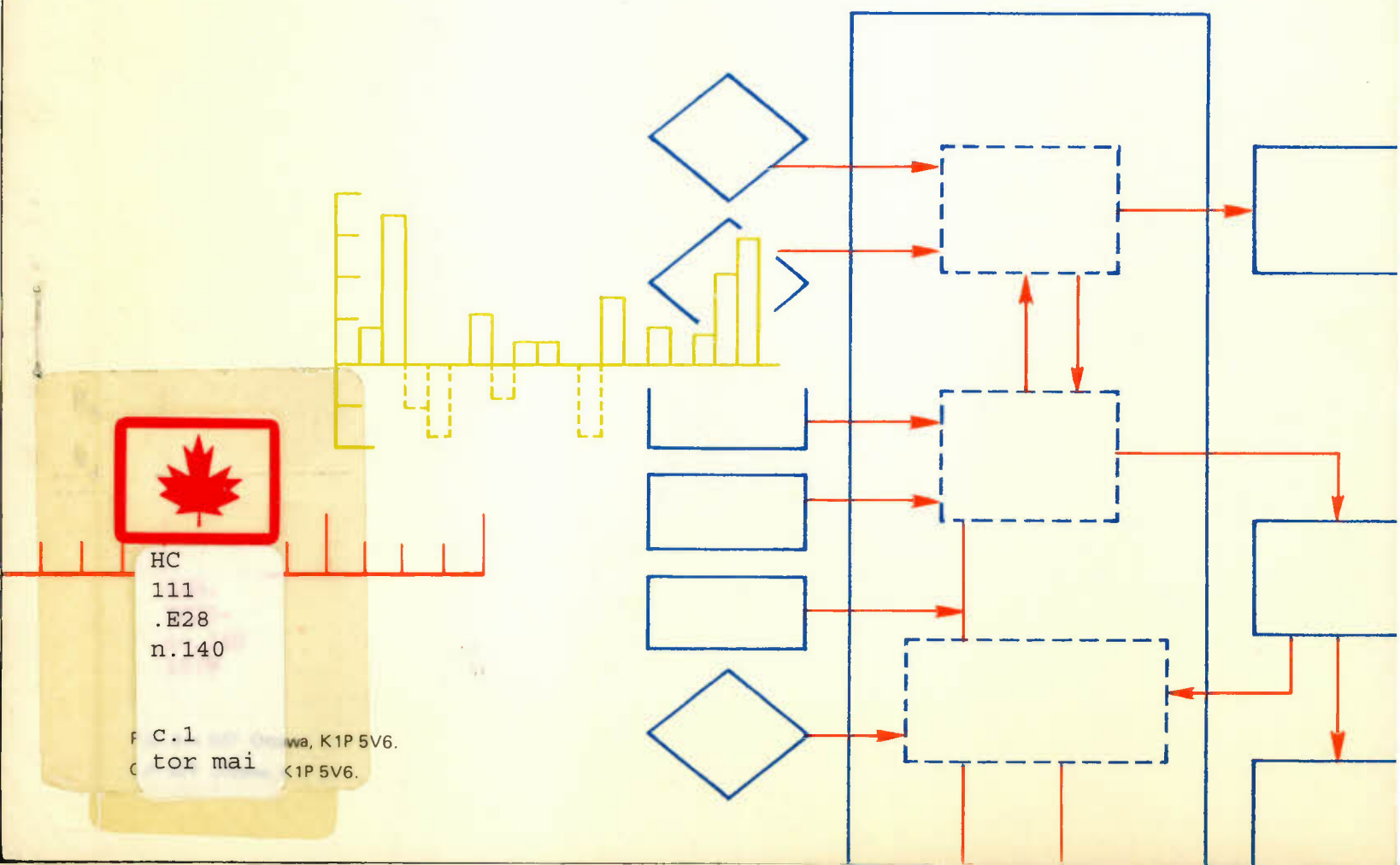


A paper prepared for the
Economic Council of Canada



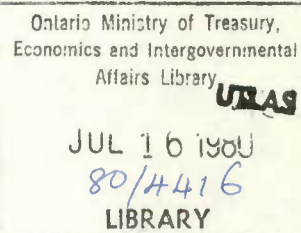
Un document préparé pour le
Conseil économique du Canada



DISCUSSION PAPER NO. 140

Estimates of Regional Shipments
and Supply Elasticities of
Primary Commodities in Canada

by Jane Ramin and
Tim Hazledine



The findings of this Discussion Paper are the personal responsibility of the authors and, as such, have not been endorsed by members of the Economic Council of Canada.

Discussion Papers are working documents made available by the Economic Council of Canada, in limited number and in the language of preparation, to interested individuals for the benefit of their professional comments.

Requests for permission to reproduce or excerpt this material should be addressed to:

Council Secretary
Economic Council of Canada
Post Office Box 527
Ottawa, Ontario
K1P 5V6

December 1979

100

CAN.
EC25-
no. 140
1979

RÉSUMÉ

Le but principal de ce document est de rendre disponibles des estimations sur les flux interrégionaux de certains produits : céréales, bétail, volaille et produits laitiers, fruits et légumes, pétrole et gaz naturel, minéraux métalliques et non métalliques, produits de la forêt et de la pêche, destinées à accompagner les estimations réalisées par Statistique Canada sur les flux interrégionaux de 1974 de biens manufacturés. Nous en profitons pour examiner en même temps les estimations existantes sur les élasticités de l'offre pour ces produits.

SUMMARY

The main purpose of this paper is to make available estimates of interregional flows of grains, livestock, poultry and dairy, fruits and vegetables, petroleum and natural gas, metallic and non-metallic minerals, forestry, and fisheries, to go with the Statistics Canada estimates of 1974 interregional flows in manufactured goods. A secondary purpose is to survey the available estimates of supply elasticities of these commodities.

I INTRODUCTION

The first purpose of this paper is to make available some estimates of the size of flows of primary commodities within and between the regions of Canada.

