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Chapter 7

The Behavior of Merchandise Exports

The focus of this chapter is on merchandise exports. The purpose is to explore the general questions raised at the start of Chapter 6. The organization of the chapter also is parallel to that of Chapter 6: section 7.1 is on patterns of exports since the Great Depression; section 7.2 is on the impact of the foreign trade regimes on exports, and is based on the results of partial- and general-equilibrium analysis.

SUMMARY AND CONCLUSIONS

i. The relative importance of exports in the Chilean economy has been much less since the Great Depression than before. Exports per capita have never again attained their pre-1931 peak levels. Exports relative to GDP have been about a fourth of what they were in 1900–30.

ii. The declines in exports primarily reflect changes in international markets. Chilean policy, however, also has been an important causal factor. Across the board, exports have declined in response to the low and secularly falling PLD-EERs. They have fallen further, moreover, because of the indirect effects of increased quantitative restrictions. Thus, policies originally adopted in part because of export pessimism have in fact lessened the foreign-exchange contribution of exports.

iii. The relative variance of total exports—in contrast to that for imports—has fallen since the Great Depression. The regimes of recent decades at least permitted, if not caused, some of this reduction.

iv. Phase-coincident patterns in exports have been very limited for two reasons: external market conditions, especially for copper, often have been more influential than Chilean policies; and the sharp breaks in policies that delineate phases have been directed much more toward foreign-exchange demands than supplies. In fact, the evidence suggests less that exports responded strongly to changes in phases than that changes in phases were in part a response to fluctuations in real export revenues.

v. Success in promoting nontraditional exports has been very limited even though exports of the nontraditional industries¹ have been more responsive to price-related and quantitative policies than those of any other sector. The problem has been precisely that nontraditional exports have reacted most strongly to the general discrimination against exports. The policies affecting them, moreover, have been altered much more frequently than those for other exports. Attempts to promote these exports, while moving in the right direction, have not been of sufficient magnitude to offset the effects of overvaluation of the escudo.

vi. The record in regard to large-scale copper mining—the dominant traditional export—has been mixed. In its last years, about 1950–56, the fixed NER policy for legal costs of production came closer to maximizing Chilean revenue per unit of copper than to maximizing total revenues, without any other obvious compensating advantages. The price-fixing agreement of the Second World War and the Chilean sales monopoly of 1952–54 also on net apparently worked to Chile's disadvantage. The *Nuevo Trato* of 1955 resulted in an increase in the volume of exports, but a reduction in the value returned to Chile. The longer-run effects are difficult to disentangle, although net investment did increase.

The policy of setting a Chilean producer price and the programs of Chileanization and nationalization have been more successful. They permitted Chile to share substantially in the benefits of the Vietnam War-related copper boom of the late 1960s. The Frei policies of Chileanization and nationalization were followed by substantial capital inflows for expanding industrial capacity. A negative effect of these changes, however, is that Chile apparently now is in the position of being a more marginal supplier in the world copper market—and thus subject to greater fluctuations than before in its copper trade.

vii. Chilean governments have sought greater diversification of export markets for three reasons: to lower the risks of being subjected to market fluctuations; to reduce the possibilities of political and economic dominance; and to increase interchange with other Latin American countries. In recent decades efforts to diversify markets have had some successes. The dominance of the United States, in particular, has dropped considerably. Japan and a number of European countries have increased their shares substantially. Regional outlets,

however, have not become very important despite the formation of LAFTA and the Andean Group.

viii. Exports broadly responded to the lessened uncertainty about future PLD-NER developments because of the sliding-peg NER policy of 1965–70. Although all but one export category responded significantly, however, the magnitude of such responses was not very large. In fact, the disincentive to exports because of the generally declining PLD-NER for these years probably more than offset the inducements due to greater certainty.

ix. Partial-equilibrium elasticity estimates for exports—as for imports—are misleading indices of the degree of general-equilibrium responses unless foreign-exchange movements and other indirect effects can be neutralized.

7.1 EXPORT PATTERNS SINCE 1930

7.1.1 Aggregate Merchandise Exports.

GENERAL CHARACTERISTICS.

The catastrophic impact of the Great Depression on the Chilean economy was noted in section 1.3. The evaporation of export markets was a major cause of this disaster. In response, the government adopted the more restrictive international economic policies described in chapters 3 and 4.

An important feature of these subsequent foreign trade regimes has been the maintenance of a substantial discrepancy between the effective return on imports and that on exports. For the 1946–70 period, for example, the ratio of the PLD-EER(PI) of imports to that of exports averaged 1.53 (column 6 in Table 5.2). ITRs and EPRs for the 1960s also reflect this same bias (Table 5.3).

As a result of changed world market conditions *and* the Chilean policy of discrimination against exports, the ratio of exports to GDP since 1930 has been about a fourth of that in the previous three decades (line 1.2.6.8 in Table A.1). As of 1973, 1929 exports per capita still had not been surpassed. The secular exponential growth rate of real exports for 1940–65, moreover, was about a fourth of that for imports (Table A.2).²

It is important to emphasize again that this lackluster export performance in part reflects the bias against exports in the trade regimes. Export pessimism, thus, somewhat ironically led to policies that resulted in lower exports than otherwise would have occurred (see section 7.2).

Not only the levels of total real exports but their fluctuations have been a matter of concern. In contrast to imports, relative variations in the constant-dollar value of exports were lower after 1930 than before.³ In this respect, then, the more restrictive regimes apparently had some success.

PHASE-COINCIDENT PATTERNS.

Phase-coincident patterns for the PLD-EER(PI) ratio of imports to exports are not very clear. The respective means of this ratio for the 1946-55 and 1962-64 Phase II periods were 1.60 and 1.63 (based on column 6 in Table 5.2). For the more liberal phases the means were 1.66 for 1956-58, 1.66 for 1959-61, and 1.26 for 1965-69. Except for the substantial drop during the Frei liberalization attempt of the late 1960s, therefore, average discrimination against exports apparently did not vary significantly among the post-World War II phases. The policies that sharply distinguish these phases from each other affected much more the level and variance of the premium on foreign exchange in domestic use (subsection 5.1.1) than the discrepancy between the average effective returns (premiums included) on imports and exports.

Phase-coincident movements in the constant-dollar value of merchandise exports or in the growth rates of exports are not strong.⁴ The data in line 1.1 of Table 8.1, for example, imply average annual percentage growth rates of the mean of the current phase or subphase over that of the previous one of -2.7 for 1956-58, 1.0 for 1959-61, and 13.1 for 1965-70 (all movements to more liberal phases); and 3.2 for 1962-64 and -4.2 for 1971⁵ (both changes to more restrictive phases). The regression for total exports shown in Table A.2 implies significant negative deviations from the 1940-65 secular growth rate both for the Phase II years of 1940-55 and the Phase III years of 1956-58.

The lack of phase-associated patterns reflects both the low correlation, noted above, between the average degree of discrimination against exports and that against imports and the substantial influence of changes in international markets, especially for copper, on movements in the constant-dollar value of exports, an influence that is quite independent of the degree of restrictiveness of Chilean policies.

WITHIN-PHASE PATTERNS.

Within-phase patterns in the ratio of the PLD-EER(PI) for imports to that for exports, as noted in subsection 5.1.2, were distinct for each of the phases. In the first year of each of the three liberalization attempts, for example, this ratio dropped (column 6 in Table 5.2). Subsequently, it increased substantially as the attempt faltered in one case (1956-58), decreased significantly in a second (1965-70), and did not change much in the third (1957-61).

