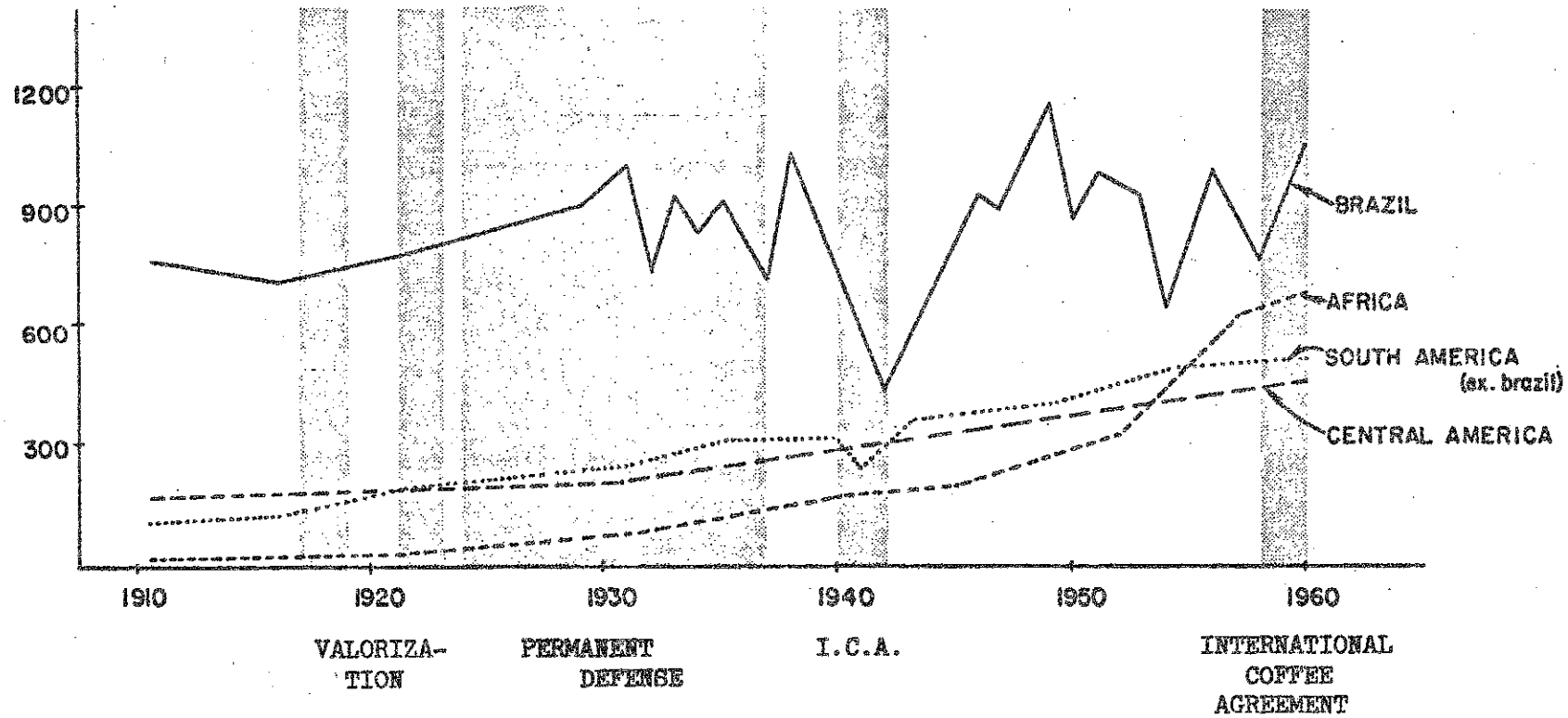
Within Brazil, São Paulo was no longer the exclusive producer of the world's coffee; prices which promised stable profits aided in destroying her monopoly position. Plantation owners pushed their way into the virgin lands of the surrounding states and developed substantial productive capacity. It became clear that any attempt to control the price of coffee on the world market could not be short run in nature as the valorizations had been and it would now have to have a broader base of support than just the state of São Paulo.

Outside of Brazil, the high coffee prices encouraged expansion of the limited production which at the time existed in Colombia. Farmers, attempting to take advantage of the high prices which were prevailing, expanded their planting schemes and increased the care given to existing plantings.

