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Trade Creation and Diversion Effects of the U.S.-Canadian Free Trade Agreement

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Highlights

The primary objective of this study is to empirically estimate and evaluate the economic benefits of the U.S. and Canadian Free Trade Agreement (FTA). Unlike past studies that mostly used aggregate data, our study emphasizes the trade effects of removal of tariff and nontariff barriers on commodity groups as classified by the Standard International Trade Classification. Import demand elasticities from a dynamic demand model are used to estimate, for both countries, the amount of trade expansion under the FTA.

For each commodity group, import demand models are estimated, using the Seemingly Unrelated Regression Technique. The study shows that U.S. imports from Canada are more sensitive to domestic, import, and world prices than are Canadian imports from the United States. Eliminating all tariff and nontariff barriers would increase bilateral trade volume across all commodities traded primarily through trade creation and diversion effects. U.S. imports from Canada would increase by an estimated $3.1 billion dollars compared to the $2.4 billion for Canadian imports from the United States under the FTA in the short run. Increases in trade volume are greatest for end products in Canada and greatest for machines and transportation equipment in the United States, implying that the United States could increase its exports of end products to Canada while Canada could increase its exports of machines and transportation equipment to the United States. This study also indicates that the FTA would not stimulate agricultural product trade between the two countries.

Trade Creation and Diversion Effects of the U.S.-Canadian Free Trade Agreement

Won W. Koo and David Karemera*

I. Introduction

Over the past decade, a number of studies have estimated the benefits resulting from regional economic integration. The benefits resulting from cuts in tariff and nontariff trade barriers can be divided into trade creation (TC) and trade diversion (TD) effects. Under a free trade agreement, a country's TC occurs when low price imports from its trading partner displace domestic production; and a country's TD occurs when imports from its trading partner replace imports from third party countries, which still face high tariffs and nontariff barriers.

TC and TD have been estimated using the methods of Verdoorn (1960) and Baldwin and Murray (1977). Both methods compute TC under the assumption that imports are perfect substitutes for domestic production and obtain identical TC estimates. However, the two methods estimate TD based on different assumptions of import behavior (Sawyer and Sprinkle 1989), and lead to different TD estimates. TD is based on the ratio of nonbeneficiary imports to domestic production under Baldwin and Murray's method, and on the share of nonbeneficiary imports to total imports under Verdoorn's method. Both ratios are usually not equal and, thereby, lead to different estimates of TD. Baldwin and Murray's method has been criticized for its unreasonably low estimates of trade diversion (Pomfret 1986).

Sapir (1981), in addition to using these above two methods, estimated the effects of the EC creation on trade among the EC countries, using a dummy variable technique and a projection method. The method provides estimates of Gross Trade Expansion, regardless of whether it is trade creating or trade diverting. However, using Sapir's method requires several time series data points under the economic integration. These are simply not available in the U.S.-Canada case.

Regardless of the technique used, a notable characteristic of these studies is the use of the single equation estimation technique and aggregate data. Koo et al. (1991) have extended the studies of the effects of regional economic integration to analyze effects of the U.S. and Canadian Free Trade agreement (FTA) for agricultural and manufactured products. Other studies have focused on the relative magnitude of the FTA's effect on total trade and welfare [Brown and Stern (1989), Cox and Harris (1986), Hamilton and Whalley (1987), Wigle (1988), Stokes (1989), and Wonnacott and Wonnacott (1967)]. Less attention was paid to estimating the effects of the FTA on specific industries or specific commodity groups.

Grouping traded commodities under the Standard International Trade Classification (SITC) may be arbitrary but it does provide accurate information on

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behavior in specific industries. The Seemingly Unrelated Regression Estimator (SURE) is used to estimate the dynamic import demand model for each industry group. This allows for contemporaneous correlation across industries and provides a more accurate description of import behavior in each industry.

The objectives of this study are 1) to estimate trade effects of the U.S.-Canadian Free Trade Agreement at industry or commodity group levels both in the United States and Canada and 2) to compare relative trade gains of U.S. and Canadian industries. Special attention is given to trade creation and trade diversion effects, using elasticity estimates from the import demand models.

The paper is organized as follows: The next section provides some highlights of the U.S.-Canadian Free Trade Agreement. Trade creation and diversion effects of the Free Trade Agreement are discussed in Section III. Section IV presents the specification for import demand functions and describes the estimation of the models under the SURE framework. In Section V, trade creation and trade diversion effects are computed and the relative benefits of U.S. and Canadian industries are derived and compared. A summary of the results, including a brief conclusion, is provided in the last section.