At least two within-phase patterns in the constant-dollar value of exports themselves might be expected to be observed:⁶

i. In anticipation of the devaluation which generally accompanies a new phase, in the last year of each phase there might be increased diversion of

exportables from current exports into speculative inventories. The constant-dollar value of merchandise exports, in fact, did drop in the last year of each of the three more liberal phases: by 11.7 per cent in 1958, 8.8 per cent in 1961, and 8.7 per cent in 1970. In contrast, however, it increased in the last year of each of the more restrictive phases: by 18.4 per cent in 1955 and 18.3 per cent in 1964. This over-all pattern suggests an alternative explanation. Given the very limited foreign-exchange reserves, a short-run export boom was an important contributing factor in ending more restrictive phases and vice versa.

ii. If the preceding explanation is correct, it would be expected that increased exports would be drawn out of the speculative stocks in the first year of new phases. Such tendencies would be reinforced in the first year of more liberal phases if competing domestic demands for exportables were lessened due to the recession which would accompany attempts at stabilization combined with liberalization (as in 1956 and 1959). For the first year of three of the last five phases, in fact, the constant-dollar value of exports did increase: by 22.1 per cent in 1959, 7.7 per cent in 1962, and 15.2 per cent in 1965. It decreased by 3.5 and 11.7 per cent respectively, however, in 1956 and 1971. The support for these hypotheses thus seems limited.

7.1.2 Disaggregate Merchandise Exports.

7.1.2.1 DESTINATION OF EXPORTS.

Diversity of export markets has long been sought by Chilean governments in order to reduce the political and economic dependence of the nation on any particular foreign country; develop stronger regional economic links; and lessen its susceptibility to cyclical fluctuations abroad.⁷ Mean percentage distributions of Chilean exports by destination are presented in Table 7.1 for the country's most important trading partners during phases and subphases in 1948-70. In light of the above aims, three features of the data in this table should be noted.

i. The United States remained the most important market throughout the period, but declined substantially in importance after the mid-1950s.⁸ In the first decade after the Second World War, the United States received about half of Chilean exports—more than five times as much as any other country. In the 1965-70 phase it absorbed about a fifth, and four other countries each accounted for about half as much.⁹ Under the Allende government this share apparently fell further. This large drop in part reflects success at diversification attempts motivated by the first two reasons stated above. For the late 1960s it also reflects the move from United States copper markets to others because the United States price generally was substantially below that which prevailed elsewhere.¹⁰

TABLE 7.1
 Mean Percentage Distribution of Chilean Exports by Destination
 for Phases and Subphases of 1948-70

Major Trading Partners	1948-51 Phase II	1952-55 Phase II	1956-58 Phase III	1959-61 Phase IV	1962-64 Phase II	1965-70 Phase III
United States	51	53	42	38	35	21
United Kingdom	7	10	15	16	13	14
Federal Republic of Germany	2	7	14	15	12	10
Netherlands	1	2	7	9	8	12
Argentina	5	9	5	4	3	5
Japan	0	0	1	3	8	12
Italy	4	3	4	3	4	7
France	6	1	2	2	2	5
All others	23	14	10	10	16	15

SOURCE: Calculated from data in IMF and IRBD [1949-72]. The countries are listed in order of their mean shares for the entire period.

ii. Japan and the Netherlands increased their shares quite substantially over this period. Italy and France did so in the late 1960s. The United Kingdom and Germany did so earlier, with peaks during 1959-61. These patterns partially reflect relative growth rates in the importing countries.

As a result of these movements, together with the secular decline of exports to the United States, diversification of destinations among the major trading partners increased greatly. At the same time the importance of the rest of the world excluding the eight countries listed in Table 7.1 dropped substantially through the 1950s. It rose again in the 1960s and probably increased further in the early 1970s because of the Allende government's emphasis on regional contacts and on expanding interchange with socialist nations. By the 1965-70 phase, however, this share still was far below the 1948-51 average of 23 per cent. Thus, concentration on the eight major trading partners vis-à-vis the rest of the world accompanied the diversification among these eight.

iii. One aspect of the concentration on the eight major trading countries is that regional markets did not become significant despite the rhetorical emphasis on LAFTA and the Andean Group. Of all Latin American countries only Argentina was a major buyer for the entire period, and its share fluctuated without any strong upward trend in the 1960s.¹¹ The failure greatly to expand regional markets reflects the generally limited over-all success of the regional movements and the concentration of Chilean exports on copper, for which demand is highly concentrated in the more industrialized countries. For the

latter reason the distribution of exports by destination probably did not change dramatically under the Allende government.

7.1.2.2 ORIGIN OF EXPORTS BY SECTOR.

The average share of merchandise exports derived from mining in 1946–71 was 83.3 per cent; from manufacturing, 8.5 per cent; and from agriculture, 8.3 per cent. The secular shift in this composition has been away from agriculture and toward mining and industry (lines 1.2.3.1, 1.2.3.2, and 1.2.3.3 in Table A.1). The estimates in Table A.2, in fact, include a negative secular growth rate for the real value of agricultural exports in 1947–65. The rate for mining also is negative or near zero before 1959, but positive thereafter.¹² The point estimate for industry is the highest for the goods sectors, although it has the largest relative variation.

The only important phase-coincident pattern is seen in the regression for industrial exports in Table A.2, which includes a significantly positive response in the first year of each of the three liberalization periods. For exports from this sector, thus, a short-run boom apparently accompanied liberalization because of previous speculative inventory accumulation and recession associated with the efforts at stabilization plus liberalization.

The absence in tables A.1 and A.2 of any other important phase-coincident regularities is not surprising, since (i) export composition depended heavily on conditions in the world copper market and (ii) policies toward exports and domestic competition for exportables varied substantially among the more liberalized phases (see sections 4.2 and 9.2). It is interesting to note, however, the impact of these factors on fluctuations in various categories of exports. The ratio of the standard deviation from the secular trend of exports in a category to the mean for that category provides an index of the degree of relative variation. The categories in order of increasing values of the ratios for 1946–65 are large-scale mining, 0.13; agriculture, 0.20; small-scale mining, 0.29; and manufacturing, 0.41.

Variations have been smallest relatively in mining, especially large-scale mining, in part because Chile has had some market power over copper, but not over any other exports. Therefore, reduced export quantities of copper may have been offset somewhat by increased prices.¹³ Another consideration is that policies toward large-scale copper mining were relatively constant during the two decades following the Second World War except for the Chilean sales monopoly in 1952–53 and the enactment of the *Nuevo Trato* in 1955 (subsection 4.2.1). For other exports, including those derived from small- and medium-scale mining, policies changed with much greater frequency.

Variations in agricultural exports have been relatively small. This result is somewhat surprising because quantitative restrictions have been used more

to limit exports from agriculture than from any other sector (subsection 4.2.2).

The largest variations by far have been in manufacturing. Apparently, this result reflects the marginal position of Chile as a supplier of industrial goods in international markets, the relatively great frequency with which policies affecting these products have been changed, and the considerable fluctuation in the competition for domestic use of these exportables.

Finally, the sectoral ordering of relative fluctuations in PLD-EER (PIs), shown in Table A.8, appears to be unrelated to variations in exports.

