THE CANADIAN COMPONENT OF THE BASIC LINKED SYSTEM: THE POLICY BLOCK

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FOREWORD

Understanding the nature and dimensions of the world food population and the policies available to alleviate it has been the focal point of the IIASA Food and Agriculture Program since it began in 1977.

National food systems are highly interdependent, and yet the major policy options exist at the national level. Therefore, to explore these options, it is necessary both to develop policy models for national economies and to link them together by trade and capital transfers. For greater realism the models in this scheme are being kept descriptive, rather than normative. In the end it is proposed to link models of some twenty countries, which together account for nearly 80 percent of important agricultural attributes such as area, production, population, exports, imports and so on.

In such a system of linked models, it is useful to endogenize government policies. If policies of all national governments are specified exogenously, the number of exogenous policy parameters would be very large. Not only questions on the consistency of the specified parameters arise, but also the number of scenarios needed for analysis would be substantial.

For these reasons, development of a policy module has been considered important for the FAP's Basic Linked System of national policy models. Gerald Robertson and Bruce Huff have described here their work on the policy block of the detailed Canadian agricultural policy model being developed in collaboration with Agriculture Canada.

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1. INTRODUCTION

1.1 Objectives and Scope

The International Institute for Applied Systems Analysis (IIASA) has undertaken an extensive research program related to the world food situation. The major part of the analysis has been the development of a world food and agriculture system which links a series of national policy models in a general equilibrium framework.

The Food and Agriculture Program was developed in order to examine the interaction between agricultural resources, markets and national and international policies in a long-term context (5 to 15 years). The model was intended both to incorporate the behaviour patterns of public and private decision-makers and to test the effects of new policy alternatives so as to examine growth, equity, sustainability and stability issues related to food production, consumption, and trade (see Parikh and Rabar, 1981).

The intent of this paper was to examine alternative approaches for incorporating into the Basic Linked System (BLS) model those major policies of a country which influence the world and domestic market price differentials and the level of trade for the ten traded commodities.

The study focuses on Canada, but the approach should be applicable to other country models. The main emphasis is on the domestic-international price difference but alternative approaches to quantitative restrictions on trade and stock levels are examined.

1.2 Use of Policy Instruments

The Basic Linked System (BLS) is the set of standardized country models which was developed with a number of explicit policy instruments such as minimum and maximum prices, trade quotas, stock levels, tax rates, balance of trade, tariffs and savings rate. For more detail about the nature and spectrum of these, see Keyzer (1981).

In addition to these explicit policy instruments, countries maintain a series of regulations (health, labelling, etc.) and non-tariff barriers. These, along with natural trade barriers (e.g., transportation) isolate, to varying degrees, the domestic from the international markets. All of these protection effects must be included in order to correctly represent world market prices in domestic markets. To date, the present simulations of the BLS have generally assumed a quasi free market for most countries, where either domestic and export prices bear a constant relationship or domestic prices tend towards world prices with a distributed lag.

It is essential that the key policies of countries in the BLS be explicitly modelled, using those policy instruments noted above as well as including other protection effects. This is particularly important for the trade policies and to a lesser extent for the supply response policies. If these are not included, then the entire model loses much of its value as a reactive policy model.

1.3 Outline of Paper

In the next section of the paper, there is a discussion of the IIASA data base and in particular the price series used. These data are critical in describing the existing domestic-world price relationships and evaluating the extent of domestic market protection.

The third section of the paper describes the characteristics of the commodity markets in Canada and main policies for the nine agricultural commodity groups. Particular attention is paid to those policies which can be characterized by policy instruments similar to those available within the BLS. The description covers the period of model estimation (1961-76) and recent changes.

The fourth section of the paper examines the domestic to international price relationships. This includes theoretical concepts of a trade model, proposes a simple model structure to test these relationships, and presents and evaluates the results.

The fifth section describes the explicit policy instruments of the BLS and how these are operated in the model. The exact procedure to follow for each of these instruments is described for the nine commodities to represent existing policies in Canada.

In the sixth section, there is an examination of the policy component currently used by IIASA in the BLS. The approach is detailed along with results for several versions of the policy component. Finally, a summary of the policy block procedures, problems and suggestions for change is provided in the last section.

2. IIASA PRICE DATA

2.1 Method of Construction

The basic commodity quantity and price data are obtained from the FAO. Using weighting procedures developed by IIASA, the FAP aggregated these data for 56 countries from 600 to 260 commodities and then to 27 commodities (the detailed commodity list) and to 16 commodities (the simplified commodity list). The domestic price data are largely for farm-level or unprocessed products. Unit export and import prices were derived from value and volume of trade. These data are described in Fischer and Frohberg (1980, p.11-32) and Fischer and Sichra (1983).

The following part of this section examines the IIASA price series for Canada. Comments are mainly on the producer prices and their relationship to world prices[1], but some comments on export unit value prices are also included. A comparison is made between these data and those published by Statistics Canada. Any significant differences between Canadian and IIASA data are important for the estimation of the model described in Sections 4 and 6. In general, the exact definition of these IIASA prices is unclear, particularly as to the time period represented (i.e., crop versus calendar year). We hope that some of the apparent errors are corrected in the updated data tapes.[2]

[1]The world price is defined in this study as the lowest price of an exporter which has a significant percent of the world markets.

[2]In review of Statistics on Prices Received by Farmers, FAO, 1982, it has been noted that FAO used estimates for many Canadian prices in 1975. Both IIASA and FAO have been notified of official Canadian prices for 1975 for these commodities. Other differences can also be traced to varying definitions for commodity year.

Table 2.1 shows results of regressions which relate Statistics Canada commodity price data to (i) IIASA data for Canadian domestic prices and (ii) IIASA data for world prices for nine commodities.[3]

For the first set of comparisons relating the two Canadian data series, the intercept should be zero and coefficient should be one. In virtually every case, different results are obtained. In the second set of comparisons relating Statistics Canada Canadian data to IIASA world prices, a similar result would be expected for the coefficient (i.e., one) and the intercept would reflect transfer costs (i.e., negative for exports and positive for imports) for these commodities which are freely traded (wheat, coarse grains, protein feed, beef, pork). This appears to be the case for all those products except for oilseeds. The results for fruit and vegetables appear strange because of the low value of the coefficients. Also, coefficient values for dairy and poultry may reflect either a rapidly rising domestic market prices or a highly subsidized export price. The large negative intercept on poultry is unexplainable.

2.2. Comparison with Canadian Sources

2.2.1 Wheat and Coarse Grains

For the Canadian domestic price there appears to be an inconsistency in the data between those reported for 1961-74 and for 1975-76, the latter being particularly high. The increase in world wheat prices occurred in the 1973/74 crop year but the IIASA data indicate this

[3]Model is specified as: $Y = a + BX$
Where Y is Statistics Canada farm level data and where X is IIASA data for farm level and world level prices. Model is estimated by OLS for the 1961-76 period.

TABLE 2.1: RELATIONSHIP OF COMMODITY PRICES FROM STATISTICS CANADA DATA TO IIASA (FAO) DATA FOR DOMESTIC CANADIAN MARKETS AND WORLD MARKETS, 1961-1976

Commodity	Domestic Price		World Price	
	Intercept	Coefficient	Intercept	Coefficient
Wheat	15.77	0.77	17.19	0.85
	(6.03)[a]	(.06)	(18.17)	(.23)
Coarse Grains	8.87	0.85	7.47	0.81
	(2.776)	(.04)	(8.30)	(.12)
Protein Feed	85.25	0.18	19.75	0.45
	(33.45)	(.07)	(41.89)	(.13)
Dairy	-8.98	1.35	44.33	1.70
	(5.33)	(.05)	(18.83)	(.36)
Beef	177.02	1.11	751.09	0.78
	(67.93)	(.08)	(270.97)	(.55)
Pork	71.44	1.30	4.37	1.23
	(39.30)	(.06)	(87.53)	(.12)
Poultry	-1427.85	1.98	-3177.34	2.55
	(429.53)	(.08)	(975.83)	(.21)
Vegetables	53.00	0.14	38.96	0.25
	(14.32)	(.02)	(25.58)	(.06)
Fruits	31.54	0.14	19.93	0.21
	(6.10)	(.01)	(17.17)	(.03)

[a]Standard errors in brackets.

Source: Statistics Canada and IIASA.

occurred in 1974. This would imply that at least part of the IIASA data are based on a calendar instead of a crop year. The unit export prices for Canada appear reasonable, except in relation to the apparently low 1973-74 reported world prices.

2.2.2 Bovine

The domestic prices appear low for Canada by about 20 percent, particularly the 1975 value relative to export, import and world prices. The 1972 price increase noted in Canadian data sources is shown in the IIASA data in 1971.

2.2.3 Dairy

All of the dairy price data appear to be too low and some of the price declines are large (e.g., the 1964 value declines four percent). IIASA shows that prices declined from 1975 to 1976 by $15/t, whereas according to Canadian data sources they increased by $4.5/t. This may be due to different aggregation procedures or definitions used.[4]

2.2.4 Protein feeds

The data for 1974-76 appear unreasonably high. Since there is free importation of protein meal, a close relationship with world prices is expected. According to IIASA data, this occurred until 1974, then Canadian prices rose to twice the world level. IIASA unit

[4]For Canadian data, price is obtained from total producer returns and total production. IIASA aggregates a series of product prices.

export and import prices for Canada are close to producer prices (and world prices) until this period. There is no reason for any divergence, since there is free trade for oilseed products.

2.2.5 Other meals

The IIASA prices for pork appear about ten percent below those from Canadian sources of data. Prices for poultry and eggs appear lower than those estimated by Agriculture Canada by almost 50 percent. For fish, the differences between world and much higher domestic prices reported by IIASA of one hundred percent appear unreasonable, since Canada exports much of its production. Furthermore, in the case of processed and unprocessed products, the high unit export prices appear to indicate a quality premium for Canadian exports.

2.2.6 Other food

The year-to-year variations in fruit prices are similar to those reported in Canadian data sources, whereas vegetable prices frequently are not. Prices levels for both Canadian sources are substantially lower than reported by IIASA.

3. AGRICULTURE COMMODITY POLICY IN CANADA

3.1 Overview

The agricultural economy in Canada is relatively open to international markets. Trade is very important to Canadian agriculture and the Canadian economy. For example, about seventy-five percent of Canadian wheat is exported and, in total, agricultural exports are equivalent to about forty percent of farm cash receipts. Agriculture accounts for about ten percent of all exports from Canada and has contributed to a positive balance of trade.

Agricultural policies which influence trade have been designed to a large degree to protect producers and consumers against short-term instability from both natural and foreign-policy-induced sources. These policies have generally had only small effect on market prices for grains and red meats. However, for dairy, poultry and many horticultural products, policies have been instituted to isolate domestic from world markets. For these sectors, prices are largely set through cost-of-production formulae, and rigid production controls exist. For those commodities which have supply management controls, imports are restricted through quotas, largely using the Export and Import Permits Act. Producer marketing boards have been instituted for many of these commodities.

Inputs policies are generally not commodity-specific. Agricultural policy and programs have played a minor role in affecting input use and prices. An exception is research and extension which is heavily government funded.

Canada has three systems of tariffs: British Preferential (BP), Most Favoured Nation (MFN) and the General Preferential (GP). Tariffs have generally had only a small impact on trade. Seasonal tariffs are used for many fresh fruits and vegetables. The GATT Tokyo Round lowered many tariffs and narrowed the gap between BP and MFN rates, particularly on products traded between Canada and the U.S. Non-tariff barriers (health restrictions, labelling requirements, etc.), and quantitative restrictions on for example for dairy products, cereals, poultry and eggs, and beef and periodic tariff surcharges, have generally been more effective than tariffs to protect domestic producers.

The following section outlines the major policies for Canada for each of the ten IIASA commodity groups. The policy description relates to those existing during the period of the estimation (1961-76). Any commodity changes since 1976 are noted in the section on new developments.

3.2 Commodity Policies 1961-76

3.2.1 Wheat

(a) General Policies/Institutions

About 95 percent of the wheat produced in Canada is grown in the designated area under the jurisdiction of the Canadian Wheat Board (C.W.B.)[1]. The C.W.B. controls the marketing of all wheat for export and sale outside the designated area (except of off-board feed

[1]Under the Canadian Wheat Board Act, the designated area is Manitoba, Saskatchewan, Alberta, the Peace River District and Creston-Wynndel Areas of British Columbia, and grains include wheat, oats, barley, rye, rapeseed and flaxseed.

wheat sales since 1974).[2] Producers are issued marketing quotas based on cultivated acreage and any grain not eligible for delivery to the C.W.B. must be stored on farms, fed to livestock or sold to other local producers.

Producers are eligible for advance payments for farm-stored grain.[3] Producers can purchase crop insurance to protect against losses from weather, disease or pests. An acreage diversion program in 1970, called LIFT, greatly reduced wheat acreage in 1970 and to a lesser extent for several years thereafter.

Canada has negotiated several bilateral long-term agreements. These have been particularly important with the U.S.S.R. and China. The agreements have generally specified minimum and maximum annual levels of grain trade. Canada is an important contributor to bilateral food aid programs, donating about 0.6-1.0 million tons annually.

(b) Pricing Policies

Producers are guaranteed an initial price which is paid upon delivery to the C.W.B. A final payment, based upon a final annual average net (pooled) price, is paid 6-7 months after the crop year. A final payment for wheat has been made every year except for 1968/69. The announcement date of initial prices has varied from prior to planting to after planting intentions are known. Thus, initial prices have had differing effects on planting decisions.

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[2] See section on coarse grains.

[3] The Prairie Grains Advance Payment Act provides interest-free cash advances of up to $15,000 per producer on the security of farm-stored wheat, oats and barley.

Minimum and maximum producer selling price and flour miller buying prices for domestic consumption have been established since 1968, following the breakdown of the International Grains Arrangement. First, these prices subsidized the producer as domestic prices exceeded world levels (1968-73) and subsequently subsidized the consumer as domestic prices were below world levels (1968-73). Price levels for this period are shown in Table 3.1.

Prairie grain producers benefit from fixed rates on rail movements of grain to export points. The rates, known as the Crows Nest Pass rates, have been frozen at their 1922 levels, thereby permitting domestic grain prices to rise to higher levels than if full cost transport rates had been used. A transportation subsidy is paid on regional feedgrain shipments (discussed in the feedgrain section).

Various transportation subsidies to the railroads also exist, such as branchline rehabilitation subsidies, hopper car lease and purchase, and box car rehabilitation, to offset losses to the railroads from the low Crows Nest Pass rates.

Stabilization payments under the 1958 Agricultural Stabilization Act were paid to wheat produced in the non-designated areas if prices fell below eighty percent of a ten-year average.

Canadian wheat commands a premium price in international markets over other lower protein and soft wheats. This premium has varied over time and from season to season, depending on quality levels and market conditions.

TABLE 3.1. MINIMUM AND MAXIMUM WHEAT PRICES FOR PRODUCERS AND MILLERS, 1969-80 FOR DOMESTIC FOOD USE[a]

	Price to Producers		Price to Millers
	Minimum	Maximum	
Nov. 5/69 -1972	71.65		71.65
Jan. 1972[b]	110.23		71.65
Sept. 11/1973[b]	119.42	183.72	119.42
May 1975[b]	130.45	183.72	119.42
Nov. 28/1978[c]	146.98	183.72	146.98 - 183.72[d]
Aug 1/1980	183.72	257.21	183.72 - 257.21

[a]For No. 1 Canadian Western Red Spring Wheat, basis Thunder Bay.
[b]Government paid difference between mill price and export price up to the maximum.
[c]No further government subsidy.
[d]Prices to millers were fixed for two months, (e.g. prices on December 15th would be in effect for January and February).

(c) Trade Policies

Imports of wheat require an allocation of permits issued by the C.W.B. Tariffs on wheat are free under the British Preference (BP) and 12¢/bushel ($4.41/t) under Most Favoured National (MFN) rates.

Exports have been assisted through credit and loan guarantees. These subsidies have been relatively minor (usually under $5 million annually).