II. Highlights of the U.S.-Canadian Free Trade Agreement

U.S. imports from Canada and Canadian imports from the United States by commodity groups are shown in Table 1. Average U.S. imports from Canada from 1988 to 1990 were $73 billion, and Canadian imports were $87 billion. U.S. imports of machinery and transportation equipment account for 47% of the total U.S. imports from Canada, followed by manufactured goods (19%). On the other hand, most Canadian imports are end products, which account for 70% of the total Canadian imports from the United States, followed by fabricated materials (20%).

For a ten-year period, starting January 1, 1989, the FTA provides for complete elimination of tariff barriers (TB) and nontariff barriers (NTB). The FTA is expected to promote competition, trade and the free movement of investment resources across both countries.

Major tariff reductions will be progressive and staggered over the ten-year period in equal yearly installments. Existing quantity restrictions and federal government procurement measures are also subject to reductions under the terms of the FTA. Many price protection measures eventually will be eliminated.

By far, tariffs constitute the protection instrument most frequently used by both countries. For example, in 1987, tariffs accounted for 75% and 60% of price protection in Canada and the United States, respectively. All other trade restriction measures have been used to varying degrees but have a much lesser impact on trade flows between the two countries. Table 2 provides comparative rates of protection in the United States and Canada. Although Canada has higher rates across almost all commodities, industries protected in Canada are also protected in the United States.

TABLE 1. BILATERAL TRADE VOLUME BY COMMODITY GROUPS BETWEEN THE UNITED STATES AND CANADA

Commodity Groups	1988	1989	1990[a]	Average	(Ratio)
	----------1,000 dollars----------				
U.S Imports from Canada:					
Food and live animals	3,183,883	3,521,495	3,768,058	4,157,812	(0.050)
Beverage and tobacco	534,616	576,615	594,923	567,718	(0.007)
Crude material, inedibles	7,205,635	7,983,478	7,481,624	7,556,912	(0.091)
Mineral fuels	6,732,599	7,770,389	9,846,197	8,116,395	(0.098)
Animal/vegetable oil & fat	73,042	89,136	92,399	84,859	(0.001)
Chemicals	3,841,045	3,934,119	4,304,979	4,026,714	(0.049)
Manufactured goods	15,451,494	16,701,688	15,788,433	15,980,538	(0.193)
Machinery /transport equipment	36,290,547	39,129,613	40,754,427	38,724,862	(0.468)
Miscellaneous manufactured articles	3,641,040	3,612,649	3,593,829	3,615,839	(0.044)
Total U.S. Imports	76,953,901	85,319,182	86,224,869	82,832,650	--
Canada's imports from the United States:					
Live animals	108,354	120,461	96,940	108,585	(0.001)
Food, feed, beverage, and tobacco	3,620,763	3,936,477	4,300,201	3,952,480	(0.045)
Crude, material, inedible	3,249,010	3,392,081	3,114,779	3,251,956	(0.037)
Fabricated materials, inedible	16,210,385	17,564,391	18,507,671	17,427,482	(0.199)
End products, inedible	61,145,694	61,417,702	59,907,189	60,823,528	(0.070)
Special transactions, trade	1,686,684	1,673,485	1,873,810	1,745,326	(0.020)
Total Canadian Imports	86,020,897	88,103,600	87,802,599	87,309,359	--

[a]Ratios of average imports of each commodity group to the total imports.

SOURCE: U.S. figures are from Highlights of U.S. Export and Import Trade, 1991; Canadian figures are from Statistics Canada, 1991.

TABLE 2. A COMPARISON OF CANADIAN AND U.S. TRADE BARRIERS FOR SELECTED AND AGGREGATED INDUSTRIES (BILATERAL PERSPECTIVES)

Industry		Trade Barriers			
		Canada		United States	
		Tariffs[a]	NTB	Tariffs[a]	NTB
Agriculture	3.0	8.6	2.0	10.7	
Forestry	0.0	0.0	0.2	0.6	
Fishing and Trapping		0.2	0.0	1.7	0.0
Mining	0.2	0.0	0.4	0.0	
Manufacturing (aggregated)		5.2	1.3	3.2	1.4
Food and beverage		5.2	6.9	3.6	8.4
Tobacco		16.5	0.0	20.7	0.0
Leather		15.7	0.0	7.5	0.0
Textiles		11.4	0.0	8.5	0.0
Knitting mills		22.7	0.0	12.3	0.0
Clothing		19.7	0.0	10.9	0.0
Furniture and fixtures		12.5	0.1	2.0	0.5
Shipbuilding		10.1	1.4	0.3	0.0
Goods production (aggregated)		4.5	1.6	2.8	1.9

