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Volume II *Appendixes: Data and Methodology*

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Abstract

Chile is a middle income country, with a predominantly urban population. Agriculture has played a changing role in the Chilean economy since approximately World War II. While the sector was perceived as having an enormous growth potential, it was not a major factor in economic growth until the 1970s. Its share in GNP was around 10 percent and it had a substantial agricultural trade deficit, while on the other hand provided employment to over 25 percent of the labor force in the 1960s, declining to 17 percent in the 1970s.

The 24-year period covered by this study was marked by radical shifts in economic policies. Following fairly conservative policies in 1960-64, a drastic agrarian reform was implemented during 1965-70. This was followed by a socialist system during 1970-73 which was replaced by a military government. This last government carried out an ambitious experiment in trade liberalization and other reforms reducing the role of the government in the economy.

The agricultural growth potential has been confirmed. Chile's agricultural trade deficit of U.S. $420 millions in 1975 evolved into a trade surplus of U.S. $1,090 millions in 1987, causing agricultural export revenues to rise from 1.9 percent to 12.9 percent of total export revenues, simultaneously with a significant increase in production of major import-competing crops, such as wheat, rice, and maize.

The study found wide variations in direct nominal and effective rates of protection among the five products examined. There was consistent positive nominal protection for milk production throughout the period, compared with persistent taxation of beef prior to 1975. Nominal protection of wheat production was positive, while apples and grapes experienced positive protection before 1975 (benefitting from export subsidies) and had no protection thereafter. Effective protection was also computed. Overall, policy reforms implemented between 1974 and 1978 resulted in a significant decline in direct intervention, except for wheat production. While varying with world prices, rates of price intervention were lower between 1975 and 1984 than they were between 1960 and 1974.

A notable finding of this study is that indirect intervention from exchange rate misalignment and industrial protection has a much greater impact on the structure of incentives for Chilean agriculture than agricultural policies did. In years when direct intervention produced positive protection, indirect intervention led to lower, or often negative total protection.

The analysis on the experience of policies reforms in Chile affecting agricultural prices suggests a trade-off between i) agricultural terms of trade; ii) real wages in the urban sector; iii) returns to capital in the nonfarm sector; iv) foreign borrowing; and v) the supply of domestic subsidized credit. Reforms lead to short-run losses of income to certain groups, and the study identifies important consideration with relation to the feasibility of agricultural trade liberalization. The study presents estimates of the magnitude of these losses, and examines the magnitude of additional resources needed to compensate those groups for their losses during the transition period, to make the reform more likely to succeed.

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Appendix I

ESTIMATION OF DIRECT PRICE INTERVENTION

This appendix presents the methodology for estimating direct price intervention for the five commodities -- wheat, beef, milk, apples, and grapes. The appendix treats separately adjustment for border prices, indirect measures of wholesale prices for milk, and methodology for measuring direct price intervention.

ADJUSTMENT FOR BORDER PRICES

Border prices are crucial for the estimation of direct and indirect price intervention. The methodology for prices presented in Appendix Table I-1 is discussed below.

Wheat. Figures correspond to import prices, expressed in nominal dollars per ton of wheat, CIF Valparaíso. Only imported wheat for human consumption was included. Three subperiods are distinguished. For 1960-78, price information came from the Anuarios de Comercio Exterior. This information corresponds to the Declaraciones de Importación, registered by the Servicio Nacional de Aduanas and processed by INE (up to 1967) and by the Cámara de Comercio (from 1968 to 1978). Second, for 1979, price information came from Informes de Importación processed by Banco Central and reported in Indicadores de Comercio Exterior. Third, for 1980-84, price information came from Declaraciones de Importación processed by Banco Central and reported

in Indicadores de Comercio Exterior.

An alternative source for CIF prices of wheat is FAO's Trade Yearbook. The FAO prices differ considerably from the ones used in this study because FAO includes wheat for consumption with grain imported to be used as seed. But when FAO figures are processed separately, the average import unit value of wheat for consumption is very similar to the prices reported by the Chilean sources used in this study.