7.1.2.3 COPPER.

The dominant Chilean export since the Great Depression has been copper. For 1960-70, for example, it accounted for an average of 81 per cent of the value of exports from mining and 70 per cent of the value of total merchandise exports.¹⁴

The effect of government policy toward large-scale copper mining in the last four decades, discussed in section 4.2.1, has been a secular, although not monotonic, increase in Chilean control over this key export:

i. From the 1930s until the *Nuevo Trato* of 1955 large-scale copper companies faced increasingly discriminatory exchange-rate treatment for local costs of production. Between 1939 and 1955, the PLD-NER for these costs declined by 97 per cent (column 1 in Table 3.2)! Reynolds [1965:378] calculates that this NER treatment, together with tax policies and the Chilean sales monopoly, caused the share of the gross value of large-scale copper mining exports returned to Chile to increase from 28 per cent in 1937 to an average of 93 per cent for 1952-54! Therefore, Chilean terms of trade of copper adjusted for the proportion of total value actually returned to the country increased greatly in the quarter-century after 1930 (and the averages after 1940 exceeded pre-Depression levels). This occurred despite a secular decline in the unadjusted terms of trade (at least until 1952-55) and despite the fact that the highest subphase mean for the unadjusted terms of trade in this quarter-century was only 63 per cent of the 1915-30 average (lines 1.1.5.1 and 1.1.5.2 in Table A.1).

These policies came closer to maximizing Chilean government revenue per unit of large-scale copper mining exports than to maximizing total Chilean revenue from large-scale copper mining exports. To illustrate this point, consider the highly simplified, short-run (i.e., fixed capacity) situation in which the objective of Chile is to maximize its revenue. Revenue is by definition the product of the quantity of copper exports, the world copper price, and the average returned value rate equivalent to the net effects of all relevant government policies. For simplicity, all quantities are assumed to be exported. Assume

that copper exports are a function of the price net of returned value (P^*). Relation 7.1 gives the revenue-maximizing average returned value rate ($ARVR$) as a function of the supply elasticity (E_{SP^*}) and the demand elasticity (E_{DP}).

$$ARVR = 1/[1 + E_{SP^*} + (E_{SP^*}/E_{DP})] \quad (7.1)$$

On the basis of the estimates in Table 7.1, E_{SP^*} is about 0.3. On the basis of the Chilean market share and world demand estimates, E_{DP} generally is assumed to be about -4.0 . For these values the implied revenue-maximizing returned value rate is 0.82.

Although this rate is quite high, it is still below the actual rate for 1952–54.¹⁵ Considerations regarding capacity expansion, employment of domestic factors, or the nature of the bilateral bargaining process between the Chilean government and the large-scale copper mining companies, moreover, may have resulted in a *lower* optimal rate. But it is hard to reconcile rates as high as those in 1952–54 with stated government objectives.¹⁶ The increases of the rates over the previous decade and a half, furthermore, contributed to the decline in the Chilean share of world copper production from 20.2 per cent in 1934 to 11.2 per cent in 1954.¹⁷

ii. The 1942–46 agreement between the Chilean and United States governments to fix copper prices resulted in a considerable reduction of returned export value to Chile and a shift of real resources to the United States. Reynolds [1965:240] reports estimates of the loss to Chile as high as \$500 million. He characterizes such a figure as “undoubtedly exaggerated,” since it is more than 160 per cent of the total returned value for 1941–45. Nevertheless, the cost to Chile clearly was considerable. When the agreement was terminated, at the end of 1946, the price of copper approximately doubled immediately. Full responsibility for the loss, of course, should not fall on the Chilean government. It probably would have found it almost impossible to resist United States pressures for participation in this “wartime effort.”

iii. After the decline of active hostilities in Korea, the Chilean sales monopoly found it difficult to find buyers at 35.5 cents per pound. Therefore, sales fell off and inventories accumulated. During the period from 1952 to 1954, when either the monopoly or the Washington Treaty (signed in 1951) was in effect, additions to inventories averaged 14 per cent of production, as contrasted with 4 per cent for the previous four years. By far the largest shortfall from the secular growth rate of total quantities exported implied by the regression in Table A.2, moreover, occurred in 1953.¹⁸ Because of these sales difficulties the monopoly was abandoned in early 1954.

Moran [1970:88–90] explains the failure of this effort partially by shortcomings on the Chilean side. He claims that the Chilean government did not

appreciate how thin the wartime copper market was, how limited was its own expertise, how difficult it was to locate new customers, and how closely wartime customers who were looking for marginal purchases had remained tied to their traditional suppliers for their basic purchases. But he also claims that the governments of the traditional producers were opposed to the Chilean policy and apparently caused the International Materials Conference to deduct purchases of Chilean copper from the quotas granted to United Nations allies at the lower ceiling price. He furthermore suggests that Anaconda and Kennecott (the major owners of Chilean large-scale copper mines) searched out potential Chilean customers to sell to at the United States ceiling price in order to disrupt the Chilean effort and protect their own established markets.

iv. The *Nuevo Trato* was signed in 1955. The effect of the new arrangements was to increase the volume of copper production. During 1945-54, Chilean production had dropped by almost 30 per cent. The Chilean share in world production had fallen from 19.7 per cent in 1945 to 11.2 per cent in 1954. In the decade after the signing, production rose steadily to 78 per cent above the 1954 level.¹⁹ The Chilean share in world production increased to as high as 15.1 per cent in 1959.

Despite the increase in the volume of copper production and exports, the short-run impact of the new treatment of large-scale mining probably was to reduce the total value returned to Chile (as opposed to total export value). The short-run (i.e., fixed capacity) impact of the *Nuevo Trato* can be investigated crudely by comparing various characteristics of the 1954 situation with those of 1956-58.²⁰ Returned value per dollar of sales decreased from 91 per cent to 56 per cent, physical product increased 32.2 per cent, Chile's share of world copper production increased from 12.6 to 13.9 per cent, the price of copper increased 28.8 per cent, and the returned value increased 3.8 per cent. Using the Fisher, Cootner, and Baily [1972] estimate of 0.11 for the Chilean short-run price elasticity, a rough calculation indicates that had the price remained constant the absolute value returned to Chile would have declined by almost 20 per cent.²¹ This result only reflects the effect of the *Nuevo Trato* in reducing the average returned value rate substantially below the revenue-maximizing level calculated above.

Longer-run considerations, of course, may have offset the negative short-run impact on Chilean control of foreign resources. A comparison of the 1956-58 values for large-scale copper mining with those for 1952-54 indicates that gross investment increased 146 per cent, gross investment minus amortization rose 129 per cent, the ratio of gross investment to after-tax profits rose from 80 to 90 per cent, and the ratio of gross investment to after-tax profits plus amortization increased from 69 to 73 per cent. A comparison of the decade before the *Nuevo Trato* with that immediately after reveals that the

constant-dollar value of gross investment increased by 95 per cent and the constant-dollar value of gross investment minus amortization rose by 50 per cent.²²

These increases suggest that the longer-run benefits to Chile of the *Nuevo Trato* offset the shorter-run losses. To settle the issue more care would have to be taken to preserve ceteris paribus assumptions, and it would be necessary to identify the time path of additional returns to foreign owners that are due to any further investments. Such an attempt is not made here because of the considerable difficulties involved. However, it is important to note that the results of the *Nuevo Trato* were not so positive as to cause it to be exempt from Chilean criticism. To the contrary, attacks on it intensified over the years.

v. In 1964 the Chilean producer price was made independent of the United States producer price. In 1964 the difference between the two prices was never more than 2.0 cents a pound, and the former averaged 0.6 cents per pound less than the latter and 13.3 cents per pound less than the LME price. In 1965 the Chilean price averaged 0.7 cents per pound above the United States price, but 23.2 cents per pound below the LME price. In 1966 CODELCO broke sharply from the United States price by setting the Chilean price equal to the LME price. Over the next five years, 1966-70, the Chilean price exceeded the steadily increasing United States price by an average of 13.2 cents per pound.