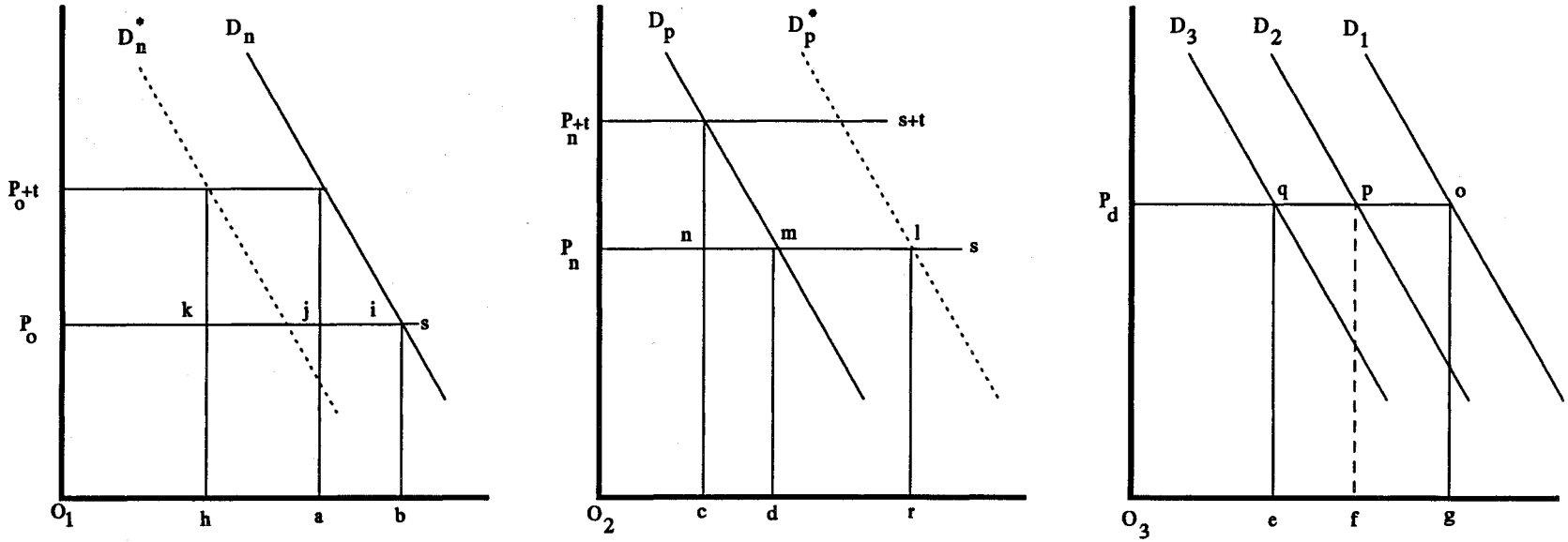
[a]The tariff estimates derived, using production data as aggregation weights. NTB are expressed as *ad valorem* equivalent, which includes quantity restrictions and federal procurement.

SOURCE: Department of Finance, Trade Barriers Between Canada and the United States, Working paper no. 88-3. Ottawa, 1988, p. 10.

III. Trade Creation and Diversion Effects

To graphically demonstrate trade creation and diversion effects, U.S. (Canadian) imports are divided into its imports from Canada (the United States) and its imports from the rest of the world. The effects of the U.S./Canadian FTA on U.S. imports are illustrated in Figure 1. Figure (1a) depicts U.S. import demand from the rest of the world; and Figure (1b) represents U.S. import demand from Canada. Figure (1c) applies to domestic producers in the United States. Free trade prices from the two external sources are indicated by P_n and P_o. Thus, the tariff inclusive prices are P_n+t and P_o+t. Since we do not assume products from alternative sources to be perfectly competitive, the prices need not be equal.

If the import duty on the product is eliminated entirely, the United States will increase its imports from the rest of the world from O_1a to O_1b and will increase its imports from Canada from O_2c to O_2d. These increases in imports would, in turn, cause the demand for similar domestic products to decline (downward shift) as consumers substitute lower priced imports for the locally-produced item. In figure (1c), the demand curve for domestic output shifts from D_1 to D_3, indicating that demand for domestic output declines from O_3g to O_3e as the tariff is eliminated. This shift in the demand can



(a) Imports from the rest of the world

(b) Imports from Canada

(c) Domestic output

Figure 1. The Effects of the U.S./Canadian FTA on U.S. Imports

be divided into two components: the shift from D_1 to D_2 is due to the substitution of imports from Canada and the shift from D_2 to D_3 is due to imports from the rest of the world.

Consider the effects of the bilateral free trade agreement between the United States and Canada, under which the United States grants duty-free treatment to only Canada. Since the U.S. tariff is not reduced for other countries, Canada has a comparative advantage in exporting to the United States. The initial decline in domestic output as a result of the FTA is gf, shifting the demand schedule from D_1 to D_2. This increase in the U.S. imports from Canada is known as the trade creation effect because trade volume increases as a result of the elimination of tariffs under the FTA. Since other countries still face tariffs, the United States may replace imports from other countries with Canadian commodities which enter the United States duty free. This implies that import demand schedule from Canada shifts outward from D_p to D_p^*, resulting in an increase in imports from Canada from O_2d to O_2r. At the same time the import demand schedule for other countries shifts inward from D_n to D_n^*, indicating a decrease in the imports from other countries from O_1b to O_1h. The demand schedule for U.S. domestic products shifts inward from D_2 to D_3, and demand for domestic output decreases further from O_3f to O_3e. This additional increase in U.S. imports from Canada is known as the trade diversion effect.

