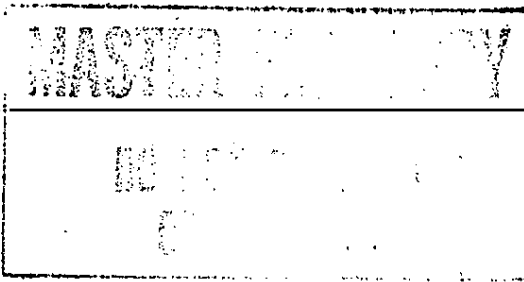




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# International Copper Market: an Added Burden for Third World Debtors

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A Research Paper

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September 1984

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# International Copper Market: an Added Burden for Third World Debtors



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A Research Paper

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This paper was prepared by [redacted] of the  
Office of Global Issues. It was coordinated with the  
Department of State. [redacted]

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Comments and queries are welcome and may be  
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OGI, [redacted]

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**International Copper Market:  
an Added Burden  
for Third World Debtors**

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**Summary**

*Information available  
as of 31 August 1984  
was used in this report.*

World recession has dealt a punishing blow to the copper market, leaving it substantially oversupplied. Although conditions have improved somewhat of late, prospects are not good for a robust demand recovery during the remaining years of this decade as OECD economic growth remains sluggish. Even if economic activity in the developed West picks up, it probably will not be sufficient to turn the copper market around. Copper demand will continue to be constrained by a falling intensity factor, primarily as a result of changing technologies and material substitution. On the supply side, planned capacity increases—mainly by the LDCs—will just about offset the modest growth in copper demand over the next several years, further entrenching the oversupply situation. Moreover, government participation in LDC copper industries is significant, making it easy to push a produce-at-all-costs policy. For instance, in Zambia, Chile, and Zaire—where copper accounts for 40 to 90 percent of export earnings—government control is virtually complete.

Weak demand growth and abundant capacities throughout the 1980s will seriously hamper LDC efforts to export their way out of the debt problem. We believe that overproduction will keep copper prices and sales low for the remainder of the decade, putting a crimp in LDC export earnings. Western producers—particularly in the United States and Western Europe—will not go unscathed either, as the buyer's market puts pressures on them to protect their domestic copper industries.

Copper producers in the developed West are already under increasing pressures from Third World suppliers. Most industrial countries are high-cost producers that are finding it increasingly difficult to compete with the LDCs under sluggish market conditions. A number of Third World suppliers—in particular Mexico and the Philippines—are complicating the problem for producers in the United States, Western Europe, and Japan by vertically integrating their industries into the smelting and refining stages. While this strategy mitigates the poor copper export prospects for the LDCs by capturing the value added in these processes, it will further increase competition for developed country producers.

The copper issue also highlights the important linkage between trade and the international debt problem. The current debt strategy supported by the United States and other Western governments calls for the restoration of LDC creditworthiness through export-based growth and LDC economic adjustment policies. For their part, debt-troubled LDCs have undertaken unpopular austerity measures to bring down payments deficits and reduce

new financing requirements. However, they are increasingly frustrated by events beyond their control—such as rising interest rates and trade barriers—that sap a growing share of foreign exchange earnings for debt repayments. For some debtors, the sluggish response of commodity prices to Western economic recovery together with rising protectionism is making the trade-oriented solution to the debt crisis unworkable. According to Chilean Government officials, a foreign exchange shortfall created by import restrictions on copper could make it impossible for Chile to continue full interest payments on its foreign debt next year.

In our judgment, trade issues such as those surrounding copper could easily become a rallying point for collective debtors' action protesting Western trade barriers and advocating the need for a new debt strategy incorporating greater support from Western governments. While Chile, Peru, Zambia, and Zaire—heavily dependent on copper for foreign exchange earnings—have the most at stake, other large debtors such as the Philippines, Indonesia, and Morocco also have an interest in maintaining and increasing their copper market sales. Current production expansion will soon make Mexico a net copper exporter. Trade barriers could reduce the incentive of debtor countries to continue implementing austerity measures and could push debtors to press collectively for better repayment terms, including limiting debt service to a smaller share of overall export earnings.

Restrictive trade practices also pose a dilemma for the IMF in its monitoring of Fund-supported programs. Shortfalls in export earnings probably would cause noncompliance with several of the programs' economic criteria, perhaps triggering requests for waivers. On the one hand, the Fund must take into account uniformity of treatment among members, many of whom could also claim they are being penalized by restrictive trade practices. On the other hand, IMF programs could fall short of what lenders view as minimally acceptable, reducing their willingness to extend new credits in the future. While resolution of the debt crisis does not hinge solely on copper, copper represents the full range of issues that will need to be addressed in the months ahead.

