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Chapter Author: Vittorio Corbo, Patricio Meller

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3 Alternative Trade Strategies and Employment Implications: Chile

Vittorio Corbo and Patricio Meller

Introduction

Chile is an important case study for this volume because it provides a clear example of the antiemployment biases of import substitution strategies in developing countries. Since World War II, Chile has consistently used an overvalued currency, tariffs, and quantitative restrictions to promote manufactured import substitutes at the expense of agricultural and mining activities—whether for export or for domestic consumption. Under these policies, manufacturing output has increased at a modest pace, but manufacturing employment has shown little growth. For example, while manufacturing output was growing at an annual average rate close to 6 percent in the 1960s, manufacturing employment grew by slightly more than 3 percent annually. In fact, manufacturing employment in recent years is about the same as it was in the early 1950s.

A study of these policies is warranted to determine why they failed to generate employment in Chile. More important, the Chilean experience may provide a sobering lesson for policymakers in other developing

Vittorio Corbo is associated with Concordia University, Montreal, Canada; Patricio Meller is associated with CIEPLAN, Universidad de Chile, Santiago.

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countries whose employment problems are even more severe than those of Chile.

The plan of this study follows that of other chapters in this volume. Section 3.1 below provides a brief overview of the Chilean economy and its trade regime;[1] section 3.2 presents the factor requirements estimates, and sections 3.3 and 3.4 analyze the effects of commodity and factor market distortions upon these factor requirements. Section 3.5 presents a dynamic analysis of factor proportions to determine the extent by which factor proportions responded to changes in trade policies during the 1960s.

Our study focuses upon the period 1960–70, and within this period the emphasis is upon the subperiod 1966–68. The major reason for this choice was data availability, namely a census of manufactures for 1967, which allowed us to make estimates of factor requirements. That year is a typical one, and its data should adequately describe the import substitution regime.

3.1 General Characteristics of the Chilean Economy: An Overview

3.1.1 Post–World War II Policy Developments

The two main events that shaped Chile's trade policies and industrialization patterns in the mid-twentieth century were the Great Depression and World War II. The fall in export earnings during the Depression (due mainly to price decreases) and the increase in the real foreign debt caused by the worldwide deflation created a strong drive for less dependence on the world economy. The interruption in international trade during and after World War II provided an additional incentive to developing countries to reduce their reliance on international trade through substituting domestic production for goods previously imported. A further impetus to this import substitution strategy (ISS) was given during the 1950s by the influence of the Economic Commission for Latin America (ECLA) under the leadership of R. Prebisch. Trade policies were influenced by the "Prebisch doctrine" concerning the long-term deterioration of the terms of trade of primary products (Askari and Corbo 1978). All of these events encouraged Chile and other Latin American countries to pursue the goal of industrialization through strong inducements for domestically oriented industrial programs.

In attempting to implement the import substitution strategy, a set of policies was designed to shift the domestic terms of trade in favor of industry as opposed to agriculture and mining. The trade policy pursued was a combination of overvalued currency, tariffs, and quotas. This resulted in a structure of effective protection rates that, in addition to discriminating against exports (especially agricultural and mineral products), was characterized by considerable dispersion in the rate of protection of industrial activities.

Table 3.1 **Sectoral Composition of Gross Domestic Product, 1950–70**

Economic Sector	Percentage Distribution						Average Annual Growth Rate	
	1950–54	1955–59	1960–62	1963–65	1966–68	1969–70	1950–59	1960–70
Agriculture, forestry, and fishing	15.5	12.7	11.1	10.4	10.3	9.3	−0.28	2.55
Mining	6.2	5.3	9.8	10.1	9.9	10.6	−0.11	4.87
Manufacturing	20.1	25.7	23.6	25.0	25.0	25.3	8.14	5.42
Construction	2.4	1.9	5.6	5.8	4.8	4.9	−0.08	2.38
Electricity, gas, water, and sanitary services	0.9	0.8	1.4	1.6	1.7	1.6	3.55	6.28
Transportation, storage, and communication	6.0	5.4	3.3	4.3	4.4	4.6	1.69	8.62
Wholesale and retail trade	19.4	19.5	21.7	20.9	21.1	21.3	3.42	4.13
Finance	3.0	2.4	2.5	2.4	2.7	4.1	−1.19	9.35
Ownership and dwellings	7.8	7.9	3.8	3.7	3.5	3.2	3.74	2.34
Public administration and defense	8.3	7.8	5.4	5.0	5.0	4.8	1.83	3.15
Services	10.4	10.6	11.8	10.8	10.8	10.3	3.21	3.09
Total	100.0	100.0	100.0	100.0	100.0	100.0	3.35	4.40

Source: Instituto de Economía (1963, tables 7 and 8); ODEPLAN (1971*b*).

Note: 1950–59 data were processed at 1960 market prices; 1960–70 data at 1965 market prices.

3.1.2 Growth and Structure of Production

The effects of the ISS can be observed from changes in the relative shares of the agricultural and manufacturing sectors since 1950 (see table 3.1). Together these sectors maintained an almost constant share of GDP from 1950 to 1970 (about 35 percent). However, the relative share of manufacturing increased from 20 percent to about 25 percent while that of agriculture fell continuously from 15 to about 9 percent. Most of the increase in manufacturing's relative share occurred in the late 1950s. Since then it has remained relatively constant. The real rate of growth of manufacturing output since World War II has been about 4 percent annually; that for agriculture has been about 2 percent.

Within the manufacturing sectors, those activities that, as of 1969–70, had the largest share in manufacturing value added were food-processing, textiles, clothing and footwear, transportation equipment, chemicals, and basic metals (see table 3.2). These six activities accounted for about 55 percent of total value added. The growth rate for value added in the entire manufacturing sector was 5.64 percent for the decade 1960–70.[2] However, there was a wide range in growth rates for individual activities. Five manufacturing activities had growth rates higher than 10 percent (paper and paper products, transportation equipment, electrical machinery and appliances, metal products, and chemicals). Five others had growth rates lower than 2 percent (clothing and footwear, printing and publishing, tobacco, leather and leather products, and furniture and fixtures). Two of these latter five industries have had negative growth rates.

The clothing and footwear industry was the largest employer in the manufacturing sector in the 1960s, although its relative importance decreased over time. Other relatively important sources of manufacturing employment were food processing, textiles, furniture and fixtures, metal products, and transportation equipment. Together, these six industries generated more than 63 percent of industrial employment.

The average annual growth rate of industrial employment was 3.14 percent during 1960–70. Six industries had employment growth rates over 5 percent (beverages, rubber products, petroleum and coal products, basic metals, electrical machinery and appliances, and chemicals). In contrast, four industries had employment growth rates lower than 2 percent (clothing and footwear, furniture and fixtures, nonelectrical machinery, and nonmetallic mineral products). The weight of the clothing and footwear industry in total employment, combined with its low employment growth rate (0.26%), has had a significant effect on the overall low manufacturing employment absorption.

The low growth rate of manufacturing employment in Chile appears to be due to the fact that industries that had high (value added) growth

Table 3.2 **Sectoral Composition of Value Added and Employment in Manufacturing 1960–70**

		Percentage Distribution (Annual Averages)								Average Annual Growth Rate		
		1960–62		1963–65		1966–68		1969–70		1960–70		Total Employment–Value-Added Elasticity[a]
Chilean Code	Manufacturing Industry	Value Added	Employment	Value Added	Employment	Value Added	Employment	Value Added	Employment	Value Added	Employment	
20	Food processing	11.87	11.71	11.09	12.37	12.09	12.82	12.30	12.49	6.28	4.12	0.66
21	Beverages	3.92	2.12	3.66	2.84	4.05	3.18	3.33	3.06	4.55	8.06	1.77
22	Tobacco	2.43	0.29	1.97	0.29	1.92	0.28	1.63	0.28	1.28	2.60	2.03
23	Textiles	10.75	9.17	10.84	9.48	10.53	9.66	9.93	9.50	4.65	3.70	0.80
24	Clothing and footwear	13.87	24.50	12.15	21.41	10.49	19.65	9.70	19.63	1.10	0.26	0.24
25	Wood and wood products	3.79	5.40	4.15	5.36	4.18	5.56	4.27	5.75	7.05	3.81	0.50
26	Furniture and fixtures	4.75	7.17	4.25	7.14	3.18	6.60	2.99	5.95	−0.53	1.07	** [b]
27	Paper and paper products	2.00	1.71	2.30	1.05	3.77	1.20	3.99	1.27	15.86	4.25	0.27
28	Printing and publishing	3.35	2.39	2.89	2.12	2.53	2.39	2.51	2.57	1.79	3.99	2.23
29	Leather and leather products	1.98	1.34	1.64	1.37	1.36	1.48	1.20	1.36	−0.51	3.91	** [b]
30	Rubber products	1.82	0.70	2.24	0.70	2.23	0.92	2.22	0.99	8.02	7.83	0.98
31	Chemicals	5.08	3.37	5.22	3.40	6.53	3.79	7.16	3.92	10.26	5.15	0.50
32	Petroleum and coal products	1.88	0.60	1.93	0.63	2.10	0.79	2.31	0.78	8.23	7.04	0.86
33	Nonmetallic mineral products	5.81	3.71	5.26	3.52	4.46	3.41	4.58	3.32	2.23	1.96	0.88
34	Basic metals	7.81	2.47	9.08	2.71	6.26	3.11	6.21	3.31	2.04	6.91	3.39

Table 3.2—*continued*

Chilean Code	Manufacturing Industry	Percentage Distribution (Annual Averages) 1960–62 Value Added	1960–62 Employment	1963–65 Value Added	1963–65 Employment	1966–68 Value Added	1966–68 Employment	1969–70 Value Added	1969–70 Employment	Average Annual Growth Rate 1960–70 Value Added	1960–70 Employment	Total Employment–Value-Added Elasticity[a]
35	Metal products	4.32	6.42	5.30	7.18	6.02	6.67	6.05	7.26	10.31	4.22	0.41
36	Machinery except electrical	2.48	3.67	2.81	3.84	2.98	3.48	2.97	3.24	8.22	1.53	0.19
37	Electrical machinery and appliances	3.54	2.84	3.93	3.41	4.83	3.76	5.27	3.62	11.13	6.56	0.59
38	Transportation equipment	5.63	7.81	6.28	7.96	7.57	8.47	8.53	8.51	11.14	4.50	0.40
39	Other manufacturing	2.93	3.16	3.01	3.22	2.94	2.79	2.84	3.18	5.38	2.27	0.42
	Total percentage	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00			
	Total value added (million 1965 escudos)	3,540.33		4,357.67		5,186.67		5,507.50		5.64		
	Total employment (thousands of persons)		434.23		483.03		535.53		556.80		3.14	0.56

Source to Table 3.2: CORFO (1972, pp. 10–11).
Note: Original data on value added were at 1965 market prices.
[a]Percentage increase in employment for each 1 percent increase in value added.
[b]Negative values (**) have been omitted.

rates had low employment–value-added elasticities. Basic metals, printing and publishing, tobacco, and beverages had high elasticities, but, with the exception of beverages, value added in these industries grew by 2 percent or less annually. Conversely, industries with low employment elasticities were nonelectrical machinery, paper and paper products, and clothing and footwear, of which nonelectrical machinery and paper products grew at annual rates over 10 percent.

3.1.3 Characteristics of Chile's Foreign Sector

Despite its import substitution bias, trade is very important to Chile. Both exports and imports increased from 10 percent of GDP in the 1950s to about 14 percent in the 1960s. The foreign trade sector plays a crucial role as a source of tax revenues for the government (supplying more than 25 percent of the total). Moreover, export earnings play a crucial role in providing a continuous flow of imported raw materials, certain basic consumption goods (sugar, coffee, meat, wheat, etc.), and above all the bulk of the capital goods required for the smooth functioning and growth of the economy.

The Composition of Trade

A dominant feature of the Chilean trade is the high concentration of export earnings in just one product, copper.[3] By the end of the 1960s, copper represented about 80 percent of exports and yielded about U.S. $900 million in foreign exchange per year. Most of the increase in the

Table 3.3 **Foreign Trade Indicators, 1950–70**

Time Periods	Exports/ GDP	Imports/ GDP	Merchandise Trade Surplus Yearly Average (Millions of U.S. Dollars)	Share of Copper in Commodity Exports[a]	Copper Price (U.S. Cents per Pound)	Terms of Trade[b] (1960 = 100)
1950–54	10.3%	8.9%	39.4	50.4%	23.6	92.8
1955–59	9.9	9.8	49.2	60.3	31.1	99.5
1960–62	13.5	14.7	−79.9	66.7	29.9	100.4
1963–65	13.7	13.3	− 2.1	63.6	32.8	104.4
1966–68	13.6	14.7	116.3	73.0	49.4	133.4
1969–70	13.7	16.2	157.9	78.0	63.3	153.3

Source: V. Corbo (1974, pp. 107–8); ODEPLAN (1971*b*).

Note: Underlying data for 1950–59 were expressed in 1960 prices, and those for 1960–70 in 1965 prices.