These estimates are intended to be complementary to the official Statistics Canada data on regional shipments of secondary (manufacturing) industries,¹ and, with these data, to get us closer to a complete picture of the trade flows within Canada. Now only data on interregional trade in the tertiary (services) sector are missing.

The new data should be of most use and interest to economists analysing the structural linkages between Canadian regions. In the past, such analysis² has been restricted to dealing only with the flows of manufactured goods. That this restriction may be serious is perhaps exemplified by the observation that shipments of primary commodities from the Prairie provinces to Quebec appear to be considerably more valuable than the manufactured goods shipments from Quebec to the Prairies.³

1 Statistics Canada 31-522 Occasional, Destination of Shipments of Manufacturers 1974.

2 For example, Federal-Provincial Relations Office, Trade Realities in Canada and the Issue of "Sovereignty-Association", Government of Canada, 1978; Tim Hazledine, 'The Economic Costs and Benefits of the Canadian Federal Customs Union' in Workshop on The Political Economy of Confederation, Proceedings, Economic Council of Canada, 1979.

3 Compare Table 1, pp. 108-9 in Statistics Canada, op. cit. with the data in Tables of this paper.

Though these data should be useful as input for regional economic models, great weight should not always be placed on the accuracy of individual components of the data block. The reason, no doubt, that data such as these have not been published officially is that direct information about the movement of goods across regional boundaries is usually unavailable, given the absence of customs surveillance that generates our data on shipments between Canada as a whole and the rest of the world.

We have had to devise a number of estimation techniques in order to infer what are, we hope, generally reasonable values for the various shipment flows. These techniques are described in detail in the body of the paper. No doubt many of them could be greatly improved if time and resources permitted (only about one-third of a person-year was available for this project).

For most commodities, regional flows are calculated for each of the years 1974, '75 and '76. The flows are constrained to add to the official Statistics Canada national-level data. These data are then averaged, and the results of this are those that are shown as the Tables at the back of this paper. We averaged because the prices for

most primary commodity fluctuate appreciably year-to-year, so that any one year's data would not necessarily give a reliable indicator of the long-run structure of inter-regional linkages.

The second purpose of the paper is to synthesize the available information, culled from various published and unpublished sources, on supply elasticities for primary commodities in Canada.

Section II describes the estimation procedures involved in calculating regional shipments of agricultural commodities, and section III does the same for shipments of non-agricultural primary commodities -- petroleum and natural gas, minerals, forestry, fisheries. An appendix has some notes on elasticities for these commodities.

References are listed separately for each section. The paper concludes with the data tables.

This table was completed for the years 1974 to 1976 and for the average values for each entry over all three years.

In most cases interregional data were not directly available and had to be estimated. In doing this, aggregate consistency was preserved (i.e., the elements of the different columns sum to their defined totals). Details of the estimation procedures for each commodity group follow.

II.1 Grains (see Table 1)

(a) Interprovincial Movement

Grains can be allocated to three different uses: 1) feed grains, 2) milled grains and 3) grains for industrial uses (e.g., malt). Initially, the interprovincial movement of grains was estimated with respect to the individual uses. Then estimates of total grain shipments were calculated.

1) Feed Grains The Canada Grains Council (8) provided data on freight-assisted shipments of feed grains by province of destination. These freight-assisted shipments covered all feed grain movement prior to the third quarter of 1976. Therefore, they are a good representation of feed grain movement over the period of study. In using

these figures we assumed that all grains (except corn) originated in the Prairies and that corn originated in Ontario. These figures were converted from Imperial Tons to Metric Tons so that they could be multiplied by average annual cash grain prices (\$/ton) established in Winnipeg (8). An average annual price established in Chatham for corn (9) was also used. Value-of-shipment figures for feed grains moving from the Prairies to Eastern regions and corn movements from Ontario to the other Canadian regions were then calculated.

2) Milled Grains Statistics Canada (14) provided information on the destination of Eastern and Western grains going to mills across Canada. Again we assumed that Western grains originated in the Prairies and Eastern corn originated in Ontario. We also assumed that all other Eastern grains originated in the region of destination. These figures were converted (16) from bushels to metric tons so that they could be multiplied by the same prices used for feed grains, to obtain the value of shipments of grains milled in Canada.

3) Industrial Grains Figures on the inter-regional movement of grains for industrial uses were not independently available, therefore they were calculated as a residual.

(b) Imports and Exports

Statistics Canada (13) provided total import and export figures by grain crop. Flaxseed, oats and corn were the only grains imported to Canada over the period of study. Since the only oilseed crushing mills are on the Prairies, we assumed that all the flaxseeds went there. We assumed that the oats went to Ontario mills. Corn imports were allocated to the different regions according to the proportion calculated from U.S. Corn Imports by Province (10). We assumed that all exports of corn were from Ontario and that exports of all other grains were from the Prairies.

The above estimates were all done on a crop year basis. In order for these estimates to fit into a calendar year framework, the average of the crop years on either side of each calendar year was taken. These figures were then incorporated into the tables along with the total value of shipments' figures obtained from Statistics Canada (18). These data were then used to help estimate the figures which were not so readily available.

(c) Domestic (Intraregional) Shipments

Obtaining a value for the grains remaining in their region of origin involved a straightforward calculation. The Value of Domestic Shipments was defined as the total value of shipments (18) less the sum of the regional exports and world exports.

(d) Regional Imports

Regional Imports were calculated by summing all shipments going to a particular region from all other regions.

(e) Absorption

The use within the region can now be calculated as the sum of domestic shipments, regional and world imports, to complete the data matrices for grains.

II.2 Livestock (See Table 2)

(a) Interprovincial Movement

Agriculture Canada (2) provided data on the rail shipments of livestock from Winnipeg and points west. Data published by Statistics Canada (26) suggest that rail carries about half of the total livestock movement. Therefore, by doubling Agriculture Canada's figures, we obtained an estimate of the total livestock movement from the Prairies to the three eastern regions. These livestock shipments, measured in number of heads, were then multiplied by average annual head prices (1) to obtain a dollar value for these shipments.⁴

4 No prices were indicated for stockyard livestock, therefore we assumed that the price of Stockyard Cattle is equivalent to the Price of Slaughter Cattle and that the price of Stockyard Calves is equivalent to the price of Feeder Calves.