The Canadian transportation and handling system capacity constraints havelimited wheat exports for much of the period under review.

(d) Stock Policy

In the 1950's and 1960's, the C.W.B. appeared to accumulate wheat stocks to prevent a decline in world wheat prices.[4] In turn, this forced grain producers to increase farm-held stocks, since the C.W.B. could not accept additional deliveries of grain. Since 1973, there is no evidence that the Board is following this policy. Such a policy would not have the impact of earlier periods, as Canada's share of world trade in wheat is much smaller.

(e) New Developments

The Western Grain Stabilization Program for the C.W.B. area was introduced in 1976. This program is voluntary and jointly funded by government (2/3) and producers (1/3). It was designed to stabilize net cash flow, the difference between total receipts from the sale of the seven major cereals and oilseeds and the cash costs of production.

For the non-C.W.B. area, the Agricultural Stabilization Act (1975) increased the support to 90 percent of previous five years, adjusted for changes in cash costs.

A bill to amend the Crows Nest Pass transportation rates was introduced in Parliament in February 1983 and will likely result in rates reflecting part of the higher transportation costs.

[4]Board stocks were increased when world prices declined during this period, when Canada accounted for over 20 percent of world wheat trade.

The two price wheat program for domestic wheat consumption noted above remains unchanged with regard to minimum and maximum prices.

3.2.2 Rice

Most of the rice consumed in Canada is imported at world prices without a tariff.

3.2.3 Coarse Grains

(a) General Policies/Institutions

Generally policies and institutions for coarse grains are similar to wheat when it is produced in the designated area. A higher proportion of coarse grains than wheat is grown outside the designated area and most production until recently was consumed in Canada, unlike wheat.

(b) Pricing Policies

In the designated area, producers delivering feed grain to the C.W.B. receive initial and final pooled prices similar to wheat. In Eastern Canada, the import price for U.S. corn provides a ceiling price for producers. Since 1974, a pricing formula directly tied the selling price of western grain by the C.W.B. in Eastern Canada to the U.S. corn import price at Montreal.

In Western Canada, grain can also be sold by producers in the off-Board market, and this increases especially when Wheat Board marketing quotas are restrictive. A substantial price differential between board and

off-board markets has existed, such as during the 1969-70 period. In 1974, Prairie producers were given the opportunity to sell non-C.W.B. quota grain outside the C.W.B. area.

Canadian barley has sold at periodic premiums and discounts relative to corn prices in international markets. These premiums and discounts have been as large as 25 percent during the 1970's and are largely based on availabilities of barley relative to corn, price of protein feed and end-use of the grain.

Feedgrain movements from the Prairies into British Columbia and Eastern Canada have been subsidized under the Feed Freight Assistance Program since 1941.[5] The program was intended to equalize the wholesale cost of Prairie grain at approximately the Thunder Bay level in all provinces. In 1976/77, subsidy rates and eligible locations were reduced. As well, its benefit has eroded since rates have been held constant in the Atlantic region. In 1981/82, almost 2 million tonnes were shipped with a $15.4 million subsidy, ranging from $3.55/t into Quebec and $28.57/t into Newfoundland.

Imports (or exports) of barley, oats, and rye require import (or export) permits from the C.W.B. Corn imports were subject to a tariff of 8¢/bu. ($3.15/t).

[5]The Livestock Feed Assistance Act provides for subsidization of transportation costs of grain from the designated area, and Ontario corn into British Columbia, Eastern Quebec and the Atlantic Provinces.

(c) Stock Policy

A similar policy exists as in the case of wheat, but stock policy has not been as important for coarse grains.

(d) New Developments

The pricing formula for feedgrains sold into Eastern Canada, based on corn import prices, may be modified to provide more flexibility to capture premiums for barley above equivalent corn prices in world markets. The corn import tariff is to be reduced in annual increments from 1980-87 from 8.0¢ to 4.0¢/bu. ($1.58/t).

3.2.4 Bovine and Ovine

(a) General Policies/Institutions

While Canada is a small net exporter of beef, large trade flows of different types of beef exist. Since 1969, sizeable imports of grass-fed manufacturing type beef have come from Oceanic countries. The US periodically exports large numbers of live grain-fed slaughter cattle, and Canada exports to the U.S. feeder cattle and calves and slaughter cows. Both veal and sheep meat trade are small in comparison to beef.

(b) Pricing Policies

U.S. prices largely determine Canadian domestic prices as a result of Canada's active international trade in beef. Production of grain-fed, youthful beef predominates in the North American beef economy and

significant premiums exist over international grass-fed beef prices. The Agricultural Stabilization Program (1958) has provided support to both slaughter cattle and feeder cattle. Payments were made in 1974/75 of $62 million and 1976/77 of $47 million. A number of provincial government programs also have been introduced to support the cattle sector.

(c) Trade Policies

Beef and veal have a 4.5¢/lb. ($99/t) tariff. Lamb and mutton have a 4.0¢/lb. ($88/t) BP tariff and 4.9¢/lb. ($108/t) MFN tariff. Tariffs are small relative to total value. Voluntary quotas on Oceanic imports were in place during 1973-77. A number of trade restraints on U.S.-Canada trade were introduced during the 1973/74 period, which distorted traditional U.S.-Canada price relationships.

Health restrictions prevent imports of live animals and meat from many regions of the world where foot and mouth disease exists. Live animals must undergo a quarantine period before importation.

(d) Stocks

Beef stocks are generally small and privately held.

(e) New Developments

A Meat Import Law was developed and introduced to replace voluntary quotas on imports from Oceania. The Law is designed to be countercyclical, allowing highest level of imports when domestic production is lowest, and vice versa.

Tariffs on beef and veal declined to 2¢/lb. ($44/t) in 1981 and lamb BP tariffs will decline from 4¢ to 3¢/lb. in 1987.

3.2.5 Dairy Products

(a) General Policies/Institutions

Milk production in Canada is highly regulated with producer production quotas, cost of production formula pricing and restricted trade. There are two distinct markets - fluid milk and industrial milk and cream. Separate production quotas exist for each. Industrial milk quotas are established to balance supply and demand on the domestic market for butterfat. The current policy administered by the Canadian Dairy Commission for industrial milk was introduced in 1967 and has remained largely unchanged since that time.[6] Per capita consumption of dairy products particularly butter, has been declining.

(b) Pricing Policy

A cost of production pricing formula exists for industrial milk at the producer level. Prices are adjusted quarterly to reflect changing costs. Fluid milk prices are set at a provincial level usually by a formula or negotiation and command a premium over industrial milk. Prices for butter and skim milk powder are supported by an offer-to-purchase program.

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[6]The Canadian Dairy Commission Act regulates all industrial milk and milk products, and under it the commission makes payments and undertakes promotion, etc.

During 1973-75 there was a consumer subsidy on fluid milk of 5¢/qt and the skim milk powder subsidy was increased from 20 to 34¢/lb.

A producer subsidy of $6.04/hl is paid directly to industrial milk producers, in addition to the price received in the market place. Each producer receives as a minimum the formula (or target return) price for milk produced within his quota.

(c) Trade Policies

Imports of dairy products are limited under the Export and Import Permits Act. A quota for imports of specialty cheese was set at 22.7 thousand tons.[7] Originally cheese quotas were to rise so as to restrict imports to 25 percent of domestic consumption, but subsequently reduced to current levels. Butter is imported when domestic shortages occur.

Tariffs on cheese are 3.0¢/lb.[8] For butter tariffs are 8¢/lb for BP and 12¢/lb for MFN. In general tariffs represent about a five percent ad valorem protection. Surplus skim milk powder and occasional butter surpluses are exported at world prices, financed by a producer levy.

[7]As imports of cheese increased under the Export and Import Permits Act, Canada imposed a quota of 50 mill. lb. in 1975, which was reduced to 45 mill. lb. in 1978.

[8]Tariffs for cheeses other than cheddar is 3.5¢/lb. Oceanic countries have preferential rates of 1¢/lb for cheese, 5¢/lb for butter and 1¢/lb. for milk powder. Tariffs provided about a five percent ad valorem protection in 1977.

(d) Stocks

Both public and private stocks exist and periodically these may be significant for skim milk powder and butter. As these stocks increase, production quotas for industrial milk are likely to decline in the following periods.

3.2.6 Other meats (pork, poultry and fish)

(a) General Policies/Institutions

Quite different marketing structures exist for each of these products. Market policies for pork are similar to those for beef, while those for poultry and eggs have evolved to a structure similar to that for dairy products.

(b) Pricing Policies

For pork, prices are set in world markets and are affected, in particular, by supply/demand forces in North America. Canada switched from a net exporter to a net importer in 1974-77 and then to a large exporter again. Stabilization payments were made to pork producers in 1971/72 ($10.5 mill.)

Egg pricing evolved to a cost-of-production pricing formula during the 1970's, with a national agency, the Canadian Egg Marketing Agency, and provincial boards setting monthly producer prices and purchasing surplus stocks to maintain these prices. Similar structures exist for turkey and chicken broilers, but prices are not solely determined through formulae.

Fish prices are primarily determined in the U.S. market, where the bulk of production is exported.

(c) Trade Policies

Most pork trades with a 0.5¢/lb. ($11/t) tariff and a 15 percent tariff on canned products. Health restrictions also prevent imports from a number of countries.

Poultry and egg products have quotas on imports. For chicken, imports are restricted to six percent of domestic production. Supplemental imports are granted if shortages occur. Surplus production is sold in export markets. Tariffs for poultry are 12 percent (10¢/lb. maximum) and eggs 2¢/dozen MFN.

The 200 mile fishing limit has increased levels of production for Canadian fishermen.

(d) Stocks

For pork, stocks are held privately and these are important for short-run price movements, but these effects decline on an annual basis.

For poultry and eggs, stocks provide the major signals to modify quota levels in subsequent periods.

3.2.7 Protein feeds

(a) General Policies/Institutions

Oilseed crops dominate this market. In the Prairies, rapeseed has become the principal oilseed crop during the 1960's and 1970's, the product is substantially improved and noted by a new name, Canola[9]. Most of Canadian exports are in the form of seed, not oil and meal products. Most oil exports have generally been in the form of food aid.

(b) Pricing Policies

Prices for Canadian oilseeds and protein feed are essentially established on a world oilseed market basis, although soybean meal commands a premium over rapeseed meal. Unlike wheat and coarse grains, however, Canadian producers do not receive a guaranteed minimum price. Transportation constraints have caused some pricing anomalies between farms and export points and some farm stock accumulations. The C.W.B. sets delivery quotas for rapeseed and flaxseed to allocate transportation and storage facilities among grains.

(c) Trade Policies

There are no tariffs or quotas on oilseed, meal or crude oil. While Canada imports considerable protein feed, it is a net exporter.

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[9]Canola oil is substantially lower in erucic acid and Canola meal is much lower in glucosinalate and fibre content.

(d) Stocks

Stocks are held both by producers and in commercial positions. In Western Canada, marketing quotas exist for rapeseed, and excess supplies are stored in farms. The level of farmer held stocks will affect acreage allocated to oilseeds in the following crop year. For example, when stocks increased 160 percent to 1.04 million t in 1976, this resulted in an acreage reduction to less than one-half the previous five-year average. Very limited stocks are held in the form of protein feed, but mainly in the form of seed.

3.2.8 Other food

It is difficult to characterize this category. The majority of products trade with relatively small or zero tariffs (especially on raw commodities). Some of the horticultural crops have higher protection, particularly "in-season" fresh products. The majority of domestic consumption of fruits (about 50 percent), sugar and plantation crops are imported.

Stabilization payments have been important for some of the horticultural crops and sugar beets.[10] Excise taxes are a barrier to consumption of imported alcoholic beverages.

[10]For 18 years, 1958-76 Agricultural Stabilization payments contributed 0.09 percent of total receipts for the horticulture sector and 0.22 percent for all field crops.

3.2.9 Nonfood agriculture

Tariffs are the main trade barrier for these products, especially for tobacco. Hides and skins are free. Products in this category are highly processed, creating widely different products between traded and domestically consumed goods.

3.2.10 Nonagriculture

A mix of tariff and other trade restraint measures are used. Many of the goods are not traded (e.g., housing, services).

3.3. New Policy Developments

In 1981, Canada introduced an Agrifood Strategy (Challenge for Growth), which outlines the general types of policies required to capitalize on the expected growth opportunities in both domestic and world markets for the rest of the decade. The growth-oriented strategy focuses on the three areas of market development, improvements in the production infrastructure and expanding mission-oriented research. Key elements of the policy are to expand processing and sales of agricultural products, to develop the basic production resources, to minimize risks to producers and to accelerate applied research and its commercial application. An agricultural export trading corporation Canagrex has been established to assist the implementation of the strategy.

In terms of new policy directions for beef, consideration is being given to instituting a new stabilization program to offset the instability of prices and production of the beef industry.

The domestic feedgrains policy is now under review. No change is likely that would significantly affect exports, but regional relative prices for grains and hence livestock production may be affected.

The domestic dairy and poultry policies are unlikely to change substantially. A recent review of dairy policy resulted in no basic change in the policy. Some regional reallocations of quota may occur reflecting shifts in demand and production costs.

The horticultural industry may be a major benefactor of the agri-food strategy through increased support for processing, storage and sales.

Changes in the Crow's Nest Pass Freight Rates are being debated and this will likely involve some increase in costs paid by producers. The latest proposal is that some future increases would be paid by producers but most of the current deficit between the railroad's costs and revenue would be paid by the federal government directly to the railroads.

If governments maintain a tight fiscal policy, it is unlikely that any other new policies will be introduced which involve large direct payments to producers. This would imply that the use of qualitative restrictions may become more important as a means of support to producers.

4. IMPACT OF TRADE POLICY ON DOMESTIC AND WORLD PRICE RELATIONSHIPS

4.1 Theoretical Considerations

The purpose of this section is to assess whether or not a simple model is useful to examine and quantify the nature and the extent of trade protection effects instituted by Canada for the nine agricultural commodities. If so, can this simple model be used to represent world prices in the domestic market? Trade protection affects in this context are considered to result not only from trade barriers as tariffs and quotas, and the nontariff barriers such as regulations, but also from natural barriers such as transportation and other marketing charges. As well adjustments for quality differences between domestic and foreign products must be made in the assessment of the protection effects.

The intent is to specify a simple model which represents the nominal trade protection effect arising from these factors as a price wedge between the domestic and international markets. If the nature and magnitude of this wedge appears consistent with the above policy description of each commodity market, then this relationship may be used to represent world prices in Canada.

The BLS is a general equilibrium model. For purposes of illustration and ease of explanation, however, the examples and most of the discussion in this section abstracts from the general equilibrium concepts and uses simpler partial equilibrium models.

To examine the nature of protection, one can use the well known price equilibrium model. For the case of one good and two countries, the supply demand and price relationships are shown for country A (Figure 1a), country B (Figure 1b) and their net trade functions (Figure 1c). This shows that under perfect market conditions, prices are equal in both countries ($P_A = P_B = P_W$) and exports of country B are equal to the imports into country A of NT.

If an import tariff or a transport cost of K is now introduced, this shifts the excess demand in Country B, to ES' , a reduction of K. The price in Country A is now higher than in Country B and trade, NT', is smaller.

$$P_{A'} = P_{B'} + K \qquad (1)$$

If the tariff was proportional to price (ad valorem), then K could be expressed as a function of P and ES' would have a smaller slope.

$$P_A = P_B (1 + K) \qquad (2)$$

If K were sufficiently high, no trade would take place and the price relationship between countries would be indeterminate.

A producer subsidy or consumer tax (S) could have a similar, but opposite impact of lowering ES by S units.