The trade-expanding benefits of the FTA for the beneficiary country are two-fold: trade creation (area dmnc) at the expense of domestic producers and trade diversion (area drlm) at the expense of other countries' exports. The trade creation effect traditionally is estimated using import demand elasticities (Verdoorn, and Baldwin and Murray)

$$TC_i = M_i e_i(\Delta t_i / 1 + t_i) \qquad (1)$$

where

TC_i = trade creation for a specific commodity i in the United States

M_i = the initial level of U.S. imports from Canada

Δt_i = the change in tariff rate in the United States

t_i = the initial tariff level for commodity i

e_i = the import demand elasticity for commodity i

The trade diversion effect is not easy to calculate, mainly because of difficulties in empirically estimating substitution elasticities. To calculate the trade diversion effect, we need to estimate the shift in import demand for Canadian products resulting from the change in relative import prices between Canada and other countries. In Figure 1, this increase in U.S. imports from Canada is drlm, and the decline in U.S. imports from other countries is hajk. If we assume that the United States simply substitutes one for the other, and does not change its spending on other goods, these areas are equal ($\square$ hajk = $\square$drlm). One way to calculate trade diversion (Baldwin and Murray) is:

$$TD_i = W_i M_{ni} \qquad (2)$$

where

M_{ni} = initial U.S. imports from other countries

W_i = the share coefficient ($hajk/ajP_0O_1$)

Assuming $\square$ cdkj is equal to $\square$ fgop, trade diversion is calculated as

$$TC_i = W_iV_i \quad (3)$$

where V_i = domestic production (i.e., 0_3g0P_d) and W_i is redefined as $fgop/0_3g0P_d$

This is based on an assumption that the substitutability between Canadian products and products produced in other countries approximately equals substitutability between Canadian products and U.S. products.

Combining equation (2) and (3) yields

$$TD_i = (TC_i/V_i)\, M_{ni}$$

$$= TC_i\, (M_{ni}/V_i) \quad (4)$$

Alternatively, trade diversion can be calculated as follows (Verdoorn):

$$TD_i = TC_i(M_{ni}\ /(M_{ni} + M_i)) \quad (5)$$

where $M_{ni}/\ (M_{ni} + M_i)$ is the ratio of the import from the nonbeneficiary to the country's total imports of commodity group i.

For empirical applications of the integration theory, the use of the Baldwin and Murray method requires domestic production by product group, which is frequently unavailable (Sawyer and Sprinkle 1989). The Verdoorn formula, therefore, has been more frequently used to compute trade diversion.

IV. Import Demand Functions and the Seemingly Unrelated Regression Estimation Approach

Several previous studies have estimated import demand functions. They hypothesize that imports are directly proportional to the importing country's GNP, inversely proportional to import prices, and directly proportional to import competing prices. We start from the following simple classical static model:

$$\ln Q_{it} = \lambda_o + \lambda_1 \ln PM_{it} + \lambda_2 \ln PD_{it} + \lambda_3 \ln PW_{it} + \lambda_4 \ln Y_t + \ln e_{it} \quad (6)$$

where Q_{it} is the dollar volume of U.S. (Canadian) imports from Canada (the United States), PM_{it} is the bilateral unit value index of imports, PD_{it} is the domestic wholesale price index in the importing country, PW_{it} is the multilateral or world price index of imports, and Y_t is a measure of the national income of the importing country. The

subscript i identifies the appropriate import commodity group under Standard International Trade Classification for the United States and Standard Industrial Classification (SIC) for Canada; and t represents the time period. The λs are parameters. Finally, e_{it} is a random error term. Equation (6) is an import demand model commonly used in import demand literature. It is hypothesized that PM_{it} is negatively related to import demand (Q_{it}) and PD_{it}, PW_{it} and Y_t are positively related to Q_{it}.

Most previous researchers (Goldstein and Khan 1978; Hill and Whalley 1989; Stokes 1989) have been concerned about import behavior and have estimated aggregate import demand functions to explain import variations as a response to changes in relative prices and national income. They assumed that model parameters are constant across industries or commodity groups. The assumption of an identical response across industries or commodity groups greatly simplifies empirical work but, at the same time, conceals valuable information specific to particular commodity or industry groups. For example, the behavior of a particular industry, initiated by bilateral tariff cuts or other terms of a Free Trade Agreement, can vary substantially from industry to industry. The assumption of constant parameters across industry may lead to incorrect estimates of import behavior.