Agriculture Canada (2) also provided data on the movement of some livestock (beef and dairy cattle) from British Columbia to other regions of Canada. We assumed that all of these shipments went to the Prairies. The prices used above were also used here to obtain an estimate of the value of livestock shipments going from British Columbia to the Prairies.

It was thought that some movement of livestock (hogs, sheep and lambs) between the eastern regions existed. Therefore, we examined the receipts at public stockyard, by province of origin (1). Not all livestock move through public stockyards, therefore these estimates are biased downwards. However, they were still multiplied by the prices established above in order to obtain some estimate of the value of these shipments.

(b) Imports and Exports

"Imports from United States for Slaughter" (1) provides a good estimation of the total livestock imports since no feeders are imported and the U.S. is our major source of livestock imports. These figures were multiplied by the same prices used above to obtain a dollar value for these shipments.

Direct exports of livestock by province were also obtained from Agriculture Canada (1) and these were multiplied by the same prices to obtain a dollar value.

(c) Other Movement

Absorption, Domestic (Intraregional) Shipments, and Regional Imports were estimated as for Grains.

II.3 Poultry and Dairy (See Table 3)

Interprovincial movement, imports, and exports of poultry and of eggs were estimated separately before adding them together. There is no interprovincial movement, imports or exports, of fresh dairy products (i.e., milk and cream).

(a) Interprovincial Movement

1) Poultry Agriculture Canada (3) provided data on the number of hatchery chicks and poults moving interprovincially. These figures were multiplied by unpublished prices (5) to get a dollar value for these shipments. These figures do not account for older poultry (chickens, fowl and turkeys) moving interprovincially. Import and export data (3) verify that this movement is so small that it can be ignored.

2) Eggs The National Farm Products Marketing Council (1) provided data on the Interprovincial Movement of Market Eggs. These figures were available only for 1977 and not for the study period 1974-76. It is uncertain what bias is involved when using these 1977 figures. They were, however, used as an estimate of the egg movement between 1974 and 1976. These figures were multiplied by the average annual prices for Grade A large eggs (4).

The value of shipments of Market Eggs and Hatching Eggs should account for the shipment values of all egg movement.

(b) Imports and Exports

1) Poultry Agriculture Canada (4) provided import and export data for live poultry (e.g., chicken, fowl and turkeys). These figures were multiplied by prices obtained from the same source to obtain a dollar value.

Agriculture Canada (3) provided import and export data for young poultry (i.e., chicks and poults). These figures were also multiplied by prices obtained from Agriculture Canada (3).

These two sets of estimates were combined to obtain estimates of the shipment values of imports and exports of all poultry.

2) Eggs Agriculture Canada (4) provided figures on the number of eggs (excluding hatching eggs) imported and exported. These were then multiplied by prices obtained from the same source to get a dollar value for this movement.

Data on imports and exports of hatching eggs were also obtained from Agriculture Canada (3). These were multiplied by prices obtained from Agriculture Canada (6) again giving value of shipment estimates.

These estimates for poultry and eggs were combined and then incorporated into the tables along with the sum of the value of shipment figures for poultry and eggs (18). From these data, we were able to estimate the other figures required to complete the tables.

(c) Other Movement

Absorption, Domestic (Intraregional Shipments and Regional Imports) were estimated as for Grains.

(d) Dairy

As mentioned above, we assumed no extra-regional shipments of fresh dairy products. In order to check this, we calculated the manufacturer's use, by region, of fresh milk and cream (17,23). These figures were very similar to the figures for the total value of shipment from farms in each region obtained from Statistics Canada (18). This does support our assumption of no movement. Therefore, the regional value of total shipments are set equal to regional domestic shipments as well as to the regional absorption of fresh dairy products. These figures were then added to the value of total shipments, domestic shipments and absorption of poultry and eggs to complete the data matrices for Poultry and Dairy.

II.4 Fruits, Vegetables and Other Crops (See Table 4)

We have assumed that all "other crops" (sugar-beets, tobacco, floriculture and nursery) are absorbed in their region of origin. Therefore we will discuss the value of interprovincial movements, imports, and exports, only for fruits and vegetables (including potatoes) as defined by Statistics Canada (18).

(a) Imports and Exports

The Report by the Tariff Board (12) calculated the percentage of total fresh vegetable imports going to each region. We used these percentages to distribute across regions the total value of vegetable imports obtained from Statistics Canada (23).

The value of total fruit imports was also obtained from Statistics Canada (23). These values were divided between competing fruits (grown in Canada) and noncompeting fruits (ones not grown in Canada). The noncompeting fruits were distributed across regions according to each region's share of the nation's population. Here we are assuming that the per capita consumption of these noncompeting fruits is uniform across all regions. Since British Columbia is a large producer of competing fruits, we assumed that its imports of competing fruits are less than those of other regions. We assigned them \$10,000,000 worth of competing imports. The remaining competing imports were distributed on a per capita basis to the four other regions.

Agriculture Canada (7) provided figures on the total Canadian exports of vegetables. These exports were then allocated to region of origin to information provided by the Tariff Board (12). They suggest (for example) that

73 per cent of the total value of exports was of potatoes and turnips and two thirds of these were for seed, of which the Atlantic region exports 90 per cent. This region also exports over half of the table potato exports (the remaining third). The Tariff Board (12) indicates that Ontario was the leader of all other vegetable exports other than potatoes, ranking second overall; 9 per cent of all vegetables exports are from Quebec and the Prairies export about one quarter of the table potatoes. They suggest that B.C. is not a significant exporter of vegetables.

(b) Absorption

Estimation of regional absorption of fruits and vegetables was carried out in three steps:

1. Total direct use (defined as Farm Cash Receipts (18) less total exports (7), plus total imports of vegetables and competing fruits (23), less the total Canadian manufacturers' use of fruits and vegetables (22,24) was calculated.
2. This estimate of the direct use of fruits and vegetables by all Canadians was then distributed regionally according to the proportion of population in each region (15).