Quotas on imports, exports or production would have the effect of introducing a "kink" in the net trade function. For example, an import quota by country A would create a perfectly inelastic excess demand at that point. Obviously,

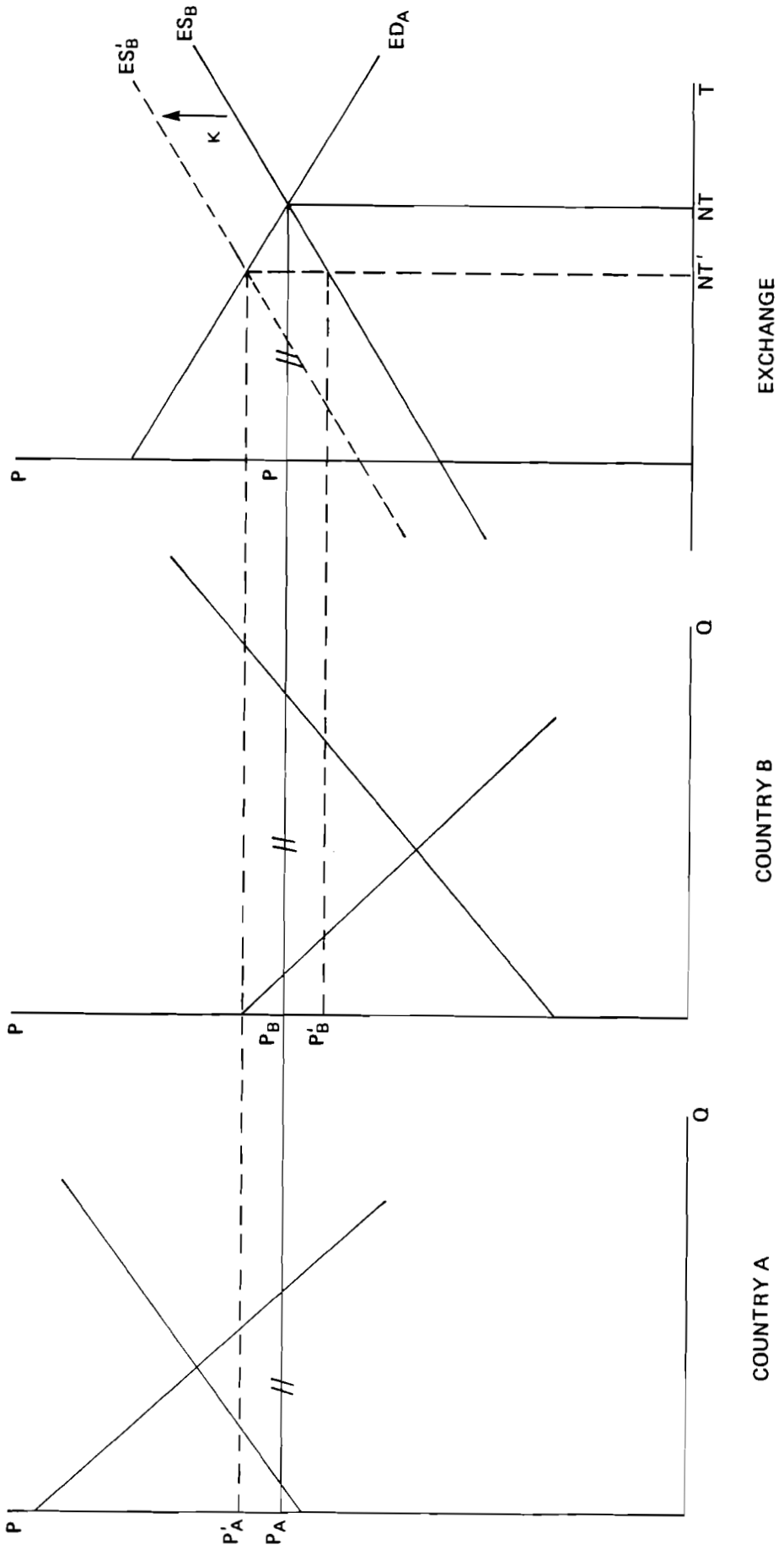

FIGURE 1: TWO COUNTRY EXCHANGE MODEL

the quota would not be effective if the equilibrium point of the net trade functions were less than the quota. If the quota were effective, and equalled NT', price in Country A would remain at P'A. The price in Country B could continue to decline if its excess supply function shifted to the right. Export or production quotas could be modelled in a similar fashion.

4.2 Proposed Model

If all policy, regulations or other protection can be represented as nominal tariff equivalents, then the relationship between domestic and international prices may indicate the nature and level of protection[1] .Suppose a regression were calculated as follows:

$$P_A = a + b\ P_B \times e \qquad (3)$$

Let Country B represent the rest of the world, and e is the exchange rate. P_A and P_B are defined above and a, b are parameters to be estimated

(i) Case 1
if a = 0, b = 1

This represents the perfect market, free trade situation, with no transfer costs.

(ii) Case 2
if a = 0, b = 0

This represents the tariff equivalent effect of a binding quota, where price in country A bears no direct relationship to price in country B, assuming no changes in excess supply or demand functions.

[1]This assumes that protection on inputs is small and/or value-added is large so that nominal and effective protection is similar.

(iii) Case 3
if $a \neq 0$, $b = 1$

This represents the case of a specific tariff (a) or fixed transportation cost.

(iv) Case 4
if $a = 0$, $b = (1 + K)$

This characterizes the ad valorem tariff which is equal to K.

In most cases, commodities will be affected by a mix of policies, natural protection and quality differences, making it difficult to attribute the "protection" effect to any one individual element.

The model proposed in equation (3) was estimated using the IIASA Canadian commodity price data for P_A and world commodity price data for P_B. A second variation of (3) was the use of the world price data lagged one period. Data were for the 1961-76 period. The objective was to test whether the estimated coefficients, based on the theoretical interpretation in the above four cases were consistent with the existing policies in Canada.

4.3 Empirical Results

Results of the estimation of Equation (3) are shown for the cases of current world prices in Table 4.1 and for lagged world prices in Table 4.2. Using current world prices for wheat, coarse grains and nonfood, the intercept was not

[2]Each model was estimated both with and without intercepts, but the latter did not provide results statistically as good as those with intercepts.

significantly different from zero nor the price coefficient different from one. This is the free trade and zero transfer cost situation, which would approximately characterize these commodities, since Canada is a net exporter. In two cases, beef and other meats, the intercept was zero, while the price coefficient was much greater than one. This implies a large ad valorem tariff, which is not the policy situation with either commodity. This is probably the effect of a quality premium. In the case of dairy, the intercept was larger than zero, but the price coefficient was approximately one. This implies a fixed tariff, which again is not the main policy tool for dairy. In the cases of protein feed and other food, the intercepts are different from zero and the price coefficient is different from one. The policy interpretation of these results in inconsistent with the policies.

In Table 4.2, using lagged world prices, the results are similar to those in Table 4.1 except for dairy, which in this case implies a tariff restraint. Model results indicate relatively good statistical relationships, with most R2 values between 0.7 and 0.9.

Nevertheless, in most cases, it was not possible to use the results from this simple model to interpret equivalent tariff or quota protection for commodities in Canada. Results were acceptable for homogeneous commodities in which Canada was a large free trader. The data problems noted in Section 2.2 may also be a factor affecting the results.

TABLE 4.1. ESTIMATED COEFFICIENTS RELATING DOMESTIC CANADIAN AND INTERNATIONAL PRICES, 1961-76

Commodity	Intercept	Price Coefficient	R2 (DW Stat)
Wheat	-10.77 (16.52)	1.27 (0.21)	0.72 (1.55)
Coarse grains	-4.44 (7.25)	0.99 (0.10)	0.86 (1.57)
Bovine	99.93 (58.98)	1.40 (0.10)[a]	0.92 (0.87)
Dairy	37.22 (12.68)[b]	1.30 (0.24)	0.66 (0.74)
Other meat	-197.52 (312.19)	2.22 (0.12)[a]	0.95 (2.21)
Protein feeds	-193.92 (80.99)[b]	1.96 (0.28)[a]	0.78 (1.75)
Other food	282.71 (69.32)[b]	0.54 (0.09)[a]	0.69 (2.25)
Non food agric.	61.09 (154.47)	1.35 (0.21)	0.73 (0.94)

Model used was shown in equation (3)
[a]significantly different from 1.0 (standard errors are shown in brackets).
[b]significantly different from 0.

TABLE 4.2. ESTIMATED COEFFICIENTS RELATING DOMESTIC CANADIAN PRICES TO LAGGED INTERNATIONAL PRICES, 1961-76

Commodity	Intercept	Price Coefficient	R2 (DW Stat)
Wheat	1.07	1.19	0.46
	(26.29)	(0.36)	(0.75)
Coarse grains	2.48	0.95	0.61
	(13.43)	(0.20)	(0.92)
Bovine	218.07	1.25	0.69
	(126.82)	(0.23)	(1.25)
Dairy	33.55	1.42	0.84
	(8.91)[a]	(0.17)[b]	(0.95)
Other meat	-519.42	2.51	0.90
	(536.41)	(0.22)[b]	(1.61)
Protein feeds	-210.50	2.12	0.74
	(96.94)[a]	(0.35)[b]	(2.19)
Other food	201.72	0.71	0.75
	(75.60)[a]	(0.11)[b]	(1.32)
Non food agric.	-61.09	1.35	0.73
	(154.47)	(0.21)	(0.94)

Model used was shown in equation (3) using one period lag on world prices.

[a]significantly different from 0 (standard errors are shown in brackets).

[b]significantly different from 1.0.

5. APPLICATION OF BLS POLICY INSTRUMENTS FOR CANADA

5.1 Policy Instruments in the BLS

The BLS was developed to include the major policy instruments commonly used by national governments in order to pursue commodity market policies. These include those policies which directly influence market prices, level of stocks and volume of exports and imports. In the BLS, those policies are introduced only in a very specific manner.

In the BLS, a price policy can be pursued through a tariff, subsidy or taxes. A buffer stock can be pursued through the operation of a public buffer stock agency which announces that it will buy and sell unlimited quantities at quoted prices. A trade policy can primarily be introduced by the imposition of quantitative constraints (quotas) on net imports.

In the exchange module of the BLS, each commodity in each country is represented as a homogeneous of degree zero excess demand (ED) function, if there is no policy intervention (i.e., none of the instruments are at their bounds). In setting values of policy parameters, countries only have information about the level of world prices (PW), their own net trade (E) and other domestic market variables (e.g., supply stocks) (Figure 2). There is no information about policy actions of other countries other than what can be obtained from the impact of other country policies on world prices and trade. In the formulation of parameter levels of policy instruments it is assumed that they respond to world prices, domestic production and the previous period's trade and stocks.

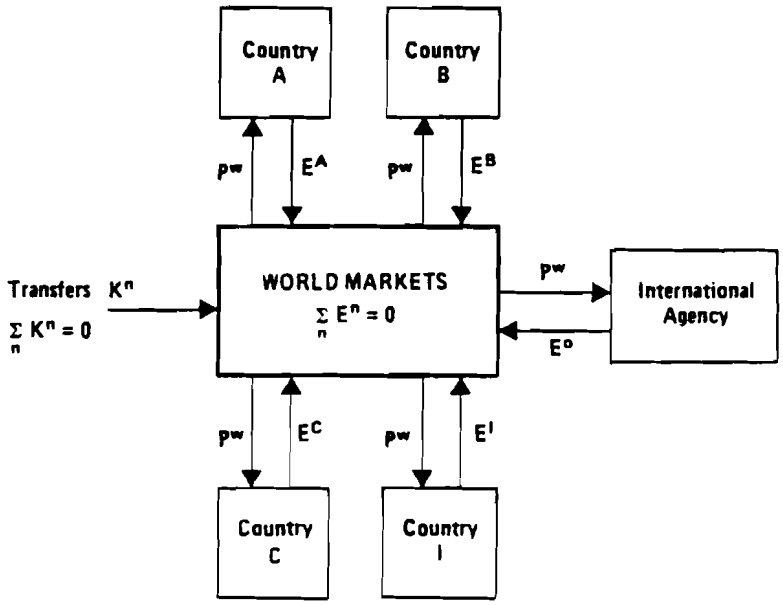

FIGURE 2: INTERNATIONAL LINKAGE OF FAP COUNTRY MODELS

It should be noted that the policy instruments in the BLS must be ranked according to priority in which they operate. In describing this ranking, Keyzer (1981) uses the notation described below and illustrated in Figures 3 and 4.

$\hat{x}$	is a target value for policy variable x (any variable can become a policy variable).
$\bar{x}$, $\underline{x}$	are the upper and lower bounds for x.
$x \rightarrow y$	is a weak adjustment rule. This implies that as long as variable y is adjusted within its bounds, x remains at its target. If y reaches a bound then x is adjusted, but the direction of adjustment is not fixed (as shown in Figure 4).
$x+ \rightarrow y$	positive adjustment rule. If y reaches its upper (lower) bound, then x is adjusted upward (downward) (as shown in Figure 4).
$x- \rightarrow y$	negative adjustment rule. If y reaches its upper (lower) bound, then x is adjusted downward (upward) (as shown in Figure 4).

5.1.1 Conditions for setting the policy response functions

The following conditions must be met for setting values for the policy variables in the BLS.

1) The ranking of the policy variables must be consistent across all commodities. The present program specifies that the ranking is Price - → Stocks - → Price - → Trade. It is possible to relax this condition.

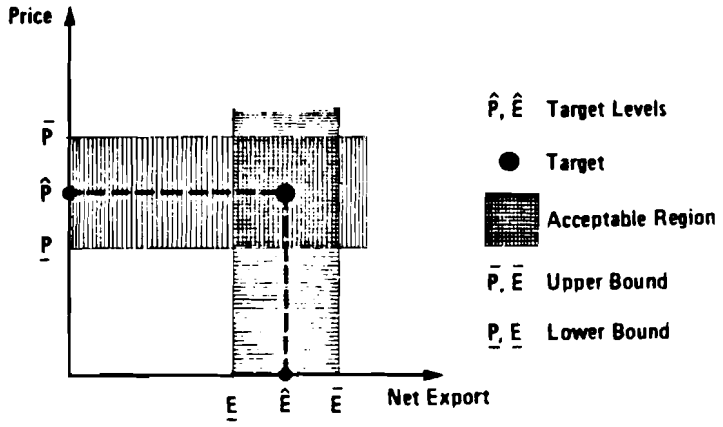

FIGURE 3: TARGET AND BOUNDS ON PRICE AND TRADE POLICY

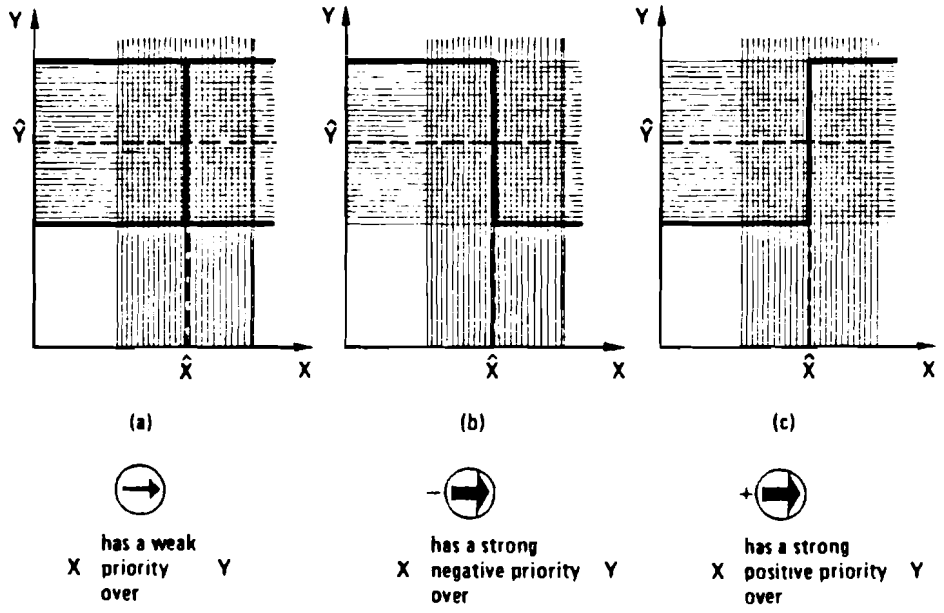

FIGURE 4: POLICY ADJUSTMENT RULES FOR THE GOVERNMENT

2) The policy response functions cannot have as arguments, variables which are current endogenous variables to the international exchange except for the world price and the trade deficit.