The immediate positive impact of this policy on Chilean control of foreign exchange was considerable. Together with the changes in taxes, surtaxes, and government participation in this phase, it enabled Chile to partake very substantially of the returns from the Vietnam War-related copper market boom.²³ In this respect, the contrast with the Second World War and the early years of the Korean conflict was striking. As a result, ECLA [1970:153] reports, mean annual current-dollar returned earnings in 1965-69 were more than 80 per cent above those of the previous phase. In fact, this increased inflow probably was the single most important factor permitting continuing liberalization during the six years of the Frei administration.²⁴

The long-run impact of the new pricing policy is less clearly positive. Moran [1970] hypothesizes that the new pricing policy (together with other changes in the Chilean copper sector, once again) may place Chile in the role of a marginal supplier in the world copper market.²⁵ In such a position she may reap more from booms, but also be subjected to much greater fluctuations than in the past. That the Chilean price has been below the United States price for much of the time from mid-1970 to the present provides some confirmation of Moran's hypothesis.

vi. The programs of Chileanization and nationalization undertaken by the Frei government in the late 1960s raised the Chilean share of gross profits from large-scale copper mining to about 80 per cent because of direct govern-

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ment participation in addition to direct taxes and surtaxes. The nationalization of July 1971 extended that share to 100 per cent. In a direct sense, *ceteris paribus*, these measures clearly increased the Chilean short-run command over foreign resources.

The Frei programs also caused a substantial rise in net foreign investment in large-scale mining. These flows had been negative in the previous two phases (line 10.1 in Table 8.1) and averaged -\$36.1 million in 1965-66.²⁶ After the agreements of 1967, however, they reversed to a mean level of \$19.6 million in 1967-69. The Chileanization program also resulted in a mean increase of \$40.8 million in other private long-term capital inflows between these two sub-phases and probably in additional increases in net capital inflows to the Chilean government (lines 12 and 13.1 in Table 8.1). Gross investment in large-scale copper mining in 1967-69, moreover, exceeded by more than 10 per cent the total at any time since the *Nuevo Trato*. The goal of these investments was to expand capacity to 23 per cent above the 1964-69 level by 1970 and to 71 per cent by 1972. Until the end of the Frei administration the necessary investment appeared to be occurring almost on schedule, although some lags were evident.

In several areas, therefore, the Frei programs seemed to have been successful. In a bilateral monopoly situation, however, it is usually possible to quibble with the terms of the solution and hypothesize that the Chilean government could have done better. In fact, the Chilean leftist Radomiro Tomic (the Christian Democratic candidate for president in 1970) and others did so.²⁷ Moreover, the Chileanization and nationalization programs combined with the pricing policy may have made Chile a more marginal supplier in the world market (see above).

Under the Allende government copper did not provide the hoped for expansion of foreign exchange. Part of the explanation for the shortfall lay in lower world copper prices. The average Chilean price for 1971-72, for example, was 22 per cent below that for 1970, a decline which more than offset the 8.2 per cent increase in the volume of Chilean copper production in the same year.

A more important factor, however, was that copper production did not expand nearly as rapidly as had been planned for. The 1971 quantity, for example, was less than 80 per cent of that predicted in the 1971 ODEPLAN [1971b:17] plan. Two new mines (Exótica and Andina) commenced production at annual rates of 50,000 metric tons in that year, but output in the three previously existing major mines fell by 9 per cent, offsetting almost half of the increment from the new sources.

It is not clear to what extent realized production was lower than anticipated because of government policy. Government officials and sympathetic observers suggested that the causes of the delayed expansion included technical problems,²⁸ flooding and power shortages resulting from severe weather, short-

ages of equipment and parts due to a lack of cooperation from United States suppliers, and maltreatment of the physical plant by former owners in anticipation of nationalization. On the other hand, a wide range of observers, including Allende and other members of his government, pointed to problems in large-scale mining which arose partially from changes in the international or over-all economic policy regimes: the exodus of several hundred skilled engineers and other technicians whose real wages were reduced because of the shift from dollar to escudo remunerations or who were charged with being "politically unreliable" by political splinter groups; political squabbles among labor groups identified with political parties both within and outside of the governing coalition; assignment of positions not on the basis of merit but on the basis of political identification; and substantial increases in costs because of bad management, lack of labor discipline, strikes (including, in May 1972 at Chuquicamata, the first general strike since 1966), and the failure of the copper workers (Chile's labor aristocracy) to make the sacrifices required to achieve the objectives of socialism.²⁹

Because of the coup of September 1973, future over-all developments in the Chilean economy are very uncertain at the time of this writing. The possibilities of substantially expanded foreign-exchange earnings from copper, however, seem to be good. World copper prices have increased from the relatively low levels of 1971 and 1972 and are likely to remain in a somewhat higher range for the near future.³⁰ The realization of large production increments at a relatively small marginal cost seems quite possible because of the as yet unrealized potential from the investment program initiated in 1967.

7.1.2.4 NONTRADITIONAL EXPORTS.

There has been increasing policy emphasis on nontraditional exports in recent phases, especially during the Frei government, under which the sliding-peg NER, special credit programs, expanded drawbacks, and inducements for related investments were instituted (see subsection 4.2.2).

Comparisons of export values before and after the major development of policies favoring nontraditional exports in 1967 does not indicate great success for these programs. For a few products large positive shifts were recorded. The mean annual value of paper, cellulose, and related exports, for example, rose from \$9.8 million in 1963-66 to \$25.8 million in 1967-70 (and averaged 27 per cent of industrial exports in the latter period).³¹ In a number of cases, however, the current-dollar values of affected exports actually fell.³² For some other items (largely agricultural), Jul [1969:143] notes that the increment in export value was less than the change in drawbacks paid. Total industrial exports in constant dollars declined 3 per cent from 1963-66 to 1967-70, and agricultural exports fell 9 per cent.³³

Why did nontraditional exports perform so poorly? A large part of the

answer is that policy continued to discriminate against them.³⁴ Any advantage granted by drawbacks and special credits was more than offset by substantial overvaluation. The export-related ITRs and EPRs were significantly less than those for imports and were negatively associated with the importance of exports in subsectoral product.³⁵ Only for a few products for a short period of time did the drawbacks offset the overvaluation as estimated by Bacha and Taylor [1973].³⁶ The export-promotion program in essence offered a small reduction in discrimination against exports—and that reduction was probably widely perceived as transitory. The decreasing PLD-NER for 1968–70 (column 13 in Table 3.2) provides support for that perception.

7.2 ECONOMETRIC MEASURES OF THE RESPONSES OF EXPORTS TO THE REGIMES

In the remainder of this chapter, I attempt to determine the nature of export responses to recent regimes within the framework of specific structural relationships: partial-equilibrium analysis in subsection 7.2.1, general-equilibrium analysis in subsection 7.2.2.

7.2.1 Partial-Equilibrium Responses.

Table 7.2 contains single-equation estimates for exports from the goods-producing sectors for 1947–65. Mining is subdivided into large scale and small and medium scale because the two parts are treated differently.

On an over-all level these results appear to be reasonably satisfactory. The point estimates generally are of the anticipated sign, and problems of serial correlation are not apparent (but see note a). The corrected coefficients of determination (\bar{R}^2) indicate that variations in the hypothesized determinants are consistent with from 74 to 96 per cent of the variations in sectoral real exports. Small- and medium-scale mining has the highest \bar{R}^2 followed by large-scale mining alternative a, agriculture, large-scale mining alternative b, and industry. The weak suggestion of this pattern is that the underlying model may be more consistent with variations in real exports from traditional than from nontraditional sectors.³⁷

The basic model hypothesizes that current real sectoral exports depend on relative price factors, quantitative supply factors, quantitative demand factors, and lagged real sectoral exports.