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### International Copper Market: an Added Burden for Third World Debtors

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#### Demand Depressed

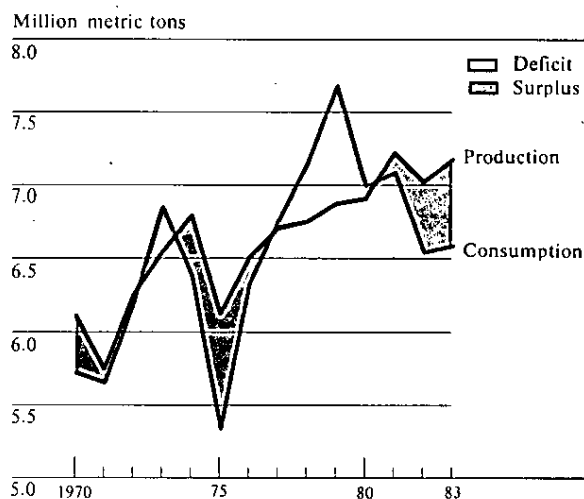
As the world economy passed through the 1980-82 recession, copper demand was hit in two ways—by the general decline in economic activity and by the continued downward trend in intensity of use. According to published industry statistics, non-Communist copper demand fell by 1.1 million metric tons between 1979 and 1982, a 15-percent decline (figure 1).<sup>1</sup> Most of the falloff in demand occurred in the OECD countries, where consumption remains well below previous levels (appendix B, table 4). Copper demand in the LDCs has also slumped as a result of the international recession, with the greatest impact occurring in 1982. After experiencing a twofold consumption increase and a doubling of its share of world use during the period of 1971-80, LDC copper demand fell by 100,000 tons in 1982 and was little changed in 1983. Had the 1971-80 rate of growth in copper usage been maintained, nearly 400,000 tons more would have been demanded by the LDCs last year.

Although much of the falloff in copper demand resulted from the slowdown in business activity in the developed countries, a large part of the reduction was caused by a continuing decline in the copper-intensity factor—copper usage per unit of economic activity. The copper-intensity factor for the period of 1979-83 was 7 percent below that of the previous five-year period and roughly one-fourth lower than in the early 1960s (figure 2). Had the intensity factor been maintained at the 1974-78 level, more than 900,000 additional tons of copper would have been used by OECD countries in 1983. The main reason for the reduced intensity pattern has been the availability of inexpensive substitutes and the trend toward lighter weight in the transportation sector.

#### Production Still Up

Despite the 1.1-million-ton drop in refined copper usage in 1980-83, world mined copper production was as high in 1983 as in 1979, a record year for copper

**Figure 1**  
Non-Communist Production and  
Consumption of Refined Copper, 1970-83



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consumption (appendix B, table 5). LDC copper producers were a major cause for the market surplus. As a group, they raised output by about 100,000 a year in 1980 and 1981 and more than 200,000 tons in 1982. Even the small 1983 decline was caused partially by technical problems at Zambian mines and by strikes in Peru, rather than by a decision to reduce excess production. With the exception of Zambia, Peru, and the Philippines, all LDC copper producers in 1983 either maintained or increased production levels in comparison with those of 1979. The largest gainer was Chile, now the world's leading copper producer, where output increased by 18 percent.

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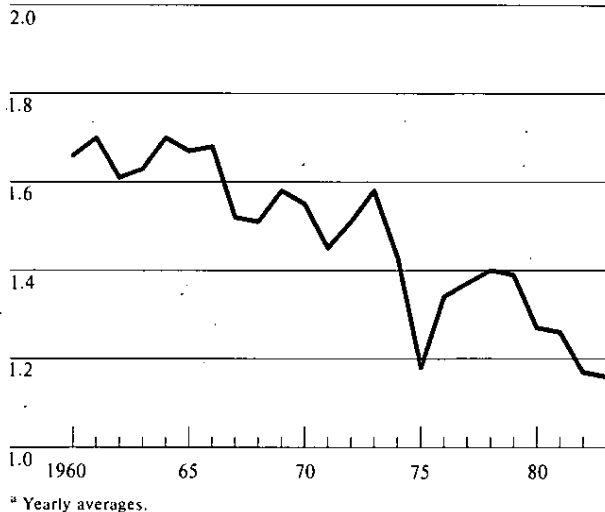
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<sup>1</sup> In this paper "world" and "non-Communist" refer to the non-Communist world.

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**Figure 2**  
**OECD Copper-Intensity Factors, 1960-83<sup>a</sup>**

Thousand tons of refined copper  
consumption per billion US \$ of real GNP



<sup>a</sup> Yearly averages.

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In contrast to LDC output increases, producers in the developed countries cut back significantly. According to the Bureau of Mines, by late summer 1982 US copper mines were operating at roughly 50 percent of capacity. While capacity utilization rates improved to 65 percent by yearend 1983, US copper production still was down one-third from 1981 levels. In Canada, the world's third-largest copper producer, mine output dropped by about 14 percent over the 1981-83 period. Australia was the only leading producer of copper in the developed West to expand output during this period.

**Production Costs and Government Policies**

The divergence in behavior between LDC producers and those in the developed countries in response to the recession is largely explained by: (a) differences in production costs; (b) the importance of copper to the domestic economy; and (c) the degree of government involvement in copper production. Costs of production vary widely around the world because of differences in ore grades and composition, processing techniques, and productivity. Weighted averages based on incomplete Bureau of Mines data indicate that break-even

production costs vary from a high of 101 cents per pound in Zambia, where low productivity offsets the advantages of high-grade ores, to a low of 66 cents per pound in Canada, where byproduct credits from nickel production cut effective copper production costs in half (appendix B, table 6).<sup>2</sup> The wide disparity in production costs largely explains why countries such as Chile, Zaire, and Australia expanded copper output during a period of sustained low prices while high-cost US producers were forced to reduce production drastically. At last year's average copper price of 72 cents per pound, few if any US copper mines operated at a profit.