3) All quantity targets and bounds must be homogeneous of degree zero in world price and trade deficit. If all the world prices and the trade deficit were multiplied by a factor there would be no change in the quantity target. For example the stock target function should satisfy

$$\tilde{w}(\lambda P^w, \lambda K) = \tilde{w}(P^w, K)$$

where $\tilde{w}$ is the stock target variable (e.g., trade target, or stock target)

P^w is the world market price,
K is the trade deficit,
and λ is a real constant.

4) The price targets and bounds must be homothetic in world prices and trade deficit. If all the world prices and the trade deficit were multiplied by a factor the price targets would change scale by a function of that factor.

$$\tilde{P}(\lambda P^w, \lambda K) = N(\lambda)\tilde{P}(P^w, K)$$

where $\tilde{P}$ is the price target
and $N(\lambda)$ is a positive function of λ
and all other variables are as defined above.

5) All of the policy response functions are continuous functions.

6) The functions must be such that the upper bound is greater than its corresponding target and the target must be greater than its corresponding lower bound.

7) The trade targets must be consistent with the trade deficit. The trade deficit must lie between the total value of net trade at the lower and upper trade bounds.

$$P^W \underline{z}\,(P^W,K) < K < P^W \bar{z}(P^W,K)$$

where $\underline{z}$ is the vector of lower bounds for trade and $\bar{z}$ is the vector of upper bounds for trade and all other variables are as previously defined.

8) The stock and trade targets are such that the minimum domestic consumption is positive

$$\bar{w}(P^W,K) < \sum_j y^j_{t-1} + w_{t-1} + \underline{z}(P^W,K)$$

where $\bar{w}$ is the upper bound for stocks.

5.1.2 Policy variables, targets and bounds

In the current version of the BLS, there are five implicit policy instruments, three of these are commodity policies - domestic prices, net trade volume, stock levels - and two are financial - taxes and balance of trade. For each of these instruments, a lower bound, target and an upper bound need to be set, as shown below.

TABLE 5.0 POLICY INSTRUMENTS IN THE BASIC LINK SYSTEMS

	Lower Bound	Target	Upper Bound	
Stocks	$\underline{W}$	$\bar{W}$	$\bar{\bar{W}}$	
Price	$\underline{P}$	$\bar{P}$	$\bar{\bar{P}}$	
Trade	$\underline{E}$	$\bar{E}$	$\bar{\bar{E}}$	Commodity
Balance of Trade	$\underline{K}$	$\bar{K}$	$\bar{\bar{K}}$	Financial
Taxes	$\underline{\Phi}$	$\hat{\Phi}$	$\bar{\bar{\Phi}}$	

For each country, the policy block includes values for those 15 variables either as constants, actuals, or as some function of other variables (e.g. P^W). In order to establish realistic values for these 15 parameters, a procedure is needed to specify the agricultural policies according to the model instruments, such as supply control, import tariffs, etc., their priority ranking and the values of the policy targets and bounds in the BLS.

To explain how this approach is implemented, we take the example of a set of policies for a single commodity - for example, wheat. We specify targets and bounds for the price as well as the net exports, as illustrated in Figure 3. The government would like the price to have value P and exports to have value E, but it wants at any rate price and export combinations to be within the quadrilled region. However, it further restricts the outcome to the heavy line in Figure 4 (X for price, Y for net exports), where, for example, in (b), the price should be on target as long as net export is within bounds, and should not be above target when the net export is at its upper bound and not below target when the net export is at its lower bound.

Figure 4, (a), (b) and (c), describes in a general way alternative adjustment rules. Again, the heavy line describes the set of outcomes which are assumed to be acceptable to the government.

Policy variable priority ranking is important to correctly represent the application of policy instruments used by policymakers. The following section provides four examples of policy ranking:

(i) Price ⟶ Trade
(ii) Trade ⟶ Price
(iii) Stocks ⟶ Price
(iv) Price ⟶ Stocks

These examples illustrate the considerations involved in policy variable ranking.

(i) Price ⟶ Trade

For this ranking of policy variables the domestic policymaker is assumed to have both a price and a trade policy; however, the price policy is more important than the trade policy. In other words, he is willing to increase imports or to give up a portion of the export market to keep the domestic price at its target level. Therefore, the price target is maintained while the trade varies from its target until one of the trade bounds is hit. Then the price is allowed to vary from its target. One example is that the domestic price target is equal to the world price and trade is allowed to vary. In Figure 5, when the world price is WP_1, then the domestic price would be DP_1, and NT_1 would be traded. Now if the world price changed to WP_2, then the domestic price would also be DP_2.

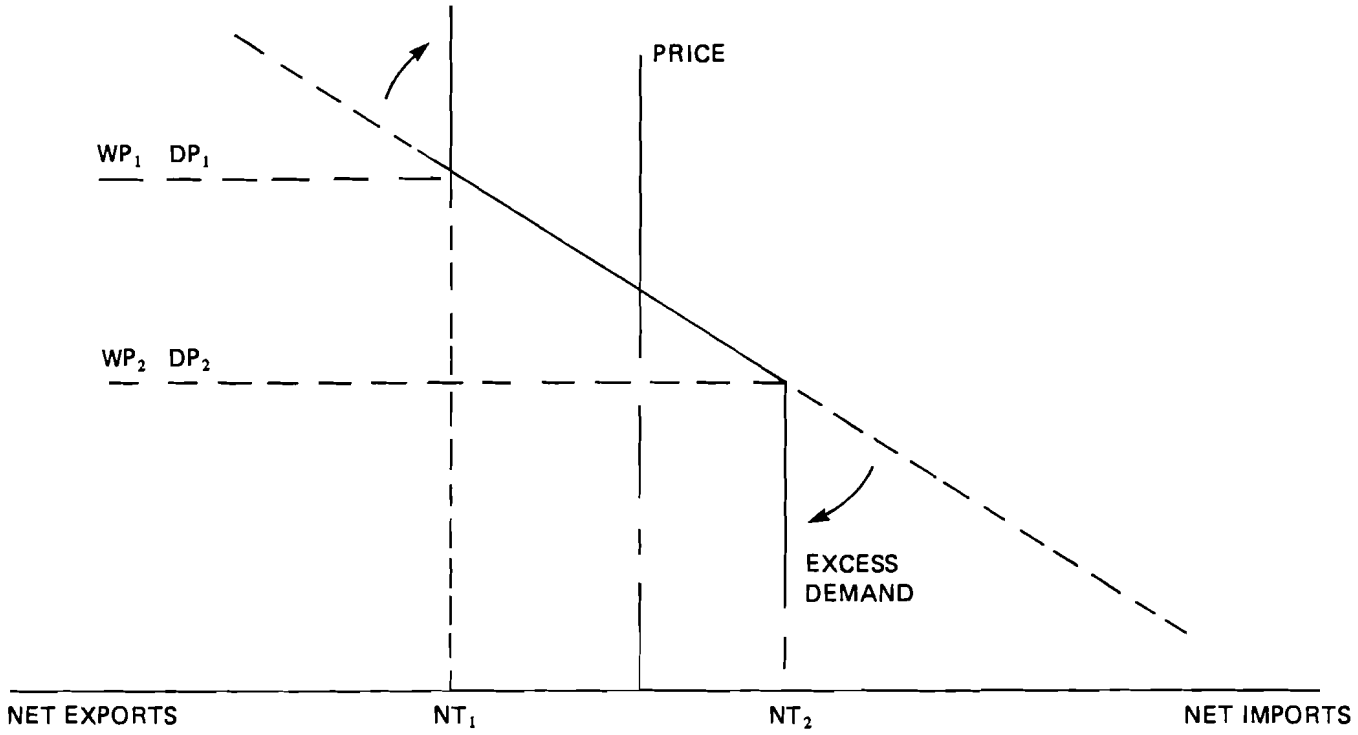

FIGURE 5: EXCESS DEMAND FUNCTION FOR PRICE – ⇒ TRADE

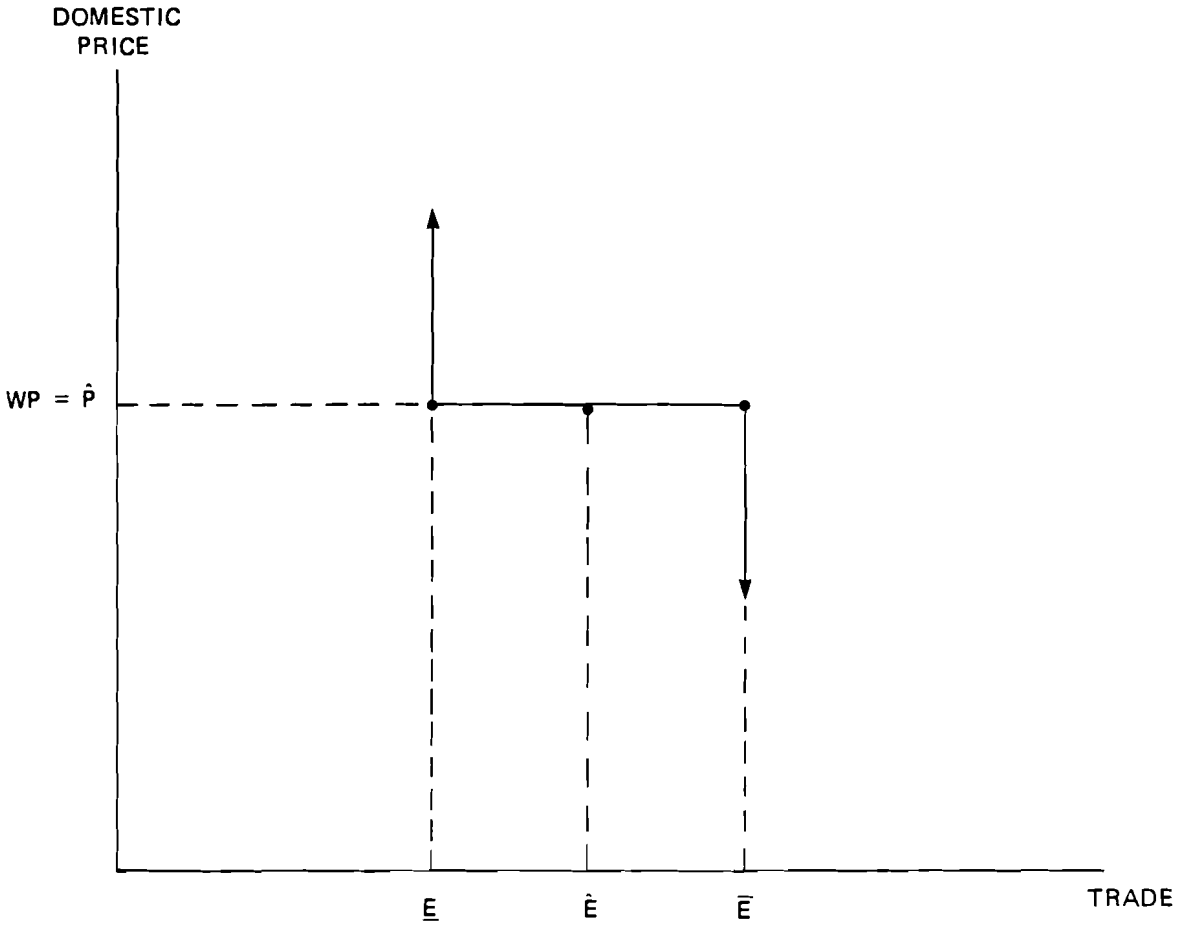

FIGURE 6: PRICE – ⇒ TRADE POLICY RANKING

If we assume that the price target P is always equal to the world price WP then we can examine this in policy space. Notice that we are graphing domestic price and trade given a world price. For this world price the domestic price target is at P. Suppose that the government also set a net trade target of $\hat{E}$ and net trade bounds of $\underline{E}$ and $\bar{E}$ as shown in figure 6. Also suppose that $\underline{E}$ in figure 8 is equal to NT_1 in figure 5 and $\bar{E}$ is equal to NT_2. As long as trade is between NT_1 ($\underline{E}$) and NT_2 ($\bar{E}$) the domestic price will be equal to the world price. However, when the net trade hits NT_1 or $\underline{E}$ then the domestic price will deviate from the world price to keep trade from going below $\underline{E}$.

(ii) Trade ⟶ Price

This ranking of policy variables assumes that the policymaker ranks maintaining a particular volume of trade more important than domestic price. This might be the case for example when a country tries to keep its share of the export market. To do this, trade is kept equal to its target by letting the domestic price vary from its target.

As shown in Figure 7, when the world price is WP, then without intervention domestic price equals WP and NT_1 would be exported. With intervention, the domestic price would have to be raised to DP_1.

The policy diagrams for this policy ranking would be as shown in Figure 8.