3. Regionally distributed manufacturers' use of fruits and vegetables (22,24) was added to the regionally distributed direct use to obtain estimates of the total regional absorption of fruits and vegetables.

(c) Interprovincial Movement

The differential between the actual regional absorption of fruits and vegetables (estimates calculated above) and the estimates of regional absorption defined as the total value of shipments (18) less total exports, plus imports of vegetables and competing fruits was then distributed across regions. In order to simplify this task we assumed that all intraregional exports of fruits were from British Columbia. We assumed that these moved east in decreasing quantities (with none going as far as the Atlantic region). We also assumed that all regional exports of vegetables originated in the Atlantic provinces and moved westward in decreasing quantities.

(d) Others

Domestic (Intraregional) Shipments and Regional Imports were again estimated in the same manner as discussed under Grains.

World Imports were adjusted in order to maintain aggregate consistency.

(e) Other Crops

We assumed that crops not elsewhere specified (i.e., sugar-beets, tobacco, floriculture, nursery and other crops) did not move interprovincially, nor were they exported or imported. As a result the regional value of total shipments are equal to the regional domestic (intra-regional) shipments as well as the regional absorption of these crops. These figures were then added to the value of total shipments, domestic shipments and absorption figures for fruits and vegetables to complete the data matrices for the commodity group.

III REGIONAL SHIPMENTS OF OTHER PRIMARY PRODUCTS: ESTIMATION PROCEDURES

A data base for the value of shipments of non-agricultural primary products was also developed. These primary products were disaggregated into four commodity groups: 1) petroleum and natural gas, 2) metallic and non-metallic minerals, 3) forestry, and 4) fisheries.

A data matrix similar to the one for agriculture was completed for petroleum and natural gas, and fisheries for the years 1974 to 1976 with three year averages shown here.

Given the time constraint facing the study data bases for metallic and non-metallic minerals, and forestry, were estimated only for one year, 1974. Lack of information also led to a reduction of the matrix, with only net trade, absorption and total value of shipments being estimated.

A detailed description of the estimation procedures by commodity group follows:

III.1 Petroleum and Natural Gas (Table 6)

Statistics Canada (4) provided data on the volume of interregional and intraregional movement of crude oil and its equivalent and natural gas. These figures were then

multiplied by their per unit values from the same source to give us value-of-shipment figures. The prices used in this calculation were consistently lower than the per unit prices suggested by sources at the Department of Energy, Mines and Resources (1,2).

Import and export data were also obtained from Statistics Canada. These figures were multiplied by their per unit values as suggested by Statistics Canada (5,17).

Regional imports were defined as the sum of the shipments going to the particular regions from all of the other domestic regions.

Absorption was defined as the sum of domestic shipments, and regional and world imports to each region.

Value of Shipments were defined as Domestic (Intraregional Shipments) plus the sum of regional exports plus world exports.

III.2 Metallic and Non-Metallic Minerals (Table 7)

Statistics Canada (15) provided data on the production value, and Imports and Exports of primary minerals.

Regional Absorption figures were derived by determining the use of these primary minerals as inputs by all Canadian industries. Input-output data (18) was available only for 1971. Before converting these figures to a 1974 base, input-output coefficients were calculated for each major user of these minerals (i.e., manufacturing, construction mines, quarries and others). In this way, the difference in the rate of growth of these different industries over the 1971/74 period was accounted for. The input-output coefficients were calculated as the proportion of primary minerals used in domestic production (i.e., valued added) (16,19). This 1971 input-output coefficient for each industry was then multiplied by the regional distribution of each of the above industries' share of the domestic product for 1974 (16,19) to obtain estimates of the regional disappearance or absorption of primary minerals by industries in 1974. These figures for each industry were summed to get absorption figures by all users. The total absorption figures, by region, were then adjusted so that they would sum to the actual total Canadian absorption of primary minerals (defined as the Total Value of Shipments, less Total Exports, plus Total Imports). The net trade position by region was then calculated by subtracting each region's absorption from its total shipments.

III.3 Forestry (Table 8)

The data base for forestry was estimated in a manner similar to that used for minerals.

Statistics Canada (3) again provided data on the value of shipments of primary forest products by province. The total value of Canadian exports and imports of these primary products (logs, bolts, pulpwood, poles, pilings and other crude wood materials) were also provided by Statistics Canada (3).

The calculation of the absorption of primary forest products by region was a more complicated procedure. First, we determined the use of primary forest products as inputs (16,19) by different Canadian industries (e.g., forestry, wood, paper and allied industries, construction and others) in 1971. Input-output coefficients were again calculated for each industry. These 1971 coefficients were then multiplied by the regional distribution of each of the above industries' share of the 1974 domestic product to obtain 1974 estimates of the regional disappearance and absorption of primary forest products by industry. The absorption estimates for each industry were summed to get absorption figures by all users. The total regional absorption figures were then adjusted so that they would sum

to the actual total Canadian absorption of primary forest products (defined as the total value of shipments less total exports and total imports). Canada's net forestry trade position by region was then calculated.

III.4 Fisheries (Table 9)

Statistics Canada (8) provided data on the total Canadian landings of fresh and sea water fish. They also provided a regional breakdown of these landings (7,9,10,11, 12,13,14). These data were used as estimates of the total value of fish shipments by each region. The total Canadian exports and imports of fish were also obtained from Statistics Canada (5,17). Total Canadian disappearance of fish was then estimated as total landings less exports plus imports. Statistics Canada (6) provided data on the intermediate disappearance of fish (i.e., material used in the fish product industry) both regionally and nationally. The total Canadian intermediate use was then subtracted from the total Canadian disappearance to obtain an estimate of the total Canadian primary use of fish. This Canadian total was then allocated regionally according to each region's proportion of total retail sales of fresh fish (20). These estimates of regional primary use of fish were added to the regional intermediate use to obtain estimates of the total absorption of fish by region.