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In addition to cost advantages at the mining level, the LDCs' heavy dependence on copper-export earnings and a high degree of government control over output levels often cause the LDCs to overproduce. In Zambia, Chile, and Zaire, copper accounts for 40 to 90 percent of export earnings, and government control over the industry is virtually complete (table 1). These factors cause these and other LDCs to attempt to maintain earnings in the face of low world prices by expanding output and export volumes even when such actions conflict with market conditions.

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In Zambia, Chile, and Zaire, it is either explicit or implicit government policy to produce and sell as much copper as possible. Even in those countries where average production costs are lower than world prices, some marginal or unprofitable mines are kept open. According to an industry publication, the Chilean Government in 1982, for example, established a price-support mechanism to aid small- and medium-size copper mines to assure a stable supply of copper ore to the smelter. This supply had been interrupted when many of the unprofitable mines closed because

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<sup>2</sup> Break-even production costs include mining and processing costs, byproduct credits, and taxes, but not recovery of capital or profits. Byproduct credits are able not only to reduce production costs but, in some instances, to determine output levels. For instance, in Canada much copper is mined as a byproduct or coproduct of nickel operations. When the market for nickel is poor, less copper is produced. In part, this coproduction phenomenon explains why copper production in Canada has fallen in recent years.

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**Table 1**  
**Government Control in the LDC Copper Industry**

Country	Ownership and Control	Government Policy
Chile	In 1971, Chile nationalized most copper operations. Under the new foreign investment law of July 1974, foreigners were again permitted to invest in Chilean mining. At present, two government-controlled companies, the Corporacion Nacional de Cobre de Chile (Codelco-Chile) and the Empresa Nacional de Minería (Enami) account for roughly 85 and 5 percent of Chile's copper output, respectively. The remainder is made up of a few medium-sized and small privately owned mines, a number of which are foreign owned.	Codelco operates as an autonomous business and trades internationally. It receives no direct government subsidies. Indeed, since it is one of the country's principal taxpayers and must turn over all its profits to the state, Codelco is one of the government's chief sources of revenue. Codelco has followed a long-term management plan for continued expansion of existing operations. This sometimes conflicts with market conditions.
Zambia	Zambia nationalized mining in 1969, and now controls 61 percent of Zambia Consolidated Copper Mines (ZCCM), with the South African conglomerate, Anglo-American Corporation, and other public shareholders controlling 39 percent. All ZCCM production is sold through the Metal Marketing Corporation of Zambia Ltd. Foreign companies have virtually no control over operations or sales.	ZCCM is proceeding with modernization and expansion plans, but no major new projects are in the pipeline. In the past, Zambia has produced as much copper as possible. We expect this trend to continue. However, because of declining ore grades, increasing costs, and lack of investment funds, current rates of production probably represent the upper limit. Majority foreign equity ownership in mining is prohibited.
Zaire	All copper is produced by state-owned firms. Le Generale des Carrieres et des Mines du Zaire (Gecamines) produces roughly 95 percent of the nation's copper. Societe de Development Industriel et Miniere du Zaire (SODIMIZA) produces the remainder. Last year a Japanese consortium led by Nippon Mining Co. sold its 80-percent interest in SODIMIZA to Zaire. Gecamines has recently been given full responsibility for copper marketing.	Although the mining facilities are state owned, Gecamines operates as an independent private company, with responsibility for investments and operations. The government taxes Gecamines' gross revenues, not its profits. Zaire has adopted a policy of producing and selling as much copper as is possible no matter what the price. Gecamines and the government are both very interested in attracting foreign investment.
Peru	In Peru there are various forms of business organizations involved in copper production: nationalized, mixed ownership, and private. Southern Peru Copper Corporation (SPCC)—a privately controlled company majority owned by the US firm ASARCO—produces roughly three-fourths of Peru's copper. Much of the remainder is produced by the government enterprises, Centromin and MineroPeru.	The copper industry in Peru encourages foreign investors. Although Peru will allow 100-percent foreign equity ownership, it prefers government majority ownership. SPCC output is dictated by both market conditions and political considerations.
Philippines	The bulk of Philippine copper is produced by privately owned companies. Philippine investors control these companies, but there are some foreign equity holdings. The Philippine Associated Smelting and Refining Association (PASAR) operates the sole smelter. It is jointly owned by the government, three Japanese companies, the World Bank affiliate, International Finance Corporation, and about eight local mining companies.	The Philippines has traditionally had a hands-off policy toward the copper industry. However, with the completion of the PASAR smelter, the government has made local miners commit a percentage of their output to the smelter. Majority foreign equity ownership is prohibited. Management decisions reflect the market.
Papua New Guinea	Privately held firms control copper production in Papua New Guinea. The Bougainville mine—the sole producer of copper at present—is 53.6-percent owned by Conzinc Riotinto of Australia Ltd. (a subsidiary of Rio Tinto-Zinc Corporation of the United Kingdom), with a 20-percent interest to the Papua New Guinea Government and 23 percent to the public. The OK Tedi deposit, which will be producing copper in the not-too-distant future, is a joint venture of the Australian firm, Broken Hill, Amoco, and three West German companies.	Bougainville is run as a profit oriented company. As a result, market conditions play a large role in determining output levels. Only net income is taxed.