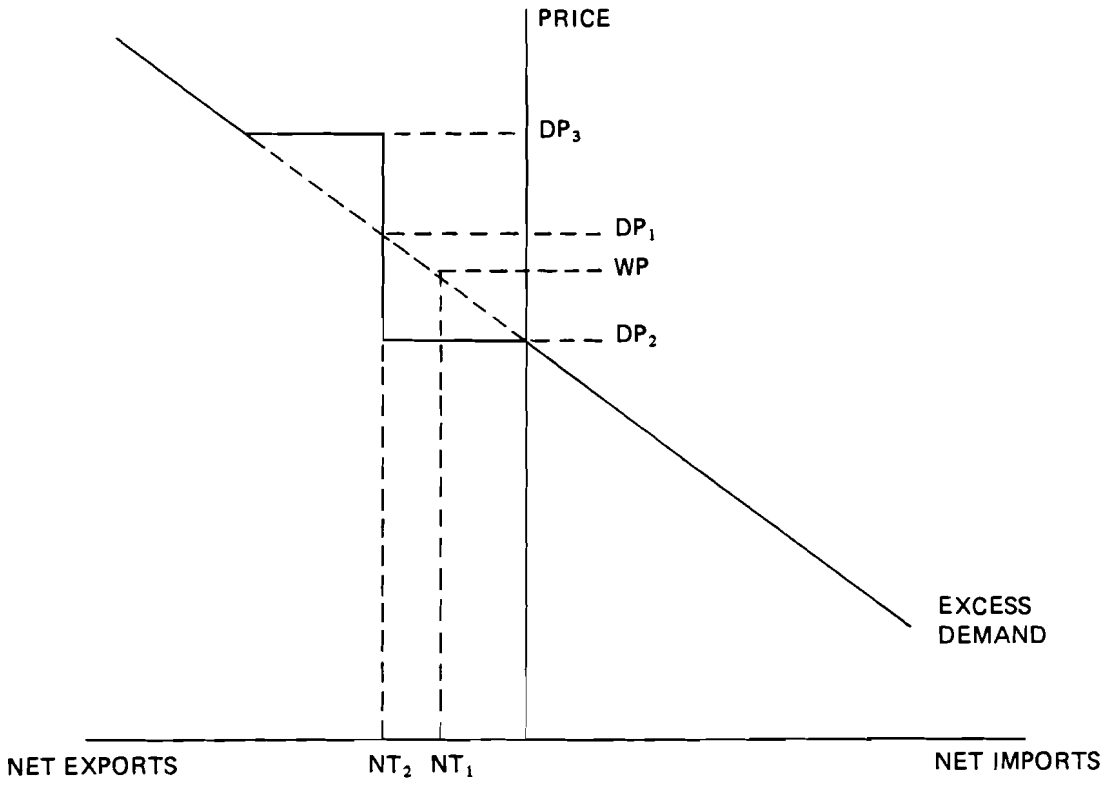

FIGURE 7: EXCESS DEMAND FUNCTION FOR TRADE – ⇒ PRICE

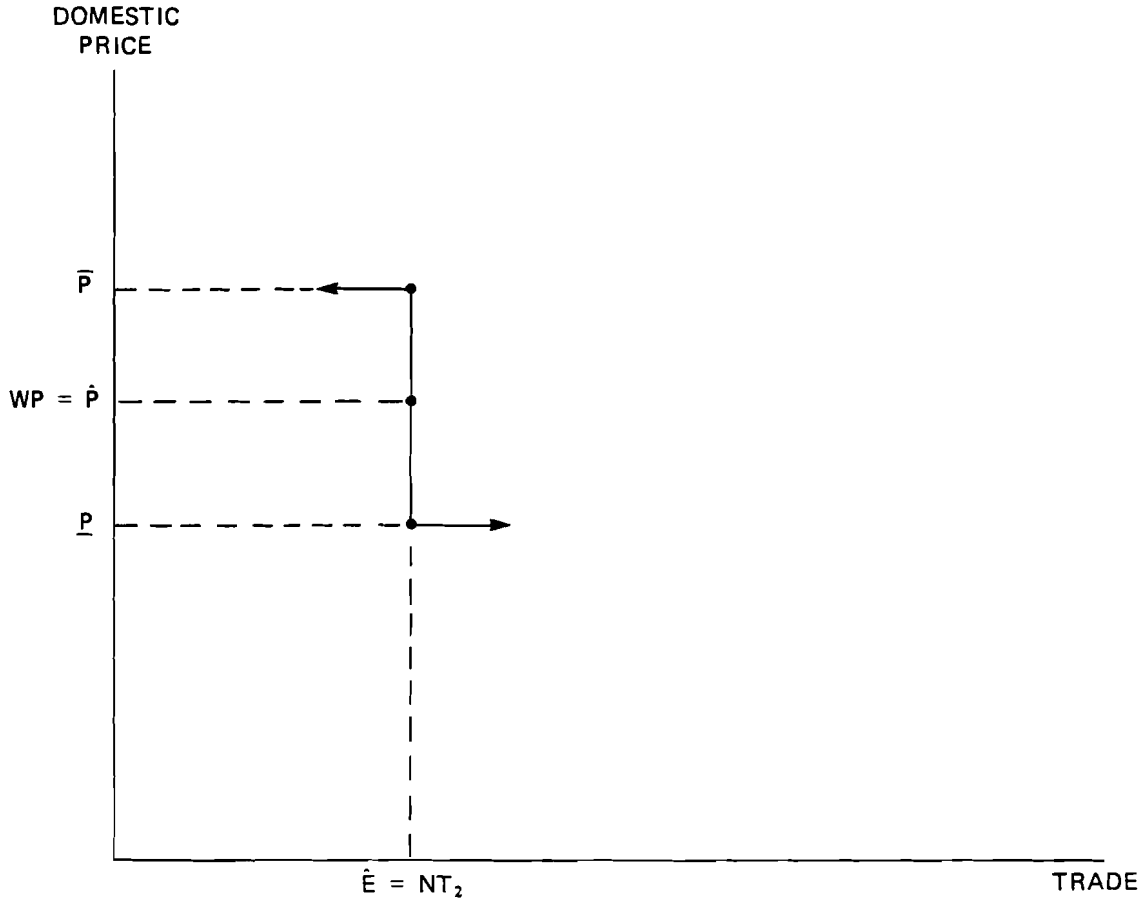

FIGURE 8: TRADE – ⇒ PRICE POLICY RANKING

Suppose P = WP and $\bar{P}$ = 1½*WP and suppose WP falls low enough that P DP_2. In other words the government would have to set the domestic price outside the bounds for price to maintain the trade target. It then lets the quantity traded adjust.

(iii) Stocks - ➡ Price

This ranking of policy variables assumes that the public stock target is more important than price. The domestic price (DP) will be allowed to vary from its target so as to keep the stock level at its target. This might be the case if a country wanted to maintain some emergency stocks of food.

(iv) Price - ➡ Stocks

For this ranking of policy variables the domestic policymaker is assumed to have both a price target and a stock target; however, the price target is more important. Therefore the price target is met while the stocks vary from their target until one of the stock bounds is hit. Then the price is allowed to vary from its target.

In three dimensions, the above rankings can be drawn as in Figures 9, and 10. Figure 11 shows the default ranking in the current BLS.

5.1.3 Examples of Policy Situations

The following examples show how the ranking and use of policy instruments would occur for different policy scenarios:

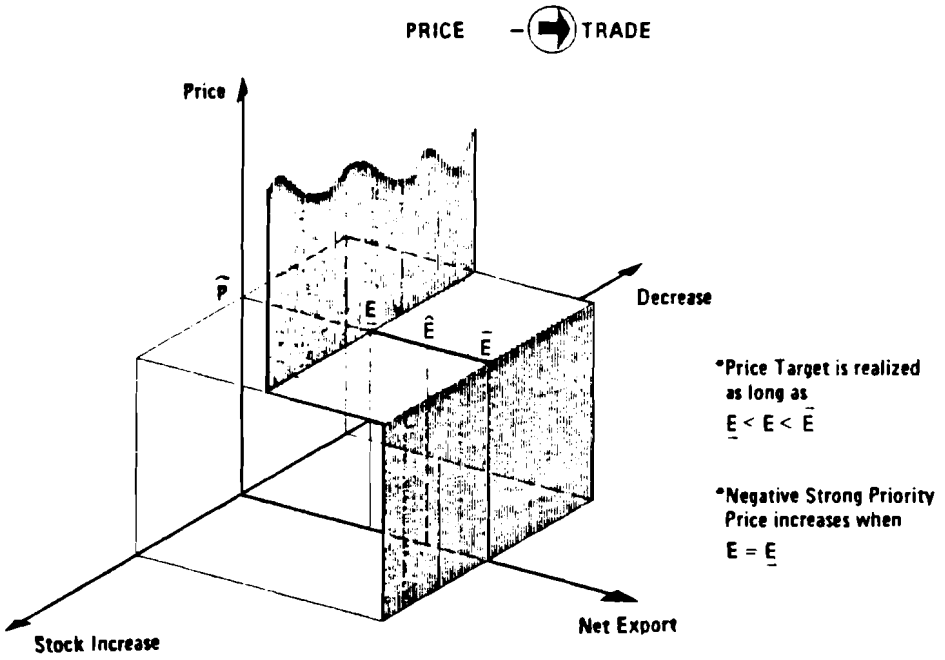

FIGURE 9: PRICE HAS A NEGATIVE STRONG PRIORITY OVER TRADE

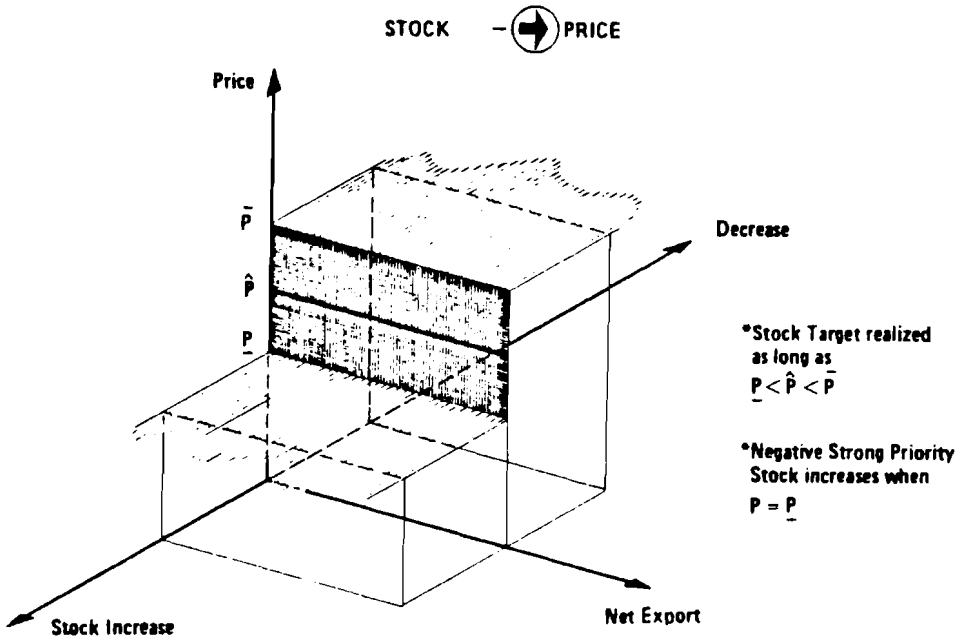

FIGURE 10: STOCK HAS A NEGATIVE STRONG PRIORITY OVER PRICE

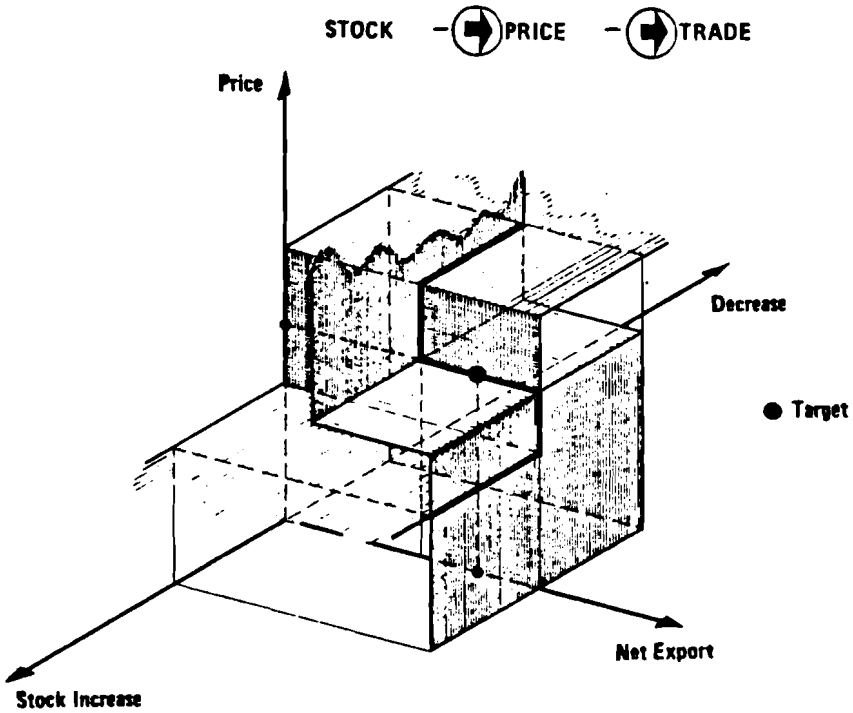

FIGURE 11: PRICE, STOCK AND TRADE POLICY

(i) Free Trade
(ii) Tariffs
(iii) Import Quotas

(i) Free Trade

For the operation of the BLS, each country model can be considered as a homogeneous excess demand function. When the international exchange calculates a set of world prices, the country model must translate this into an internal equilibrium, i.e., quantity consumed, change in stocks, and net trade . The net trade of each good is required by the international exchange (Figure 12). This can be depicted from the policy space as shown in Figure 13. In the free trade case, the only allowable combination of domestic price and net trade lies on a price line such that the domestic price is equal to the world price and any quantity may be traded.

(ii) Tariff

The above policy can be modified so that the home country imposes an ad valorem tariff (t) on imports and a subsidy on exports.

$$DP = (1 + t)WP \qquad (4)$$

Without the tariff, the excess demand would be ED_1. With the tariff, it shifts to ED_2. If the world price is at WP_1 then the quantity imported will be NT_1 and the domestic price is DP_1. Alternatively if the world price is WP_2, then the quantity exported will be NT_2 and the domestic price DP_2 (Figure 14).