Statistics Canada (5) provided figures on the domestic exports of fish to the USA by region of landing. These figures were adjusted so that they would sum to the total Canadian export value of fish (5) to obtain a regional distribution of these exports. The adjustment factor was greater than one since the exports to the U.S. included both fresh and frozen fish whereas the total export figure includes only fresh fish. When adjusting the figures in this way, we are assuming that the regional distribution of fish exports going to the rest of the world is in roughly the same proportion as those going to the U.S. We are also assuming that the regional distribution of exports of fresh fish is roughly equivalent to that of frozen fish.

When distributing world imports of fish, we assumed that all fresh water fish went to Ontario and that the sea water fish landed on one of the two coasts. Since the Maritime provinces have a larger fishing industry we gave them a larger proportion of the sea water fish imports.

We then assumed that all domestic fresh water fish remained in their region of origin and only sea water fish from British Columbia and the Maritimes moved interprovincially and that these two regions receive no fish imports from other regions. Given these assumptions, we were then

able to estimate the domestic shipments (absorption of sea water fish in B.C. and the Maritimes, less world imports, less regional imports). The residual was then allocated to the other regions in decreasing quantities with increasing distances. These figures are estimates of the regional imports of other regions and provide the additional information required to estimate domestic shipments (absorption, less world imports, less regional imports) of the three central regions. Aggregate consistency was verified by summing domestic shipments, regional exports and world exports to the total value of shipments for each region.

APPENDIX: ESTIMATES OF SUPPLY ELASTICITIES

(1) Agricultural Commodities

In order to obtain estimates of long-run supply elasticities of agricultural commodities we did an extensive survey of the literature, focusing on Canadian and American studies. We also obtained "off the cuff" estimates of these elasticities from various individuals at the Department of Agricultural Economics at Saskatoon.

After surveying the literature on supply elasticities of livestock we found it useful to divide this commodity group into two: cattle and calves, and hogs. Separate estimates of these two sub-commodity groups were obtained for Eastern and Western Canada, giving four different estimates for the livestock sector. An average of estimates from three different sources (11,13,15) gave us a long-run supply elasticity for Eastern hogs of 0.55 and for Western hogs of 0.27. Supply elasticities for cattle and calves in Eastern and Western Canada, estimated by Kulshreshtha (12) were also used. These four estimates were weighted according to the commodities' share of farm cash receipts for all livestock, by region. The weighted estimates were then summed to obtain weighted average estimates of long-run supply elasticities for all livestock.

After surveying studies with estimates of supply elasticities for the different grains we concluded that 0.75 would be a good estimate for all grains. This was very similar to the "off the cuff" estimates made by the economists at the University of Saskatoon.

There were no available studies on the supply elasticities of fruits and vegetables, therefore we were forced to rely solely on the "off the cuff" estimates. These suggest that a reasonable long-run supply elasticity for fruits and vegetables would be 0.35.

There were few studies which estimated the elasticities of dairy products and poultry so again we had to rely on the "off the cuff" estimates. We concluded that the average long-run supply elasticity of dairy products was 0.65 and that of poultry and eggs was 0.65. These estimates were then weighted by each commodity's share of the farm cash receipts for the whole group of "Poultry and Dairy Products".

The above estimates are reported in Table 5.

(2) Natural Resources

There was not time to fully investigate all the available sources of non-agricultural product supply elasticities. A summary of the findings of several studies is given below.

- (a) Tilton (5) suggests that the supply curves for non-fuel minerals tend to rise gradually until full capacity is reached and then become very steep.
- (b) Charles River Associates (1) suggest that the supply of magnesium and aluminum are perfectly elastic in the relevant price range.
- (c) Fisher (3) has estimated the long run elasticity of supply for copper to be 1.67 in the U.S. and 14.84 in Canada.
- (d) Different studies (2,7) have suggested a supply price elasticity of oil around unity. These were estimated in the early 1970's prior to the price increases in oil. More current estimates are not available.
- (e) It might be possible to get a feel for supply elasticities for oil by considering estimates of supply done by the U.S. National Petroleum Council (6), the Petro-Canada Office or the National Energy Board.

References for Section II: Agricultural Data

1. Agriculture Canada, Production and Marketing Branch, Livestock Division, Livestock Market Review, 1974-76, 55th and 57th editions. (Tables 4,6,17, 18,25,26,32,35,38).
2. Agriculture Canada, Production and Marketing Branch, Livestock Division, Livestock Meat Trade Report, Weekly, 1977.
3. Agriculture Canada, Production and Marketing Branch, The Cattle Industry in B.C. - A Statistical Handbook, Vancouver, B.C., November 1977.
4. Agriculture Canada, Production and Marketing Branch, Poultry Division, "Poultry Market Review", First Quarterly Report of 1974 to the Fourth Quarterly Report of 1976. (Table 8,9,10,11,12,13,14,15,16, 17,18,24,25,26,27,28,29).
5. Agriculture Canada, Production and Marketing Branch, Poultry Division, "Poultry Market Review", Twenty-Fourth to Twenty-Sixth Annual Review, 1974-76. (Tables 13,14,16,26,27,28).
6. Agriculture Canada, Production and Marketing Branch, Poultry Division, unpublished data, "Poultry Prices by Province and Year", obtained from Susan Johnson.
7. Agriculture Canada, Production and Marketing Branch, Poultry Division, unpublished data on Ontario Hatching Egg Prices, obtained from Bob Ebbie.
8. Agriculture Canada, Selected Agriculture Statistics of Canada. (Table 63).
9. Canada Grains Council, Canada Grains Industry Statistical Handbook 77. (Table 40,60).
10. Canadian Livestock Feed Board, Annual Report, crop year 1974-75, (Table 16), 1976-77 (Table 17).
11. Canadian Livestock Feed Board, unpublished data, "U.S. Corn Imports by Month and by Province", crop year 1973-74.
12. National Farm Products Marketing Council, Annual Report 1977-78, Appendix 10.