**Table 1**  
**Government Control in the LDC Copper Industry (continued)**

Country	Ownership and Control	Government Policy
Mexico	Three companies, Mexicana de Cobre, Cia, Minera de Cananea, and Industrial Minera Mexico (IMMSA) are responsible for more than 90 percent of all Mexican production. The Cananea mine is 49-percent owned by the US firm Anaconda, with the remainder of the equity being held by government enterprises and private interests.	The maximum foreign equity ownership permitted is 49 percent for private lands and 34 percent for government reserve areas. The Mexican Government is anxious to develop the country's mining potential. Market conditions dictate production levels. Foreign companies entering the mining business in Mexico must form joint ventures with Mexican interests, private or government, in which Mexicans not only have a majority equity interest, but also effective policy and management control.

[Redacted]

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Most Zambian copper is now being produced unprofitably, according to our calculations of break-even costs. Last year, Zambia considered closing down some mining capacity because of low world prices but decided against it, apparently because of foreign exchange and employment considerations. Not since 1958 has a major operating mine closed in Zambia. Despite efforts to diversify the economy, copper still provides 90 percent of Zambia's foreign exchange earnings. Thus, the foreign exchange earnings of even marginal mines are of great importance, and closing them down would, in effect, close down sections of the economy. In addition, approximately 60,000 workers—one out of every seven Zambian wage earners—are directly employed in copper production, and many times this number are dependent on the industry. As a result, layoffs in the copper sector could have serious domestic political and economic ramifications. [Redacted]

in 1981 to 800,000 tons by the end of last year (appendix B, table 7). [Redacted]

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**Impact on Stocks**

Overproduction by the LDCs caused a dramatic buildup in commercial copper stocks during 1982-83. Copper stocks grew by nearly two-fifths, to 1.5 million tons, in 1982 alone. Although the market was in better balance last year, total stocks increased by another 36,000 tons, and were equivalent to about three months world consumption by yearend.<sup>3</sup> Most excess copper ended up on the metal exchanges, as producers, merchants, and consumers reduced inventories to a minimum. Copper held by the metal exchanges nearly tripled, growing from 300,000 tons

**Coming Out of the Recession**

Increased worldwide economic activity has significantly improved copper demand during the first half of this year. Through June, non-Communist copper demand grew by about 6 percent in comparison with the same period last year. In both the United States and Japan, which together account for 45 percent of non-Communist consumption, copper demand rose more sharply, increasing by 10 percent. US consumer expenditures in the housing and automotive sectors were largely responsible for the stronger performance here. In Japan, vigorous growth in industrial production has stimulated copper demand. Over the past few months, however, growth of copper usage in the developed West has slowed. Looking ahead to 1985, forecasters expect considerably slower industrial growth, leading many industry observers to believe that the copper recovery will be short lived.<sup>4</sup> [Redacted]

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Copper price trends have roughly paralleled demand developments. After climbing steadily to nearly 70 cents per pound earlier this year in response to rising

<sup>4</sup> Chase Econometrics, for example, expects industrial production in the United States, Japan, and Western Europe to grow in 1985 by only 0.9, 6.2, and 2.4 percent, respectively. By comparison, the growth rate projections for these countries in 1984 are 11.8, 10.6, and 4.0 [Redacted]

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<sup>3</sup> Stocks typically average less than two months' consumption. [Redacted]

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consumption and subsequent stock liquidation—since the beginning of 1984 stocks on the LME have fallen by almost 60 percent and now total about 180,000 tons—copper prices have fallen back. At midyear, prices were averaging only 65 cents per pound, about the same as average fourth-quarter 1983 prices and roughly 10 percent below the full-year average for 1983, and by the end of July had dropped below 60 cents per pound (figure 3).

the price retreat has been triggered by a slowdown in the decline of LME stocks and reduced investment demand. The rise in US real interest rates also has made financial markets a more attractive alternative than holding copper.

Unless interest rates fall sharply, copper prices are likely to rise only slowly over the next year because the market remains substantially oversupplied. In spite of significant drawdowns, total commercial stocks remain high at 1.2 million tons, and ample standby capacity will continue to hold down prices.

more than 900,000 tons of copper mining capacity—14 percent of non-Communist 1983 consumption—has been temporarily shut down since the recession. If prices begin to show a sustained rise, idle capacity would be quickly reactivated and operating mines would step up their production rates.