[a]1950–59 includes only large-scale copper mining; 1960–70 includes total copper mining exports. Manufactured copper goods are included in manufactured exports.

[b]Export price index divided by import price index.

export share from 10 to 14 percent of GDP was due to the increase in copper's share, in turn caused by abnormally high prices of copper in the period 1965–70. The second important group of exports consists of iron ore and nitrates. Their importance has declined over time from close to a 30 percent share at the beginning of the 1950s to about 10 percent by the end of the 1960s (table 3.4).

Manufactured exports were not quantitatively of major importance during 1950–70 either as a fraction of total Chilean exports (9.5 percent) or as a percentage of manufacturing output (less than 3 percent in 1967). This suggests that the external market did not play a major role in the Chilean industrialization of the 1950s and 1960s.

The relatively more important manufactured exports were processed foods, paper and paper products, and basic metals. Together these three industries provided more than 65 percent of manufactured exports (see table 3.5). Within processed foods, meat products and fish products (such as fish meal and frozen seafood) were the most important. Within the paper industry, the most important export products were cellulose and paper itself. Both of these export groups maintained a high level throughout the period. On the other hand, exports of basic metals were very unstable both in volume and in the type of goods exported. Iron and steel products alternated with manufactured copper products as the main goods exported by this industry.

Table 3.4 **Composition and Growth of Commodity Exports, 1950–70**

Time Period	Copper[a]	Rest of Mining	Agriculture and Fishing	Manufacturing	Total[b] (Millions of U.S. Dollars at Current Prices—Annual Averages)
1950–54	50.35%	28.60%	11.17%	9.55%	382.74[b]
1955–59	60.29	22.95	7.98	8.57	439.18[b]
1960–62	66.73	19.38	5.48	8.41	478.60
1963–65	63.58	19.51	4.28	12.63	593.34
1966–68	72.96	13.41	2.64	10.99	883.53
1969–70	77.99	10.02	2.55	9.44	1,149.70
Average annual growth rate (based on values in current U.S. Dollars)					
1950–59	4.51	−1.25	−3.11	4.40	2.02
1960–70	12.93	2.88	0.53	12.84	10.87

Source: Instituto de Economía (1963, p. 175); ODEPLAN (1971*a*, p. 421).

[a]See table 3.3, note a.

[b]Includes noncommercial exports which were 0.33 percent of total for years 1950–54 and 0.21 percent for years 1955–59.

The bias of the import substitution policies is clearly seen in the commodity composition of imports shown in table 3.6. Intermediate products and investment goods had the highest shares, fluctuating around 50 percent and 30 percent during the 1960s; the share of consumer goods imports was about 16 percent by the end of the 1960s. The average annual growth rate for 1960–70, at current values measured in United States dollars, was nonetheless substantial—6.73 percent. In other words, even at the end of the 1960s, annual spending on consumer goods imports exceeded U.S. $150 million. About 45–50 percent of these imports consisted of manufactured food and agricultural products, while motor vehicles accounted for 10–14 percent.

The Direction of Trade

During the 1960s, Chile succeeded in diversifying the destination of its exports, although most (90 percent) exports still are destined for developed nations. In the early 1960s, exports to the United States made up 40 percent of total exports; by the end of the decade, the United

Table 3.5 Composition of Industrial Exports, 1960–70

Chilean Code	Manufacturing Industry	Percentage Distribution 1960–62	1963–65	1966–68	1969–70
20	Food processing	25.69	25.83	31.53	26.97
21	Beverages	1.03	1.32	0.97	1.42
23, 24	Textiles, clothing, and footwear	0.34	0.18	0.03	0.00
25, 26	Wood and wood products, furniture and fixtures	5.86	3.59	3.81	7.42
27	Paper and paper products	17.84	10.03	21.97	26.59
28	Printing and publishing	0.26	0.77	1.70	1.89
29, 30	Leather and leather products, rubber products	2.41	1.59	1.14	1.51
31	Chemicals	7.41	3.68	3.64	5.72
32	Petroleum and coal products	1.81	1.68	1.00	0.85
33	Nonmetallic mineral products	0.00	0.05	0.14	0.99
34	Basic metals	31.12	47.30	26.82	12.56
35, 36	Metal products and machinery, except electrical	2.59	1.59	2.26	2.74
37	Electrical machinery and appliances	0.86	0.91	1.70	1.32
38	Transportation equipment	0.17	0.23	1.94	8.03
39	Other manufacturing	2.59	1.32	1.32	1.98
	Total	100.00	100.00	100.00	100.00
	Total (annual average in million U.S. dollars)	38.67	73.43	96.20	105.85

Source: CORFO (1972, pp. 14–15); ODEPLAN (1971*a*, p. 160).

Table 3.6 Composition and Growth of Imports, 1950–70

Time Period	Consumer Goods	Investment Goods	Intermediate Products	Total (Millions of U.S. Dollars at Current Prices—Annual Averages)
1950–54	31.67%	25.38%	42.95%	342.46
1955–59	29.73	34.26	36.01	417.24
1960–62	15.14	30.67	54.19	535.30
1963–65	13.11	27.18	59.71	588.20
1966–68	13.16	29.32	57.52	760.93
1969–70	16.11	31.36	52.53	955.75
Average annual growth rate (based on values in current U.S. Dollars)				
1950–59	3.61	9.62	0.93	4.26
1960–70	6.73	7.50	6.52	6.83

Source: 1950–59, Instituto de Economía (1963, p. 199); 1960–70, ODEPLAN (1971*a*, p. 425).

States share fell to 15 percent. The United Kingdom, France, and West Germany absorbed 33 percent of total exports in the early 1960s and 28 percent in the late 1960s. But the export share of other regions besides Latin America (mainly Japan and other European countries) rose from 20 to 45 percent. Exports to Latin American countries ranged around 10 percent of total exports over the decade.

Similarly, most (75 percent) Chilean imports originate in developed nations, although the origins have changed over time. The share of United States imports in total imports fell from 50 to 35 percent between 1950 and 1970. Likewise, the share of imports from the United Kingdom, France, and West Germany fell from 25 to 20 percent in the same period, while imports from countries outside Latin America rose from 1 to 20 percent. The share of Latin America imports fell from 23 to 17 percent in the 1950s, then increased over the 1960s to about 25 percent of total imports.

Balance of Payments

Chile has had chronic balance of payments problems ever since World War II. Although its merchandise trade balance has frequently been in surplus over this period (see table 3.3), its current account has continuously shown a deficit, largely because of repatriated profits on direct investment (mainly in large-scale copper mining). The current account deficits have been financed by capital inflows, principally associated with direct investment in large-scale mining (in the 1950s) and central government borrowing (in the 1960s). As we will see (section 3.1.4), these balance of payments problems contributed heavily to the development of the Chilean import substitution strategy.

3.1.4 The Trade Regime

The chronological history of Chile's trade regime can be divided roughly into periods before and after 1955.[4] Before 1955, policies were highly restrictive and enacted as ad hoc reactions to balance of payments problems. The policies after 1955 can best be described as "cycling," that is, switching back and forth from restrictive to more liberalized trade regimes. Even in the more liberalized phases, however, import substitution remained the central policy focus.

The Pre-1955 Period

The effect of the Great Depression on the Chilean economy led to the adoption of highly restrictive, ad hoc measures that reacted to balance of payments problems within a context of fixed exchange rates and high rates of inflation. Import and export procedures were often subject to arbitrary, endless regulations. Furthermore, institutional changes, frequent policy alterations, and the numerous exceptions to established regulations provided very uncertain and unstable rules for importers and exporters. In brief, the period before 1956 was characterized mainly by (1) quantitative restrictions (import and export quotas) applied with varying degrees of intensity; (2) a large number of exceptions to the general regime that affected an important proportion of total imports (such exceptions being related to special regimes, bilateral trade and compensation agreements, exemptions for government agencies, regional accords, and so forth, and (3) the establishment of an exchange control system with an overvalued domestic currency.

The Post-1955 Period

Policies after 1955 "cycled" back and forth from more to less restriction. There were three attempts to liberalize the trade regime: 1956–58, 1959–61, and 1965–70 (Behrman 1976, pp. 27–34). In all three cases, liberalization was not a goal per se but was one of the components of an overall stabilization program. Internal concerns (mainly related to inflation and income distribution) were paramount in causing these changes, although the influences of foreign payment obligations, speculation against the currency, capital flight, and donor and creditor country pressures were also felt. As Behrman (1976, p. 300) states, "Foreign-sector policy generally has been much more an appendage of domestic policy, albeit an important appendage, rather than vice versa."

In general, policies during 1956–70 gradually simplified and rationalized the trade regime and, toward the end of the period, decreased some of the bias in favor of import substitution as opposed to exports. Several measures were taken in this direction: (1) the bureaucratic and administrative procedures of export and import regulations were gradually reduced; (2) steps were taken to unify and stabilize the exchange rate in real terms and to keep the exchange rate close to its equilibrium level (especially during the subperiod 1965–1970 when a sliding-peg system was used); (3) import restrictions were reduced;[5] (4) some specific incentives for exports were introduced (e.g., a system of drawbacks up to 30 percent of the value of exports); and (5) improvements were made in the system of forecasting foreign exchange reserves and the balance of payments, thereby allowing more effective planning of external economic policies.

Owing to the important role of copper in export earnings, however, developments in the world copper market frequently played the crucial role in shaping the outcome of foreign trade policies. Furthermore, there is some suggestion that changes in the trade regime in this period were in response to fluctuations in real copper export revenues.

The Exchange Rate

During 1960–70, the Chilean escudo was always overvalued. Although the nominal exchange rate (escudos per unit of foreign currency) was frequently increased, internal inflation quickly resulted in overvaluation of the currency. Even with the sliding-peg policy of 1965–70, which provided a stable real exchange rate, the cost of foreign exchange was below the long-run equilibrium level (Behrman 1976, pp. 60, 129–30). Moreover, the wide dispersion in tariffs, quotas, and so on, dis-

Table 3.7 PPP-PLD-EERs for Imports and Exports, 1952–70 (1969 Escudos per U.S. Dollar)

		Exports	
Time Periods	Imports	Copper Exports[a]	Other Exports
1952–54	9.12	3.39	—[b]
1955–59	10.60	7.58	8.91[c]
1960–62	10.29	8.37	8.72
1963–65	10.57	8.42	9.86
1966–68	10.59	8.63	9.82
1969–70	10.84[d]	8.95	10.65

Source: Ffrench-Davis (1973, pp. 266, 269).
Note: See chapter 1 for definition of terms. These rates do not include import premiums. See also note 7.
[a]Only large-scale copper mining.
[b]Not available.
[c]Excluding 1955.
[d]Data not available for 1970.

Table 3.8 PLD-EERs for Major Production Sectors, 1950–70 (1965 Escudos per U.S. Dollar)

Time Periods	Agriculture and Forestry	Mining	Manu-facturing
1950–54	5.11	4.17	7.92
1955–59	5.14	3.99	8.19
1960–62	4.70	3.56	6.96
1963–65	4.46	3.35	6.45
1966–68	4.01	2.95	5.70
1969–70	3.91	2.20	5.14

Source: Behrman (1976, pp. 340–47).
Note: Data relate to imports. These rates are simple averages of exchange rates at a more disaggregate level (Behrman 1976, p. 347). See also note 7.

criminated against exports and shifted the domestic terms of trade in favor of the manufacturing sector. The effective exchange rates shown in tables 3.7 and 3.8 provide empirical support for these propositions.

Table 3.7 presents the effective exchange rates (EER) for imports and exports during 1952–70. Import EERs, which do not include premiums on import licenses, were higher than those for exports, although the difference decreased through time. Among exports there was discrimination in favor of noncopper exports that had an EER about 17 percent higher than the EER for large-scale copper mining. This rate applied only to the copper revenues used to buy domestic inputs and was mainly used as a tax for revenue purposes rather than to exploit any monopoly power in world copper markets.[6] The gap between the EER for imports and that for exports other than copper almost closed by the end of the 1960s, when the Chilean government became a partner in the copper corporations.

The EERs of table 3.8 show discrimination not only between exports and imports, but also between major Chilean production sectors. There was discrimination against mining and agriculture and discrimination in favor of manufacturing over the entire period.[7] Furthermore, mining was treated less favorably than agriculture, with EERs at least 20 percent lower than those of agriculture. These differences were undoubtedly further aggravated by quantitative restrictions.

Effective Rates of Protection

Effective rates of protection (ERP) and domestic resource cost (DRC) estimates given in Behrman (1976, pp. 137–40) are summarized in table 3.9. Our estimates by trade category (discussed below, section 3.2) are found in table 3.10.[8] Note first that ERPs were high and varied widely not only from industry to industry but also over time.