13. Report by the Tariff Board, Fresh and Processed Fruits and Vegetables, Reference No. 152, No. 1, Part 1. (Table 18).
14. Statistics Canada, Agriculture Branch, Crop Section, Supply and Disposition of Major Grains in Canada, November 1977.
15. Statistics Canada, Agriculture Branch, Crop Section, unpublished data, "Grains Milled in Canada".
16. Statistics Canada, Canadian Statistical Review, Pub. No. 11-003E, Vol. 51, No. 12, December 76. (Section 2, Table 1).
17. Statistics Canada, Agriculture Branch, Crop Section, unpublished data, "Conversion Factors".
18. Statistics Canada, Dairy Products Industry, Cat. No. 32-209, Annual, 1975, 1976. (Tables 1 and 5).
19. Statistics Canada, Farm Cash Receipts, Cat. No. 21-201, Annual, 1975, 1976. (Table 2).
20. Statistics Canada, Feed Industry, Cat. No. 32-214, Annual, 1975, 1976. (Tables 1, 5).
21. Statistics Canada, Flour and Breakfast Cereal Products Industry, Cat. No. 32-228, Annual, 1975, 1976. (Tables 1 and 5).
22. Statistics Canada, Fruits and Vegetable Processing Industries, Cat. No. 32-218, Annual, 1975, 1976. (Table 1 and 5).
23. Statistics Canada, Imports-Merchandise Trade. Cat. No. 65-203, Annual, 1974, 1976. (Table 3).
24. Statistics Canada, Miscellaneous Food Processors, Cat. No. 32-224, Annual, 1975, 1976. (Tables 1 and 5).
25. Statistics Canada, Poultry Processors. Cat. No. 32-227, Annual, 1975, 1976. (Tables 1 and 5).
26. Statistics Canada, Slaughter and Meat Processors, Cat. No. 32-221, Annual, 1975, 1976. (Tables 1 and 5).
27. Statistics Canada, Vegetable Oil Mills, Cat. No. 32-223, Annual, 1975, 1976. (Tables 1 and 5).

References for Section III: Non-agricultural Data

1. Energy, Mines and Resources, Energy Policy Sector, Petroleum Utilization Group, average felt gate prices of natural gas, obtained from M. Schwartz.
2. Energy, Mines and Resources, Energy Policy Sector, Petroleum Utilization Group, well head prices of crude oil, obtained from D. Young.
3. Statistics Canada, Canadian Forestry Statistics, Cat. No. 25-202, Annual 1975. (Tables 6,10,11.)
4. Statistics Canada, The Crude Petroleum and Natural Gas Industry, Cat. No. 26-313, Annual 1975, 1976. (Tables 2,7,8.)
5. Statistics Canada, Exports -- Merchandise Trade, Cat. No. 65-202, 1973-75, 1975-77. (Tables 3,7.)
6. Statistics Canada, Fish Product Industry, Cat. No. 32-214, Annual 1975, 1976. (Tables 1,5.)
7. Statistics Canada, Fisheries Statistics British Columbia and Yukon, Cat. No. 24-208, Annual 1975-1976. (Table 2.)
8. Statistics Canada, Fisheries Statistics of Canada, Cat. No. 24-201, Annual 1975, 1976. (Table 2.)
9. Statistics Canada, Fisheries Statistics New Brunswick, Cat. No. 24-204, Annual 1975, 1976. (Table 2.)
10. Statistics Canada, Fisheries Statistics Newfoundland, Cat. No. 24-202, Annual 1975, 1976. (Table 2.)
11. Statistics Canada, Fisheries Statistics Nova Scotia, Cat. No. 24-205, Annual 1975, 1976. (Table 2.)
12. Statistics Canada, Fisheries Statistics Ontario, Prairie Provinces and North West Territories, Cat. No. 24-207, Annual 1975, 1976. (Table 2.)
13. Statistics Canada, Fisheries Statistics Prince Edward Island, Cat. No. 24-203, Annual 1975, 1976. (Table 2.)
14. Statistics Canada, Fisheries Statistics Quebec, Cat. No. 24-206, Annual 1975, 1976. (Table 2.)

15. Statistics Canada, General Review of Mineral Industries, Cat. No. 26-201, Annual 1974. (Table 1C.)
16. Statistics Canada, Gross National Product Division, Provincial Economic Accounts 1961-1974 -- Experimental Data. (Table 1.)
17. Statistics Canada, Imports -- Merchandise Trade, Cat. No. 65-203, 1974-76. (Tables 3,7.)
18. Statistics Canada, The Input-Output Structure of the Canadian Economy 1961-1971, Cat. No. 15-506E, Occasional. (Tables 82,86.)
19. Statistics Canada, Manufacturing Industries of Canada, National and Provincial Areas, Cat. No. 31,203, 1971 (Table 8), 1974 (Table 7).
20. Statistics Canada, Retail Commodity Survey, Cat. No. 63-526, Annual 1974. (Table 3.)
21. Statistics Canada, Survey of Production, Cat. No. 61-202, Annual 1975. (Table 2.)

References for Appendix: (1) Agricultural Supply Elasticities

1. Askari, H. and J.T. Cummings, "Estimating Agricultural ,
Supply Response with the Nerlove Model: A Survey"
International Economic Review, June 1977, Vol. 18,
pp. 527-92.

(Grains)

2. Gardner, B.L., "Futures Prices in Supply Analysis",
American Journal of Agricultural Economics,
February 1976, Vol. 58, pp. 81-84.
3. Houch, J.P. and P.W. Gallagher, "The Price Respon-
siveness of U.S, Corn Yields", American Journal of
Agricultural Economics, November 1976, Vol. 58,
pp. 731-734.
4. Houch, J.P. and A. Subotnik, "The U.S. Supply of
Soybeans", Regional Acreage Functions,
Agricultural Economic Research, October 1969,
Vol. 21, pp. 99-108.
5. Lowe, J., Agriculture Canada, unpublished paper,
"Agriculture Sector Forecasting Model, Grains and
Oilseeds Sub-Model", 1978.
6. Meilke, K.D. and R.K. Kramar, "Acreage Response in
Ontario", Canadian Journal of Agricultural
Economics, February 1976, Vol. 2, pp. 51-66.
7. Nagy, J.G. and W.H. Furtan, "Economic Costs and Returns
for Crop Development Research: A Case of Rapeseed
Breeding in Canada", Canadian Journal of
Agricultural Economics, February 1978, Vol. 26,
pp. 1-5.
8. Paddock, B.W., "Supply Analysis of Rapeseed Acreage",
Canadian Journal of Agricultural Economics, July
1971, Vol. 19, pp. 110-117.
9. Schmitz, A., "Canadian Wheat Acreage Response",
Canadian Journal of Agricultural Economics, June
1968, Vol. 16, pp. 79-86.
10. Schmitz, A. and D.L. Bauden, "The World Wheat Economy:
An Empirical Analysis", University of California,
Division of Agricultural Sciences, Giannini
Foundation of Agricultural Sciences, Giannini
Foundation Monograph, No. 32, March 1973.