This study departs from this tradition and assumes that each import commodity group responds differently to economic disturbances. Allowing different behavior among import commodity groups is appropriate in analyzing specific effects of the trade agreement, because each industry has its own financial and economic structures and resource endowments, and faces different competition. Furthermore, statistical tests suggest that single-equation specification may not be sufficient to capture cross-industry random variations.

Random variations in time series observations can be assumed to arise from several sources: industry characteristics, national and international economic conditions, labor, technology, and local conditions, such as weather and soil types for agriculturally related products. For example, a labor-intensive industry and a capital- intensive industry will respond differently to an import tariff cut. Several industries have common characteristics and enjoy, at minimum, some degree of substitution between imports and domestic productions (Baldwin and Murray 1977; and Verdoorn 1960).

An efficient estimation procedure that accounts for cross industry correlation and variations is Zellner's Seemingly Unrelated Regression Estimation (SURE) technique. Judge et al. (1985) show that the efficiency gain from using SURE can be high when explanatory variables do not have a high degree of collinearity in respective equations but there is a high degree of contemporaneous correlations in random errors.

Import markets are dynamic markets; and the dynamic behavior of imports should be incorporated in Equation 6. A dynamic version of Equation 6 can be derived under an assumption of stock adjustment in the import demand behavior. Complete derivations of a dynamic import demand function are available in Goldstein and Khan (1978) or more recently in Koo et al. (1991). For an empirical implementation of the model using quarterly data, quarterly dummy variables D_{2t}, D_{3t}, and D_{4t} are included to capture seasonality in the import behavior of both countries.

In a dynamic framework, the SURE system consists of nine equations for the United States (one equation each for SITC categories 0 to 8); and six equations (under the SIC) for Canada as shown below:

$$\ln Q_{it} = \lambda_o + \lambda_1 \ln PM_i + \lambda_2 \ln PD_{it} + \lambda_3 \ln PW_{it} + \lambda_4 \ln Y_t + \lambda_5 D_{2t} + \lambda_6 D_{3t} + \lambda_7 D_{4t} + \lambda_8 \ln Q_{it-1} + e_{it} \quad (7)$$

i=0 to 8 for the United States, i=0 to 5 for Canada, and t=1, 2,.....T

Equation (7) represents a system of Seemingly Unrelated Regression Equations (Zellner 1962). Since these equations contain a lagged dependent variable and autocorrelated errors, we used the Three-step Gauss-Newton procedure (3SGN), developed by Wang et al. (1981).

V. Results

The U.S. and Canadian trade data were collected quarterly from 1970 to 1987. Bilateral values of U.S. imports from Canada and corresponding import unit value indexes were obtained from Highlights of U.S. Export and Import Trade published by the U.S. Department of Commerce. Domestic wholesale price indexes, multilateral price indexes, and GNP were obtained from the International Monetary Fund. Values of Canadian imports from the United States were obtained from Statistics Canada. Trade in Automobiles is not included in the analysis since the Free Trade Agreement does not affect it. Auto and Auto parts are tariff free across the United States and Canada under the 1965 Automotive Product Trade Agreements (APTA), often referred to as Auto pact.

The system specified in (7) was estimated using the modified 3SGN procedure. Results for both the U.S. and Canadian import demand models are shown in Tables 3 and 4, respectively, by commodity groups under available classifications: SITC for the United States and SIC for Canada. In the U.S. models, most parameters in all equations have expected signs and differ significantly from zero at the 5 percent level. The system weighted R^2 is .926, implying that included variables explain most of the variations in the quantity of imports in respective equations. The coefficients on the lagged dependent variables in most cases are significant, indicating that imports exhibit dynamic behavior. Except for beverage and tobacco, the imports exhibit significant seasonality.

Estimated parameters indicate that income is a major determinant of demand for every commodity group. As expected, bilateral import prices are negatively correlated to the quantity of imports. However, in a few cases, world price variables caused estimation problems of multicolinearity and were dropped from the estimation. In most commodity groups, the assumption of substitution between domestic production and imports is supported by the data. The substitution effect is pronounced in all categories except for imports in the groups of manufactured and miscellaneous manufactured goods. This implies that high technology products in manufacturing are not easily substitutable for the Canadian counterparts.