Table 3.9 **Nominal Protection Rates, Effective Protection Rates, and Domestic Resource Costs in Chile, Twenty-eight Sectors, 1961, 1967, and 1968 (Percent)**

	Protection Rates Nominal (NPRs)			Effective Protection Rates (EPRs)			Domestic Resource Costs (DRCs)	
Tradable Goods Sectors	1961 (1)	1967 (2)	1968[a] (3)	1961 (1)	1967 (2)	1968[a] (3)	1961 (1)	1968[a] (2)
1 Agriculture and forestry	43	1	19	50	− 7	15	250	111
2 Fishing	21			25				
3 Coal mining	37			31				
4 Iron mining	2		0	− 7		−12		180
5 Copper mining	0		0	−14		−10		60
6 Nitrate mining	1		0	− 6		−11		
7 Stone, clay, and sands	66			64				
8 Other mining	46		6	40		− 6		82
9 Food products	82	32	27	2,884	365	3	253	97
10 Beverages	122	7		609	−23		259	
11 Tobacco	106	0		141	−13		47	
12 Textiles	182	99		672	492		[b]	
13 Footwear and clothing	255	23	29	386	16	5	1,916	52
14 Wood and cork	35	0	24	21	− 4	22	210	161
15 Furniture	129	0	30	209	− 5	18	241	73
16 Paper and paper products	55	44	27	41	95	14	683	164
17 Printing and publishing	72	0		82	−15		297	
18 Leather and leather products	161	25	15	714	18	−20	2,109	55
19 Rubber products	102	125		109	304		77	
20 Chemical products	94	38	24	89	64	14	356	75
21 Petroleum and coal products	50	55		45	1,140		47	
22 Nonmetallic mineral products	139	27		227	1		[b]	
23 Basic metals	66	25	28	198	35	21	[b]	380
24 Metal products	59	80		43	92		217	
25 Nonelectrical machinery	84	56	12	85	76	− 9	150	59
26 Electrical machinery	105	162	26	111	449	10	131	50
27 Transportation equipment	84	150	21	101	271	1	118	56
28 Other manufacturing	125		18	164		4	175	41
Equally weighted arithmetic mean	83	48	18	254	168	3	419	106
Standard deviation	58	51	11	552	282	13	598	86
Range	255	162	30	2,898	1,127	42	2,109	339

Source: Behrman (1976, pp. 138–39).

[a]For subsectoral exports only.

[b]Value was negative, indicating that the total foreign exchange cost per unit exceeds the foreign exchange final product price.

Table 3.10 Average Nominal and Effective Rates of Protection by Trade Category, HOS Manufactures, 1967

Trade Category	ERP for Domestic Sales	Range	ERP for Export Sales	Range
Exportables	37%	−25% to 100%	0%	−23% to 14%
Importables	267	−15 to 1,830	2	−23 to 21
Noncompeting imports	155	−38 to 741	6	− 9 to 22
Total	233	−38 to 1,830	4	−23 to 22

Source: Based upon estimates in Corbo and Meller (1978*a*, appendix table IVA).
Note: Averages are unweighted averages of estimates for activities within a category; for a discussion of trade categories, see section 3.2.

Of the twenty manufacturing industries studied by Behrman (sectors 9 to 28 in table 3.9), half had ERPs greater than 100 percent in 1961. By 1967 the number of industries with such high ERP values had decreased to six. Manufacturing industries with consistently high ERPs were food processing, textiles, rubber products, electrical machinery, and transportation equipment. The relaxation of import restrictions during the 1960s is reflected in the decrease in the average ERPs from 254 percent to 168 percent in table 3.9.

The bias against exports is clearly seen in table 3.10. There was no effective protection on exports (for export sales), whereas importables received very high levels of protection (267 percent on domestic sales). In fact, exportable production for domestic sales had lower ERPs than importables, while export sales of importable production had positive ERPs.

The DRC estimates (table 3.9) coincide with the ERPs. They are systematically lower in 1968 than in 1961. This decrease probably indicates an improvement in the production efficiency of the Chilean manufacturing industries over time. Thus the years for which our estimates of the employment-trade relationship are made, 1966–68, were probably ones of greater efficiency and smaller variance in incentives than had prevailed earlier.

3.1.5 The Chilean Labor Market

Among the countries in the project, Chile's labor force bears the greatest resemblance to that of developed countries. Chile is a highly urbanized country. Even by 1960, 69 percent of the population (then 7.5 million) was urbanized. Population growth during the decade 1960–70 was just over 2 percent annually so that, despite continued urbanization, urban population grew at the fairly moderate rate of 3.7 percent annually. By 1970, 83 percent of the population was urban. That such a high fraction of the population is already urban suggests that out-migration from rural areas cannot continue at past rates; so, in that sense, Chile's need to create new jobs is less pressing than the need of developing countries where the fraction of the population under labor force age is high, where the rate of population growth is more rapid, and where the fraction in rural areas is so great that important future out-migration to the cities can be expected.

During the 1960s, manufacturing output grew at an average rate of about 5 percent. Manufacturing employment in Chile, however, was virtually constant, as can be seen from table 3.11; it was at about the same level in 1970 as in 1963, and currently it is below that level. Chile's employment problem, therefore, is the failure of employment opportunities to grow. This has been reflected first in a substantial expansion in employment in the public sector, which has been an employer of last resort, and second in reported rates of open urban unemployment over 5 percent throughout most of the 1960s and even higher rates at

Table 3.11 **Chilean Labor Market Data**

Year	Population (Thousands) (1)	Labor Force (Thousands) (2)	Manufacturing Employment (1970 = 100)	Unemployment Rate (3)	Real Wage Rate (1970 = 100) (4)
1952	6,162	2,154	92[a]	4.9%	—
1960	7,583	2,427	96	7.1	55.7
1961	7,773	2,475	97	8.0	59.2
1962	7,961	2,523	98	7.9	62.0
1963	8.147	2,572	100	7.5	56.9
1964	8,330	2,622	103	7.0	59.2
1965	8,510	2,673	106	6.4	64.1
1966	8,686	2,725	104	6.1	75.6
1967	8,859	2,778	104	4.7	81.7
1968	9,030	2,833	104	4.9	86.9
1969	9,199	2,888	98	5.0	92.5
1970	9,369	2,950	100	6.1	100.0
1971	9,539	3,021	97	3.8	119.3
1972	9,711	3,094	108	3.1	108.2
1973	9,887	3,168	111	4.8	71.3
1974	10,068	3,244	107	9.2	67.6
1975	10,253	3,321	100	14.5	65.7
1976	10,443	3,405	91	13.7	70.3
1977	10,639	3,490	94	12.7	88.3
1978	10,840	3,578	93	10.9	99.4

Sources: Columns 1 to 3—from Ministerio de Hacienda, Exposición sobre el estado de la hacienda pública, January 1979; Column 4—from Departamento de Economía, Universidad de Chile, Comentarios sobre la situación Económica, second semester, 1978.

[a]Based on manufacturing employment in Santiago, Valparaiso, and Vine del Mar.

present. Only during the Allende years did the unemployment rate fall, and that decline was accompanied by a growth of manufacturing employment not associated with output increases.

There is ample reason on a priori grounds to believe that much of the failure of manufacturing and urban employment to grow in Chile may have been attributable to policies surrounding the determination of urban wages. As can be seen from table 3.11, urban wage rates in real terms almost doubled between 1960 and 1970, and that increase undoubtedly affected both the commodity composition of trade and the factor proportions with which outputs were produced. These subjects are discussed in more detail in section 3.4.

3.1.6 Inflation

Another chronic problem for Chile has been its very high rate of inflation. During 1950–70, the average annual increase in the GDP price deflator was in the neighborhood of 35 percent. The various relaxations of the trade regime after 1955 invariably were reactions to high rates of inflation in the preceding years (see Behrman 1976, chap. 1, for discussion), and usually the annual rate of inflation improved during the periods of relaxed restrictions. For example, during 1956–61 the annual rate of increase in the GDP deflator fell from about 50 to 10 percent. As restrictions were tightened in 1962, inflation rose to about 40 percent per year, and with the loosening of restrictions in the late 1960s, inflation fell back to about 20 percent annually. Thus, lower rates of inflation appear to be related to more liberal trade policies. However, inflation outpaced the rather substantial devaluations throughout the period, and the currency was continually overvalued (as mentioned earlier), thus decreasing incentives to export and increasing the need for restrictions on imports.

3.1.7 Summary

In the postwar era, Chile has consistently applied policies to encourage (with varying degrees of emphasis) the domestic production of manufactured goods previously imported. These policies have included, among other things, an overvalued currency, quantitative restrictions, and tariffs. Although they have been moderately successful in increasing domestic production of manufactures, they have not absorbed a significant amount of labor.

3.2 Trade Orientation, Factor Requirements, and Factor Proportions in Chilean Manufacturing

In this section we estimate the factor requirements (labor, capital, and skill) embodied in the production of Chilean HOS manufacturing activities. For this purpose we first classify manufacturing industries at the four-digit International Standard Industrial Classification (ISIC) level as being Heckscher-Ohlin-Samuelson (HOS) or natural resource based (NRB),[9] then we separate the HOS manufacturing industries into trade categories—that is, exportable, importable, or noncompeting import industries. Factor requirements and factor proportions are estimated for the first two types of industries.[10]

3.2.1 Classification of Industries by Trade Categories

The T_i statistic is used to separate activities into their respective trade categories (see chap. 1 for discussion). Exportable industries are those with a negative T_i; importable industries are those with a T_i falling between 0 and 0.75, and noncompeting imports have a T_i of more than 0.75.[11] To eliminate the effects of trade fluctuations, we used a three-year average for exports and imports over 1966–68 in our calculations.

With this procedure, seven four-digit industries were classified as exporting, sixty-six as import competing, and nine as noncompeting. That there are so few exporting HOS manufacturing industries is a reflection of the bias of the trade regime in favor of import-competing industries that prevailed in Chile for most of the 1950s and 1960s. The seven exporting industries are listed in table 3.12, which also gives a breakdown of exports by destination (DC and LDC) and estimates of factor intensities. Note the predominant role of canned fish in exports to DCs and pulp and paper in exports to LDCs. For both products, Chile had the opportunity to export the unprocessed counterpart (raw wood in the case of pulp and paper products, and fresh and simply preserved fish in the case of fish products), and thus we have initially classified both industries as HOS.[12] However, two factor-requirements estimates for exports are given below. One includes, and the other excludes, pulp and paper. The separate estimates are made because pulp and paper may be considered a borderline HOS good and because it receives special preferences in LAFTA. As we will see, the results are sensitive to whether it is included. The principal importable industries are listed in table 3.13. A full listing of industries in all categories is found in the Appendix (table 3.A.1), where their classification is indicated in each case by their T_i statistic.

Using three-year averages centered on 1967, 46 percent of Chile's total exports of manufactures, excluding copper products, went to DCs, and 54 percent went to LDCs. Within the LDCs, 99 percent went to Latin American Free Trade Association (LAFTA) members, and of this total 45 percent went to Argentina and 16 percent to Mexico.[13] However, for the HOS exportables in table 3.9, only 16 percent went to DCs (44 percent if pulp and paper are excluded).

Table 3.12 **Characteristics of Chile's HOS Export Industries**

ISIC Number	Industry	DVA per Unit of Output	Exports[a] (Thousands of U.S. Dollars) Developed Countries	Developing Countries	Total	Factor Intensities Labor[b]	Capital[c]	Skill[d]
3113	Canning and preserving of fruit and vegetables	.499	330	989	1,319	46.9	935.7	93.0
3114	Canning, preserving, and processing of fish, crustaceans, and similar foods	.582	1,868	31	1,899	69.5	1,575.9	93.6
3132	Wine industries	.301	518	416	934	55.1	2,218.7	143.9
3133	Malt liquors and malt	.623	—	1,363	1,363	21.5	487.4	87.1
3311	Sawmills, planing, and other wood mills	.411	413	1,334	1,747	121.2	934.9	223.1
3411	Manufacture of pulp, paper, and paperboard	.507	848	16,945	17,793	22.4	1,846.1	147.4
3901	Manufacture of jewelry and related articles	.543	67	—	67	112.7	208.5	480.9
	Total		4,044	21,078	25,122			

Source: Corbo and Meller (1978*a*, appendix tables III A, III B, and III C).

[a]Average for 1966–68. For the value in escudos of these flows, see Corbo and Meller (1978*a*).

[b]Number of persons employed per million escudos of direct DVA.

[c]Thousand escudos of fixed assets per million escudos of direct DVA.

[d]Number of skill units per million escudos of direct DVA.