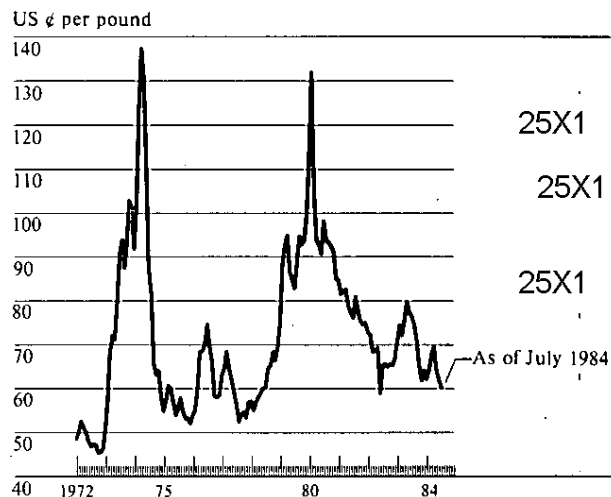
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#### Looking Ahead

The longer term outlook for the copper market is also bearish. Even a sustained recovery probably will not be sufficient to turn the copper market around. The industry has yet to stem the decline in the intensity factor, and the encroachment on its traditional markets by new materials and technology is likely to worsen. In addition, shifts occurring on the supply side in the LDCs could dramatically alter the structure of the industry, adversely affecting copper producers in the developed countries.

**Weak Demand.** We believe copper demand over the longer term is likely to be significantly constrained by a falling intensity factor in the developed countries, primarily as a result of changing technologies and material substitution. Advances in electronics and design, for instance, have permitted the use of thinner gauge wires in telephone equipment. In addition, improvements in multiplexing—the process of sending

**Figure 3**  
**Copper Prices, 1972-84<sup>a</sup>**



<sup>a</sup> LME monthly average.

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multiple conversations through a single telephone circuit—are reducing the need for additional cables. The copper industry estimates that 15 to 20 percent of potential wire consumption in telecommunications is displaced every year by electronic innovation.

Material substitution will also contribute to falling factor intensity. Automobile and aluminum industry experts predict roughly a 50-percent increase in aluminum usage in automotive applications by 1990; much of the aluminum will displace copper, particularly in radiators. Copper also faces a major challenge from fiber optics, which is expected to make substantial inroads in communications uses. Conservation in the use of copper has also been driven by the trends toward lightness and size reductions in the transportation sector. For example, to counter the trend toward greater use of aluminum radiators, copper fabricators

**Fiber Optics: the Implications for Copper**

Optical fibers are technically superior to copper coaxial cables in telecommunications applications, which currently account for about 15 percent of copper usage in the United States. Although copper cables are cheaper than optical fiber cables by as much as 1 dollar per meter, on a cost-per-message basis the latter are considerably less costly, and, as demand for optical fibers increases, costs will drop.

optical US fiber communications links are already operational along the eastern seaboard. Moreover, late last year it was announced that a consortium of the world's leading telecommunications organizations will lay the first transatlantic fiber optic submarine cable, putting it into operation by 1988. Indeed, a US Government study estimates that optical fibers will supplant 30,000 to 40,000 tons of copper per year in the United States by 1987.

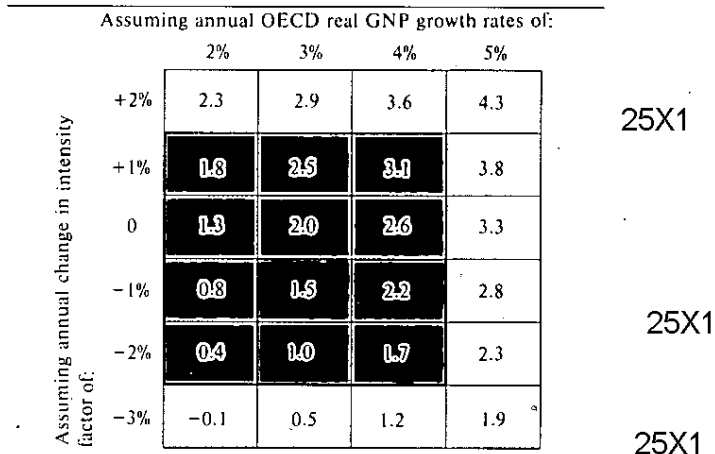
have developed thinner gauge strips and tubes. This development will stave off a complete switch to aluminum radiators, but it also will mean less copper used per automobile produced.

While the LDC copper-intensity factor will continue to rise somewhat, total LDC copper demand is expected to remain weak because of slow growth prospects, worsening terms of trade, and import cutbacks. After nearly tripling during the 1970s, LDC copper usage since 1980 has declined by 10 percent overall. Over the longer haul, copper demand by the LDCs also is likely to depend in part on their development paths and strategies. Even current gloomy demand projections may be too high if many LDCs take advantage of innovations in technology that could enable them to leapfrog stages of their economic development. Traditional uses for copper that accounted for a high intensity-of-use factor during later stages of industrialization in the OECD countries may be bypassed entirely by the LDCs. For example, LDCs are not expected to use copper for guttering and roofing, telephone switching, long-distance telecommunications, and mechanical control systems. They are expected instead to use aluminum and fiberglass, solid-state devices, fiber optics, and computer controls in these applications.