Cattle. As a result of a program to control foot-and-mouth disease, several restrictions on cattle imports have been imposed during recent years. Up to 1975, imports of live cattle were authorized in all regions of the country. Starting January 1976, however, imports of live cattle were forbidden in the Region IV and in the southern regions. In Regions I to III, live cattle imports continued up to January 1980. Starting January 1977, only imports of boneless slaughtered cattle were authorized in Region VI and in the southern regions. Regions I to III were still authorized to import slaughtered cattle with bones up to January 1981. In January 1981, Chile was declared free of hoof-and-mouth disease. Since then, only imports of boneless slaughtered cattle have been authorized in the whole country.[1]

Hence, at least two alternative scenarios are required to simulate free trade cattle's prices: one assuming that imports of live

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[1] This information was provided by the Servicio Agrícola y Ganadero (SAG), which is the institution of the Ministry of Agriculture in charge of sanitary regulations.

cattle are permitted, the other that only imports of boneless cattle are authorized.

For live cattle, prices correspond to nominal dollars per ton of Argentinian live cattle imported through the Paso de los Andes in the central Chile. This point of importation was chosen because most (if not all) of the live cattle imported for consumption in Santiago were imported through this point.

As noted, live cattle imports were authorized only up to 1975. Because trade flows were small during 1975, CIF prices are available only for the period 1960-74. We took them from the Anuarios de Comercio Exterior.[2] These are implicit prices for cattle imported for consumption only (excluding cattle for breeding). Therefore, CIF prices reported in Appendix Table I-1 for the period 1975-84 are not the result of actual transactions. Instead, a simple econometric model was estimated to simulate the CIF prices of imported cattle that would have prevailed in the absence of the trade restriction on live cattle. This simulation model related CIF prices of live cattle with FOB prices of Argentinean slaughtered cattle plus transport cost, for the period 1960-74.[3]

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[2] When trade flows are too small, CIF prices become erratic. Because of this, live cattle imports on 1975 were not reported as actual transactions, even though imports were allowed.

[3] FOB prices of live cattle in Argentina could not be found for the period 1975-1984. For this reason it was not feasible to simulate the CIF prices of live cattle with a regression model relating these CIF prices with the FOB prices of live cattle.

Regression 1 in Appendix Table I-2 shows the relationship between CIF and FOB prices for the period 1960-74.[4] The predictive power of the model is satisfactory (R^2 = 0.95). As a proxy for transport cost, the domestic price of diesel in Argentina was used. The negative coefficient for this variable is to be expected, if one considers that the live cattle comes from areas in the interior, close to the Chilean border, while the alternative market for Argentinian ranchers exporting to Chile is to sell near Buenos Aires, where the Argentinian export price is determined.

In summary, equation 1 in Appendix Table I-2 was used to generate CIF prices of live cattle for the period 1975-84.

Beginning in January 1977, the government restricted cattle imports to slaughtered cattle (boneless meat). We did not use boneless import figures to compute implicit CIF prices in Chile, however, because of quality differences. That is, trade flows were quite small and the composition of trade was too variable. Price variations at the CIF level therefore could be associated with quality variations and not necessary with price level variations. Thus, we estimated CIF prices under the slaughtered cattle category reported in Appendix Table I-1 for the whole period 1960-84 based on the following approach:

First, we obtained FOB prices of boneless meat from two Argentinian sources, Anuarios de Comercio Exterior and Junta Nacional de Carne.

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[4] See Appendix Tables I-1 and I-3 for information on data used in this model.

Second, using a cost structure for 1985, we converted those FOB prices to CIF prices in Chile.[5] Cost items considered included transportation, insurance, financial cost associated with the operation, commission of the custom agent in Chile, and sanitary inspection. The cost structure for 1985 was reconstructed for the period 1960-84 using oil price variations for the transportation items and a rate of interest of LIBOR plus 6 percent yearly for financial costs. We also assumed that the ad valorem costs remained constant at the 1985 level during the period under analysis. These criteria were checked with current and previous meat importers. This, in general, validated our procedure for estimating the cost structure. Because transportation of this kind of processed beef is usually agreed up to the final destination, CIF prices of boneless meat reported in Appendix Table I-1 are those of the product placed in Santiago, the major Chilean consumption center.

For milk, figures correspond to nominal dollars per ton of powdered milk imported each year.[6] The sources of information are the same as those for wheat above. An alternative source of information is FAO's Trade Yearbook. Its data are consistent with the figures used in this study.