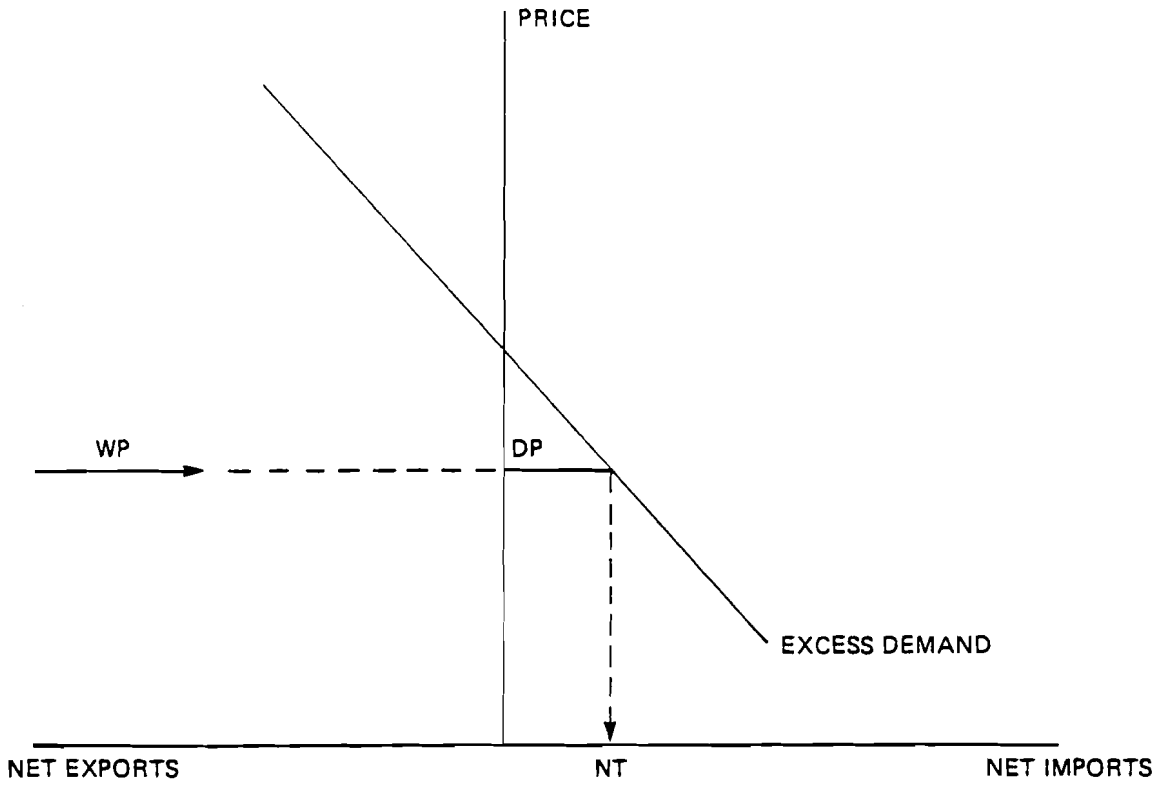

FIGURE 12: EXCESS DEMAND FUNCTION FOR A FREE TRADE POLICY

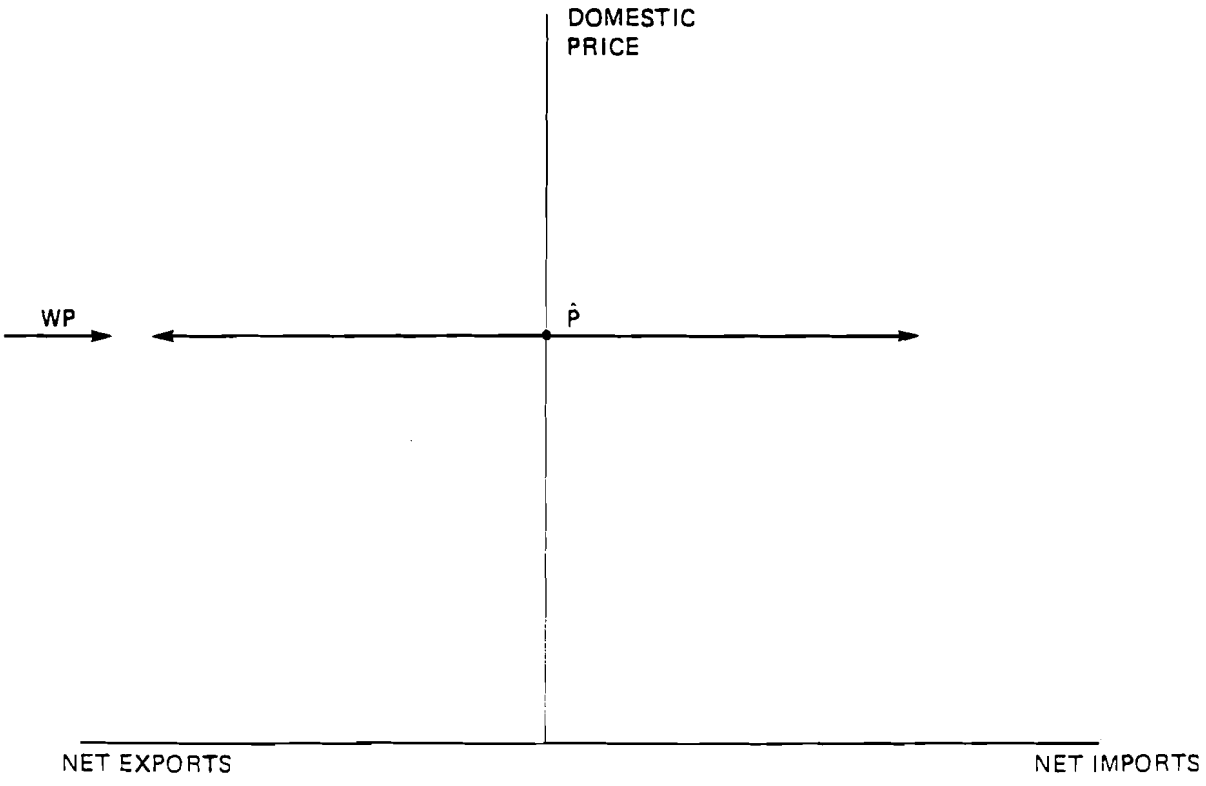

FIGURE 13: FREE TRADE POLICY RANKING

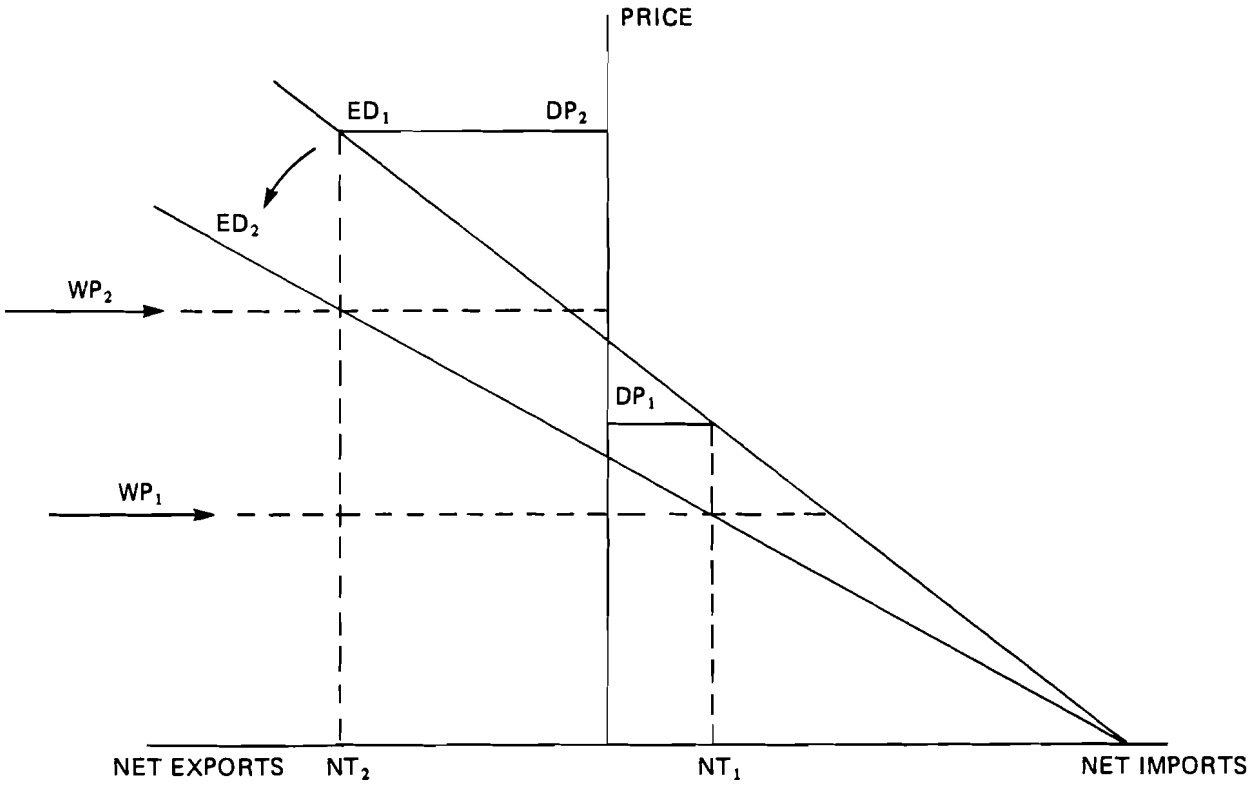

FIGURE 14: EXCESS DEMAND FUNCTION WITH A TARIFF

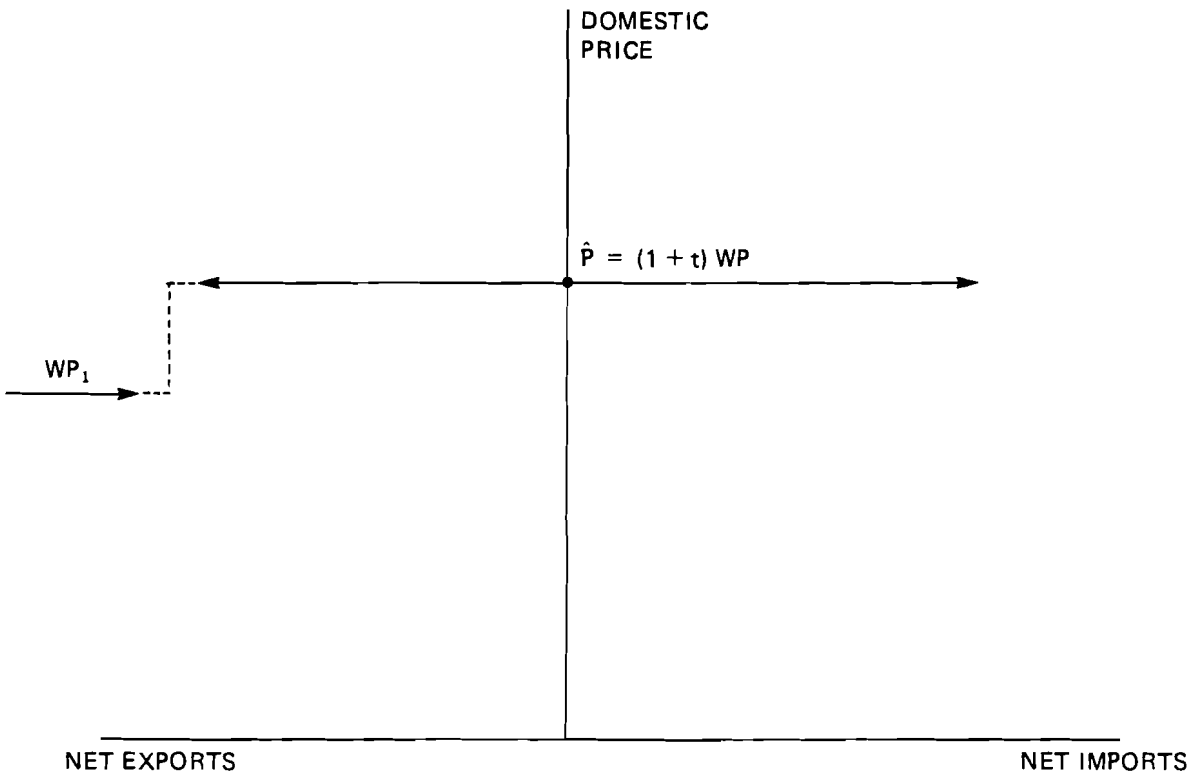

FIGURE 15: POLICY RANKING WITH A TARIFF

The allowable combinations of domestic price and net trade lie on a line which is (1 + t)WP and any quantity may be traded.

This does not mean that the domestic price is held at a fixed level but rather equals (1 + t)WP (Figure 15).

(iii) Import Quota

If the home country introduces an import quota, this can be pictured in the excess demand diagram (Figure 16). Before the quota, the excess demand was ED_2. The import quota effectively puts a kink in the import side, to ED_2. If the world price were at WP_1, the import quota would not be binding and the quantity imported would be NT_1 and the domestic price would be DP_1. If, however, the world price declined to WP_2, then the quantity imported would be NT_2, the maximum quantity allowed and the domestic price be DP_2. This can be represented in the policy space as shown in Figure 17. In other words, the only allowable combination of domestic price and quantity traded lies on the line shown in Figure 17. The domestic price will be equal to the world price unless the resulting volume of imports would exceed the quota, i.e., to lie on the dotted line. In this case, the imports would be constrained and the domestic price would rise above the world price.

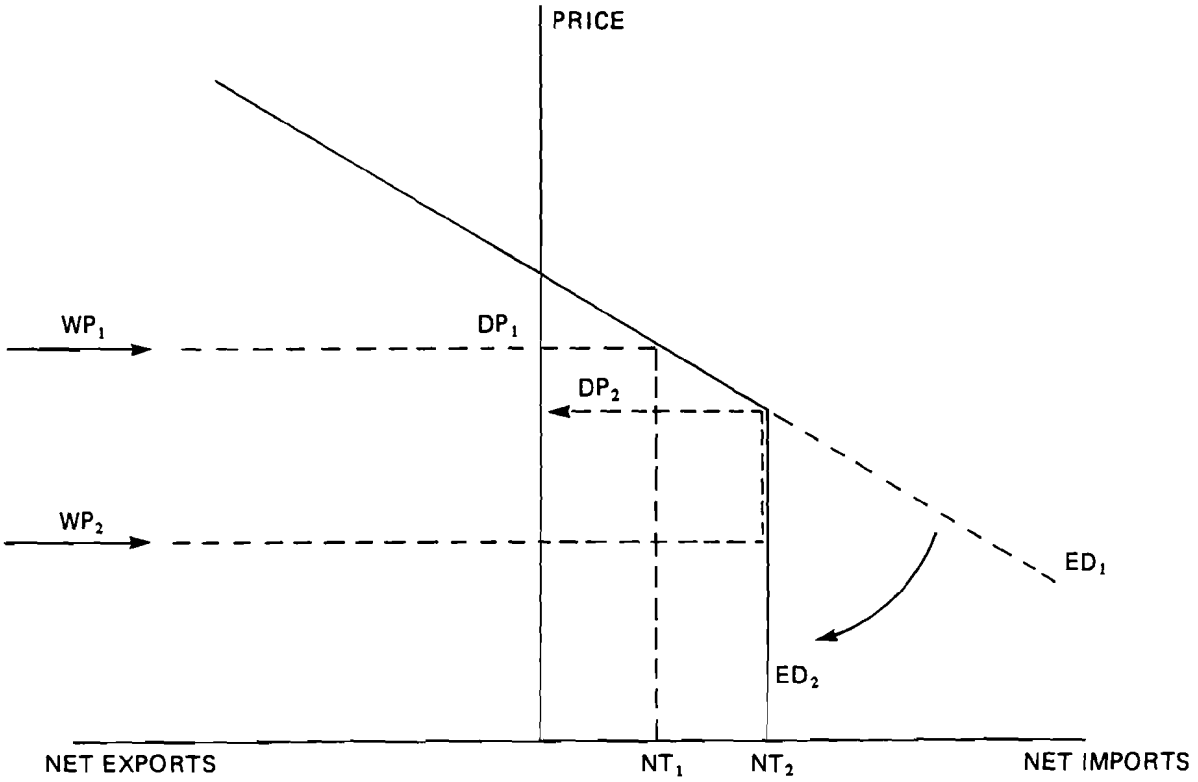

FIGURE 16: EXCESS DEMAND FUNCTION WITH AN IMPORT QUOTA

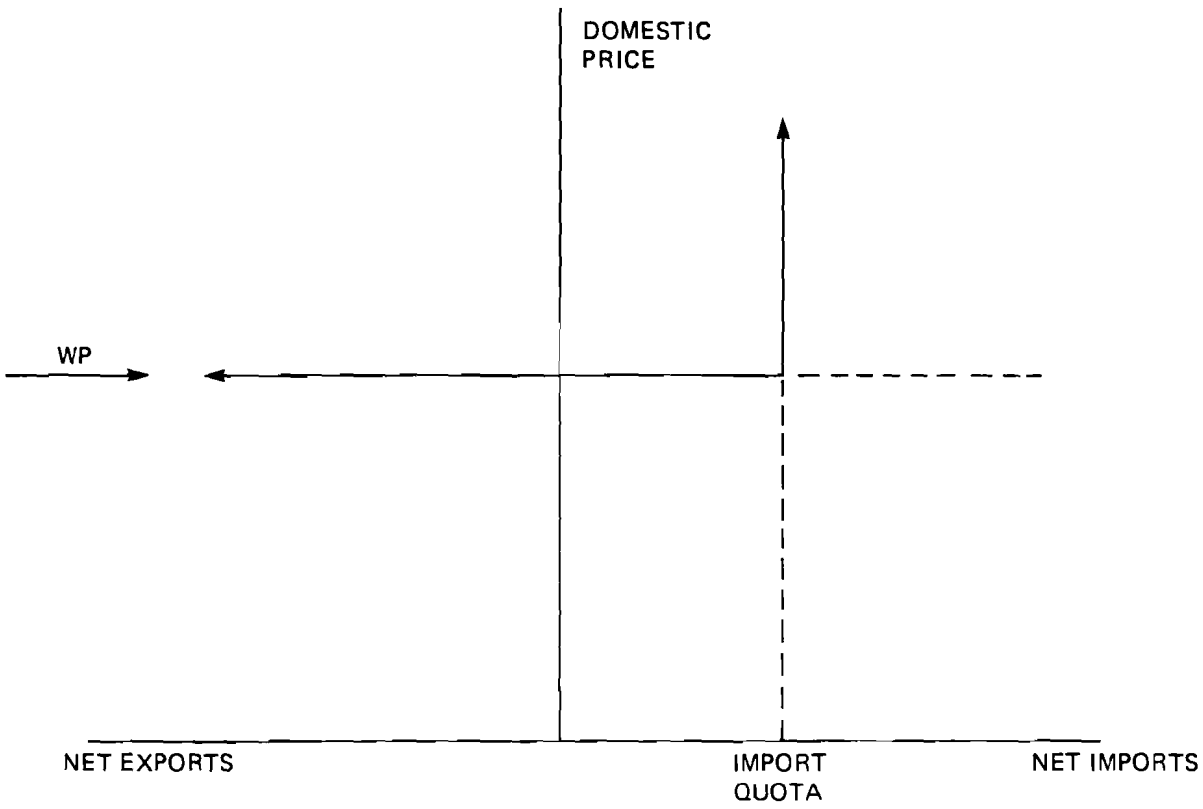

FIGURE 17: POLICY RANKING WITH AN IMPORT QUOTA

Figure 18 combines Figures 16 and 17. The dotted and continuous lines are the policy set (the admissible set of domestic price and trade values given a world price). This policy set may change as a function of the world price (i.e. as WP_1 drops to WP_2). If the world price were at WP_1 and there were no policy intervention, then the domestic price would be WP_1 and NT_1 would be traded. If the world price were at WP_2, the domestic price would also be WP_2. However, if there were an import quota, the domestic price would be DP_2 and NT_2 would be traded.

Figure 19 presents the case where there is an import quota and in addition a domestic buffer stock agency. Suppose that the world price is WP_1 then without intervention NT_1 would be traded and the domestic price would be DP_1. Suppose that the import quota would not allow more than NT_2 to be imported. In this case the domestic price would be DP^2 and NT_2 would be imported.