**Figure 4  
 Growth in OECD Copper Demand  
 Under Alternative Scenarios**

Million metric tons

- Unlikely scenario
- Possible scenario
- Most likely scenario



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As a result, we estimate an average rate of growth in LDC copper usage of only 5 percent per year through the end of the decade, less than half the rate of the 1970-80 period. This estimate assumes that the Asian LDCs—particularly South Korea and Taiwan—will continue to make robust gains, but that debt-troubled countries, particularly in Latin America, will show lower-than-average increases. If we are correct in our estimates, LDC copper consumption will total about 1 million tons in 1990. As for the OECD, if real GNP growth through 1990 is about 2.5 percent a year, as many observers forecast, and if the OECD intensity factor continues its current downward trend—a rate of decline of about 1.5 percent a year—OECD copper demand would total only about 6.4 million tons in 1990, barely a 1.5-percent average annual increase over 1983.

**Table 2**  
**Selected LDC Copper Mining Projects**

	Project	Capacity Increments	Remarks	
Argentina	El Pachon	100,000 tons	This deposit should come onstream as an open-pit mine by the late 1980s. It is owned by St. Joe Minerals. [redacted]	25X1
Brazil	Caraiba	90,000 tons	The open-pit mine is currently producing about 60,000 tons of copper. Further expansion to 150,000 tons probably will come in the second half of this decade.	25X1
Chile	Chuquicamata	100,000 tons	Expansion of the mine is being funded by a \$268 million loan from the Inter-American Development Bank (IADB). When the expansion is complete in 1987, capacity will equal 650,000 tons.	
Peru	Tintaya	40,000 tons	The project is being financed by a US \$100 million credit line from the Export Development Corp. (EDC), Canada's official export-import promotion agency, and a US \$115 million syndicated loan managed by the Toronto Dominion and Nova Scotia Banks. Tintaya, which is state owned, is contributing \$100 million to this project, which will be completed by 1985.	
Papua New Guinea	OK Tedi	50,000 tons	The \$600 million second stage of this project, which initiates copper production, has been postponed for two years. It is supposed to begin in 1986 at rates building up to around 120,000 tons per year of contained copper and about 8 tons per year of contained gold. During the first few years of operation, however, production rates will be considerably lower.	
			[redacted]	25X1

Putting the OECD and LDC projections together, total world copper demand by 1990 will reach only about 7.5 million tons, if our economic growth and intensity-of-use projections are correct. That level would be below the amount consumed in 1979, copper's peak year of demand, and would represent an average annual growth rate of only 1.9 percent over present depressed levels. More optimistic growth and intensity assumptions—especially for the OECD countries—would of course lead to larger additions to demand. For example, 3-percent OECD economic growth and no further decline in OECD intensity factors would mean a 2-million-ton increase in OECD demand by 1990. Figure 4 shows estimates of net additions to OECD copper demand under a different growth and intensity-of-use scenarios. [redacted]

**Changing Structure of Supply.** The increase in copper capacities during the remainder of the decade—most of it in Third World countries—will approximate the modest recovery in world copper demand, further entrenching the oversupply situation. About 700,000 tons of new mining capacity is planned by 1990, with nearly two-thirds of the increase occurring in the LDCs. Large projects in Argentina, Brazil, Chile, Papua New Guinea, and Peru alone will account for 380,000 tons of the planned increase (table 2). With only a 900,000-ton increase in demand projected, surplus mining capacity will, therefore, continue to pose a serious problem throughout the 1980s. [redacted]

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[redacted] the LDCs are planning to increase their smelting and refining capacities by roughly 900,000 tons and 650,000 tons, respectively, between now and 1990. If these expansion plans are realized, the LDCs will have a capability to process more than 80 percent of their copper output through the smelting stage and nearly 65 percent through the refining stage. This compares with 1983 smelting and refining capabilities of 72 and 57 percent, respectively. These developments will mean refining and smelting losses of several hundred thousand tons a year for the OECD economies, adding to pressures within the industry for increased protection. [redacted]

Much of the increase in refining and smelting capacity will occur in the industrializing LDCs:

- Brazil plans to expand capacity at the Caraiba smelter/refinery to 150,000 tons by 1986, up from 50,000 tons in 1983.
- The Philippines' PASAR smelter/refinery, which began operations late last year, will reach its rated capacity of 135,000 tons by 1986.
- Mexico's La Caridad smelter probably will come onstream next year with 180,000 tons of capacity.

The capacity increases in Brazil and Mexico are of particular interest, since both countries are significant users of refined copper. With its expanded capacity, Brazil, for example, will be able to satisfy about 75 percent of its refined copper needs and will be able to reduce imports accordingly. Mexico will be able to satisfy all of its copper requirements and have substantial tonnages available for export. [redacted]

**Implications**

If our demand and supply projections materialize, world copper refining capacity will continue to exceed demand by roughly 2 million tons, about 20 percent, throughout the remainder of this decade (figure 5). These projections indicate that the world copper market will remain substantially oversupplied. In these circumstances, the LDCs that are already in financial trouble and rely on copper for the bulk of their foreign exchange earnings, Zaire and Zambia, will be hard pressed to keep their domestic economic

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**Copper Processing**

*Copper processing consists of four stages: (1) mining, in which ore is extracted from the ground either by underground operations or from open pits; (2) milling or concentration, which includes crushing and grinding the ore and removing the bulk of the waste material to produce concentrates that contain 12 percent to more than 30 percent copper; (3) smelting, which involves feeding the concentrates into furnaces from which flows molten material that is about 98.5-percent copper, called blister; and (4) refining, by either an electrolytic process or a pyrometallurgical process, with the former having somewhat higher purity than "fire refined" copper. The last two stages have been combined in some of the newer processes. Most of the world's copper is electrolytically refined.*