Available information does not allow us to estimate CIF prices of imported milk according to the fat content in the powdered milk. The Central Bank of Chile started classifying the product according to this criterion only in 1979. But the Servicio Nacional de Salud

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[5] See Panorama Económico de la Agricultura (DEA-UC) 41 and 42 for details of this cost structure.

[6] These figures do not include concessionary imports.

(SNS), the largest milk importer, has changed its import requirements with regard to fat content. Up to 1976, SNS imported mostly low-fat milk (12-18 percent). Around that year, and as a result of studies showing caloric deficit in the target population, public sector imports might have changed in favor of high-fat-content milk (26 percent). However, it was not possible to reconstruct a time series for the 1960-84 period indicating the evolution of milk imports according to the fat content.

Because changes in fat content of imported milk might induce erratic changes in CIF average prices of powdered milk, some models were designed to check whether the changes in these prices were related to changes in FOB prices of the main exporters (Holland and New Zealand). The assumption is that FOB average prices in the exporter countries were not significantly affected by changes in quality.

Results of these exercises are reported in Regressions 2, 3, and 4 of Appendix Table I-2. The high R^2 in Regression 2 (0.83) shows a strong correlation between CIF and FOB prices of powdered milk. A problem with this model is that the high R^2 could be just an indication that both the CIF price of milk in Chile and the FOB price of milk in New Zealand and Holland have a common trend pattern. In addition, the low value of the Durbin-Watson test might indicate that a relevant variable (such as fat content) was excluded from the model. To cope with this problem, we performed a second test, regressing a model in which the trend pattern was eliminated from the variables by a polynomial adjustment. These results are reported in equations 3 and 4. The R^2 dropped to 0.24 to 0.28, and the FOB price

of milk in New Zealand became the only significant variable. However the Durbin-Watson (1.68) allows us to reject the null hypothesis of autocorrelation. Thus, if the low R^2 is caused by the omission of a relevant variable, this one cannot have a systematic trend pattern, and, according to previous evidence, it seems more plausible that the opposite holds in the case of the fat content of imported powdered milk. Therefore, the lack of information regarding fat content of imported powdered milk apparently does not induce a significant bias in the time series of CIF prices included in Appendix Table I-1.

Apples and Grapes. Price information at the FOB level for apples and grapes came from the same sources as the wheat prices above.

Wholesale Prices of Powdered Milk. Our methodology for obtaining wholesale prices of powdered milk for the period 1960-68, reported in Appendix Table I-4, should be explained in some detail.

Domestic prices of milk (fluid and powdered) are needed to measure direct price intervention. INE does not report wholesale prices of powdered milk for the period 1960-68. However, consumer prices for that period have been compiled by Zegers (1984). We estimated a regression model relating wholesale with consumer prices for the period 1969-83 and used the coefficients obtained to simulate wholesale prices for 1960-68 (results are presented in Appendix Table I-5). To avoid heteroskedasticity, the model was estimated in real dollars of December 1981, using the CPI corrected by Yañez (1978)[7] as

[7] See Appendix Table I-6 for information on data used in this model.

deflactor. The high R^2 indicates the strong relation between the two variables.

Prices for the period 1960-68 were obtained with the following equation:

$$WPpm = 18.26 + 0.769\ CPpm \qquad (A.1)$$

Nominal wholesale prices reported in Appendix Table I-6 for 1960-68 were obtained by multiplying WPpm nominal by the Yañez (1978) adjusted Consumer Price Index, and where CPpm represents the consumer price of powdered milk.

METHODOLOGY ON MEASURING DIRECT PRICE INTERVENTION

The figures reported in Table 3-2 in the text correspond to the ratios between the adjusted border prices that would have prevailed under free trade and the prices that effectively prevailed under the "distorted" situation, at the official exchange rate. In general, border prices reported in Appendix Table I-1 must be adjusted before we compare them with the prevailing ("distorted") prices reported in Appendix Table I-4, to measure properly the direct price intervention. These adjustments are discussed now.

Wheat Adjustments. Three types of adjustments were made for wheat. The first was for domestic transportation and custom expenses. Because wholesale prices are measured in Santiago, and import prices reflect CIF prices at the port of San Antonio (main port of entrance for wheat), the CIF prices must be adjusted to make them