Table 3.13 Characteristics of Chile's Main Import-Competing Industries

ISIC Number	Industry	DVA per Unit of Output	Imports[a] (Thousands of U.S. Dollars) Developed Countries	Developing Countries	Total	Factor Intensities Labor[b]	Capital[c]	Skill[d]
3513	Synthetic resins, plastic materials, and manmade fibers	.562	12,632	1,608	14,264	28.7	1,173.4	103.6
3514	Basic industrial organic chemicals, except fertilizer	.427	14,863	2,645	17,642	38.7	3,204.6	245.2
3710	Iron and steel basic industries	.465	25,357	1,780	27,166	34.4	1,914.4	243.8
3811	Cutlery, hand tools, and general hardware	.679	22,074	2,838	24,285	67.7	542.4	198.0
3813	Structural metal products	.488	28,718	766	29,672	71.5	773.2	235.1
3824	Special industrial machinery and equipment	.545	33,506	654	34,356	66.1	626.8	202.2
3829	Machinery and equipment except electrical n.e.c.	.615	33,208	2,846	36,271	42.5	642.4	160.3
3831	Electrical industrial machinery and apparatus	.597	23,307	420	23,772	54.0	379.7	190.3
3843	Motor vehicles	.587	28,715	1,757	30,559	20.3	237.0	90.1
3845	Repairs of aircrafts and aircraft parts	.851	14,753	0	14,753	83.0	127.4	348.7
	Total		237,113	15,314	252,427			

Source: Corbo and Meller (1978*a*, appendix tables III A, III B, and III C).
[a]Average for 1966–68. For the value in escudos of these flows, see Corbo and Meller (1978*a*).
[b]Number of persons employed per million escudos of direct DVA.
[c]Thousand escudos of fixed assets per million escudos of direct DVA.
[d]Number of skill units per million escudos of direct DVA.

Of Chile's imports of manufactures, 86 percent of the total (both in the importable group and in other manufactures) came from DCs and 14 percent came from LDCs. For imports from developing countries, 85 percent came from LAFTA countries, of which 58 percent came from Argentina and 11 percent from Mexico.

3.2.2 Procedures

In the estimates of factor requirements below, labor is measured by the number of persons employed. Capital is measured by the book value of fixed assets at 1967 prices less accumulated depreciation. Skill is approximated by dividing the wage bill by the unskilled wage in manufacturing to estimate the "blue collar" equivalent of the labor employed, then subtracting the number of persons actually employed (Corbo and Meller 1978*a*, appendix II, table XV).[14]

We encounter two problems related to weights in computing factor requirements for a basket of tradables. The first centers on the proper basket to use as weights. There are three alternatives: trade flows, domestic production, or total supply (production plus imports). The use of a trade-flow basket assumes that an import substitution (export promotion) strategy is implemented by increasing importable (exportable) production in proportion to actual imports (exports). The domestic production basket assumes that an import substitution (export promotion) strategy increases importable (exportable) production in proportion to current production. Finally, the use of a total supply basket for importables assumes that an import substitution policy increases domestic importable production in proportion to current consumption patterns.

The second problem is the choice of either value added or production weights. Leontief used value-of-production weights in his pioneering work on factors proportions of trade (Leontief 1953). But, since we focus upon HOS activities only, value-added weights are more appropriate for our purposes. Only value added in a given HOS manufacturing industry should be considered output of that industry, since the raw materials entering into the production are the output of other activities, principally NRB activities such agriculture and mining. Therefore using value-of-production weights may introduce an important NRB content into our HOS manufacturing activities. Value-added weights avoid this problem.

We initially tried all three baskets for weighting factor requirements. The results for importable production differed only marginally among the three baskets. In contrast, the results for exportables did differ according to the weights used. Calculations using domestic production weights generated labor requirements substantially higher and capital and skill requirements substantially lower than for the other two baskets. We thus opt for the trade weights, since neither domestic production nor total supply weights can be used to study the implications of trade upon factor requirements.

In computing direct factor requirements in trade, as given in table 3.13, we use as weights the shares of each industry in the direct value-added content of the basket of each tradable category considered. In computing direct plus indirect requirements, as in table 3.14, the weights are given by the shares of each industry in the direct plus home goods indirect value-added content of each category. Correspondingly, factor requirements cover only direct requirements in the first instance, whereas in the second they also include requirements in the home goods producing sectors that provide inputs directly and indirectly into the different tradable sectors.[15]

The results for labor requirements of importable products are very similar for DC and LDC weights. This is a consequence of the small variance in the sectoral labor to DVA coefficients and the large number of import-competing sectors considered.

3.2.3 Factor Requirements by Commodity Category

The factor requirements estimates given in tables 3.14 and 3.15 generally conform to expectations of a multicountry, multicommodity model (Jones 1977; Krueger 1977). Specifically, a basket of exportables to DCs uses more labor (per unit of DVA) than any other tradable category. However, there is some ambiguity caused by pulp and paper. As we will see below, the ranking of labor intensities is sensitive to whether it is included.

A major difference to be noted at the outset when comparing the results of table 3.14 with those of table 3.15 is the increase in labor requirements per unit of value added in all tradable categories when the computations include home goods indirect effects. This increase reflects the relatively high ratio of labor to value added in commercial services, which are an important supplier of inputs into the manufacturing sector. By contrast, capital requirements are moderately increased, and skill requirements are reduced, when measured on the broader basis.

A quick inspection of tables 3.14 and 3.15 suffices to show that the most striking result is the very high capital/labor ratio (col. 5) of Chile's HOS exports to other LDCs, much higher than for any other tradable category. It is more than twice as high as that for exports to DCs on a direct basis and still almost twice as high on a direct-plus-indirect basis. The difference stems from the much smaller labor inputs into HOS exports to LDCs rather than from differences in capital requirements. Like the capital/labor ratio, the skill/labor ratio is much higher in exports to LDCs than in exports to DCs, reflecting in this case both the lower labor content and the higher skill content of this trade flow. We also see that the results are heavily influenced by pulp and paper. In-

Table 3.14 **Direct Factor Requirements and Factor Proportions in Exportables and Import Competing Products by Destination and Origin of Trade Flows, 1966–68**

Tradable Category[a]	Weights[b] (1)	Labor[c] (2)		Capital[d] (3)		Skill[e] (4)		Capital/Labor Ratio (5) = (3) ÷ (2)		Skill/Labor Ratio (6) = (4) ÷ (2)	
Exportables	Exports										
	a. World	34.09	(63.80)	1,642.6	(1,125.1)	141.1	(125.0)	48.18	(17.62)	4.14	(1.96)
	b. DCs	61.00	(71.40)	1,555.6	(1,477.3)	125.6	(119.8)	25.50	(20.69)	2.06	(1.68)
	c. LDCs	28.92	(57.69)	1,659.3	(836.8)	144.1	(129.4)	57.37	(14.50)	4.98	(2.24)
Import competing products	Imports										
	d. World	42.59		851.5		167.6		19.99		3.93	
	e. DCs	42.59		793.2		169.4		18.62		3.98	
	f. LDCs	42.45		1,151.2		157.3		27.12		3.71	
Ratio of requirements	Exports and imports										
	g. World (a ÷ d)	0.800	(1.499)	1.929	(1.321)	0.842	(.746)	2.410	(.881)	1.053	(.498)
	h. DCs (b ÷ e)	1.432	(1.676)	1.961	(1.862)	0.741	(.707)	1.369	(1.111)	0.518	(.422)
	i. LDCs (c ÷ f)	0.681	(1.359)	1.441	(.727)	0.916	(.823)	2.115	(.555)	1.342	(.604)

Note: Values in parentheses exclude pulp and paper from the HOS exportables and treat it as NRB.

[a]See tables 3.12 and 3.13 and appendix table 3.A.1 for composition of trade flows by major industries.

[b]Weights used are the value-added content of the trade flows specified.

[c]Number of persons employed per million escudos of direct DVA.

[d]Thousand escudos of fixed assets per million escudos of direct DVA.

[e]Number of skill units per million escudos of direct DVA.

Table 3.15 **Direct Plus Home Goods Indirect Factor Requirements and Factor Proportions in Exportables and Import Competing Products by Destination and Origin of Trade Flows, 1966–68**

Tradable Category[a]	Weights[a] (1)	Labor[b] (2)		Capital[c] (3)		Skill[d] (4)		Capital/Labor Ratio (5) = (3) ÷ (2)		Skill/Labor Ratio (6) = (4) ÷ (2)	
Exportables	Exports										
	a. World	58.46	(95.73)	1,733.7	(1,438.5)	122.4	(83.8)	29.65	(15.03)	2.10	(.88)
	b. DCs	98.64	(111.03)	1,829.7	(1,815.7)	84.1	(71.9)	18.55	(16.35)	0.85	(.65)
	c. LDCs	49.56	(84.61)	1,712.1	(1,164.2)	130.9	(92.4)	34.55	(13.76)	2.65	(1.09)
Import competing products	Imports										
	d. World	60.10		983.4		145.6		16.36		2.42	
	e. DCs	59.97		910.2		147.7		15.18		2.46	
	f. LDCs	60.74		1,338.5		134.3		22.04		2.21	
Ratio of requirements	Exports and imports										
	g. World (a ÷ d)	0.973	(1.591)	1.763	(1.463)	0.841	(0.576)	1.812	(0.919)	0.868	(0.364)
	h. DCs (b ÷ e)	1.645	(1.851)	2,010	(1.995)	0.569	(0.487)	1.222	(1.077)	0.345	(0.264)
	i. LDCs (c ÷ f)	0.816	(1.393)	1.279	(0.870)	0.975	(0.688)	1.568	(0.624)	1.199	(0.493)

Note: Values in parentheses exclude pulp and paper from the HOS exportables and treat it as NRB.

[a]See table 3.11 for composition of trade flows and for weights used in computing factor coefficients.

[b]Number of persons employed per million escudos of direct plus home goods indirect DVA.

[c]Fixed assets per million escudos of direct plus home goods indirect DVA.

[d]Number of skill units per million escudos of direct plus home goods indirect DVA.

deed, when pulp and paper is excluded, the capital/labor ratio of Chile's HOS exports to other LDCs is the lowest among all tradable categories. However, the skill/labor pattern does not change when pulp is excluded.

It is also noteworthy that, when pulp and paper is included, the next highest capital/labor ratio is again found in Chile's trade with other LDCs, this time in its imports or, more specifically, its production of HOS goods competing with imports from LDCs. For such goods the capital/labor ratio is almost 50 percent greater than that for HOS products competing with imports from DCs. In this comparison, unlike that for exports, the difference in the ratios stems entirely from the capital side. The difference in labor inputs per unit of value added is negligible. Moreover, in contrast to exports, skill requirements are lower and therefore the skill/labor ratio is lower in goods competing with imports from LDCs than in those competing with imports from DCs. It is interesting that, at least in the aggregated factor requirements of tables 3.14 and 3.15, skill requirements do not seem to be closely related to capital inputs.

Observe next that Chile's total exports of HOS goods (strongly influenced by the LDC component) embody far more capital and slightly less labor and skill than do total imports, the latter being much more heavily weighted by trade with developed countries. These results seem anomalous for a less developed country like Chile. However, they are somewhat more expected if we consider only its DC trade. In DC trade, exports are far more labor-intensive than import-competing products, as one would anticipate, although they also use much more capital per unit of value added.[16] These results again are sensitive to the inclusion of pulp and paper. When this commodity category is excluded, Chile's total exports embody far more labor and capital and less skill than its imports—this result is entirely due to the change in factor requirements in Chile's trade with LDCs. Chile's exports to LDCs now embody more labor and less capital and skill than its imports from LDCs.

Sections 3.3 and 3.4 will consider some of the influences determining factor coefficients in Chile's trade. More immediately, however, some light is thrown on the question by examining the commodity composition of its trade. As we already noted with regard to table 3.12, exports to LDCs and to the world as a whole are dominated by the value-added content of the pulp and paper group, requiring heavy capital inputs and little labor per unit of value added. On the import-competing side, the results for LDCs, as table 3.13 indicates, are strongly affected by the value-added content of the first three product groups—synthetic resins and fibers, industrial chemicals, and iron and steel—all of which also have high capital requirements and low labor requirements. It is likely that the composition and factor requirements of Chile's manufacturing production and trade are strongly influenced by special trading arrangements within LAFTA, given the predominance of LAFTA trade in total LDC trade.

3.2.4 Net Factor Content of Trade

Using the average composition of a basket of tradables, we estimated factor requirements of a marginal change of one million escudos of international value added (IVA) in import-competing goods and in exportables.[17] In measuring the IVA content of exportables and import-competing goods, we converted DVA values to IVA ones using effective rates of protection for each four-digit ISIC industry. There are several problems in this approach. We may find, for example, that within a four-digit industry there are firms who export and firms who produce primarily for the domestic market. In a trade regime such as Chile's in the 1960s, with tariffs and quotas on imports and without fully compensating subsidies to exports, the ERP for the importable firm would be higher than that for the exportable firm. An industrywide value conceals this variation. Second, there is no careful and complete study of ERPs in the mid-sixties. The ERP estimates given earlier (section 3.1) are taken from a variety of sources. For importable production, the only study available for this period is De la Cuadra (1974), which covers only ninety-two commodities, of which eighty-three are of industrial origin. We use a procedure similar to Behrman's (1976) to allocate these commodities to a given four-digit ISIC sector.[18]

For exportable production, we use the rates given by Taylor and Bacha (1973), which pertain to the entire export production of a given three-digit ISIC manufacturing activity.

Bearing these data problems in mind, we present the factor requirements of exportables by destination and of import-competing goods by origin, distinguishing between developed and developing countries in table 3.16. The most important result that emerges is that the local production of HOS goods competing with imports from LDCs uses more of each factor than the production of goods destined to exports of LDCs. What this result shows is that Chile saves on all factors by trading with LDCs. In effect, local production of HOS goods competing with imports from LDCs would use more of each of the three factors per unit of IVA than any of the other baskets. (This result should be interpreted cautiously because of the weakness of the ERP rates used.)