[redacted]

conditions from worsening. Even Chile—which is in a better position than most other LDC copper producers because of low production costs—will find it difficult to service its debt or to increase domestic investment in such a weak market. Given the poor outlook for copper, we doubt that export growth will provide much help to LDC copper producers in trying to work out their debt problem. With few alternatives and with constraints imposed by debt restructuring, the LDCs may be stuck with a failed policy for years. (See appendix A.) [redacted]

The bearish copper market will put additional pressure on producers in the United States and Western Europe who already are having difficulty competing with low-cost LDC copper. Moreover, their problems will be compounded by the LDC move to vertically integrate copper operations. This development will simultaneously tighten supplies of raw copper and shrink OECD markets for their refined output. Many industry experts feel that, in the absence of government support, numerous copper producers in the developed countries may have to close down operations, especially refining. With other industries' such

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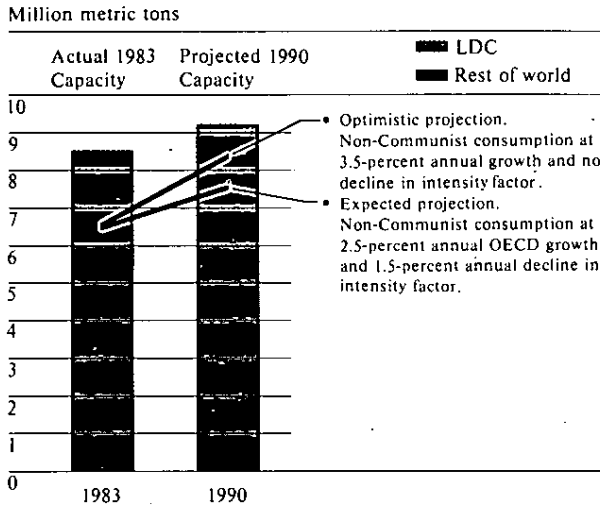
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**Figure 5**  
**Copper: Supply and Demand, 1983-90**



Some evidence of tensions has already surfaced. Chile, in particular, has been most vocal in addressing the threat to its export markets. While Chile is opposed to a debtors' club, according to published statements by its Minister of Economy, it may press for better debt-repayment terms. Suggestions such as limiting debt service payments to 25 percent of overall export earnings have been made in recent weeks.

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Restrictive trade practices also pose a potential dilemma for the IMF. Debt rescheduling and new financial assistance are, in most cases, conditional on implementation of Fund-supported programs. Foreign exchange shortfalls probably would trigger noncompliance with several of the programs' economic criteria, and the Fund would have to decide how flexible to be in waiving the criteria.

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as steel and textiles also facing the problem of competing against cheaper foreign imports, more calls for protection will be heard. This will be especially true in Western Europe, where unemployment is already high and budget flexibility is limited.

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The expected weak world copper market and probable reactions also could spill over into the debt-negotiation area. For example, the current debt strategy supported by the United States and other Western governments calls for the restoration of LDC creditworthiness through export-based growth and LDC economic adjustment policies. For their part, debt-troubled LDCs have undertaken unpopular austerity measures to bring down payments deficits and reduce new financing requirements. However, they are increasingly frustrated by events beyond their control—such as trade barriers—that prevent them from earning needed foreign exchange. In our judgment, trade issues such as those surrounding copper could easily become a rallying point for collective debtors' action protesting Western trade barriers and advocating a new debt strategy incorporating greater support from Western governments.

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**Appendix A**

Copper is the Third World's most important metal. With sales between \$5 billion and \$6 billion annually, it ranks third, after petroleum and coffee, among the leading foreign exchange earners for the LDCs. Growing financial difficulties have magnified copper's importance in the earnings picture of many LDC exporters. With dim prospects ahead for copper during the remainder of the 1980s, LDCs will have to look elsewhere for help in exporting their way out of the debt problem. [redacted]

Copper's contributions to the economies of individual Third World exporters vary greatly. Copper's impact for Chile, Zambia, Zaire, and Papua New Guinea—

which depend on copper for 40 to 90 percent of their foreign exchange earnings—is readily apparent. These economies suffer substantially during periods of slow sales and weak prices. There is another group of LDC copper exporters, however, in which copper's importance is less visible but nonetheless important. This second tier includes Peru, the Philippines, Indonesia, and Malaysia—who rank among the world's most indebted LDCs. For example, even in the Philippines, which has a diverse export base, copper accounts for 5 percent of export earnings and provides a 6-percent offset on Manila's annual debt service payments. [redacted]

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**Table 3  
Third World Copper Exporters and The Debt Problem**