If there was in addition a domestic buffer stock agency which wanted to buy Q units of product this would shift the ED curve out to ED_1. In this case the domestic price would rise to DP_3.

In policy space, suppose the stock target $\hat{W} = Q$ and the trade target was $\hat{E} = \bar{E} = NT_2$ and $\hat{P} = WP$. Suppose the world price WP_1 so that all the targets are met. If the world market price falls to WP_1 then without intervention the quantity imported would be greater than NT_2 so the next variable to adjust is price, the domestic price rises to $\bar{P}$ (if one exists). At $\bar{P}$ the stock target can no longer be met.

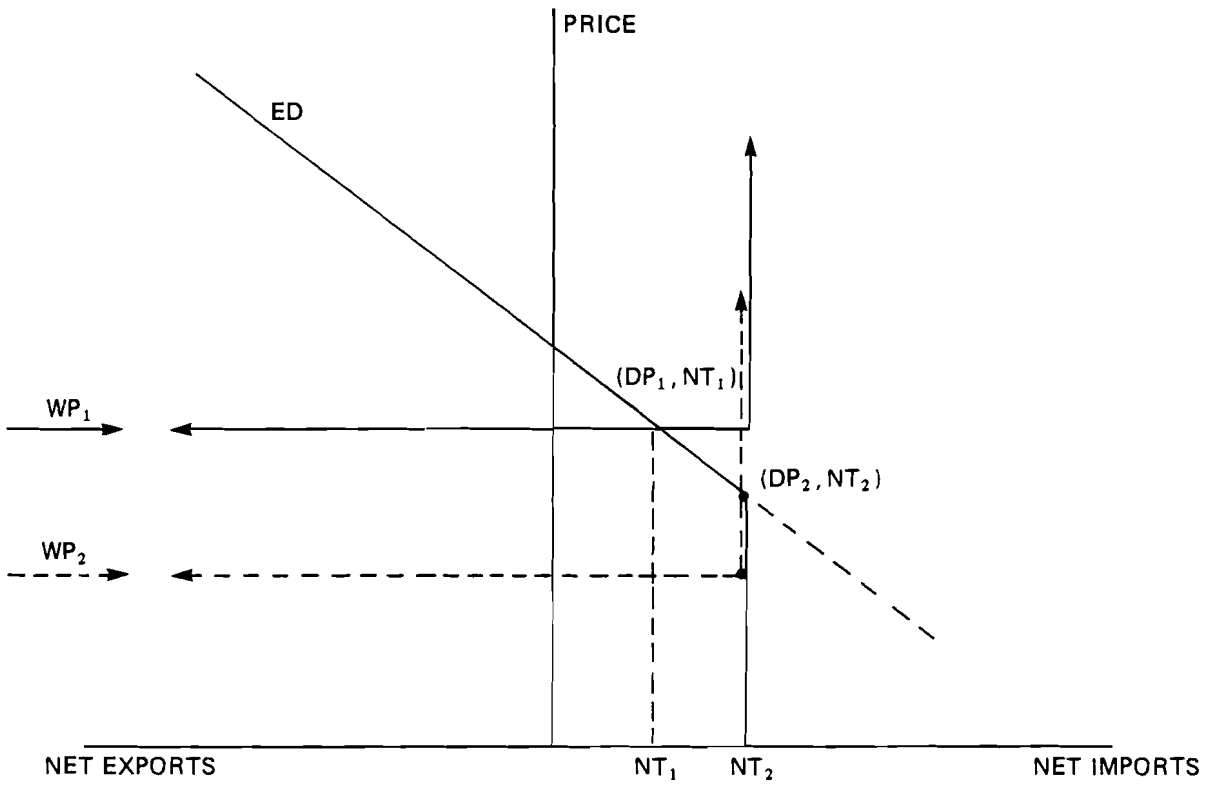

FIGURE 18: ILLUSTRATION OF TRADE QUOTAS

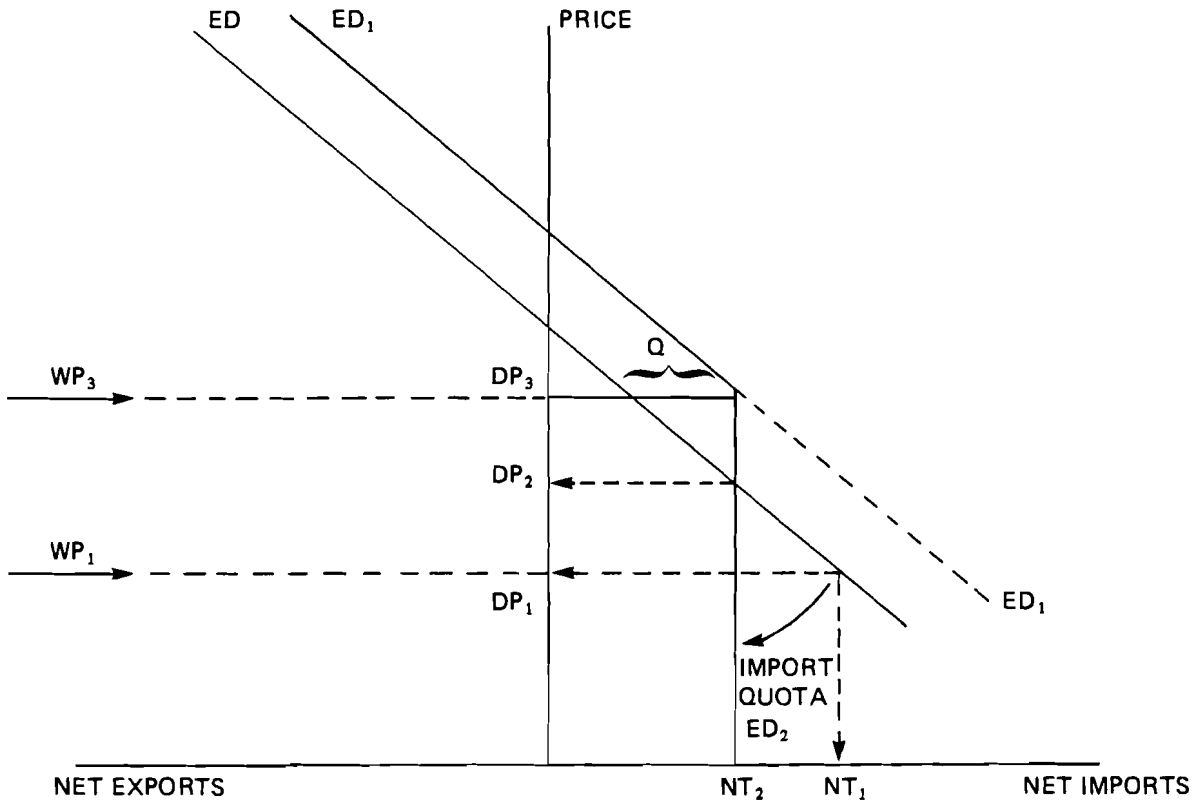

FIGURE 19: EXCESS DEMAND FUNCTION WITH IMPORT QUOTA AND STOCKS

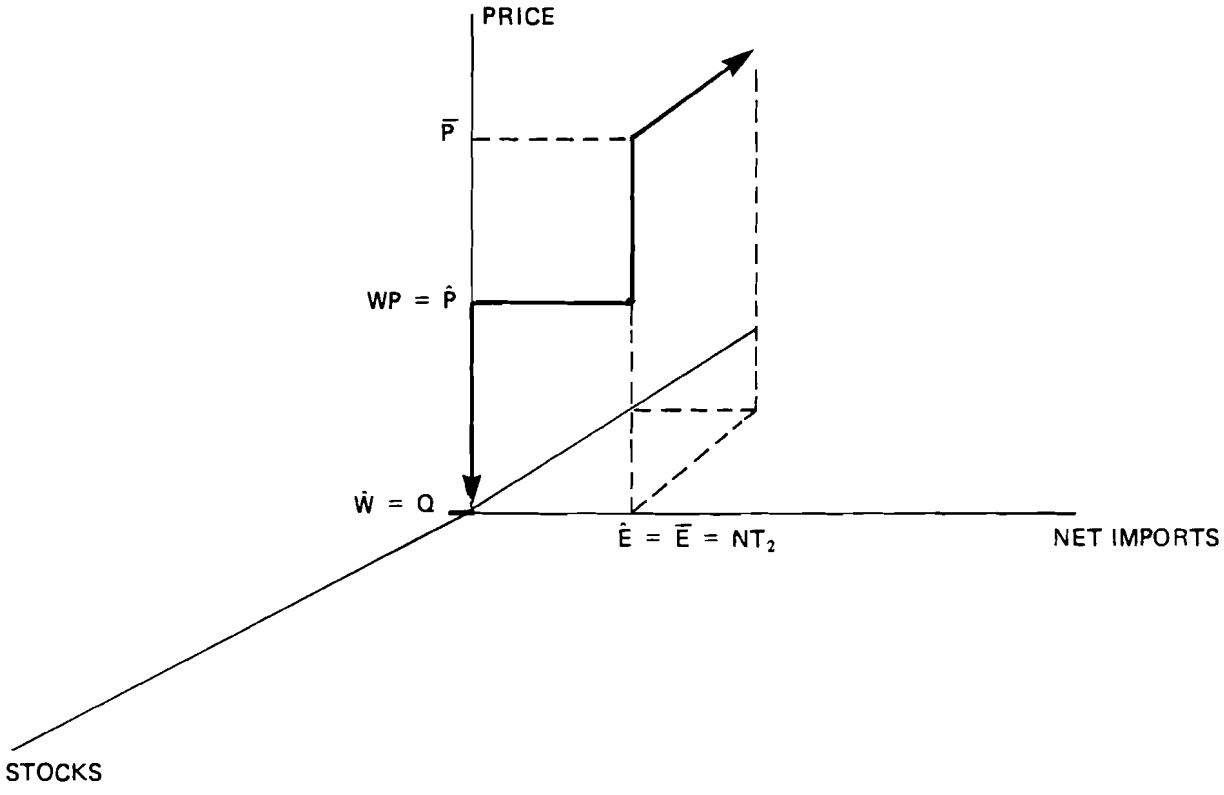

FIGURE 20: POLICY RANKING: STOCKS – (⇒) PRICE – (⇒) TRADE

Figure 21 combines Figures 19 and 20. Suppose the world price was at WP then without intervention the net imports would be larger than the import quota therefore the price rises. The excess demand surface intersects the allowable policy settings at (NT, P W) and these will be the values for imports, domestic price and stocks.

5.2 Specification of Parameters for the Policy Instruments for Canada

This section describes the rationale and the relationships used to establish the target and bounds for the policy parameters in the BLS. These values are required for the operation of the exchange (demand and price equlibrium) module. In addition, there are policies affecting the supply module which are explained in the last part of this section. Each of the ten commodities in the BLS are covered.

Where consumer subsidies exist, the farm-retail margin (i.e, difference between raw material farm and retail prices) is reduced by this amount.

5.2.1 Rice, other food, nonfood agriculture and nonagriculture (free trade)

Rice, other agriculture, nonfood agriculture and nonagriculture should all be represented with a general "free trade" model.

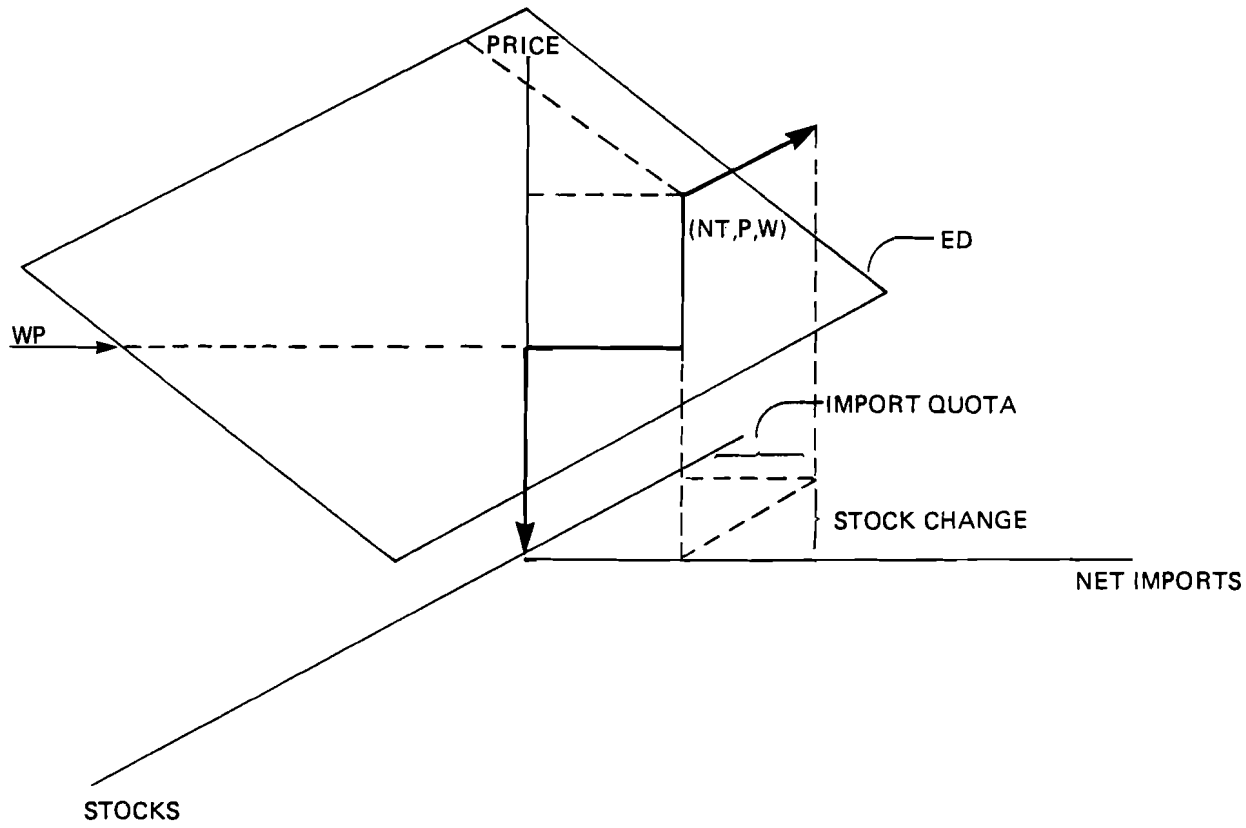

FIGURE 21: POLICY RANKING AND EXCESS DEMAND FUNCTIONS FOR: STOCKS – ⊜ PRICE – ⊜ TRADE

The trade target ($\hat{E}$) is set equal to last year's net exports. There are relatively wide bounds on trade ($\underline{E}$ and $\bar{E}$) for rice, the net exports minimum can be set at -5 times last year's consumption. For the other two commodities mentioned above, the minium net exports ($\underline{E}$) can be set equal to a percentage of domestic production. Therefore, as domestic production rises, the lower bound on net exports rises (in other words, the import quota tightens). For all of these commodities, the net export maximum or upper bound ($\bar{E}$) can also be set as a function of domestic production essentially to represent nontradable goods.

The price target ($\hat{P}$) can be specified as a function of the world price and the trade deficit. The minimum ($\underline{P}$) and maximum ($\bar{P}$) can be set equal to some proportions of the target. (For exammple, min 0.5 x $\hat{P}$, max 2 x $\hat{P}$ current defaults for the BLS). The price target is only released if the trade bounds are constraining. The stock level targets ($\hat{W}$) and bounds ($\underline{W}$ and $\bar{W}$) should be set equal to zero, thereby effectively removing stock behaviour from the policy options.

Beginning at the target, the quantity trade is allowed to vary over a wide range. For any given world price (WP), the domestic price is a function of the world price (for example (1 + t)WP).