Permanent Defense

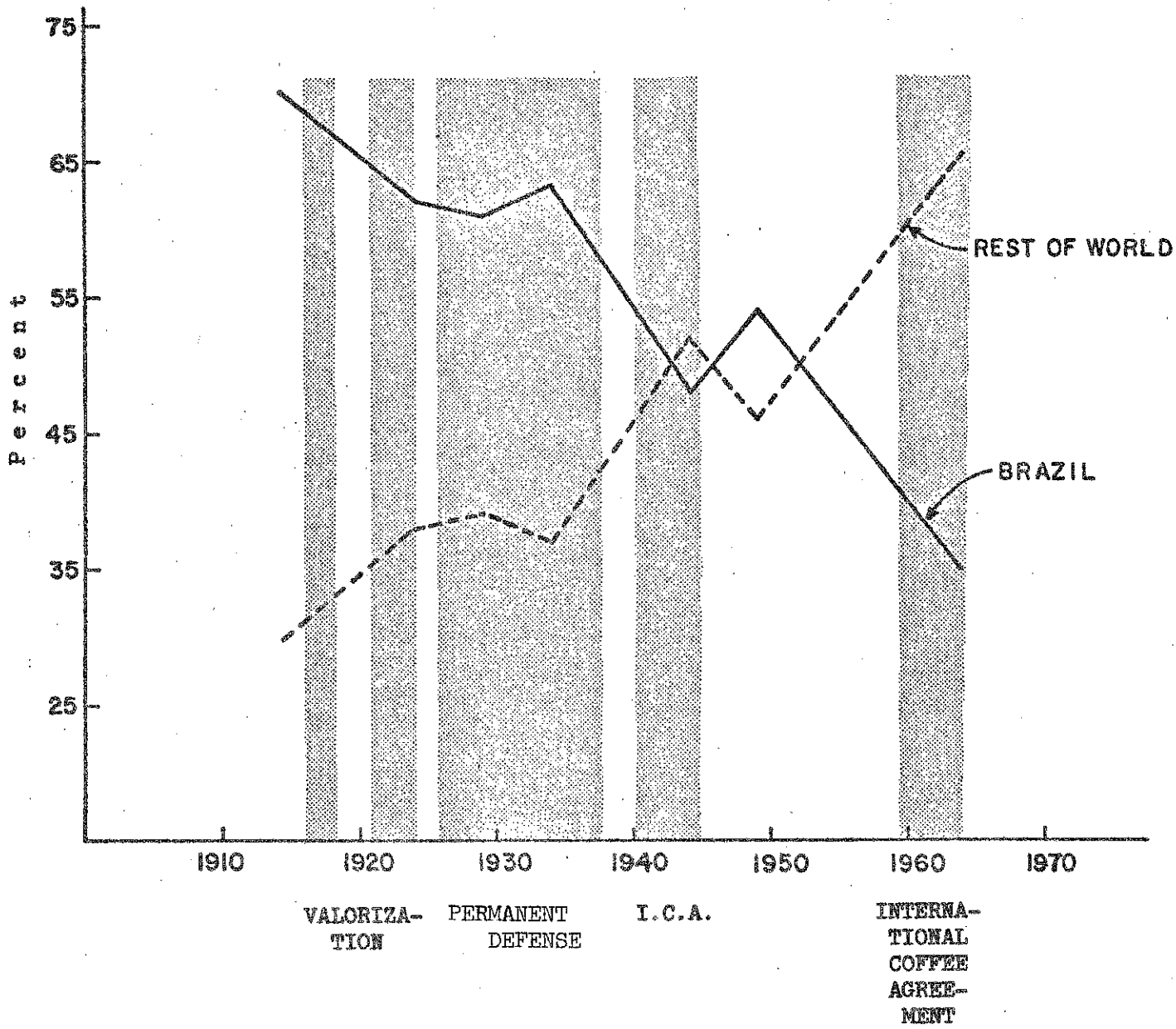
In 1923 Brazil adopted a policy of "permanent coffee defense." This policy had a broader base than the previous valorization attempts in that

CHART 5. WORLD'S COFFEE PRODUCTION BY MAJOR PRODUCING AREA



Sources: V. D. Wickizer, The World's Coffee Economy, 1943; and FAO, The World Coffee Economy (Commodity Bulletin Series No. 33, 1961).