Relative price terms include both levels and standard deviations. The latter is justified as a crude proxy for uncertainty. The underlying price ratios themselves are of three types: (i) the ratio of the product of the external price

TABLE 7.2
Sectoral Real Export Functions^a for Chile, 1947-65

Sector	Relative Prices			Stand. Dev.	Quantitative Supply Factors		Quantitative Demand Factors		Lagged Exports	Con- stant	\bar{R}^2 SE DW
	Level				1	2	1	2			
	1	2	3								
Agriculture	39.2 ^b (9.1) [0.5]	6.72 ^c (2.6) [0.1]		-17.5 ^b (1.6) [-0.0]	49.8 ^d (1.4) ^e [0.4]	0.0531 ^f (2.3) [0.6]	42.6 ^f (5.5) [0.2]		-103.0 (2.1)	0.87 11.5 1.6	
Mining Large-scale (a)	6.83 ^a (7.8) [0.2]	1.34 ⁱ (6.2) [0.1]		-306.0 ^j (4.1) [-0.1]	-190.0 ^k (3.6) [-0.0]	-1,454.0 ^l (5.0) [-1.0]			-0.379 (3.8)	2,737.0 (9.4) 46.9 1.8	
Large-scale (b)	7.99 ^a (5.6) [0.2]	1.58 ⁱ (4.4) [0.1]		-332.0 ^j (2.7) [-0.1]	-218.0 ^k (2.4) [-0.0]				-0.557 (3.5)	1,363.0 (8.6) 78.9 2.9	
Small- and medium-scale	0.992 ^m (5.8) [0.4]	25.1 ⁿ (1.5) ^g [0.4]			0.106 ^h (1.7) ^g [0.0]		7.14 ^p (3.2) [2.1]	11.5 ^p (4.5) [3.2]	-1,083.0 (11.2)	0.96 31.9 2.7	
Industry	5,271.0 ^q (2.8) [1.0]	117.1 ⁿ (4.2) [1.9]	40.8 ^r (5.1) [4.4]	48.8 ^s (2.6) [-0.2]	0.137 ^t (5.8) [2.0]	-273.0 ^u (1.9) [-1.3]			0.363 (2.3)	-706.0 (2.8) 27.7 2.2	

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Notes to Table 7.2

R^2 = coefficient of multiple determination adjusted for degrees of freedom.

SE = standard error of estimate.

DW = Durbin-Watson statistic.

- a. Data sources and estimation techniques are discussed in Chapter 2 and in Appendix A. The figures in parentheses are the absolute values of the t statistics. All point estimates are significantly nonzero at the 5 per cent level unless otherwise noted. The figures in brackets are the long-run elasticities at the point of sample means. These elasticities are long run in the sense that all adjustments due to the inclusion of lagged imports are assumed to have occurred. For such relationships in which the lagged import value is included, the Durbin-Watson statistic is biased toward 2.0.
- b. Ratio of unit value of sectoral exports multiplied by the exchange rate to the sectoral labor price including employer social security contributions.
- c. Black-market PLD-NER minus national accounts PLD-NER.
- d. Sectoral output relative to sectoral output lagged.
- e. Sectoral GDP.
- f. Dummy variable for LAFTA (value of 1.0 in 1961 and thereafter).
- g. Significantly nonzero at the 10 per cent level.
- h. Ratio of United States producer price for copper adjusted for direct tax rate on mining to index of intermediate prices for mining adjusted for the NER for large-scale mining.
- i. Ratio of United States producer price for copper adjusted for direct tax rate on mining to price of labor in mining including employer social security contributions.
- j. PLD-NER.
- k. Post-Korean War Chilean sales monopoly dummy variable with value of 1.0 in 1953.
- l. Ratio of total GDP lagged one year to total GDP lagged two years.
- m. Same as i, but lagged one year.
- n. PLD-NER lagged one year.
- o. First difference of sectoral GDP.
- p. Factor 1 is an index of industrial activity in the United States. Factor 2 is the same index lagged one year.
- q. Ratio of unit value of sectoral exports multiplied by the exchange rate to domestic sectoral product price.
- r. Same as c, but lagged one year.
- s. Sectoral capacity utilization.

(or unit value) and the NER (adjusted for unit direct tax rates in the case of mining) to factor costs (intermediate or labor costs, the latter adjusted for employers' social security taxes); (ii) the ratio of the product of the external price and the NER to the domestic market price; and (iii) ratios relating to various PLD-NEs. The last group of ratios may be thought to be redundant because it is incorporated in the others. This third group, however, does seem to provide information about the most volatile element in the other ratios. In the cases in which the black-market NER is involved, moreover, it provides a measure of an added incentive for exporting (perhaps accompanied by some such action as underinvoicing) beyond that captured by the other two types of ratios. Thus more than one type of relative price ratio is allowed in the estimates.

The estimates in Table 7.2 suggest that significant responses to both price levels and standard deviations are widespread. All three types of price ratio

mentioned above are relevant. The implied elasticities are fairly substantial for some sectors. For example, the elasticities with respect to the general NER are 2.9 for industry, 0.8 for small- and medium-scale mining, 0.5 for agriculture, and 0.3 for large-scale mining.³⁸

In general, price reactions were more pervasive for exports than for imports (subsection 6.2.1). The estimates indicate that the secular decline in the PLD-NER caused substantial foreign-exchange losses through reduced exports.³⁹ *Ceteris paribus*, the foregoing elasticities and the 63 per cent drop in the over-all PLD-NER between 1946 and 1972, for example, imply complete elimination of exports from industry; and drops of 50 per cent from small- and medium-scale mining; 32 per cent from agriculture; and 19 per cent from large-scale mining.

The nontraditional industrial exports were particularly responsive to price. The maintenance of a disequilibrium exchange-rate system with an overvalued exchange rate, therefore, especially discouraged these exports.⁴⁰ In this manner the effect of the post-World War II regimes has been to increase relative dependence on the traditional exports even though one persistent underlying motive supposedly was to reduce their dominance. As is noted above, the export-promotion programs started in the 1960s were not very effective because they only partially compensated for overvaluation.

The price response of large-scale mining exports, in contrast, was relatively small. The result is consistent with an earlier contention that the benefits to Chile of the more favorable treatment of this subsector initiated by the *Nuevo Trato* of 1955 probably were quite limited.

For all export sources except small- and medium-scale mining, the estimates suggest a significant negative response to the standard deviation term. A policy to reduce uncertainty regarding future real returns from exports thus would have a widespread payoff in the form of increased exports. The sliding-peg NER of 1965–70 was such a policy. Although the payoff was widespread across sectors, however, the elasticities imply that it was limited in magnitude.

Quantitative supply factors include levels and indices of marginal changes of real sectoral outputs (to find out whether the availability of sectoral real product affected sectoral exports); sectoral capacity-utilization rates and measures of over-all aggregate demand (to find out whether in sectors with low demand—and thus low sectoral capacity utilization—there were increased attempts to sell to external markets); the French-Davis quantitative restrictions index (to find out whether QRs either on imported inputs or on particular exports limited the levels of aggregate sectoral exports); and dummy variables such as one for the period of the Chilean sales monopoly in mining after the Korean War.