Second, note that Chile's total exports are more capital-intensive and less labor- and skill-intensive than its total imports. In bilateral comparisons we now find that exports to DCs are more capital-intensive and less labor- and skill-intensive than importable production competing with imports from DCs. Another robust result is that, within exportables,

Table 3.16 **Direct and Direct Plus Home Goods Indirect Factor Requirements in Exportables and Import Competing Products by Destination and Origin of Trade Flows: Tradables at International Prices, 1966–68**

Tradable Category[a]	Weights[a]	Direct			Direct plus Home Goods Indirect		
		Labor[b]	Capital[c]	Skill[d]	Labor[e]	Capital[f]	Skill[g]
Exportables	Exports						
	a. World	36.95	1,780.4	152.9	52.75	1,564.2	110.4
	b. DCs	63.41	1,617.2	130.6	78.58	1,457.6	67.0
	c. LDCs	31.61	1,813.4	157.5	46.06	1,591.5	121.7
Import competing products	Imports						
	d. World	78.74	1,574.1	309.8	94.34	1,543.4	228.5
	e. DCs	75.21	1,400.6	299.1	90.77	1,377.8	223.6
	f. LDCs	104.34	2,829.7	386.6	116.70	2,571.5	258.1
Ratio of requirements	Exports and imports						
	g. World (a ÷ d)	0.469	1.131	0.494	0.559	1.013	0.483
	h. DCs (b ÷ e)	0.843	1.155	0.437	0.866	1.058	0.299
	i. LDCs (c ÷ f)	0.303	0.637	0.407	0.395	0.619	0.472

[a]See tables 3.12 and 3.13 for composition of trade flows. Weights used are the international value-added content of the trade flows specified.
[b]Number of persons employed per million escudos of direct IVA.
[c]Fixed assets per million escudos of direct IVA.
[d]Number of skill units per million escudos of direct IVA.
[e]Number of persons employed per million escudos of direct plus home goods indirect IVA.
[f]Fixed assets per million escudos of direct plus home goods indirect IVA.
[g]Skill units per million escudos of direct plus home goods indirect IVA.

the basket with DC weights is more labor-intensive and less skill-intensive than the one with LDC weights.

In terms of employment, we find that one million escudos of direct plus home goods indirect IVA in exports to DCs generates 78.58 jobs. Using an exchange rate of 5.132 escudos per dollar, the latter figure implies 40,327 jobs per 100 million dollars of IVA. This figure represents 10 percent of the manufacturing employment and about 1 percent of the total labor force in 1967.

3.3 Distortions in Commodity Markets: Protection and Factor Inputs

In this section we analyze the effects of distortions in commodity markets upon factor requirements and the factor proportions of exportables and importables. Our approach to this problem is twofold. First, we group industries in each of the two tradable categories according to their level of protection, then compare factor requirements for industries above and below the median protection rate. Second, we undertake an econometric analysis of the effect of the protection system on factor requirements and proportions. This analysis also provides a test of the implications of the Heckscher-Ohlin-Samuelson (HOS) theory for the pattern of trade.

We use the structure of effective protection as a measure of incentives accorded by the trade regime to different industrial activities. However, in the context of a general equilibrium model one can only show that the sector with the highest protection will attract resources. For the other sectors, nothing can be said a priori (see especially Bruno 1973). Nonetheless, empirical general equilibrium models built for some LDCs have shown that there is a high correlation between the partial equilibrium measure of ERP and the ex-post ERP derived from these models (Taylor and Black 1974; De Melo 1978). Thus the structure of effective protection can be used to capture the effects of Chile's trade regime.

Protection will generally affect factor requirements through two channels. First, it generates an overall import substitution or export promotion bias to the trade regime. Second, it may provide different incentives to individual activities within a commodity category. It thus may change the output mix of a given category, which in turn will change the overall factor requirements of that category. Both effects occurred during the period analyzed. The Chilean trade regime discriminated strongly in favor of import-competing activities. Furthermore, the wide range in ERPs within a category indicates that the regime affected the output mix of the category.

3.3.1 Factor Proportions in Above and Below Average Protected Industries

In table 3.17 we present our calculations of factor requirements for more and less protected exportable and importable activities. Less (more) protected importables are those with ERPs below (above) the median ERP of 76 percent. Less (more) protected exportables have ERPs below (above) the median of 3 percent.

The most important conclusion emanating from this table is that labor requirements in more protected activities are *always* below those of less protected activities. This is true for both importable and exportable categories and for both DC-LDC directions of trade. The trade regime thus appears to have encouraged industries with low labor requirements in both tradable categories.

Considering Chile's total trade, it is apparent that the more protected activities within each tradable category are more capital-intensive than less protected activities. Furthermore, the highest capital requirement per

Table 3.17 **Direct Plus Home Goods Indirect Factor Requirements and Factor Proportions in Exports and Import Competing Products by Destination and Origin of Trade Flows and Protection Levels, 1966–68**

Tradable Category	Weights (1)	Labor (2)	Capital (3)	Skill (4)	Capital/ Labor Ratio (5)	Skill/ Labor Ratio (6)
Exportables	Exports		*Above Median Protection Level*			
	World	44.39	1,852.6	151.8	41.73	3.42
	DCs	64.45	1,682.3	189.2	26.10	2.94
	LDCs	42.95	1,864.8	149.1	43.42	3.47
			Below Median Protection Level			
	World	91.98	1,450.3	52.4	15.77	0.57
	DCs	110.72	1,881.7	46.9	16.99	0.42
	LDCs	76.42	1,091.7	56.9	14.29	0.74
Import competing products	Imports		*Above Median Protection Level*			
	World	53.81	1,066.0	117.7	19.81	2.19
	DCs	53.32	931.4	116.7	17.47	2.19
	LDCs	55.99	1,514.9	121.6	27.06	2.17
			Below Median Protection Level			
	World	67.72	883.4	179.3	13.04	2.65
	DCs	66.93	888.0	180.2	13.27	2.69
	LDCs	73.78	854.8	169.2	11.59	2.29

Note: See tables 3.12 and 3.13 for composition of trade flows and for weights used in computing factor coefficients.

unit of DVA is for the most protected exports to developing countries. This bundle also has the lowest labor requirements per unit of DVA.[19] Another characteristic evident in table 3.17 is the high capital-intensity of goods competing with imports from developing countries produced by the industries with above-median protection level. These findings strongly suggest that most of the trade within LAFTA countries is done in capital-intensive and highly protected commodities.

Exports with above-median protection are more skill-intensive than exports with below-median protection. This result holds not only for total exports but also separately for exports to developed and to developing countries. On the other hand, the opposite result emerges in importable activities; those with above-median protection level have skill requirements on the average lower than sectors with below-median protection level.

These results pertain to direct plus home goods indirect effects. Computations for direct effects alone show the same pattern, but the differences in employment requirements in exportables between industries with above- and below-median protection levels are somewhat more pronounced when indirect effects are included.[20] This difference is due to the simultaneous operation of two forces: (*a*) very high shares of indirect value added in home goods; (*b*) higher labor intensity in home goods industries than in HOS industries and a differing importance of home goods in more and less protected tradable products. For the other primary factors, the pattern of results obtained for direct plus home good indirect effects is not affected.

To generalize, these results indicate that the structure of protection has created a bias in favor of the production of low labor-intensive and high capital-intensive commodities in both trade categories.

3.3.2 An Econometric Study

Next we proceed to a more disaggregated econometric analysis of the relation between net HOS imports (and also total imports), classified at a four-digit ISIC level, and factor inputs and protection of domestic production. The analysis is made separately for Chile's total trade and for its DC trade. In addition to searching for further evidence of the influence of protection upon the composition of production, we want to test the hypothesis that, in its trade with developed countries, Chile is a net importer of skills and capital and a net exporter of (raw) labor. We apply regression techniques in a manner similar to that of Hufbauer (1970), Baldwin (1971), and Branson and Monoyios (1977). Our initial model expresses factor inputs as stocks. Later the problem of chosing the appropriate scaling is treated as a problem of testing for heteroskedasticity.

The regression model is of the form:

Table 3.18 **Commodity Composition of Trade: Regression Estimates for Chile's Trade with the World and with Developed Countries**

Equation Number	Dependent Variable	Explanatory Variables: Constant	*LM*	*LS*	*K*	*AVERP*	R^2	*F* Ratio
1.1	*NM*	12,124.1	−9.01	4.47	−.046	708.3	.337	8.6
	(World)	(1.31)	(−3.43)**	(4.71)**	(−.81)	(.53)		
1.2	*M*	15,505.9	−9.80	4.75	−.025	312.1	.390	10.8
	(World)	(1.71)	(−3.81)**	(5.11)**	(−.45)	(.24)		
1.3	*NM*	14,277.3	−10.33	4.66	−.08	35.0	.351	9.2
	(Developed)	(1.72)	(−4.39)**	(5.47)**	(−1.52)	(.03)		
1.4	*M*	15,757.7	−10.17	4.63	−.07	−75.96	.351	9.2
	(Developed)	(1.87)	(−4.26)**	(5.37)**	(−1.34)	(−.06)		
		*H**Constant	*H***LM*	*H***LS*	*H***K*	*H***AVERP*	R^2	
1.1′	*H***NM*	11,632.6	−7.370	3.84	−.03	535.1	.192	
	(World)	(1.55)	(−2.46)*	(3.77)**	(−.49)	(.48)		
1.3′	*H***M*	11,169.6	−8.113	4.00	−.06	68.22	.224	
	(Developed)	(1.72)	(−3.02)**	(4.40)**	(−.99)	(.07)		

Note: Terms in parentheses are *t* values. One asterisk and two asterisks indicate coefficients that, in a two-tailed test, are significantly different from zero at the .05 level and .01 level, respectively. The same convention applies for the testing of the whole model through *F* ratio test of R^2.

$$NM_i = \beta_1 + \beta_2 LM_i + \beta_3 LS_i + \beta_4 K_i + \beta_5 AVERP_i + u_i,$$

where

NM_i = Net imports (imports minus exports) in 1966–68 of sector i (at the four-digit ISIC level) in thousands of escudos, where each trade flow has been converted from dollars to escudos using its own exchange rate.

LM_i = Labor (raw) employed in sector i, in thousands of persons.

LS_i = Skill in sector i, in skill units.

K_i = Capital stock in sector i, in thousands of escudos.

$AVERP_i$ = Average effective rate of protection in sector i, as a percentage.[21]

i is a four-digit import-competing or exporting industry.[22]

To verify the hypothesis mentioned above, the signs of β_2 and β_5 must be negative and those of β_3 and β_4 positive.[23] Table 3.18 summarizes our estimates. Equations 1.1 and 1.2 are estimated over seventy-three industries, of which sixty-six are importables and seven are exportables. The dependent variables are net imports and total imports. Equations 1.3 and 1.4 are estimated over seventy-three industries, but only DC trade is included. The dependent variables are the same as in 1.1 and 1.2.[24]

All estimates yield highly significant coefficients (with proper signs) for LM and LS. No pattern is observed on signs of the capital and ERP variables. These results lead to the conclusion that, in trade in manufactures, Chile implicitly imports skill and exports labor. The results for physical capital are ambiguous. The protection system, however, has no effect upon net imports, according to these estimates. The "bad showing" of the protection variable may be due in part to a problem of measurement errors for this variable. As we mentioned before, the ERP estimates are imperfect. They may be used for ranking incentives for individual sectors but not for accurately measuring the absolute levels of protection.

The next problem is to determine if the factor inputs and net imports should be scaled by some variable related to industry size. This question was raised by Stern (1975) and Harkness and Kyle (1975). Here, as in Branson and Monoyios (1977), we approach this question as an econometric problem of performing a constructive test for heteroskedasticity on the disturbances of equation 1. We test for heteroskedasticity and then reestimate the equations using generalized least squares. This procedure is equivalent to deflating or scaling the data before performing the regression. We proceed to test for heteroskedasticity in the disturbances in equations 1.1 and 1.3 following the procedure outlined by Park (1966).[25] The scaling performed is equivalent to dividing the dependent variable and the regressors by a function of production to express all variables in terms of intensities.

The results incorporating the corrections for heteroskedasticity appear at the bottom of table 3.18. Comparing the corresponding equations, we see that our main conclusion is not affected by the scaling of the variables.[26] The variables for raw labor and skill are significant with the proper signs; those for capital and protection are not significant.

3.4 Distortions in Factor Markets and Factor Requirements in Trade

Here we analyze the effects of factor market distortions (caused by the trade regime itself) upon factor requirements in Chilean manufacturing. We ignore factor market distortions resulting from other causes. That is, any distortion in the price of labor or capital or both brought about by public policies (including direct government intervention) not associated specifically with the trade regime will be excluded. However, the methodology developed here can be applied to evaluate factor market distortions not associated with the trade regime.