For the Canadian models, all parameters have expected signs. The system weighted R^2 is 0.758, suggesting that the included variables explain a high proportion of the TABLE

3. BILATERAL TRADE RELATIONSHIPS: SURE ESTIMATES OF U.S. IMPORTS FROM CANADA

Model	Constant	Income	Import Price	Domestic Price	World Price	Lagged Dependent	qtr 2	qtr 3	qtr 4
SITC O: Food and Live Animals.									
M1	-1.0306	0.4690	-0.4690	0.5471	--	0.4533	0.2465	0.1998	0.4533
	(-3.86)	(4.69)	(-4.37)	(5.10)	--	(5.24)	(5.33)	(2.32)	(5.24)
SITC 1: Beverage and Tobacco									
M2	2.1468	0.5481	-0.2934	0.5835	--	0.0915	0.1233	0.2170	0.3661
	(6.16)	(5.43)	(-2.43)	(4.07)	--	(1.06)	(1.89)	(3.53)	6.11)
SITC 2: Crude Materials									
M3	-4.2873	0.8143	-0.2934	0.5795	0.2666	0.2667	0.2072	0.2129	0.0201
	(-2.77)	(3.36)	(-2.43)	(5.33)	(5.20)	(4.06)	(3.87)	(3.99)	(0.373
SITC 3: Mineral Fuels									
M4	-8.6419	0.8723	-0.9586	0.9771	0.3519	0.6170	-0.1859	-0.1687	-0.1069
	(-1.42)	(1.123)	(-3.88)	(4.02)	(3.16)	(8.08)	(-1.27)	(-2.49)	(-1.57)
SITC 4: Animal, Vegetable Oil and Fat									
M5	-6.5305	0.6049	-0.8755	0.9739	0.5531	0.4714	0.5751	0.4447	0.4201
	(-4.97)	(2.49)	(-2.27)	(2.91)	(3.26)	(5.94)	(4.08)	(3.24)	(3.06)
SITC 5: Chemicals									
M6	-3.5601	0.7994	-0.8857	1.4103	0.4205	0.0582	0.0401	0.1036	-0.0851
	(-4.50)	(5.02)	(-3.37)	(5.97)	(3.70)	(0.75)	(0.42)	(1.03)	(-0.84)
SITC 6: Manufacturers									
M7	-0.0247	0.8430	-0.7204	0.9848	0.1774	--	0.1462	0.2769	0.0514
	(-0.02)	(5.04)	-2.33)	(3.75)	(1.22)		1.36)	(2.58)	(0.48)
SITC 7: Machines and Transport Equipments									
M8	0.7981	0.5862	-0.3255	0.4067	--	0.4388	0.1131	-0.0477	0.0573
	(2.07)	(4.79)	(-2.21)	(3.20)	--	(5.52)	(1.76)	(-0.74)	(0.89)
SITC 8: Miscellaneous Manufacturers									
M9	-2.9672	0.8602	-0.7079	0.7439	0.1011	0.4058	0.1927	0.1967	0.1607
	(-6.04)	(6.73)	(-4.72)	(5.58)	(1.85)	(5.81)	(3.63)	(3.78)	(5.81)

System R^2 =0.924.
DF=559.
System weighted MSE=0.964

Numbers in parentheses are the corresponding t-values.

variation in the imports from the United States in most commodity groups. The income coefficients are all significant except in the group of live animals . Bilateral import prices are significant except for SIC categories 0 and 2. World price coefficients are not significant in most equations. The coefficients on lagged dependent variables are strong and significant, indicating a strong dynamic mechanism in Canadian imports from the United States. For Fabricated Materials, Inedibles and Special transactions, the hypothesis of no seasonality could not be rejected at the 5% level.

TABLE 4. BILATERAL TRADE RELATIONSHIPS: ECONOMETRIC ESTIMATES OF CANADIAN IMPORTS FROM THE UNITED STATES

Model	Constant	Income	Import Price	Domestic Price	World Price	Lagged Dependent	qtr 2	qtr 3	qtr 4
SIC 0: Live Animals									
M1	5.0515	0.0852	-0.1553	0.2724	0.0421	0.4105	0.4245	0.0719	0.5274
	(4.95)	(1.42)	(-1.29)	(2.05)	(0.14)	(4.72)	(2.07)	(0.35)	(2.58)
SIC 1: Food, Feed, Beverage, and Tobacco									
M2	2.6300	0.1569	-0.1943	0.6397	0.1796	0.6450	0.1990	0.1158	0.2129
	(2.12)	(4.24)	(-3.32)	(5.64)	(0.95)	(4.60)	(1.59)	(0.91)	(1.96)
SIC 2: Crude Materials									
M3	2.5374	0.0509	-0.0552	0.1733	-0.0891	0.7595	0.4862	0.3598	0.3210
	(4.21)	(2.12)	(-1.32)	(3.29)	(-0.26)	(15.15)	(6.866)	(5.03)	(4.52)
SIC 3: Fabricated Materials Inedibles									
M4	1.6560	0.1881	-0.2356	0.6400	0.1668	0.4403	0.0743	-0.0503	0.1114
	(1.79)	(6.62)	(-5.150)	(7.10)	(0.58)	(8.10)	(0.78)	(-0.51)	(1.17)
SIC 4:End Product, Inedibles									
M5	6.2555	0.1953	-0.2212	0.6456	0.2175	0.3249	0.1675	-0.1922	-0.1014
	(2.41)	(2.97)	(-2.23)	(3.08)	(0.68)	(1.58)	(0.78)	(-0.83)	(-0.47)
SIC 5: Special Transactions									
M6	-0.1682	0.2120	-0.3055	0.7202	0.1868	0.6443	0.0111	-0.3804	0.2328
	(-0.11)	(3.14)	(-3.00)	(3.34)	(0.56)	(4.13)	(0.05)	(-2.74)	(1.96)
System Weighted R2=.7589.									
System weighted MSE=0.9298.									
DF=396.									