The results support the claim that there were important reactions to these quantitative supply factors. Marginal changes in output caused significant and,

in most cases, substantial responses in exports from agriculture, small- and medium-scale mining, and industry. The state of capacity utilization reinforced this effect in industry. The continuance of the Chilean copper sales monopoly in the face of declining demand after the end of the Korean War was associated with a fall of approximately 20 per cent in the real value of large-scale mining exports.

Large-scale mining exports also seem to have been significantly and strongly negatively related to the lagged rate of growth in over-all GDP. This relation can be interpreted in several ways: (i) In periods of general stagnation inputs were more readily available for this subsector than was otherwise the case. (ii) In recessions the government more vigorously pursued policies to induce an expansion of exports from large-scale mining in order to increase aggregate demand generally and in order to obtain income to offset reduced tax revenues from the rest of the economy. (iii) In cyclical downturns the rate of inflation was less, *ceteris paribus*; so the PLD-EER for such exports was more favorable. (iv) At those times competing demands for domestic uses were less; so a higher proportion of production was exported.⁴¹

All of these rationales have some merit—although, in some cases, only if the hypothesized effect is not really better represented by some other variable included in the regression which a priori would seem more logical (e.g., for iii, the price ratios). That the total effect of such factors was as large as is implied by the data in Table 7.2, however, is somewhat doubtful. Therefore, this table also contains an alternative relationship which is identical except for the exclusion of this one variable.

Despite widespread evidence regarding the importance of supply considerations, finally, no significant response to quantitative restrictions is reported. This lack of statistical evidence does not definitely indicate that QRs had no impact on exports. For example, since QRs were applied to only a few specific products, their effect may be obscured by aggregation. Variations in the QR index, moreover, might not well represent possible negative effects on the competitiveness of Chilean exports. Inefficiencies may have been fostered by the generally high protective barriers, but may have varied quite slowly in response to changing QRs.

Quantitative demand factors include a dummy variable for the impact of LAFTA and indices of demand in the most important destination countries.⁴² The results indicate that only agricultural exports increased with the formation of LAFTA, but they rose by 20 per cent of the mean real export value for the entire sample period.

The structuralist school (e.g., Sierra [1969:62]) has placed considerable emphasis on the role of fluctuations in the importing countries. Statistical support for this hypothesis is observed only for small- and medium-scale mining. The explanation for this result may be that this subsector was relatively a

marginal supplier in the markets in which it participated and thus was more subject to demand fluctuations. Small- and medium-scale mining was a marginal supplier because it lacked the intracorporate ties of large-scale mining and because it expanded its productive capabilities relatively quickly and had to find new buyers.

Lagged exports are included to represent either the distributed lag adjustment of actual to desired real sectoral exports over several periods due to adjustment costs or an inventory effect (in the sense that large real sectoral exports one year result in inventory depletion and smaller exports in the subsequent year, *ceteris paribus*). The *a priori* expected signs of the two effects are opposite; so they may cancel each other out partially or completely.⁴³ No attempt is made to identify these effects separately, however, in this study.

The estimates suggest that the inventory effect was dominant in large-scale mining; and the adjustment effect, in industry. In small- and medium-scale mining and in agriculture, the two effects neutralized each other.

7.2.2 General-Equilibrium Responses.

The model described in Chapter 2 once again is used to examine the general-equilibrium impact of specified changes, *ceteris paribus*. Table A.11 contains the resulting elasticities or proportional deviations. Exogenous price-related changes are analyzed first and then exogenous QR changes.

7.2.2.1 PRICE-RELATED CHANGES.

Simulation 1.1 involves equal proportional variations in all export prices and unit values for the first year of the simulation only. The direct impact of such changes is primarily on exports.

The total general-equilibrium export elasticity is only 0.1 in the first year and 0.2 in the third year. The fairly pervasive partial-equilibrium price responses in Table 7.2—as in the case of imports (subsection 6.2.1.1)—are almost swamped by indirect effects on domestic prices. In the case of exports, however, the problem is clearly not a lack of general price responsiveness. The results in Table 7.2 suggest widespread and, in some cases, substantial reactions to prices. The limited general-equilibrium responsiveness, instead, lies in the inability of the banking system to neutralize the effects of changes in international reserves.

In simulation 2.1.1 equal proportional changes are assumed for all legal exchange rates in the first year of the simulation only. Direct impacts on imports and prices are involved, in addition to those on exports.

The first-year total elasticity—0.2—is somewhat higher than in simulation 1.1, although the third-year response is lower. These differences are marginal, however. The basic thrust of this simulation is to reinforce the view that ex-

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ports respond hardly at all to changes in NERs, i.e., in this general-equilibrium analysis, exports are inelastic with respect to the hypothesized foreign-trade regime.

In simulation 2.1.3 actual NERs are replaced by the Bacha and Taylor [1973] equilibrium exchange rates—45, 35, and 61 per cent above the national accounts NER for the first three years of the model run. The results again reinforce the findings of general-equilibrium export inelasticity. Despite the quite substantial hypothetical devaluations, exports increase by only 4 per cent in the first year and 6 per cent in the third year. As for imports, moreover, there are apparently diminishing returns to devaluation since the implied aggregate first-year elasticity is less than that for simulation 2.1.1.

On the disaggregate level, also, it is diminishing returns that are generally found. One important exception is industrial exports, for which the first-year elasticity is higher in this simulation than in simulation 2.1.1. In addition, the price responsiveness of the export sectors in the two simulations—industry first, followed by agriculture, and then by large-scale mining—bears out the partial-equilibrium conclusion that the disequilibrium regimes with their overvalued exchange rates discouraged most particularly the industrial exports whose expansion the government supposedly desired.

In simulation 2.5, the question of the price responsiveness of nonmining exports is further pursued by positing a subsidy for agricultural and industrial exports equal to a 10 per cent increase in world prices for these products in the first year of the simulation only. Most of the nontraditional exports and most of the products receiving drawbacks are included in these two sectors (see subsection 4.2.2).

The impact of such a policy is to increase total exports by 0.01 in the first year due to a 0.04 increase in agricultural exports and a 0.18 increase in industrial exports. Note that this implies that in escudo terms the subsidy to agriculture is 2.5 times the increment in exports since all exports (not just marginal ones) are subsidized. This result is consistent with the above-mentioned Chilean experience for a number of products in the late 1960s.⁴⁴

The reactions of other exports and imports are generally quite small. As a result the surplus on current account, net international banking reserves, and Central Bank reserves all rise, and the GDP deflator increases by 0.01. However, in a longer-run sense, control of foreign resources may not be expanded because the enlarged government deficit (due to the subsidies) financed abroad exceeds the increment in the current account.⁴⁵ The subsidization of nontraditional exports, thus, would immediately increase control of foreign resources from exports, but the associated greater government deficit would result in greater inflationary pressures or foreign-debt obligations, or both.

Simulation 2.6.1 explores the general-equilibrium price sensitivity of traditional exports by altering the NER for large-scale mining. The elasticity

of total exports with respect to this change is 0.2 in both the first and third years. For large-scale mining the elasticities for the two years are 0.3 and 0.2. Interestingly enough, in the third year, as the result of indirect effects related to the over-all increase in economic activity, the elasticities for both agricultural and industrial exports are larger than the elasticity for large-scale mining.

The net responses in the surplus on current account and in net banking system reserves are positive. The responses in government deficit and in government deficit financed abroad also are positive because the government's revenue has risen as a result of the favorable differential on foreign exchange which it purchases from large-scale mining enterprises and then resells.