Our approach is to estimate production functions for each four-digit ISIC industry, then simulate the factor intensity under an undistorted factor price ratio. In the simulation, it is assumed that the only distortion is a subsidy to capital resulting from a preferential effective exchange rate for capital goods. For the period analyzed here, quantitative and other restrictions on capital goods imports were very minor (Ffrench-Davis 1973, pp. 96–107).

3.4.1 Technology in Chilean Manufacturing

Elsewhere[27] we have estimated production functions at the four-digit ISIC level. Here our procedures and results are briefly summarized. Translog functions with three factors (labor, skill, and capital) were estimated for forty-four four-digit ISIC industries[28] using cross-section data from the 1967 Chilean census of manufactures, disaggregated at the establishment level (11,468 establishments employing five or more persons.) We then tested the general translog model for constant returns to scale (CRTS). For forty-one out of forty-four sectors studied, the CRTS hypothesis could not be rejected at the 1 percent level. For these forty-one sectors, we tested further for a Cobb-Douglas technology. For thirty-five out of the forty-one sectors the Cobb-Douglas technology could not be rejected at the 1 percent level. For the six CRTS industries for which the Cobb-Douglas technology was rejected, we proceeded further to test for pairwise linear and nonlinear separability.[29] For the three sectors for which the CRTS hypothesis was rejected, we tested for complete global separability. In the three cases the null hypothesis was not rejected. For these three sectors we proceeded further to test for a Cobb-Douglas technology. In two cases the null hypothesis could not be rejected.

In our simulations under CRTS for the thirty-five sectors for which a Cobb-Douglas technology was not rejected, we use the estimated Cobb-Douglas function. For the six CRTS sectors for which the Cobb-Douglas technology was rejected (ISICs 3211, 3311, 3420, 3812, 3824, and 3829), we approximated our technology by the estimated Cobb-Douglas function. This was done to avoid the need for solving a nonlinear system of equations.

For the simulations of the three non-CRTS sectors, we used a non-CRTS Cobb-Douglas function. Again, only for two of these sectors was the Cobb-Douglas non-CRTS technology appropriate for use, based on the test results. For the third case (sector 3117), we used a non-CRTS Cobb-Douglas as a local approximation to avoid the nonlinearities involved.

Before we proceed to the simulation results, two complications should be noted. First, Cobb-Douglas functions could not be estimated for all seventy-three exporting and import-competing four-digit sectors because of insufficient observations in some sectors. The second problem is that the Cobb-Douglas function for sector 3559 was not well behaved; in particular, it is not monotonic in the capital input (i.e., there was a negative marginal product of capital). As a solution for these two problems, we approximated the technology for the sectors for which the function could not be estimated and for sector 3559. This was done by using for those sectors coefficients obtained as the simple average of the value-added elasticities of primary factors of the four-digit Cobb-Douglas functions belonging to the same three-digit industry. The value of the elasticities used in the simulations appears in Corbo and Meller (1978*a*, table 17).

3.4.2 Simulating the Effect of Factor Market Distortions

Having obtained estimates of production functions in Chilean manufacturing, we solved for an expression relating factor intensities to factor prices (see Appendix A), then used an estimate of the subsidy to capital to adjust factor prices and trace the effects of the factor price adjustment upon factor intensities.

All our estimates are for a cross section of 1967. Therefore, $q_{c,i} = q_{m,i} = 1.0$ (see Appendix A for notation). We assume further that $\delta^m{}_i = \delta^c{}_i$ and thus we obtain:

$$\frac{P^*{}_{k,i} - P_{k,i}}{P_{k,i}} = \left(\frac{e^*}{e} - 1\right)(1 - \lambda_i).$$

The value of λ_i for each of the seventy-three four-digit tradable sectors was obtained from the 1967 census of manufactures.[30] To estimate e^*/e, we need information on the equilibrium exchange rate and on the average tariff rate. The e^*/e ratio is equal to 1.30×1.0543 where 1.30 is the ratio between the equilibrium and the official exchange rate for 1967 as estimated by Taylor and Bacha (1973). The 1.0543 is the ratio between the average exchange rate and the exchange rate on investment goods. Thus, this last factor corrects for the lower tariffs on investment goods than on other imports. On the other hand, the 1.30 factor corrects for an absolute distortion between the price of tradables and the price of home goods.[31]

Now we adjust the market price of capital for the subsidy, then make new estimates of factor requirements and factor proportions under the new factor price ratio. We have run simulations for both the direct requirements only and for direct plus indirect requirements of home goods. Since the types of findings are very similar, we present in table 3.19 only those for direct plus indirect requirements of home goods. A comparison of these estimates with those actually observed (see table 3.16) shows that, when the subsidy to capital is eliminated, capital requirements for both exportables and import-competing products decrease about 19–23 percent, labor requirements increase about 6–8 percent, and skill requirements increase about 6–8 percent. The decrease in the capital/labor ratios is about 24–29 percent, and the skill/labor ratio remains practically constant.[32] The results imply that eliminating the preferential effective exchange rate on capital goods imports would have contributed significantly to creating employment in Chile's manufacturing sector.

3.5 Factor Requirements in Manufacturing: A Dynamic Analysis of the 1960s

The analysis of sections 3.2–4 centered upon the period 1966–68. In this section we extend our analysis to cover the entire decade of the 1960s. Two exercises are performed. First, we trace the evolution of the wage/rental ratio to determine how changes in relative factor prices might have affected factor requirements and altered the relative profitability of exportable and importable production. Second, we measure factor requirements in other periods of the 1960s to evaluate the robustness of our results for 1966–1968. In this regard our results indicate that the factor requirements for 1966–68 held, in general, throughout the decade.

The composition of tradables will be affected by changes in the wage/rental ratio, via changes in the overall profitability of individual industries. The evolution of the wage/rental ratio in 1960s is given in table

Table 3.19 **Direct Plus Home Goods Indirect Factor Requirements and Factor Proportions in Exportables and Import Competing Products by Destination and Origin of Trade Flows: Simulation Experiment**

Tradable Category	Weights (1)	Labor (2)	Capital (3)	Skill (4)	Capital/Labor Ratio (5) = (3) ÷ (2)	Skill/Labor Ratio (6) = (4) ÷ (2)
Exportables	Exports					
	a. World	62.94	1,348.1	132.5	21.42	2.10
	b. DCs	105.61	1,472.2	90.4	13.94	0.86
	c. LDCs	53.49	1,320.5	141.8	24.69	2.65
Import competing products	Imports					
	d. World	64.11	789.2	155.6	12.31	2.43
	e. DCs	63.95	730.6	157.9	11.42	2.47
	f. LDCs	64.87	1,072.7	143.8	16.54	2.22
Ratio of requirements	Ratio of exports to import requirements					
	g. World (a ÷ d)	0.982	1.708	0.852	1.740	0.864
	h. DCs (b ÷ e)	1.651	2.015	0.573	1.221	0.348
	i. LDCs (c ÷ f)	0.825	1.211	0.986	1.493	1.194

Note: See tables 3.12 and 3.13 for composition of trade flows and for weights used in computing factor coefficients. See table 3.14 for units used in factor coefficients.

3.20. Observe that it fell from 1960 to 1964, started to rise at the beginning of the Frei government (1965), declined slightly in 1967, then increased substantially in 1968 as the Frei government's stabilization program collapsed, After 1968 the wage/rental ratio decreased. From this evolution, we expect the production of labor-intensive goods to have been encouraged in the early 1960s, discouraged in the mid-1960s, and encouraged again in the late 1960s.

To evaluate the robustness of our results for 1966–68, we have calculated direct plus home goods requirements for trade flows in four of the five periods outlined in table 3.20 (the evolution on a direct basis is similar and is ignored here). These estimates are found by applying the estimated 1967 factor requirements to actual trade flows in each of these periods. The results of this exercise are given in table 3.21.

Observe that the main feature of these results is that our findings for the period 1966–68 hold in general for the other three periods; namely, exports have higher labor requirements than imports. Second, differences in the factor intensity of exports reflect shifts in their composition as trade policies were changed over the decade. Owing to space limitations, we focus only upon baskets with world trade weights. For exportables, when we compare the first two periods, there is a slight decrease in all three factor requirements. Then, between the second and third periods, there is a decrease in labor requirements and an increase in capital and

Table 3.20 Evolution of Wage/Rental Ratio in Chilean Manufacturing

Year	Wage Rate (Escudos per Worker)	Rental Price of Capital (Current E^{os} per E^{os} of Capital)	Wage/ Rental Ratio	Period Average
1960	803.2	.0396	20,282.8	19,857.4
1961	862.4	.0444	19,432.2	
1962	1,005.8	.0515	19,530.1	18,461.2
1963	1,454.0	.0836	17,392.3	
1964	2,131.8	.135	15,791.1	16,891.8
1965	2,878.8	.160	17,992.5	
1966	4,015.5	.213	18,852.1	
1967	5,247.2	.292	17,962.9	19,067.5
1968	7,785.3	.382	20,380.4	
1969	11,226.9	.585	19,191.3	18,649.0
1970	15,752.8	.870	18,106.7	

Sources: The wage rate in the industrial sector is taken from ODEPLAN (1971*a*, p. 182), and the rental price of capital is computed as described in M. Corbo (1974, pp. 154–55, p. 224).

skill requirements. In terms of factor proportions, the capital/labor ratio and the skill/labor ratio increased by 34.9 percent and 49.6 percent, respectively, from the second to the third period (this period coincides with the increase in the wage/rental ratio of the Frei government). After 1968 there is an increase in the requirements of labor and skill and a slight decrease in capital requirements.

Table 3.21 Direct Plus Home Goods Indirect Factor Requirements in Exports and Import Competing Products by Destination and Origin of Trade Flows: Dynamic Evolution

Periods	Weights	Labor	Capital	Skill
1962–63	Exports			
	World	77.56	1,738.3	113.2
	DCs	113.06	1,912.6	55.4
	LDCs	74.13	1,740.0	121.2
	Imports			
	World	60.91	1,030.6	155.8
	DCs	61.55	892.9	158.2
	LDCs	56.55	1,804.5	138.2
1964–65	Exports			
	World	75.15	1,651.6	105.2
	DCs	111.45	1,802.1	74.8
	LDCs	81.54	1,613.0	99.4
	Imports			
	World	59.08	1,153.8	145.2
	DCs	60.16	941.6	146.2
	LDCs	54.25	2,008.3	139.6
1966–68	Exports			
	World	58.46	1,733.7	122.4
	DCs	98.64	1,829.1	84.1
	LDCs	49.56	1,712.1	130.9
	Imports			
	World	60.10	983.4	145.6
	DCs	59.97	910.2	147.7
	LDCs	60.74	1,338.5	134.3
1969–70	Exports			
	World	62.32	1,781.4	139.6
	DCs	105.04	1,842.4	97.8
	LDCs	59.62	1,772.6	141.6
	Imports			
	World	60.71	987.7	150.9
	DCs	60.71	927.6	150.4
	LDCs	59.78	1,338.7	138.2

Note: See tables 3.12 and 3.13 for composition of trade flows and for weights used in computing factor coefficients. See table 3.14 for units used in factor coefficients.

For importable goods, labor and skill requirements are more stable throughout the four periods. Capital requirements for these goods increase from the first to the second period, then they decrease from the second to the third period. After 1968 they become fairly constant. This evolution is due to the changes in the composition of goods competing with imports from the developing world and, hence, changes in their capital requirements. Capital requirements of a basket of goods competing with imports from developing countries decreased substantially after the mid-1960s.

These patterns are expected, given the "cycling" of the trade regime in the period. As we mentioned earlier, Chile's trade regime was relatively liberal in the early 1960s, became more restrictive in the mid-1960s, and became liberal again in the late 1960s. Presumably, then, factor requirements at the beginning and end of the decade ought to have better reflected its comparative advantage than factor requirements in the mid-1960s. That is, its labor requirements ought to have been higher and skill and capital requirements lower in periods of trade liberalization than in periods of trade restrictiveness. The estimates shown in table 3.21 generally coincide with these expectations.

3.6 Concluding Remarks

The main conclusions of this study may be summarized as follows:

1. With regard to the composition and direction of Chile's trade, one important feature is its failure to develop a significant volume of HOS exports, especially in trade with developed countries. This failure reflects in considerable part the strong emphasis over the last several decades on import substitution and hence on the production of import-competing HOS goods. The small size of the HOS component in Chile's exports also reflects the country's considerable endowment in natural resources and their major contribution to its exports, as exemplified by refined copper. Indeed, the natural resource factor plays also some role in the production of goods here treated as HOS exports, notably pulp and paper, which dominate exports to other LDCs—chiefly neighboring countries in LAFTA—and various fish, meat, and vegetable products figuring prominently in exports to developed countries.

2. The factor content of Chile's trade in HOS goods is most strikingly marked by the high capital and low labor requirements of its exports to other LDCs and, therewith, the relatively small contribution made by those exports to employment in Chile. In particular, comparing the factor requirements and factor proportions of baskets of tradables with equal DVA content we have found:

HOS exports to DCs are more labor- and capital-intensive and less skill-intensive than Chile's production of HOS goods competing with imports from DCs. Thus, in its trade with DCs, Chile implicitly exports labor and capital and imports skill.