CHART 6. PERCENT OF WORLD TOTAL EXPORTS



Source: V. D. Wickizer, The World's Coffee Economy, 1943; and FAO, The World Coffee Economy (Commodity Bulletin Series No. 33, 1961).

all the states in Brazil were participating in the control schemes. Specially constructed warehouses were built and the government purchased all the production at the governmental set "market level." Restrictions were placed on the movement of all coffee from the interior and stock levels were closely monitored, being released only as it was desired to influence prices.

The coffee defense required the holding of tremendous stocks, especially as the trees which were planted during the periods of the valorization came into production. 1927/28 proved to be a bumper crop year which necessitated the purchase and stockpiling of 27 million bags of coffee. The purchase of these stocks from the producers required vast amounts of capital inputs from the government. The end of the Brazilian coffee defense plan came in 1929 with the crash of the U.S. stock market. With the financial deterioration in the U.S., Brazil was no longer able to obtain the finances necessary to continue her stockpiling efforts.

It has been argued that (21, p. 157):

> . . . the permanent coffee defense during the 1920's undoubtedly brought growers abnormal profits for a period of a few years, but the price to be paid for such prosperity in later years more than offset the temporary gains . . .

As Charts 5 and 6 indicate, it is apparent that Brazil's continued policy of price maintenance made coffee production desirable to entrepreneurs around the world. Coffee plantings were expanded in Colombia and Central America and coffee plantations were started throughout Africa. These events took place during a period when production exceeded demand at the world price yet the "supported" price still allowed profits to accrue to coffee producers. Brazil found it necessary to continue financing the destruction of stocks in order to hold up the world price.

By the 1930s the coffee plantings, which were made throughout the world at Brazil's announcement of permanent coffee defense, began producing. Supplies from the expanded production far exceeded demand from the depressed economies of the United States. The price of coffee continued to tumble and Brazil instituted a new series of defense measures in 1931. Phase two of the coffee defense plan consisted primarily of stock destruction and planting prohibition (21, p. 147).

Recognizing the need for a broader base of control, Brazil in the 1930s attempted to enlist the support of other coffee producers in maintaining coffee prices through stock manipulation and production control. Although obtaining this support through agreements such as the Pan American Coffee Agreements of 1934 and 1936, in practice, international producers continued to expand production. Brazil continued to hold back larger and larger portions of her production as demand grew slowly and world supplies expanded. During the mid 1930s the quantity of coffee retained in Brazil for local consumption, stockpiling and destruction represented almost 40 percent of the world's total production (6, p. 16).

It became evident that Brazil could no longer afford to maintain the world's coffee price without more than the verbal aid of other producers. In November of 1937 Brazil abandoned her price defense policy. In effect the world's largest single producer started a price war in the international market. Brazil reduced her export tax on coffee by more than 80 percent so that her coffee would become more competitive on the world market without significantly harming the returns which her producers received. Brazil's price defense policy was thus replaced by a policy of free competition.

The effects of the Brazilian action were immediate and substantial. The price of Santos No. 4 (N.Y.) dropped from 11.1 cents per pound in 1937 to 7.5 cents per pound in 1939 (see Chart 4). The substitution of the now relatively cheap Brazilian coffee allowed for the strengthening of Brazil's position in the world market.

Although Brazil's position was strengthened by the end of the coffee defense plan, the country had lost her position in the world market. The policies which she followed not only allowed, but encouraged other nations to develop coffee production capacity. As Charts 5 and 6 indicate, Brazil's position in the world market had declined considerably during her permanent defense plan. It is doubtful whether Brazil could ever again gain the prominence she once held in the world coffee market.

InterAmerican Coffee Agreement

World War II brought a drastic reduction in the demand for coffee as the European market (approximately 40 percent of the world's total) was virtually eliminated. The world's coffee producing nations were facing disaster. The United States devised a plan which divided the remaining world's market among the producers. The InterAmerican Coffee Agreement (ICA) was the first in a series of aid programs which were developed for the coffee producing nations. Under this plan, Brazil gained somewhat in her position as a world producer (see Chart 6).

Under the ICA, export quotas were developed for the producing countries. Prices were frozen on the U.S. market so there were few speculatory moves or attempts to control. Returns to producers, no longer as favorable as they had been, were, however, stable. Production starts were limited and the existing productive capacity was neglected.