The indirect effects of altering the NER for large-scale mining have some significant consequences in other major policy areas. Real capacity utilization reacts with an elasticity of 0.1 in the third year. The GDP deflator has an elasticity of 0.2 in the first year owing primarily to the increased international reserves (augmented by the impact of the altered NER on internal large-scale-mining-related prices). Long-run capacity among the goods sectors responds relatively positively in mining, and short-run real product responds more positively in industry and in agriculture. In the income distribution area the most noticeable response is the strong first-year inverse reaction in net factor income from abroad, but inverse reactions also occur for both years in labor income. Among the aggregate growth-related variables some of the responses are positive, although small.

Substantial costs, thus, were incurred by maintaining a fixed NER for large-scale mining for long periods of time (see section 3.2). The gains in lessening inflationary pressures, reducing factor payments abroad, and increasing the labor share of income do not seem to have been sufficient to warrant these costs.

Simulation 2.6.2 further explores the sensitivity of traditional exports to price-related policies by positing that the average direct tax function for large-scale mining is multiplied by 0.9 in the first year only. In response to this tax reduction total exports increase by about 0.01 because of an increase of the same relative value in large-scale mining exports, a somewhat larger proportional increase in industrial exports, and a somewhat smaller proportional increase in agricultural exports. The net impact on the balance on current account is positive, although the reduction in direct large-scale mining taxes (which are paid in dollars) about offsets increased gross dollar export earnings in the first year, with the result that banking system and Central Bank international reserves do not change substantially. Also, because of this tax reduction, the government deficit and the government deficit financed abroad increase slightly.

The effects of this tax reduction on most other major areas of concern are quite small. Some shift in real product toward mining occurs in the first

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year and toward industry in the third year. A shift in income distribution toward foreigners takes place in the first year. An increase in gross domestic savings is found in the first year. Such effects do not seem to be very substantial (and are not all positive) which reinforces the earlier analyses of the tax reduction in the *Nuevo Trato* (see subsection 7.1.2.3).

7.2.2.2 CHANGES IN QUANTITATIVE RESTRICTIONS.

Simulation 2.3.1 investigates the consequences of equal proportional changes in all the QR indices in the first year only. As is discussed in subsection 7.2.1, there is not statistical evidence of direct export responses to quantitative restrictions. The indirect effects, however, are fairly large. In the first year of the simulation, the total general-equilibrium export elasticity is -0.7 . Industrial exports are particularly affected: they have a first-year elasticity of -8.9 . Increases in quantitative restrictions prompted by foreign-exchange shortages, thus, exacerbate the situation by causing reductions in foreign-exchange earnings from exports. The exports most affected, moreover, are once again the industrial exports whose expansion supposedly has been most desired by the government.

NOTES

1. Not all nontraditional exports are from industry, but many of the most important ones are.

2. If the time period is extended to include the late 1960s (with the Vietnam War-related copper market boom), however, this discrepancy is much less (see lines 1.1 and 1.2 in Table 8.1).

The data in line 1.2.4.2 of Table A.1 and the growth rate presented in Table A.2 differ in three ways: the 1930s are excluded from the Table A.2 figures; geometric growth rates over the previous year are used in Table A.1 and exponential growth rates are used in Table A.2; and, most important, the Table A.1 data are deflated by the United States GNP deflator, and the Table A.2 data, by a Chilean export price deflator that is dominated by the price of copper. As a result of the last-mentioned difference, the data in Table A.1 are a better measure of the real purchasing power of exports, and the data in Table A.2 better approximate the physical quantity of exports.

3. For example, the mean absolute proportional deviation from the level implied by the exponential trend for the constant-dollar value of exports for 1931-55 is 0.14 (with a standard deviation of 0.14). This is significantly less at the 20 per cent level than the mean of 0.19 (with a standard deviation of 0.24) reported above in section 1.2 for the 1878-1927 phase (under the same assumption as is made there).

4. Phase-coincident patterns are also not obvious in the extent of underinvoicing as measured by the ratio of exports recorded by Chile to imports recorded by destination countries (line 1.2.5.2. in Table A.1). This ratio has its highest and lowest values for Phase II regimes, with those for the more liberal periods falling in between.

5. Banco Central [1972b:310] reports an ODEPLAN estimate that exports in constant escudos increased by 5.7 per cent in 1971. The difference between the constant-

escudo and the constant-dollar estimates is due to the difference between the decline in copper prices and the over-all increase in international prices. For the first three quarters of 1972, Banco Central [1973b:33] reports an increase of 1.5 per cent in the current-dollar value of exports, which implies a fall of about 1.5 per cent in the constant-dollar value.

6. An important qualification of the following analysis is that *ceteris paribus* conditions are not maintained. Other changes, such as in the terms of trade, might be obscuring the underlying relationships.

7. The assumption has been that such fluctuations are not perfectly correlated among countries; so diversification of destinations results in less fluctuation in exports.

8. The fall in the share of the United States in exports was somewhat greater than the fall in the share in imports noted above in subsection 6.1.2.

9. On an annual basis this decline is even more striking—from 64 per cent in 1953 to 14 per cent in 1970.

10. The ratio of the United States to the London Metal Exchange price averaged 1.04 for 1956–58, 1.03 for 1959–61, 0.93 for 1962–64 (but 1.03 for 1962–63), 0.66 for 1965–70, and 1.04 for 1971.

11. The Brazilian share grew rapidly in the 1960s, but still was less than 2 per cent in 1970. This proportion placed it behind the eight countries in Table 7.1, as well as behind Belgium and Sweden.

12. The late 1960s are not included in these estimates because of problems of data consistency. If they were included, however, the secular trend for mining might exceed that for industry because of the copper-market boom of those years.

13. The price elasticity of demand for Chilean copper is generally assumed to be about -4 .

14. In the same period, the share in total merchandise exports of nitrates, the dominant export from 1880 to 1930, was 5 per cent. Within mining this proportion was exceeded not only by copper, but also by iron ore, which had 9 per cent of total gross exports.

15. The elasticity estimates, of course, are subject to statistical error. If E_{SP} were really as low as 0.1 or E_{DP} as low as 1.3, the actual rate would have been optimal for short-run revenue maximization. The possibility that E_{SP} was in fact that low is hard to evaluate. The probability that E_{DP} was that low must be quite small since such a value would imply considerably more market power than anyone claims Chile had.

16. One can conceive of objectives with which these rates might have been consistent, e.g., to conserve copper resources for future uses or to drive the companies out of business. Such objectives, however, were not the stated ones of the Chilean government in the early 1950s.

17. For evidence of responses to such policies see subsection 7.2.1 below and Behrman [1972b and 1973a].

The statements in this subsection on Chilean copper production, market shares, investments, etc., are based primarily on Senado, Oficina de Informaciones [1970].

18. For 1953 the proportional deviation from the level (not the logarithm) was -0.20 . In the 1940–65 period, the mean absolute deviation was 0.063 (with a standard deviation of 0.049). In only four years—1941, 1948, 1949, and 1951—were absolute proportional deviations even half as large as the deviation for 1953. On the other hand, on the basis of an exponential growth rate for total exports in constant dollars for the entire 1931–55 period, the proportional deviation for 1953 was 0.03. Thus, in that year, although the sales monopoly may have resulted in a fall in export quantities, it apparently did not result in a fall in the constant-dollar purchasing power of exports.

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19. Steady increases occurred even though copper prices peaked in 1955 and 1956 at levels which were not exceeded until 1964. The LME price averaged 44.3 cents per pound in 1955, 41.4 cents per pound in 1956, and not above 31.1 cents per pound in 1957-63. The United States producer price averaged 37.5 cents per pound in 1955, 41.8 cents per pound in 1956, and not above 32.1 cents per pound in 1957-64.