HOS exports to LDCs are more capital-intensive and less labor- and skill-intensive than Chile's production of HOS goods competing with imports from LDCs. The labor and capital requirements of Chile's trade with LDCs are strongly dominated by pulp and paper, a commodity group that has had preferential treatment within LAFTA. Indeed, when exports of pulp and paper are excluded, we found that Chile's HOS exports to LDCs are more labor-intensive and less capital- and skill-intensive than its imports from LDCs. These results suggest that trading arrangements within LAFTA may have been such as to place demands on members' scarce capital resources while giving less inducement to creation of employment.

In exportables (including indirect effects), Chile's exports to DCs are more capital-intensive and less skill-intensive than export to LDCs. These patterns are not affected by the treatment of the pulp and paper sector.

In import-competing products, Chile's imports from DCs are more skill-intensive and less capital-intensive than imports from LDCs. Labor requirements are almost the same for both baskets.

3. The measurement of factor coefficients in terms of international value added is handicapped by lack of good data on effective protection needed for this calculation. Subject to these qualifications, it appears that Chile's production of HOS goods competing with imports from other LDCs would use more labor, capital, and skill per unit of IVA than any of the other trade flows examined. Thus it appears that Chile saves on all factors through its trade with LDCs.

4. Analysis of the effects of trade regime on factor requirements and factor proportions, by major trade categories, indicates that in general the structure of protection has created a bias in favor of the production of low labor-intensive and high capital-intensive commodities. This applies to both exporting and import-competing industries.

5. Concerning the effects of distortions in factor prices brought about by the trade regime and related commercial policies, we estimated an equilibrium price of capital services above the observed price. In studying the effect of this distortion on factor requirements, we find that, when the distortion is present, labor and skill requirements are about 6–8 percent lower and capital requirements are about 19–23 percent higher than without the distortion. The capital/labor ratio would thus be about 25 percent lower without distortions.

6. When we extend the study to other periods in the 1960s, we find that our results and conclusions are still valid for the decade as a whole.

7. As a concluding observation, we judge that a significant, though not spectacular, amount of employment could be created through export

expansion. Chilean exportables to the developed world generated about 40,000 employment opportunities per \$100 million of IVA, which is probably a feasible annual increase in export levels; this would represent an annual increase in manufacturing employment of about 11 percent (equal to about 1 percent of the total labor force). The Chilean basket of exportables to developed countries would generate about 20 percent more employment opportunities per unit of IVA than the basket of exportables to LDCs.

Appendix A: Relationship of Factor Intensities to Factor Prices

Start with an aggregate production function at the industry level given by:

(A1) $$Y_i = A_i \, LM_i^{\alpha_1} LS_i^{\alpha_2} K_i^{\alpha_3}.$$

Then introduce the following first-order conditions for cost minimization:

(A2) $$\frac{\partial Y_i/\partial LM_i}{\partial Y_i/\partial LS_i} = \frac{w}{P_{s,i}},$$

(A3) $$\frac{\partial Y_i/\partial LM_i}{\partial Y_i/\partial K_i} = \frac{w}{P_{k,i}},$$

where w is the wage rate of unskilled labor, $P_{s,i}$ is the price of a unit of skill,[33] and $P_{k,i}$ is the price of capital services. Using equations (A1), (A2), and (A3), solve for K_i/Y_i, LM_i/Y_i, and LS_i/Y_i as a function of relative factor prices and the level of value added. These solutions are:

(A4) $$\frac{LM_i}{Y_i} = C\left(\frac{\alpha_1}{\alpha_3}\,\frac{P_{k,i}}{w}\right)^{\frac{\alpha_3}{\alpha_1+\alpha_2+\alpha_3}} \times \left(\frac{\alpha_1}{\alpha_2}\,\frac{P_{s,i}}{w}\right)^{\frac{\alpha_2}{\alpha_1+\alpha_2+\alpha_3}}$$

(A5) $$\frac{LS_i}{Y_i} = C\left(\frac{\alpha_1}{\alpha_3}\,\frac{P_{k,i}}{w}\right)^{\frac{\alpha_3}{\alpha_1+\alpha_2+\alpha_3}} \times \left(\frac{\alpha_1}{\alpha_2}\,\frac{P_{s,i}}{w}\right)^{-\frac{\alpha_1+\alpha_3}{\alpha_1+\alpha_2+\alpha_3}}$$

(A6)
$$\frac{K_i}{Y_i} = C\left(\frac{\alpha_1}{\alpha_3}\frac{P_{k,i}}{w}\right)^{-\frac{\alpha_1+\alpha_2}{\alpha_1+\alpha_2+\alpha_3}} \times \left(\frac{\alpha_1}{\alpha_2}\frac{P_{s,i}}{w}\right)^{\frac{\alpha_2}{\alpha_1+\alpha_2+\alpha_3}},$$

where
$$C = A_i^{\left(-\frac{1-\alpha_1-\alpha_2-\alpha_3}{\alpha_1+\alpha_2+\alpha_3}\right)} \times Y_i^{\left(\frac{1-\alpha_1-\alpha_2-\alpha_3}{\alpha_1+\alpha_2+\alpha_3}\right)}.$$

Then, differentiating these expressions, we obtain the change in factor intensity as a function of the change in factor prices:

(A7)
$$d\frac{LM_i}{Y_i} = \frac{LM_i}{Y_i}\left(-\frac{\alpha_2+\alpha_3}{\alpha_1+\alpha_2+\alpha_3}\, dln\, w_i + \frac{\alpha_2}{\alpha_1+\alpha_2+\alpha_3}\, dln\, P_{s,i} + \frac{\alpha_3}{\alpha_1+\alpha_2+\alpha_3}\, dln\, P_{k,i}\right);$$

(A8)
$$d\frac{LS_i}{Y_i} = \frac{LS_i}{Y_i}\left(\frac{\alpha_1}{\alpha_1+\alpha_2+\alpha_3}\, dln\, w_i - \frac{\alpha_1+\alpha_3}{\alpha_1+\alpha_2+\alpha_3}\, dln\, P_{s,i} + \frac{\alpha_3}{\alpha_1+\alpha_2+\alpha_3}\, dln\, P_{k,i}\right);$$

(A9)
$$d\frac{K_i}{Y_i} = \frac{K_i}{Y_i}\left(\frac{\alpha_1}{\alpha_1+\alpha_2+\alpha_3}\, dln\, w_i + \frac{\alpha_2}{\alpha_1+\alpha_2+\alpha_3}\, dln\, P_{s,i} - \frac{\alpha_1+\alpha_2}{\alpha_1+\alpha_2+\alpha_3}\, dln\, P_{k,i}\right).$$

These expressions are local approximations (i.e., valid only for a given level of output) around Y_i for the non-CRTS case and global (independent of the level of output) with $\alpha_1 + \alpha_2 + \alpha_3 = 1.0$ for the CRTS case.

Distortions in Price of Capital Services

Next we must adjust the price of capital services upward to correct for the subsidy resulting from the existence of a preferential effective exchange rate for capital goods imports.

The market price of capital services is given by:

(A10) $$P_{k,i} = q_{c,t}\,\lambda_i(r_i + \delta_i^c) + q_{m,i}\,(1 - \lambda_i)\,(r_i + \delta_i^m),$$

where λ_i is the share of construction in the total capital stock, $1 - \lambda_i$ is the share of machinery and equipment in the total capital stock, $q_{c,i}$ ($q_{m,i}$) is the price of one unit of construction (machinery and equipment), δ_i^c (δ_i^m) is the depreciation rate for construction (machinery and equipment) capital, and r_i is the cost of capital.

On the other hand, the distortion-free price of capital services is given by:

(A11) $$P_{k,i}^* = q_{c,i}\,\lambda_i\,(r_i + \delta_i^c) + q_{m,i}\,(1 - \lambda_i)\,(r_i + \delta_i^m)\,\frac{e^*}{e},$$

where e^* is the equilibrium effective exchange rate and e the effective exchange rate for imported capital goods.

Finally, the percentage change in the rental price of capital services resulting from eliminating the distortions is given by:

(A12) $$\frac{P_{k.i}^* - P_{k,i}}{P_{k,i}} = \frac{q_{m,i}\,(1 - \lambda_i)\,(r_i + \delta_i^m)\,(e^*/e - 1)}{q_{c,i}\,\lambda_i\,(r_i + \delta_i^c) + q_{m,i}\,(1 - \lambda_i)\,(r_i + \delta_i^m)}$$

Table 3.A.1 **Foreign Trade Participation of Chilean Manufacturing Industries—Computation of *T* Statistic**

Industry (ISIC)	Exports[a] (Average, 1966–68) (1)	Imports (Average, 1966–68) (2)	Net Production (1967) (3)	Con-sumption (4)	Trade Classification Coefficients $\frac{(4) - (3)}{(4)}$ (5)
3111 Slaughtering, preparing and preserving meats	142,982	100,103	1,478,860	1,435,980	—.02986
3112 Dairy products	0	73,759	382,102	455,862	.16180
3113 Canning and preserving of fruits and vegetables	9,129	5,477	140,001	136,350	—.02678
3114 Canning, preserving, and processing of fish, crustaceans, and similar foods	8,826	42	142,856	134,072	—.06551
3115 Vegetable and animal oils and fats	4,925	64,935	304,685	364,695	.16454
3116 Grain mill products	3,627	46,452	628,336	671,161	.06390
3117 Manufacture of bakery products	9	676	585,836	586,503	.00113
3118 Sugar factories and refineries	0	93,011	350,154	443,165	.20987
3119 Cocoa, chocolate, and sugar confectionery	489	7,032	127,428	133,972	.04884
3121 Manufacture of food products n.e.c.	2,543	77,835	330,126	405,418	.18571
3122 Prepared animal feeds	0	907	87,247	88,153	.01028
3131 Distilling, rectifying, and blending of spirits	26	2,662	153,225	155,861	.01691
3132 Wine industries	8,205	114	432,174	424,083	—.01907
3133 Malt liquors and malt	11,935	26	161,916	150,007	—.07938
3134 Soft drinks and carbonated waters industries	0	9	171,246	171,255	.00005
3140 Tobacco manufactures	0	263	172,548	172,811	.00152
3211 Spinning, weaving, and finishing of textiles	48,909	171,440	1,278,940	1,401,470	.08743
3212 Made-up textile goods except wearing apparel	132	69,419	26,524	95,811	.72316
3213 Knitting mills	13	1,877	413,309	415,172	.00448
3214 Manufacture of carpets and rugs	0	1,493	22,281	23,775	.06281
3215 Cordage, rope, and twine	0	20,391	22,723	43,114	.47295

Table 3.A.1—*continued*

Industry (ISIC)	Exports[a] (Average, 1966–68) (1)	Imports (Average, 1966–68) (2)	Net Production (1967) (3)	Con-sumption (4)	Trade Classification Coefficients $\frac{(4)-(3)}{(4)}$ (5)
3219 Textiles n.e.c.	13	2,484	1,584	4,055	.60946
3220 Wearing apparel, except footwear	40	28,783	587,654	616,397	.04663
3231 Tanneries and leather finishing	0	13	202,442	202,455	.00006
3233 Products of leather and leather substitutes except footwear	30	4,500	31,894	36,364	.12291
3240 Footwear, except vulcanized or molded rubber or plastic footwear	493	10,076	374,045	383,627	.02497
3311 Sawmills, planing, and other wood mills	12,167	1,741	506,528	496,102	−.02101
3312 Wooden and cane containers and small caneware	14	3,434	19,565	22,985	.14877
3319 Wood and cork products n.e.c.	801	75,481	19,971	94,652	.78900
3320 Furniture and fixtures, except primarily of metal	369	58,265	163,909	221,805	.26102
3411 Pulp, paper, and paperboard	141,180	37,862	316,845	213,527	−.48386
3412 Containers, and boxes of paper and paperboard	0	3,896	42,645	46,540	.08370
3419 Pulp, paper, and paperboard articles n.e.c.	2,110	5,332	9,838	13,059	.24666
3420 Printing, publishing, and allied industries	13,266	92,671	421,550	500,954	.15850
3511 Basic industrial inorganic chemicals, except fertilizers	40,196	82,383	112,191	154,377	.27326
3512 Fertilizers and pesticides	750	21,204	34,719	55,173	.37072
3513 Synthetic resins, plastic materials and man-made fibers except glass	24,120	109,190	182,965	268,035	.31738
3514 Basic industrial organic chemicals, except fertilizers	3,705	134,742	16,459	147,496	.88841
3521 Paints, varnishes, and lacquers	0	7,938	128,250	136,188	.05828
3522 Drugs and medicines	130	83,140	248,174	331,184	.25064
3523 Soap and cleaning products, perfumes, cosmetics, and other toilet preparations	15	8,528	270,317	278,829	.03052
3529 Chemical products n.e.c.	3,942	51,020	137,645	184,723	.25485