With the close of the war, demand in both Europe and the United States expanded rapidly. This buoyant demand, coupled with the reduced production, led to rapid increases in the price of coffee. The high prices and increased demand made the quotas and restrictions imposed by the ICA unnecessary.

By the mid 1950s the expanded plantings, which were made in response to the prices following WWII, came into production. By 1955 the coffee situation returned to its historic norm. Production exceeded world demand and the price began to fall. Stockpiling again became commonplace in

Brazil, who had clearly established herself as the world's residual supplier.4/ Brazil's stocks doubled in size from 1951/52 to 1954/55.

International Coffee Agreement

The world coffee situation was tense. Prices were falling, Brazil held considerable stocks and as long as a price differential existed between Brazilian and other coffees, the consumers preferred not to purchase large quantities of Brazil's. With her extreme excess capacity and high stock levels, Brazil could have easily dumped her coffee on the world market, thus substantially reducing any price differential which may have existed. However, Brazil needed foreign exchange and the government feared the long-range impact that depressed coffee prices might have on the market (5, Chapter 3).

The preliminary draft of the International Coffee Agreement was signed in 1959. The signing of the final Agreement with U.S. support came in 1962. Under the International Coffee Agreement producers and consumers entered into a plan which was to stabilize the world's coffee prices and aid both the producers and the consumers. This agreement did not in actuality develop a producer cartel since the consuming nations had substantial power to support the terms of the agreement. The necessity of consumer support becomes clear when the International Coffee Agreement is viewed in perspective.

The producer's response to the 1962 Agreement is of interest. The primary condition developed in the Agreement was a series of export quotas for the producing nations. In addition both a floor and ceiling price was established for coffee which entered the world market. The price was allowed to move freely, as demand dictated, between these two established prices. The export quotas were set at 37.8 million bags (which was about 3.3 million bags above actual export levels) and the price was considerably below the set ceiling (6, p. 7).

Overshipment and price competition of coffee became a serious problem under the Agreement, especially in years when production and stocks were high or if prices were approaching the ceiling. Table 3 indicates the level of the overshipments which were made under the terms of the International Agreement.

The failure of the 1962 Coffee Agreement was due in part to the inability to police the terms of agreement. Consuming nations were willing to purchase quantities of coffee below the established floor. It is clear that in order for any bilateral agreement of this sort to be effective, it

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4/ By this time, the coffees which were produced in Colombia and the African countries had established themselves in the world market. Consumer preference had developed for the Milds of Colombia and Kenya and the Robustas of the other African producers. Brazilian coffee was typically purchased as a lower quality coffee which was used to finish blends. As long as a significant price differential existed between the poorer quality Brazils and these other types, the Milds and Robustas were purchased in favor of the Brazils.

TABLE 3. OVERSHIPMENTS OF 60 KILOGRAM BAGS OF COFFEE*

Country	Number of Bags	Country	Number of Bags
Tanzania	216	Nicaragua	34
Costa Rica	1	Panama	11
Dominican Republic	1	Ghana	56
Ecuador	115	Indonesia	253
El Salvador	112	Nigeria	78
Guatemala	388	Sierra Leone	114

* Source: Bart S. Fisher, The International Coffee Agreement (1972).

is necessary that the consuming party adheres strictly to the terms. It is apparent that frequently the producers will attempt to continue to sell over their quotas and perhaps make secret price concessions in an attempt to increase their earnings.

Conclusions on Coffee Market Control Schemes

As with the copper control attempts, the coffee control activities met with difficulties in actually controlling the supplies which entered the market. Again, the abnormal prices which were supported by the controllers encouraged entry into the market. The inability to cut back production and to hold sizeable stocks again led to the failure of the several attempts at control. The long-term impact of the cartels was to shift the production of coffee from Brazil to other areas in the world which had the ability to shift their production to the commodity which offered relatively high returns.

Had Brazil not attempted to keep the world price at levels which offered such substantial returns she perhaps would still be in a position of relative monopoly power. Her actions, however, were in direct conflict with her long-term goals of controlling the world market over an extended period of time.