20. The year 1954 is used instead of 1955 because the *Nuevo Trato* was enacted in the latter year; 1952 and 1953 are not included with 1954 because of the very special conditions in those years due to the operation of the sales monopoly discussed in the text. Because of the lumpiness of investment, however, in the long-run comparison below the 1952-54 period is used as the base. Sources for the data used in this calculation are Reynolds [1965:378], Senado, Oficina de Informaciones [1971:22], and Behrman [1974].

21. In this calculation it is assumed that the returned value rate would have been the same as it actually was in 1956-58 if production had been lowered due to a lower price. In fact, it probably would have increased somewhat in such circumstances because of the tax structure and because some of the legal costs of production were fixed.

22. A 10 per cent discount rate is used in these calculations. Moran [1970:102] made comparisons in current dollars with a zero discount rate. He then concluded that the long-run impact was negative since by his calculations the dollar value of gross investment minus amortization fell by 33 per cent.

23. Because of the copper boom the United States price in 1965-70 averaged 39 per cent above that in 1962-64, and the LME price averaged 77 per cent higher. Chilean terms of trade therefore increased considerably (line 1.1.5.1 in Table A.1).

24. French-Davis and Carrasco [1969] suggest instead that the sliding-peg NER policy created sufficient surpluses to permit continued liberalization. They seem to overstate the relative benefits from this NER policy, however, because they assume a "normal" copper price of 40 cents per pound as compared to an average actual price of only 30.7 cents per pound for 1957-64. They also are much more optimistic about the absolute magnitudes of Chilean trade elasticities than seems warranted on the basis of the results reported in sections 6.2 and 7.2. Finally, they ignore the fact that the PLD-NER was quite low (and decreasing in later years) under the sliding-peg NER policy (Table 3.1).

25. The world copper market is segmented because of the pricing policies of United States producers and the existence of a large scrap market. The LME price reflects conditions in a relatively small part of the total market and therefore fluctuates considerably more than the United States price. For more details see Behrman [1970], Fisher, Cootner, and Baily [1972], and McNicol [1972].

26. All the figures cited in this paragraph are in 1958 dollars.

27. Griffin [1969] calculated the present discounted value of net income to the Chilean government resulting from the 1967 Chileanization alone. Although his results probably are biased downward because his estimate of world copper prices is too low, they suggest that from the point of view of control over resources this program was more beneficial than would have been a continuation of previous policies. Nevertheless, he claims that Chile could have done better.

28. Examples included excessive accumulation of sediment at Chuquicamata, adjustment problems for local minerals at El Teniente, geological problems at El Salvador, and an unexpected composition of copper from Exótica which requires more sulfuric acid than the Chuquicamata plant can provide.

29. According to de Onis [1971c] Alejandro Halles, minister of mining in the Frei government, estimated that the production cost of a pound of copper increased from 29 cents in June 1970 to 76 cents in June 1971 primarily because of bad management. Although Halles is referring to the year before the complete nationalization of July 11,

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1971, much of the cost increase he cites apparently arose from higher labor costs because of state pressure to expand the labor force and to increase real wage rates (or because of union pressure which the companies felt that they could not resist owing to the known very strong labor sympathies of the government). Note that this cost rise *may* bring into question the charge that in this period the companies were maximizing short-run profits by mining rich ores and ignoring maintenance operations. However, Halles's estimate is not consistent with the statement in October 1971 by Allende that costs per pound had risen to an average of 47 cents since May 1971, which also was reported by de Onis [1971c]. Reconciliation of these estimates is not easy, especially since CODELCO considers all copper cost estimates to be secret information.

Chilean sales in this period were constrained by supply problems. On the demand side, Kennecott's attempts to impound Chilean shipments to Europe were somewhat troublesome. The signing of contracts for substantial shipments to various socialist nations, however, probably basically compensated for any demand difficulties in the traditional markets.

30. For forecasts of developments in the copper market, see Behrman [1970], Fisher, Cootner, and Baily [1972], and Sutulov [1972].

31. The years 1963-66 were not ones during which Chile had a great boom in nontraditional exports; so this comparison is biased against finding a favorable impact of those policies. For 1963-66 as compared to 1950-53, in fact, Balassa and associates [1971:41-42] report that Chile's competitive position (as measured by market shares) deteriorated for minor exports.

32. A few examples include nitrate and iodine products (from a mean of \$109.4 million in 1964-66 to one of \$79.1 million in 1967-68), molybdenum (from \$39.7 million to \$34.4 million), fish flour (from \$50.1 million to \$49.6 million), and semi-elaborated copper (from \$126.6 million to \$24.4 million).

33. Declines continued under the Allende government in part because of increased domestic competition for these goods. In 1971 the government increased drawbacks by 50 per cent in constant-escudo terms, but the constant-dollar value of embarkations declined for all exports except fresh fruit, fish flour, possibly chemical and metal products, and some minor mining products (but neither copper nor iron). In the first nine months of 1972, the current-dollar value of agricultural and industrial exports, respectively, fell 29 and 14 per cent. The exchange-rate realignment of August 1972, however, was supposed to favor nontraditional exports with high NERs (although data are not yet available with which to evaluate this policy).

34. In section 7.2 evidence is presented of substantial responsiveness of nontraditional exports (especially from industry) to government policies. Baerresen [1966:5-6, 12] gives further evidence for gold and wine in the 1950s. The large fall in the constant-dollar value of nonmonetary gold exports after 1955 (line 2 in Table 8.1) also apparently originated in such a reaction.

35. Changes in ITRs and EPRs between 1961 and 1967 also were not significantly associated with the degree of concentration of production destined for exports (Table A.6).

36. French-Davis [1971:95] also suggests that the drawback program encouraged inefficiency by giving larger drawbacks to more costly operations. If the drawback rates in fact were based on tax incidence, the basis for this claim is not clear. However, if the establishment of rate levels reflected in part political pressures (such as Jul [1969] claims for many of the category-B products) then French-Davis may be right.

De Castro and de la Cuadro [1972] also criticize the drawback program for discouraging efficient production because of disparities in the rates among different com-

modities and for being more uncertain than devaluation because the former policy could be changed at any time (although in Chile, exchange-rate policy also seems to be subject to sudden changes).

37. This interpretation is valid if nontraditional exports are defined to be well-represented by industrial exports and if alternative a for large-scale mining is acceptable. However, industrial exports include traditional exports at least in the sense that many industrial commodities have been exported for decades (see Chapter 1); nontraditional exports certainly include some agricultural commodities and (depending on the definition used) perhaps some mining products; and the acceptability of estimate a for large-scale mining is somewhat questionable. Therefore, the distinction made here between traditional and nontraditional exports is weak.

38. These elasticities refer only to changes in the ratios. It is assumed that the standard deviation and the difference between the PLD-NER for the black-market and the national accounts rate remain unchanged.

39. For most export categories the PLD-EER has moved closely with the PLD-NER.

40. Sierra [1969:85] also emphasizes this point.

41. In that case the variable might better be reclassified as representing quantitative demand.

42. Incorporation of quantitative demand factors makes the results in Table 7.2 for some sources more reduced-form market-clearing relationships than export-supply functions.

43. The two effects have opposite implications for short- and long-run elasticities. If the inventory effect is dominant, the short-run elasticity exceeds the long-run elasticity. The opposite is the case if the adjustment effect is dominant.

44. If the escudo is sufficiently overvalued and the subsidies are given in escudos, the subsidy could be less than the incremental value of exports measured in escudos of equilibrium value.

45. If, alternatively, the increased government deficit were financed internally, the domestic price impact would be greater.