(Livestock)

11. Chin, S. and M. Spearin, "An Analysis of Quarterly Provincial and Regional Hog Supply Functions", unpublished paper, Agriculture Canada, Economics Branch.
12. Kulshreshtha, S.N., "An Analysis of the Canadian Cattle Supply Using Polynomial Distributed Lags", Canadian Journal of Agricultural Economics, July 1976, Vol. 24, pp. 1-14.
13. MacAulay, T.G., "Commodity Forecasting Models for Canadian Agriculture", Canadian Agriculture, to be published, Agriculture Canada, Policy Planning and Economics Branch, Vol. 2, 1978.
14. Martin, L.J. and R. Haack, "Beef Supply Response in North America", Canadian Journal of Agricultural Economics, November 1977, Vol. 25, pp. 29-47.
15. Meilke, K.D., A.C. Zwart and L.J. Martin, "North American Hog Supply: A Comparison of Geometric and Polynomial Distributed Lag Models", Canadian Journal of Agricultural Economics, July 1974, Vol. 22, pp. 15-30.
16. Reutlinger, S., "Short-Run Beef Supply Response", Journal of Farm Economics, Vol. 48, pp. 909-919.
17. Tryfos, P., "Canadian Supply Functions for Livestock and Meat", American Journal of Agricultural Economics, February 1974, Vol. 56, pp. 107-113.

(Poultry and Dairy Products)

18. Martin, L. and D.C. Holliday, "The Output Decision Process of Canadian Broiler Marketing Boards", Canadian Journal of Agricultural Economics, July 1977, Vol. 25, pp. 45-60.
19. Sahi, R.K. and D.H. Harrington, "A Policy Analysis Model for the Canadian Dairy Industry", unpublished paper, Agriculture Canada, Economics Branch.

References for Appendix: (2) Agricultural Supply Elasticities

1. Charles River Associates, Economic Analysis of the Magnesium Industry, Cambridge, Massachusetts.
2. Erickson, E.W. and R.M. Spann, "Supply Price in a Regulated Industry: A Case of Natural Gas", The Bell Journal of Economics and Management Science, Vol. 2, No. 1, Spring 1971.
3. Fisher, F.M., P.H. Castner and M.N. Baily, "An Econometric Model of the World Cap per Industry", The Bell Journal of Economics and Management Science, Vol. 3, No. 2, (Autumn 1972), p. 576-79.
4. Kennedy, M., "An Economic Model of the World Oil Market", The Bell Journal of Economics and Management Science, Vol. 5, No. 2, Autumn 1974.
5. Tilton, J., The Future of Non-Fuel Minerals, The Bookings Institute, Washington, D.C., 1977.
6. National Petroleum Council, U.S. Energy Outlook: An Appraisal, Washington, 1971.
7. U.S. Cabinet Task Force on Oil Import Control, The Oil Import Question, Washington, D.C., U.S. Government Printing Office.

Table 1

The Value of Shipments of Grains: A Three Year Average, 1974-76
(not adjusted to sum to 1974 actual total shipments)

To From	B.C.	Prairies	Ontario	Quebec	Atlantic (Dollars)	World Exports	Imports		Absorption	Value of Shipments
							World	Regional		
B.C.	24,000,000	1,000,000	0	0	0	0	11,500,000	28,000,000	63,500,000	25,000,000
Prairies	28,000,000	324,000,000	210,000,000	230,000,000	38,000,000	2,230,000,000	10,000,000	11,000,000	345,000,000	3,060,000,000
Ontario	0	10,000,000	214,800,000	10,000,000	10,000,000	70,000,000	50,000,000	210,000,000	474,800,000	314,800,000
Quebec	0	0	0	7,500,000	0	0	32,000,000	240,000,000	279,500,000	7,500,000
Atlantic	0	0	0	0	500,000	0	250,000	48,000,000	48,750,000	500,000
Canadian Total						2,300,000,000	103,750,000	537,000,000	1,211,550,000	3,407,800,000

Sources: See Section II.1, "Grains", of the "Estimation Procedures".

Table 2

The Value of Shipments of Livestock: A Three Year Average, 1974-76
(not adjusted to sum to 1974 actual total shipments.)

To From	B.C.	Prairies	Ontario	Quebec	Atlantic (Dollars)	World Exports	Imports		Absorption	Value of Shipments
							World	Regional		
B.C.	38,000,000	28,000,000	0	0	0	5,000,000	75,000	75,000,000	113,075,000	71,000,000
Prairies	75,000,000	1,132,000,000	131,000,000	24,000,000	2,550,000	35,500,000	4,900,000	43,000,000	1,179,900,000	1,400,000,000
Ontario	0	15,000,000	826,200,000	27,500,000	0	11,300,000	20,300,000	132,790,000	979,290,000	880,000,000
Quebec	0	0	1,750,000	325,400,000	500,000	6,300,000	930,000	51,550,000	377,930,000	334,000,000
Atlantic	0	0	40,000	50,000	61,690,000	220,000	0	3,000,000	64,690,000	62,000,000
Canadian Total							26,205,000	305,340,000	2,714,885,000	2,747,000,000

Sources: See Section II, "Livestock", of the "Estimation Procedures".