Table 3.A.1—*continued*

Industry (ISIC)	Exports[a] (Average, 1966–68) (1)	Imports (Average, 1966–68) (2)	Net Production (1967) (3)	Consumption (4)	Trade Classification Coefficients $\frac{(4)-(3)}{(4)}$ (5)
3530 Petroleum refineries	34	50,444	651,882	702,292	.07177
3540 Miscellaneous products of petroleum and coal	0	1,683	84,128	85,811	.01961
3551 Tire and tube industries	68	27,551	169,117	196,601	.13979
3559 Rubber products n.e.c.	2,935	72,037	84,124	153,226	.45098
3560 Plastic products n.e.c.	12,960	96,980	214,140	298,161	.28179
3610 Pottery, china, and earthenware	86	3,660	61,393	64,968	.05502
3620 Glass and glass products	503	26,692	135,225	161,414	.16224
3691 Structural clay products	96	38,444	26,044	64,391	.59553
3692 Cement, lime, and plaster	578	4,324	171,375	175,121	.02139
3695 Fiber-cement products	0	867	49,685	50,552	.01714
3699 Nonmetallic mineral products n.e.c.	268	26,607	90,141	116,480	.22612
3710 Iron and steel basic industries	52,046	290,745	697,687	936,386	.25491
3729 Nonferrous metal basic industries, except copper	87,772	98,924	17,466	28,618	.38969
3811 Cutlery, hand tools, and general hardware	822	165,033	40,464	204,675	.80229
3812 Furniture and fixtures primarily of metal	0	2,929	102,244	105,173	.02784
3813 Structural metal products	1,529	201,641	160,244	360,356	.55531
3814 Metal containers and metal housewares	20	11,553	272,287	283,819	.04063
3815 Cable, wire, and their products	0	3,208	97,424	100,632	.03187
3819 Fabricated metal products except machinery and equipment n.e.c.	170	8,447	116,803	125,080	.06617
3822 Agricultural machinery and equipment	27	25,871	44,147	69,990	.36924
3823 Metal and woodworking machinery	14	65,823	31,014	96,823	.67968

Table 3.A.1—*continued*

Industry (ISIC)	Exports[a] (Average, 1966–68) (1)	Imports (Average, 1966–68) (2)	Net Production (1967) (3)	Con-sumption (4)	Trade Classification Coefficients $\frac{(4) - (3)}{(4)}$ (5)
3824 Special industrial machinery and equipment except metal and woodworking machinery	428	233,472	19,829	252,873	.92158
3825 Office, computing, and accounting machinery	673	56,608	38,290	94,225	.59363
3829 Machinery and equipment except electrical n.e.c.	4,859	246,485	420,363	661,989	.36500
3831 Electrical industrial machinery and apparatus	653	246,552	41,605	287,503	.85528
3832 Radio, television, and communication equipment and apparatus	3,920	127,020	285,359	408,458	.30137
3833 Electrical appliances and housewares	0	2,987	27,612	30,599	.09761
3839 Electrical apparatus and supplies n.e.c.	11,326	75,277	141,881	205,832	.31069
3841 Shipbuilding and repairing	0	677	89,428	90,105	.00750
3842 Railroad equipment	11	84,098	178,597	262,685	.32010
3843 Motor vehicles	366	338,911	594,367	932,912	.36289
3844 Motorcycles and bicycles	0	3,671	15,702	19,373	.18948
3845 Repairing of aircraft and manufacture of aircraft parts	1,076	163,616	10,923	173,464	.93703
3849 Transport equipment n.e.c.	0	233	2,724	2,957	.07875
3851 Professional and scientific equipment n.e.c.	288	105,647	16,976	122,334	.86123
3852 Photographic and optical goods	78	18,665	15,920	34,508	.53865
3901 Jewelry and related articles	743	111	19,119	18,487	—.03419
3902 Musical instruments	11	4,869	1,024	5,882	.82586
3903 Sporting and athletic goods	55	6,455	1,483	7,882	.81186
3909 Manufacturing industries n.e.c.	0	11,867	64,650	76,517	.15508

[a]Columns 1–4 are in thousands of escudos.

Notes

1. We recommend Behrman (1976) and Corbo (1974) to the reader interested in greater detail on Chilean economic development. A more detailed analysis of alternative trade strategies and employment in Chile and the complete set of data used in this study are found in Corbo and Meller (1978*a*), available for the cost of reproduction from the National Bureau of Economic Research.

2. Note that this value is slightly different from that given in table 3.1, owing to different data sources.

3. Most studies indicate conclusively that Chile has a comparative advantage in the production of this resource-based commodity. Hence there is need to design a policy to stabilize copper earnings. This is readily seen by the fact that changes in the price of copper have an important effect upon trade surpluses (see table 3.3). The high copper prices in the late 1960s allowed the banking system to accumulate, by 1970, the highest level of net international reserves in twenty years (U.S. $343.5 million). Also, one should note the impressive improvement in Chile's terms of trade at the end of the 1960s (table 3.3). This behavior depends in a very important way upon the trend in the price of copper.

4. For a more detailed analysis see Ffrench-Davis (1973) and Behrman (1976).

5. The main tools to control imports were: (1) import restrictions with a list of "allowed goods"; (2) prior deposits on imports; and (3) tariffs, generally high but with a wide range of rates.

6. The major reason for this type of discrimination was the foreign ownership of large-scale copper mining. Thus the exchange rate was used as a device to tax large-scale copper mining.

7. It will be noted that EERs in tables 3.7 and 3.8 show different levels and different time trends. The difference in levels arises because table 3.7 is in terms of 1969 escudos per dollar, whereas table 3.8 is in 1965 escudos. The difference in trends arises because the EERs in table 3.7 are "purchasing-power-parity-adjusted" (i.e., multiplied by the ratio of the foreign price level to the domestic price level), whereas the EERs in table 3.8 are "price-level-deflated" (i.e., deflated by the Chilean GDP deflator). Furthermore, the sources cited for the tables report quite different methodologies for computing the EERs. Behrman's EERs are based on direct price comparisons for 220 commodities between Chile and the United States. Ffrench-Davis's EERs are based on comparisons of the total cost of imported commodities with their c.i.f. prices. Thus, he transforms each explicit import cost into an ad valorem tariff equivalent that is added to the c.i.f. price.

8. All estimates use price comparisons to estimate nominal protection and the Corden method to calculate ERPs.

9. See chapter 1 for a discussion of this distinction. Particularly important among the products here classified in the NRB category are refined copper (ISIC 3721) and meat meal and fish meal (SITC 081.4, which, for Chile, consists mainly of fish meal).

10. In Corbo and Meller (1978*a*) we also study the factor proportions and requirements of noncompeting import industries.

11. We also experimented with 0.90 as a cutoff point for the classification of industries in the import-competing and noncompeting import categories. The factor requirements in import-competing industries were only marginally affected when this alternative was used.

12. Indeed, over the period studied Chile did export significant amounts of both raw wood and fresh or simply preserved fish (such exports being here classified as NRB).

13. For details of these trade flows by four-digit ISIC sectors and by countries, see Appendix I, section III, of Corbo and Meller (1978a).

14. This way of defining "skill" assumes that all differences in wage rates within the manufacturing sector can be attributed to skill differences and that there is perfect substitution among different types of labor. The only evidence we have for Chile on earnings within the manufacturing sector (M. Corbo 1974), shows that a substantial proportion of the variance in labor earnings can be accounted for by human capital characteristics of the labor force. This way of measuring skill has been popularized by Griliches and used extensively in the testing of trade theories (see especially Stern 1975).

15. The treatment of home goods in computing factor requirements has been discussed in the introductory chapter of this volume. For Chile a problem arises because of the lack of a cost structure for each of the eighty-two four-digit ISIC industries used in computing direct factor requirements. There is available, however, a fifty-four-sector input-output table for 1962. Of the fifty-four sectors, twenty are manufacturing sectors that correspond closely to the ISIC classification at the three-digit level. We use this source to compute value added and factor requirement multipliers at the level of disaggregation provided by the I-0 table. For details on the derivation of these multipliers see Corbo and Meller (1978a, chap. 3). Then we use the same multiplier for all four-digit industries belonging to a given three-digit industry of the I-0 table. This procedure assumes that each four-digit industry belonging to a three-digit group has the same intermediate structure with respect to home goods.

16. Initially (Corbo and Meller 1978a, chap. 3) we treated Argentina and Mexico separately, but the factor requirement of Chile's trade with these two countries was not too different from the ones for Chile's trade with other LDCs. Thus we decided to include these two countries in the LDC group.

17. This procedure assumes that the marginal basket uses the same technology as the average one (see Lydall 1975, pp. 26–27, for a discussion of the validity of this assumption) and that the output mix is the same. For effective rates of protection see Corbo and Meller (1978a, Appendix I, table IV-A).

18. For effective rates of protection see Corbo and Meller (1978a, Appendix I, table IV-A).

19. These results are again dominated by the ERP of, and factor requirements in, the pulp, paper, and paperboard industry.

20. We also computed direct plus total indirect effects, and the pattern of results is similar to the one for direct plus home goods indirect effects. The difference in labor requirements by protection level within a given tradable category was even higher than for direct plus home goods indirect effects owing to the greater labor intensity of agricultural products that have a heavier weight as inputs in the industries with lower protection level.

21. This variable is defined as the weighted average of the effective rate of protection of import-competing industries (ERPM) and the effective rate of protection of exporting industries (ERPX), where the weights are import-competing production and exports, respectively.

22. We also used, as did Baldwin (1971), a concentration index as an explanatory variable, but it was never significant.

23. The simple correlation in the sample between LM and LS is 0.90, and between LS and K it is 0.63, both of which are significantly different from zero at the .01 level. Furthermore, NM is positively correlated with LM, LS, and K: the simple correlation coefficients are 0.26, 0.46, and 0.32, respectively, all of them significant at a .01 level.

24. On the other hand, when we ran equations using total exports as dependent variables the results were very poor, and they are not reproduced in the table. No coefficient was significantly different from zero at the .05 significance level. These results are due in part to the behavior of the dependent variable. In nineteen out of the seventy-three exporting and import-competing tradable sectors, total exports are zero, and in many other sectors they are very small. Furthermore, it is meaningless to estimate this equation for exporting sectors only, because of the small number of degrees of freedom available.

25. In the Park test, the squared residuals of the original regression are regressed on a function of some size variable. In our computations, we used as a size variable the output of the sector and the consumption of the sector. The results were better for the first variable, and they are the ones we present here.

We proceed now with one equation at a time. When the residuals of equation 1.1 were regressed as a function of *PRO*, the best fit was for the following equation:

$$e^2_i = \underset{(1.05)}{1.396 \times 10^9} + \underset{(1.69)}{6221.7\,PRO} \qquad R^2 = .039,$$

where e_i is the residual of the regression and *PRO* is production. In the case of the residuals of equation 1.3, the best fit was for the following equation:

$$e^2_i = \underset{(.90)}{1.018 \times 10^9} + \underset{(1.73)}{5436.58\,PRO} \qquad R^2 = .040.$$

The correction for heteroskedasticity is performed by creating a diagonal matrix H whose ith diagonal element (d_{ii}) is given by the reciprocal of the square root of the right-hand side terms in the equations for e^2_i above. Then all the original variables are premultiplied by the diagonal matrix H. This procedure is equivalent to a deflation of the original variables.

26. We also used *ERPM* in the equation for imports, but the results were of the same form; that is, the protection variable was never significant even at a .10 level.

27. Corbo and Meller (1978*a*, *b*). For a fuller discussion of the implications of technology for the pattern of trade see Corbo and Meller (1978*b*).

28. We could not estimate a production function for all the seventy-three exporting and import-competing sectors owing to a lack of degrees of freedom for some sectors.

29. For details of the results see Corbo and Meller (1978*a*).

30. Instituto Nacional de Estadísticas (1970, pp. 40–45).

31. In Corbo and Meller (1978*a*), we also simulate the joint effect of this increase in the price of capital services together with a 10 percent decrease in the minimum wage rate.

32. We have also studied the effect of distortions on factor requirements and factor proportions measuring value added at international prices. When compared with the results of table 3.16, the same pattern emerges: the removal of distortions yields a 6–8 percent increase in labor and skill requirements and a substantial decrease in capital requirements. This pattern of results is found for both the direct effect and the direct plus home goods indirect effect. As in section 3.3, we also grouped the tradables by protection level and studied the factor requirements and factor proportions of trade for two sets, one with tradables with rate of protection above the median and the other with rate of protection below the median. When we compare the results with those in section 3.3, the pattern is again similar for corresponding baskets; we observe an increase in labor and skill requirements and a substantial decrease in capital requirements and in the capital/labor ratios. For details of these results see Corbo and Meller (1978*a*).

It should be mentioned that these simulation results correspond to the substitution effect, that is, movements along an isoquant. The full effect on factor requirements, measured above, would therefore take time to materialize. Moreover, output adjustments are neglected.

33. Skill is expressed in units of unskilled labor. Therefore its price is also equal to the minimum wage.

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