Numbers in parentheses are the corresponding t-values.

U.S Import Demand for Canadian Goods

The estimated import demand elasticities with respect to import price range from -0.29 (crude materials) to -0.95 (mineral fuels), and those with respect to domestic price range from .40 (machines and transports) to 1.41 (chemicals).

These elasticities suggest that U.S. imports from Canada are more sensitive to the U.S. domestic prices than to import prices across all commodity groups. In other words, the commodities imported respond more to domestic prices than to bilateral import prices. The elasticities are greater than 1.0 only for chemicals, indicating strong competition with domestic products in that market. The income elasticities are strong and significant, though mostly less than 1.0. Imports of animal, vegetable oil, and fat are more sensitive to domestic prices than the group of food and live animals.

Canadian Import Demand From the United States

Contrary to the past research that used aggregate data, the income elasticities are significant for all commodity groups except for the group of live animals. The estimated parameters for domestic prices have the expected signs and are significant at the 5 percent level for all commodity groups; and those for import prices are significant for all commodity groups, except for live animals and crude materials. The estimated coefficients on the lagged dependent variables differ significantly from zero at the 5 percent level in most cases, indicating that Canadian imports from the United States contain dynamic elements.

Estimated import elasticities with respect to import and domestic prices are much smaller than those for the United States. The import price elasticities range from -0.05 for crude materials to -0.30 for special transactions, while domestic price elasticities range from .17 (crude materials) to .72 (special transactions). The inelastic price elasticities suggest existence of less competitive market environment. Indeed, the Canadian economy has a much smaller internal market than does the United States.

Economic Benefits of the FTA

Estimated import price elasticities are used to calculate the trade creation and trade diversion effects of the FTA. The 1988 import data were used in the computation. The Verdoorn model is used to estimate the amount of trade diversion following equation 5.

The average import tariffs in Canada are higher than those in the United States, except for tobacco. However, the United States has higher nontariff barriers than Canada for all commodity groups. When all tariff and nontariff barriers are eventually eliminated, bilateral trade volume between the United States and Canada is expected to increase through the trade creation and trade diversion effects outlined earlier.

Using estimated price elasticities and the 1988 import figures from Table 1, we estimate that elimination of tariff barriers and nontariff barriers would produce trade creation effects of $2.76 billion, and trade diversion effects of about $.495 billion (Table 5). Similarly, Canadian imports would increase by $1.46 billion as a TC effect and by $0.97 billion as a TD effect (Table 6).

In general, under a complete tariff cut following the FTA, Canadian imports from the United States are expected to increase by about $2.4 billion, while U.S. imports from Canada are expected to increase by about $3.2 billion, representing an increase in trade volume for both countries. The Canadian import increases under the FTA are proportionately smaller than those of the United States, mostly because Canadian import demands are less elastic than U.S. import demands. Because of its smaller internal market, Canada also has a smaller absorption capacity than the United States.

TABLE 5. TRADE CREATION AND TRADE DIVERSION EFFECTS OF THE U.S.-CANADIAN FREE TRADE AGREEMENT ON IMPORTS FROM CANADA

Commodity Groups	Trade Creation	Trade Diversion	Trade Expansion
		$1,000	
SITC 0: Food & live animals			
1. Removal of trade barriers	52,429	8,263	61,092
2. Removal of nontrade barriers	248,416	39,150	287,566
Total	300,845	47,413	348,258
SITC 1: Beverage & tobacco			
1. Removal of trade barriers	8,626	1,112	9,738
2. Removal of nontrade barriers	23,497	3,029	26,526
Total	31,523	4,063	35,586
SITC 2 : Crude materials			
1. Removal of trade barriers	74,530	38,688	113,218
2. Removal of nontrade barriers	46,306	24,037	70,343
Total	120,656	62,632	183,288
SITC 3: Mineral fuels			
1. Removal of trade barriers	549,741	90,212	639,953
2. Removal of nontrade barriers	0	0	0
Total	549,741	90,212	639,953
SITC 4: Animal & vegetable oil & fat			
1. Removal of trade barriers	1,836	156	1,992
2. Removal of nontrade barriers	9,053	767	9,820
Total	10,889	923	11,812
SITC 5: Chemicals			
1. Removal of trade barriers	108,295	20,468	128,763
2. Removal of nontrade barriers	73,485	13,889	87,374
Total	181,780	34,356	216,136
SITC 6: Manufacturers			
1. Removal of trade barriers	355,441	76,953	432,394
2. Removal of nontrade barriers	155,505	33,667	189,172
Total	510,946	110,620	621,566
SITC 7: Machines & transport equipment			
1. Removal of trade barriers	522,368	81,385	603,753
2. Removal of nontrade barriers	354,464	55,225	409,689
Total	876,832	136,610	1,013,442
SITC 8: Miscellaneous manufacturers			
1. Removal of trade barriers	124,793	5,952	130,745
2. Removal of nontrade barriers	54,597	2,604	57,201
Total	179,390	8,557	187,947
Grand Total	2,762,602.00	495,386.00	3,257,988.00