Table 3

The Value of Shipments of Dairy and Poultry: A Three Year Average, 1974-76
(not adjusted to sum to 1974 actual total shipments)

To From	B.C.	Prairies	Ontario	Quebec	Atlantic	World Exports	Imports		Absorption	Value of Shipments
							World	Regional		
B.C.	167,100,000	11,500,000	90,000	400	0	1,000,000	900,000	300,000	168,300,000	179,500,000
Prairies	248,000	308,000,000	650,000	4,000	15,000	3,000,000	2,700,000	18,500,000	329,000,000	312,000,000
Ontario	20,000	6,300,000	703,200,000	1,500,000	8,000	11,000,000	32,000,000	5,000,000	738,000,000	722,000,000
Quebec	11,000	700,000	3,900,000	650,800,000	12,000	3,600,000	5,500,000	1,900,000	655,000,000	659,000,000
Atlantic	20,000	28,000	440,000	380,000	106,600,000	500,000	900,000	35,000	107,500,000	108,000,000
Canadian Total						23,600,000	42,000,000	25,735,000	1,997,800,000	1,980,500,000

Sources: See Section III, "Dairy and Poultry", of the "Estimation Procedures".

Table 4

The Value of Shipments of Fruits, Vegetables and Other Crops NES: A Three Year Average, 1974-76
(not adjusted to sum to 1974 actual total shipments)

From	To	B.C.	Prairies	Ontario	Quebec	Atlantic (\$0)	World Exports		Absorption	Value of Shipments
							World	Regional		
B.C.		70,500,000	3,700,000	3,000,000	1,700,000	0	30,600,000	800,000	104,900,000	109,500,000
Prairies		0	152,500,000	0	0	0	5,700,000	5,900,000	236,700,000	158,200,000
Ontario		0	0	538,900,000	0	0	27,000,000	7,700,000	606,600,000	565,900,000
Quebec		0	0	0	113,400,000	0	8,400,000	8,100,000	282,100,000	121,800,000
Atlantic		800,000	2,200,00	4,700,000	6,400,000	53,000,000	52,000,000	0	101,400,000	119,100,000
Canadian Total							123,700,000	22,500,000	1,331,700,000	1,074,500,000

Sources: See Section IV, "Fruits, Vegetables and Other Crops", of the "Estimation Procedures".

Table 5
Weighted Estimates of Supply Elasticities of Canadian Agricultural Commodities: By Region

	Atlantic	Quebec	Ontario	Prairies	British Columbia
Dairy Products	0.38	0.47	0.41	0.34	0.36
Poultry	0.12	0.10	0.11	0.14	0.12
Eggs	0.09	0.04	0.01	0.10	0.10
Dairy and Poultry	0.59	0.61	0.59	0.58	0.58
Cattle and Calves: East West	0.60	0.39	0.77	1.16	1.20
Hogs: East West	0.26	0.36	0.18	0.05	0.04
Livestock	0.86	0.75	0.95	1.21	1.24
Grains	0.75	0.75	0.75	0.75	0.75
Fruits and Vegetables	0.35	0.35	0.35	0.35	0.35

Source See Section V, "Estimates of Supply Elasticities of Agricultural Commodities".

Table 6

The Value of Shipments of Petroleum and Natural Gas: A Three Year Average, 1974-76
(not adjusted to sum to 1974 actual total shipment values)

To From	B.C.	Prairies	Ontario	Quebec	Atlantic	Exports	Imports		Absorption	Value of Shipments
							World	Regional		
(Thousands of dollars)										
B.C.	165,483	0	0	0	0	133,767	0	258,885	424,368	299,250
Prairies	258,885	896,333	1,365,160	1,485,054	7,394	3,289,414	38	0	896,371	7,302,239
Ontario	0	0	40,554	0	0	0	16,585	1,365,160	1,422,299	121,221
Quebec	0	0	0	725	0	0	1,868,262	1,485,054	3,354,041	724
Atlantic	0	0	0	0	30	0	1,178,716	7,394	1,186,140	30
Canadian Total						3,423,180	3,063,601	3,116,493	7,283,219	7,723,464

Source See Part B, Section I, "Petroleum and Natural Gas" of the Estimation Procedures.

Table 7

The Value of Shipments of Metallic and Non-Metallic Minerals N.E.S. 1974

	Net Trade	Absorption	Value of Shipments
		(\$000)	
British Columbia	+318,500	151,000	469,500
Prairies	+647,000	139,000	786,000
Ontario	+682,500	846,000	1,528,500
Quebec	+187,000	429,000	616,000
Atlantic	+496,000	71,000	567,000
Canadian Total	2,331,000	1,636,000	3,967,000

Source See Part B, Section II, "Metallic and Non-Metallic Minerals" of the Estimation Procedures.

Table 8

Value of Shipments of Forestry Products 1974

	Net Trade	Absorption	Value of Shipments
		(\$000)	
British Columbia	+603,500	974,000	1,577,500
Prairies	-125,500	239,500	114,000
Ontario	-343,000	669,000	326,000
Quebec	-263,000	697,000	434,000
Atlantic	+105,000	176,500	281,500
Canadian Total	-23,000	2,756,000	2,733,000

Source See Part B, Section III, "Forestry" of the Estimation Procedures.

Table 9
The Value of Shipments of Fish: A Three Year Average, 1974-76
(not adjusted to sum to the 1974 actual total shipment values)

To From	B.C.	Prairies	Ontario	Quebec	Atlantic (Thousands of dollars)	World Exports	Imports		Absorption	Value of Shipments
							World	Regional		
B.C.	74,000	12,000	7,800	0	0	12,000	21,000	0	94,500	108,000
Prairies	0	2,500	0	0	0	7,000	0	12,000	14,700	9,500
Ontario	0	0	6,000	0	0	5,500	3,500	12,500	21,500	11,000
Quebec	0	0	0	13,000	0	2,500	0	10,000	22,300	15,000
Atlantic	0	0	5,000	8,000	109,500	59,000	35,000	0	144,500	181,000
Canadian Total						86,000	59,500	34,500	297,500	324,500

Source See Part B, Section IV, "Fisheries" for the Estimation Procedures.

HC/111/.E28/n.140

Hazledine, Tim

Estimates of

regional shipments

diek

c.1

tor mai