If coffee is representative, it is clear that the same type of economic characteristics appear to inhibit cartelization in the agricultural commodities as in the mineral commodities. Perhaps cartelization is even more difficult in this area due to the limits which are placed on the storage of these perishable foodstuffs. The uncertainty of production also plays an important part in limiting the success of any control attempt.

VI. Conclusions on the Potential for Cartels

Historic Look of Success

The lack of success of the various cartel attempts in the copper and coffee markets indicates that the prospect for long-term control over primary commodity markets is limited. Recently, even OPEC has experienced some difficulties which may threaten its continued existence. These problems are similar to those which were faced by the producer groups in the copper and coffee cartels.

In order for any group of producers to effectively hold the world prices of a commodity at an abnormally high level, two critical conditions must exist. First, the producers must have relatively complete and lasting control over the sources of supply of that commodity. Second, the commodity must continue to exhibit relative inelasticity of demand over a substantial range of prices. Whenever one of these two conditions fails to be met, cartelization fails, with the result that the supporting producers are frequently in a relatively weaker market position than that prior to the control attempt. The inability to maintain these two conditions will continue to threaten the formation of cartels as well as limit the long-term effectiveness of those which are formed.

The control of the worldwide supply of a commodity is extremely difficult. As long as resources are allowed to move freely from the production of one commodity to another the supply potential of a particular commodity may be increased. As long as profits and economic gains are the motivating factors behind production decisions, supplies will expand and contract in response to market prices. These two basic principles are manifested in the marketplace by several reactions of producers to cartel attempts.

Prices higher than those which would exist in a competitive market situation tend to bring about a reallocation of the factors of production as entrepreneurs move into a market to take advantage of profits which may be allowable by the high price. The abnormally high price will not only act as a stimulus for nonparticipating producers to expand production in order to increase earnings but they will also serve as a shelter for the development of high cost or high risk production areas. The potential for high profits will bring about increased expenditures for the development of new tehhniques to increase production in existing areas as well as expenditures for the development of new areas. This occurred repeatedly in both the copper and coffee markets and it is apparent that it may occur in the petroleum industry. Both private industry and governments have made commitments of large sums of money to tap the petroleum reserves in the North Sea and Alaska as the ten-dollar-a-barrel OPEC petroleum makes production in these new areas economically feasible.

During periods of price or supply fluctuations it becomes increasingly difficult to control the production of cartel members and police the supply movements in accordance with the agreements which have been made. As prices rise and the potential profits increase, an individual member may view his short-term profitability as more important than the long-run success of the cartel. Frequent incidences of price cutting or covert marketing techniques occur as one member attempts to gain additional income. Price cutting is beneficial to an individual producer as long as it is done without retaliation on the part of the other producers. However, as every member of the cartel secretly increases his production to increase his individual profits, the total market supplies increase and the cartel position weakens. While it is difficult to obtain data on covert pricing activities, there are indications that they did occur in most of the cartel attempts studied. Perhaps most revealing is the data concerning price cutting and overshipments under the 1962 International Coffee Agreement. There have been several reported incidences of marketing practices which are not in keeping with the best interests of the OPEC concerns. Libya and Saudi Arabia have already made marketing concessions by extending credit terms to purchasers of their petroleum. There are indications that additional concessions may be made, especially if the Saudis exert their power within the OPEC organization.

Storage of a commodity is typically a primary factor in any control attempt. However as past attempts have indicated, storage as a means of supply restriction may be extremely difficult. In regards to agricultural commodities, storage carries with it a rather substantial risk of loss due to the perishable nature of most agricultural goods.

The failure to effectively control the movement of supplies into the market which necessitates the building and holding of stocks requires influxes of capital which are typically too burdensome for cartels to maintain. The burden of stocks caused the eventual failure of several of the cartel attempts in both the copper and coffee markets. For OPEC, storage is in the form of the reserves which are held in the ground and the costs associated with this storage are the opportunity costs of the lost sales due to cutbacks in production.

The inelasticity of demand for a product may be affected by the cartel's attempt to control the market. While demand for many products is extremely inelastic in the short run over small levels of price changes, the elasticity increases over time as the price changes become larger.

Significant increases in price levels may meet with market resistance in the short run as consumers postpone their consumption in hopes of lower prices in the future. In the long term, consumers may adjust their consumption patterns. They may switch to substitute products which perform similar functions or they may simply use less of the now expensive commodity.