TABLE 6. TRADE CREATION AND TRADE DIVERSION EFFECTS OF THE U.S.-CANADIAN FREE TRADE AGREEMENT ON CANADIAN IMPORTS FOR THE UNITED STATES

Commodity Groups	Trade Creation	Trade Diversion	Trade Expansion
	----------$1,000----------		
SIC 0 : Live animals			
1. Removal of trade barriers	48,700.00	424.00	911.00
2. Removal of nontrade barriers	1,241.00	1,139.00	2,380.00
Total	1,728.00	1,563.00	3,291.00
SIC 1: Food, feed, beverage & tobacco			
1. Removal of trade barriers	34,004.00	17,534.00	51,538.00
2. Removal of nontrade barriers	20,036.00	10,331.00	30,367.00
Total	54,040.00	27,865.00	81,905.00
SIC 2 : Crude materials			
1. Removal of trade barriers	8,297.00	3,867.00	12,164.00
2. Removal of nontrade barriers	4,889.00	2,278.00	7,167.00
Total	13,186.00	6,145.00	19,331.00
SIC 3: Fabricated materials, inedible			
1. Removal of trade barriers	184,292.00	118,777.00	303,069.00
2. Removal of nontrade barriers	108,593.00	69,989.00	178,582.00
Total	292,875.00	188,766.00	297,359.00
SIC 4: End products, inedibles			
1. Removal of trade barriers	664,929.00	455,597.00	1,120,526.00
2. Removal of nontrade Barriers	391,806.00	268,458.00	660,264.00
Total	1,056,735.00	724,055.00	1,780,790.00
SIC 5: Special Transactions			
1. Removal of trade barriers	25,011.00	15,801.00	40,812.00
2. Removal of nontrade barriers	14,737.00	9,310.00	24,047.00
Total	39,748.00	25,111.00	64,859.00
Grand Total	1,459,312.00	973,505.00	2,432,817.00

Completely eliminating TB and NTB in the United States would sharply increase U.S. imports of machines and transport equipment ($1.01 billion), mineral fuels ($0.640 billion), and manufactured goods ($0.621 billion). Imports of food and live animals show a modest increase of $0.348 billion.

In Canada, after complete elimination of TB and NTB, imports of end product materials could increase by $1.78 billion and imports of fabricated materials could reach $ 0.481 billion. Canadian imports of live animals would increase by only $0.004 billion.

The effect of income changes on imports under the FTA can be estimated, using the income elasticity estimates. As shown in Table 3, the increase in imports due to the income increase alone would be larger for the United States than for Canada because the income elasticities for the United States are larger than those for Canada across all commodities. This finding is also contrary to results of past studies that used aggregate or semi-aggregate data.

Several studies have estimated the impact of the FTA, using macroeconomic models (Cox and Harris 1986; Stokes 1989). Their general conclusion is that under FTA, Canada and the United States would potentially increase the respective national welfare. The finding is similar to our results, which show welfare gains by industry or commodity groups.

VI. Concluding Remarks

Both the United States and Canada are developed economies with similar cultural and historical heritages. However, the import demand behavior varies significantly by industry or commodity groups in both countries. The difference in import behavior suggests different responses to the FTA.

The study shows that U.S. imports of Canadian goods are more sensitive to domestic and bilateral import prices than are Canadian imports of U.S. goods. This is mainly because the United States has a larger and more competitive internal market than does Canada.

Eliminating all tariff and nontariff barriers would increase bilateral trade volume across all commodities traded, primarily through trade creation and trade diversion effects, which are greatest for end products in Canada and greatest for machines and transportation equipment in the United States. This implies that the United States could increase its exports of end products to Canada while Canada could increase exports of machines and transportation equipment to the United States.

This study used a short-run snapshot approach under an assumption that industries in both countries remain unchanged under the full implementation of the FTA. In the long run, industries in both countries will change on the basis of resource endowments. Therefore, effects of the FTA could be larger than those presented in this paper.

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