TABLE 5.1 VALUES FOR POLICY INSTRUMENTS FOR RICE, OTHER FOOD, NONFOOD AGRICULTURE, NONAGRICULTURE (free trade)[1]

	Lower Bound	Target	Upper Bound
Stocks	$\underline{W} = 0$	$\bar{W} = 0$	$\bar{W} = 0$
Price	$\underline{P} = 0.5\bar{P}$	$\bar{P} = f(WP,K)$	$\bar{P} = 2\bar{P}$
	rice = $-5\ C_{t-1}$		
Trade	$\underline{E}$	$\bar{E} = E_{t-1}$	$\bar{E} = 0.8$ prod.
	nonagr = -0.2 prod.		
	Other food = -0.2 prod.		

[1]The actual implementation in the computer program of these policy bounds may be slightly different than indicated here. For example since production is determined when the exchange module is entered trade bounds are implemented as consumptilon bounds.

5.2.2 Bovine and ovine meats (tariff and import quota)

In this sector the trade target ($\bar{E}$) can be see at last year's net exports. The upper bound or constraint on trade ($\bar{E}$) is fairly high and is set equal to a function of domestic production. However, in this case the minimum net exports ($\underline{E}$) maximum net imports) is set fairly tight but also a function of domestic production. The import quota for beef is actually calculated using a countercyclical formula. The price target ($\bar{P}$) is specified as a function of world price and the trade deficit. The minimum and maximum bounds ($\underline{P}$,$\bar{P}$) are represented as a proportion of the target price. Stock targets (W) and bounds ($\underline{W}$,$\bar{W}$) are set equal but to a small number.

TABLE 5.2 VALUE OF POLICY INSTRUMENTS FOR BOVINE AND OVINE MEATS (tariff and import quota)

	Lower Bound	Target	Upper Bound
Stocks	$\underline{W} = \bar{W}$	$\hat{W}$ = small #	$\bar{W} = \hat{W}$
Price	$\underline{P} = 0.5\bar{P}$	$\hat{P} = f(WP,K)$	$\bar{P} = 2\bar{P}$
Trade	$\underline{E}$ = a + b prod. (import quota)	$\hat{E} = E_{t-1}$	$\bar{E}$ = .5 prod.

5.2.3. Other meats (pork, poultry and eggs, fish)

There are several possible specifications for this sector. The reason for the indecision is the divergence of policies for this sector. The pork sector can basically be represented in the same way as bovine and ovine meats; however, the poultry and eggs sector are subject to production quotas, formula pricing and import quotas. In general, the pork and fish sectors are allowed to trade freely with the rest of the world whereas the poultry and egg sectors are very controlled.

The proposed specification is the same as for bovine and ovine meats, since the trade in pork dominates trade in poultry and eggs. The trade target ($\hat{E}$) should be set equal to the trade last year. The upper bound ($\bar{E}$) should be set relatively close to the target as a function of lagged stocks and production. The lagged stocks term allows all of last year's stock to be traded. The lower bound also can be formulated as a function of production.

The price target ($\bar{P}$) is a function of world price, trade deficit, price of coarse grain lagged and the price of nonagriculture lagged. The latter two prices represent a cost of production pricing formula. Again, the price bounds ($\underline{P}$,$\bar{P}$) are equal to proportions of the target. The stock level target $\bar{W}$ and lower bound ($\underline{W}$) would be set equal to zero and the maximum ($\bar{W}$) set at a capacity constraint

TABLE 5.3 VALUE OF POLICY INSTRUMENTS FOR OTHER MEATS

	Lower Bound	Target	Upper Bound
Stocks	$\underline{W} = 0$	$\bar{W} = 0$	$\bar{W}$ = capacity
Price	$\underline{P} = 0.5\bar{P}$	$\bar{P} = f(WP, K,$ cost of prod.)	$\bar{P} = 2\bar{P}$
Trade	$\underline{E} = a + b$ prod.	$\bar{E} = E_{t-1}$	$\bar{E} = W_{t-1} + B$ prod.

Dairy

5.2.4

This sector of Canadian Agriculture is largely controlled by the Canadian Dairy Commission (CDC). The policies relating to prices, stocks and trade may be relatively well defined, but they are not easily translated into the structure of the BLS. In some cases, decisions are made by the CDC on an ongoing basis and one can only speculate which type of stock or trade policy would be adopted for any given situation.

The trade target ($\tilde{E}$) can be set at last year's trade. The lower bound ($\underline{E}$) is a cheese import quota and the upper bound ($\bar{E}$) can be set at last year's stock level level plus a proportion of production. The price target ($\tilde{P}$) is a function of the price of coarse grain lagged and the price of nonagriculture lagged to represent a cost of production. The upper and lower bounds ($\underline{P}$ and $\bar{P}$) can be proportions of the target. The stock level target ($\tilde{W}$) and lower bound ($\underline{W}$) should be set equal to zero and the upper bound ($\bar{W}$) represents a storage capacity.

TABLE 5.4 VALUE OF POLICY INSTRUMENTS FOR DAIRY

	Lower Bound	Target	Upper Bound
Stocks	$\underline{W} = 0$	$\tilde{W} = 0$	$\bar{W}$ = capacity
Price	$\underline{P} = 0.5\ \tilde{P}$	$\tilde{P}$ = f(cost of prod.)	$\bar{P} = 2\tilde{P}$
Trade	$\underline{E}$ = cheese quota	$\tilde{E} = E_{t-1}$	$\bar{E} = W_{t-1}$ + B prod.

5.2.5 Wheat, coarse grain and oilseeds

This sector is largely controlled by the Canadian Wheat Board, since the board is responsible for imports and exports of most grains.

The trade target ($\hat{E}$) can be set at last year's trade. The upper bound ($\bar{E}$) is a total capacity constraint for transportation and storage of grain to be allocated among the three commodities. The lower bound ($\underline{E}$) for oilseeds is 5 times production. The lower bound for both wheat and coarse grains can be a function of production. This is used to represent a market share idea. The price target ($\hat{P}$) should be a function of the world price and the trade deficit. If price does vary (i.e., if trade bounds are constraining) then it should be allowed to vary from 0.2 $\hat{P}$ to 5 $\hat{P}$. The stock targets ($\hat{W}$) are probably last year's stocks (or pipeline supplies). The minimum bounds ($\underline{W}$) are a proportion of production. The stock upper bound ($\bar{W}$) is also a maximum storage constraint and should be allocated between the three commodities.

TABLE 5.5 VALUE OF POLICY INSTRUMENTS FOR WHEAT, COARSE GRAINS, OILSEEDS

	Lower Bound	Target	Upper Bound
Stocks	$\underline{W}$ = B prod.	$\hat{W} = W_{t-1}$	$\overline{W}$ = total grain storage capacity[a]
Price	$\underline{P} = 0.2\hat{P}$ (wheat, coarse grain)	$\hat{P} = f(WP,K)$	$\overline{P} = 5*\hat{P}$
Trade	$\underline{E}$ = -.2 prod (coarse grains)		
	$\underline{E}$ = - 5 prod. (oilseeds)	$\hat{E} = E_{t-1}$	$\overline{E}$ = total handling and transportation capacity[a]

[a] Separate capacity levels are specified for each commodity, with their sum being the total for the system.

6. THE BLS POLICY MODULE

6.1 Model Specification

Because of a lack of detailed information to specify the policy parameters for all countries in the BLS, for those policy instruments defined above, a simplified approach was adopted. Since the target for trade is only used as a starting value for the solution algorithms and in general the trade bounds are fairly wide, the BLS specification for the policy module for Canada will involve essentially a set of price transmission equations. This policy reaction function concented on the price variable. Thus, for operation of the BLS, trade was allowed to move freely (bounds were very wide) and price was held to the target described below.

The approach used follows that of Abbott (1979), Meilke and Griffith (1983), and Lattimore and Schuh (1979). This approach was to define and quantify the major policy performance variables which decision-makers observe and respond to by introducing policies affecting the size of the wedge between domestic and international commodity prices.

Two ratios were incorporated in the functional specification to approximate policy reactions. The first was a parity ratio between agricultural and nonagricultural sectors. The second was a self-sufficiency ratio. It was expected that if either of these ratios declined, policy makers would modify policies to increase agricultural prices.

Lagged prices were also used to account for the adjustment lag and possible variations in crop years reporting data. Policy makers may try to stabilize domestic prices which also may be incorporated in the lagged price coefficient.

All prices were expressed in real terms, deflated by the nonagricultural price. This was a requirement to satisfy the homogeneity conditions of the model solution algorithm. A Cobb-Douglas specification was used to simplify interpretation and it was expected that the relationships were nonlinear.

The general form of the equations is as follows:

$$\left(\frac{P_i}{e*PW_n}\right) = A*LAG\left(\frac{Pi}{e*PW_n}\right)^B * \left(\frac{e*PW_i}{e*PW_n}\right)^C *LAG\left(\frac{ZA}{ZNA}\right)^D *LAG\left(\frac{Y_i+1}{X_i}\right)^E \qquad (5)$$

where

A, B, C, D and E are coefficients to be estimated

P_i is the domestic price of the i-th commodity

PW_n is the world price of the nonagriculture commodity (used here as a deflator)

PW_i is the world price of the i-th commodity

ZA is per capita GDP for agriculture

ZNA is per capita GDP for nonagriculture

Y_i is production of the i-th commodity

X_i is disappearance of the i-th commodity

e is the exchange rate (Can/US Dollars)

Six variations of equation (5) were estimated. These included variations on constraints of coefficients, three year moving averages on parity and self-sufficiency ratios, and variations in the time period of estimation. There were some data problems for certain countries for 1975-76 as this was preliminary data from FAO. Therefore the models were estimated over both 1961-74 (Version 7-10) and 1961-76 (Versions 5-6).

For all variations, the coefficients were constrained as follows:

$$-1.0 \times 10^{10} \leq A \leq 1.0 \times 10^{10}$$
$$0.0 \leq B \leq 0.95$$
$$0.0 \leq C \leq 2.00$$
$$-5.0 \leq D \leq 0.00$$
$$-5.0 \leq E \leq 0.00$$

For Versions 6, 8 and 10, there was an additional constraint that B + C adds to 1.0. In other words the long run elasticity of response of domestic prices to world prices is constrained to be 1.0.

For versions 9 and 10, a three year moving average of parity ratio and self-sufficiency ratio is used. The constraints on the estimated coefficients reflect the a priori expectations of acceptable levels of results.

For a stable relationship, the coefficient on lagged prices must lie within the specified range. Acceptable coefficients for world prices (C) must be positive and for parity (D) and self-sufficiency (E) must be negative. All other values reflect maximum acceptable levels. The results of version 5 are shown in Table 6.1.

For wheat, the coefficient on the world market price is at its lower constraint, zero. This implies that the Canadian domestic wheat prices does not follow the world wheat price, which obviously is incorrect. Coarse grain, on the other hand, has an excessively large coefficient for the world price and the coefficient on the self-sufficiency term is at its lower constraint, zero. Bovine meat responds to all the

terms but also has a strong response to the income parity term. For dairy, again the coefficient on the world price is zero. Because of the pricing formula used, this could be acceptable. For dairy there are also coefficients on the income parity term and the self-sufficiency term. Results for other meats as an aggregate show a response to world prices and income parity. Protein feeds have significant coefficients only on the two price terms. For nonfood and nonagriculture all the terms are nonzero, but only the intercept is signficant.

Selections for each commodity of these policy reaction functions for actual use in the BLS were made from the six versions of equation (4) described above. These selections are shown in Table 6.2. The selections were based on R2, t values, a priori expectations and model simulation results.

For wheat, influence of current world prices is low (0.32), but with a high lagged effect (0.68). Similar results are shown for rice. Impact of world prices are higher for coarse grain, beef, other meats and protein feed. For dairy, self-sufficiency ratio is very important, but not world prices. For other food, world prices are important and the lagged price affect is strong. For non food agriculture, the lagged price affect is very high.

TABLE 6.1 ESTIMATED COEFFICIENTS FOR POLICY REACTION FUNCTION FOR CANADA (1961-76)

Commodity	A (T)	B (T)	C (T)	D (T)	E (T)	RBAR2	DW Stat
Wheat	0.3987	0.5646	0	0	-0.1438	0.310	1.857
	1.225	2.370	0	0	-0.4547		
Rice	0.6308	0.3629	0.2256	0	0	0.281	1.276
	2.176	1.442	1.180	0	0		
Coarse grains	13.47	0.1302e-01	1.999	-0.4865	0	0.440	1.613
	0.3810	0.2629e-01	1.584	-0.9804	0		
Beef	4.416	0.2928	0.6830	-0.2792	-1.917	0.822	2.105
	0.4590	1.460	3.523	-2.035	-0.6253		
Dairy	12.07	0.8986	0	-0.1580	-3.968	0.897	2.123
	1.284	7.937	0	-2.467	-4.041		
Other Meats	2.092	0	0.7019	-0.5866e	0	0.349	1.873
	3.038	0	2.685	-0.6087	0		
Protein Feed	1.993	0.7456	0.7855	0	0	0.645	1.384
	2.465	4.235	4.130	0	0		
Other Food	1.327	0.2103	0.4268	-0.6162e	-0.1948	0.363	2.018
	2.409	0.5372	1.384	-0.4941	-0.2741		
Non Food Agric.	1.178	0.2599	0.1620	-0.1547	-0.3802	0.753	1.846
	5.716	1.261	1.501	-1.847	-1.630		

See text for definition of coefficients.

TABLE 6.2 SELECTED PRICE POLICY REACTION FUNCTIONS FOR THE BLS: ESTIMATED PARAMETERS FOR CANADA

	Wheat	Rice	Coarse Grains	Beef	Dairy
A	1.032*	1.168*	0.912*	4.416	1.407
B	0.684*	.721*	.247	0.293	.949*
C	0.317	.289	.753	0.683*	.022
D	0.	0.	-0.077	-0.279*	-.006
E	-.040	0.	0.	-1.917	-.564
R	.11	.35	.39	.82	.87

	Other Meats	Protein Feed	Other Food	Non Food Agriculture
A	2.114*	1.261*	1.455*	1.074*
B	0.	0.740*	0.906	0.773*
C	0.688*	0.803*	0.580	0.227
D	-0.054	-0.850	-.019	-0.144
E	0	0	-0.187	-0.122
R	.37	.87	.41	.57

*Significantly different from zero at the one percent level of significance.

7. SUMMARY AND CONCLUSIONS

7.1 Summary

The examination of the commodity price data showed a number of discrepancies between data from IIASA (FAO) and Canadian sources. Of particular concern was the timing of the large price increases in grains and oilseeds in the early 1970's. Nevertheless, in all cases prices from Canadian sources were highly correlated with IIASA data for domestic and international prices, although the absolute level may have been different.

Canadian agriculture, while relatively open to international markets, has a number of policy instruments affecting trade. This is particularly important for dairy and other meats categories. Policy developments since the mid-1970's have been largely to protect producers against income instability and to expand trade for competitive products.

The use of a simple model (which included only prices) to relate domestic and world prices was not adequate in most cases to interpret the type of magnitude of the trade restraints for most Canadian commodities. It is apparent that a large number of forces-- economic, political and environmental--are influencing these price relationships.

The BLS structure includes explicit policy instruments for five major policy variables. For Canada, procedures were proposed to establish bounds and targets for each of the three commodity policy varibles for the 10 commodities. However, data limitations made it difficult to define these for use in the BLS.

The operational policy component for the BLS was a price linkage equation including world prices, lagged prices, a parity ratio and a self-sufficiency ratio, with all prices expressed in real terms. Various alternative specifications using different time periods, coefficient restrictions and moving averages of the ratios were evaluated for use in the BLS.

7.2 Conclusions

Insufficient attention has been given by IIASA to the accuracy of the data. This problem may return to overshadow the interpretation of the results from the FAP policy analysis.

Considerable detail is available on Canadian and other country agricultural policies, which could be included in the BLS model. Policy applications are the main "raison d'etre" for the development of the FAP model. The present policy component only takes this information into account in a very general manner. This will greatly restrict the quality and breadth of policy applications.

It is very important for those countries where sufficient policy data are available that this information be incorporated in the detailed policy instrument in the BLS. The default policy block should only be used for those countries where limited information on agricultural policies exist.

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