The prices which are maintained by a cartel's activity could very well stimulate the development as well as the use of substitutes and alternatives. As the production of substitutes becomes economically feasible, more expenditures will be made for their development. It is clear that the substitution of other materials has played a role in limiting to some extent the control of the copper market. Substitution threatens to play a role in the OPEC control attempt. Massive expenditures are presently being made for the development of alternative energy sources. If these substitutes are developed to any degree, demand for petroleum could conceivably drop to such a level that even the limited supplies would cause a glut in the market at present prices. Already the impact of demand adjustment has taken a toll on OPEC production, the demand for OPEC petroleum has declined by approximately 25 percent since the 1973 price increases (25, p. 33).

The control of the market supply and a sustained level of demand are critical if a cartel attempt is to succeed. A horizontal supply curve (a given supply being offered at a fixed cartel price) and a vertical demand curve (a perfectly inelastic demand curve) are perfect conditions for a cartel. These conditions are frequently met to some degree in the short run, thus the temptation to attempt cartel control is strong. However, as the time horizon is expanded both the supply and demand curve become more elastic.

Implications for the Future

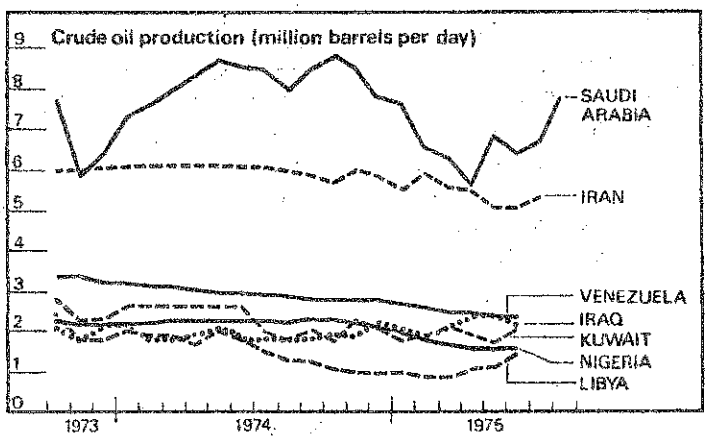
The potential for short-term profits is great. The initiators of a cartel have frequently benefitted from the increased commodity prices due to their relatively strong position in the market at the time of the attempt. However, the members of OPEC as well as any LDC contemplating the formation cartel must consider these short-term profits in respect to the potential long-term adjustments which may occur in response to the cartel.

The long-term success of OPEC seems limited in the context of the supply and demand characteristics mentioned above. The recent disagreement within OPEC stems from the concern of the Saudi's of the long-term adjustments in the petroleum market. With proven reserves in excess of 165 billion barrels and annual production of approximately 2 billion barrels Saudi Arabia possesses the resources for the continued earning of foreign exchange if the petroleum market stays relatively stable (28, p. 34). However, other OPEC members who have much smaller reserves and a much greater requirement for immediate foreign exchange (i.e., Iran, Nigeria, Venezuela) would like to see petroleum prices as high as possible in order to generate as high a level of profits as possible on the limited quantities of petroleum which they possess.

The Saudi's position may be compared to that of Brazil's in the coffee market at the turn of the century. As the largest producer with the largest productive capacity, Saudi Arabia stands to lose the most from the long-term adjustments in the petroleum market. Shifts in production

to new areas (i.e., North Sea, Alaska, etc.), increased uses of substitutes (i.e., nuclear power and solar energy) and decreased total demand for petroleum may make the Saudi's reserves less valuable in the long run. The Saudi's have taken the brunt of the recent market adjustments. Chart 7 indicates that Saudi Arabia has made subtaantial production cutbacks in order to maintain OPEC's controlled prices while smaller producers have suffered little. Only the Saudi's continued cooperation will allow OPEC to continue with the same economic power even in the short run.

CHART 7. CRUDE OIL PRODUCTION



Source: The Economist, September 20, 1975, p. 84.

The government of Saudi Arabia and other less developed countries must weigh the short-term profits from market control and maintained prices against the potential long-term losses from adjustments in the market. Decisions concerning cartel activities must be made with these trade-offs in mind. These decisions, if made on a rational basis mindful of the historical failures of commodity cartels, will limit the increases in a sustained price level which will be brought about by cartel activity.

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