	Copper Export Earnings, 1983 (million US\$)	Copper Earnings Change Since 1980 (percent)	Copper Export Earnings as a percent of Total Export Earnings	Debt Service, 1983 (million US\$)	Copper Export Earnings as a percent of Debt Service
<b>First Tier</b>					
Chile	1,836.0	-15	48	3,415.0	54
Zambia	905.5	-33	89	468.9	193
Zaire	771.8	-3	40	724.2	106
Papua New Guinea	418.6	+17	54	132.0	317
<b>Second Tier</b>					
Peru	316.9	-42	14	2,610.3	12
Philippines	189.0	-35	5	3,233.5	6
Indonesia	122.1	-5	1	3,999.4	3
Botswana	51.5	-27	9	82.3	63
Malaysia	50.7	-14	1	2,435.2	2
Morocco	34.9	+166	2	2,131.0	2
Zimbabwe	41.2	-17	2	497.3	8

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## Appendix B

**Table 4**  
**Refined Copper Consumption: Major Non-Communist Countries**

*Thousand metric tons*

	1970	1979	1980	1981	1982	1983
<b>Total</b>	<b>5,720</b>	<b>7,679</b>	<b>6,988</b>	<b>7,084</b>	<b>6,538</b>	<b>6,586</b>
<b>OECD</b>	<b>5,421</b>	<b>6,878</b>	<b>6,101</b>	<b>6,192</b>	<b>5,741</b>	<b>5,791</b>
United States	1,854	2,165	1,868	2,030	1,661	1,786
Japan	821	1,330	1,158	1,254	1,243	1,216
West Germany	698	794	748	748	731	714
United Kingdom	554	499	409	333	355	358
Italy	274	352	388	366	342	334
Other	1,220	1,738	1,530	1,461	1,409	1,383
<b>LDC</b>	<b>264</b>	<b>732</b>	<b>797</b>	<b>803</b>	<b>716</b>	<b>722</b>
Brazil	74	223	246	179	249	145
Mexico	54	104	123	141	88	87
Other	136	405	428	483	379	490
<b>Other</b>						
South Africa	35	69	90	89	81	73
<b>LDC consumption as a percent of total</b>	<b>5</b>	<b>10</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>11</b>

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**Table 5**  
**Mined Copper Production: Major Non-Communist Countries**

*Thousand metric tons*

	1970	1979	1980	1981	1982	1983
<b>Total</b>	<b>5,065</b>	<b>6,023</b>	<b>5,925</b>	<b>6,376</b>	<b>6,122</b>	<b>6,006</b>
<b>OECD</b>	<b>2,594</b>	<b>2,576</b>	<b>2,383</b>	<b>2,730</b>	<b>2,265</b>	<b>2,198</b>
United States	1,560	1,443	1,181	1,538	1,140	1,046
Canada	610	636	716	691	612	615
Australia	158	238	244	231	245	265
Other	266	259	242	270	268	272
<b>LDC</b>	<b>2,316</b>	<b>3,244</b>	<b>3,330</b>	<b>3,431</b>	<b>3,646</b>	<b>3,592</b>
Chile	692	1,063	1,068	1,081	1,240	1,257
Zambia	684	588	596	587	530	515
Zaire	387	400	460	505	503	503
Peru	212	397	367	328	356	322
Philippines	160	298	305	302	292	271
Mexico	61	107	175	231	239	193
Papua New Guinea		171	147	165	170	183
Other	120	220	212	232	316	348
South Africa	144	203	212	211	207	211
LDC output as a percent of total	46	54	56	54	60	60

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**Table 6**  
**Copper Ore Grades and Break-Even Costs:**  
**Major Non-Communist Countries**

	Average Ore Grades (percent)	Average Break-Even Production Costs (cents per pound)	Average Break-Even Production Costs Less Taxes <sup>a</sup> (cents per pound)	Index US=100
<b>World Average</b>	<b>0.83</b>	<b>77</b>	<b>67</b>	<b>77</b>
<b>Developed Countries</b>				
United States	0.66	93	87	100
Canada	0.52	66	61	70
Australia	1.77	73	65	75
<b>LDCs</b>				
Chile	0.97	67	60	69
Peru	0.85	88	76	87
Philippines	0.48	82	75	86
Zaire	4.01	88	65	75
Zambia	3.04	101	84	97

<sup>a</sup> Taxes vary from country to country, but in general they trend a little higher in the LDCs, ranging from 9 percent of the break-even production costs in the Philippines to 17 and 26 percent in Zambia and Zaire, respectively. By contrast, taxes account for 6, 8, and 11 percent of break-even production costs in the United States, Canada, and Australia, respectively.

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**Table 7**  
**Commercial Stocks of Refined Metal**

Thousand tons

	1980	1981	1982	1983	June 1984 Estimates
<b>Total Commercial Stocks</b>	<b>1,029.4</b>	<b>1,086.9</b>	<b>1,498.9</b>	<b>1,535.2</b>	<b>1,185</b>
<b>Metal Exchange Stocks</b>	<b>285.5</b>	<b>296.9</b>	<b>502.2</b>	<b>806.9</b>	<b>555</b>
New York Metal Exchange	162.9	170.2	249.0	371.2	330
London Metal Exchange	122.6	126.7	253.2	435.7	225
<b>Country Stocks</b>	<b>743.9</b>	<b>790.0</b>	<b>996.7</b>	<b>728.3</b>	<b>630</b>
Producers	376.4	402.7	572.3	388.6	320
Merchants	27.6	46.6	51.0	17.2	40
Consumers	339.9	340.7	373.4	322.5	270

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