NAFTA INTRA INDUSTRY TRADE IN AGRICULTURAL FOOD PRODUCTS

by

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ABSTRACT

The paper focuses on NAFTA's impact on intra-industry and inter-industry trade in agricultural food products. Bilateral trade among U.S., Canada, and Mexico, as well as their trade with the rest of the world during 1990 and 1995 are investigated. U.S. trade patterns for agricultural food products are slowly changing.

THE EFFECT OF NAFTA ON TRADE IN AGRICULTURAL FOOD PRODUCTS.

1. INTRODUCTION

In January of 1989 the United States and Canada implemented a free trade agreement which called for the gradual elimination of most of their bilateral tariff and non-tariff barriers by 1998. In January of 1994, the United States, Canada, and Mexico implemented NAFTA, a free trade agreement, which calls for the gradual elimination of tariff and non-tariff barriers on nearly all traded goods over a 15 year period.

Prior to the implementation of NAFTA, tariff and non-tariff barriers were minimal between the U.S. and Canada in most sectors. Except for the relative size of the countries with respect to population and GDP, the two economies are considered very similar. However, Mexican culture and the structure of Mexico's economy is very different from its neighbors to the north. Until Mexico became a member of GATT in 1986, Mexican tariff and non-tariff barriers were extremely restrictive. Mexican tariffs were as high as 100%, and 92% of all imported goods required an import license (Ten Kate 1992). By 1994, the Mexican tariff rate had fallen to an average of 20% and most import licensing requirements were eliminated (Qasmi and Fausti 1994).

Economic theory suggests that economic benefits will result from an increase in trade among NAFTA countries. Increased trade will result from a realignment of relative prices as trade barriers disappear. As relative prices change, the basic economic principle of comparative advantage will encourage resources to flow into those productive activities where opportunity cost is minimized. In turn, specialization in production and exchange will occur as producers and consumers adjust to changing economic conditions.

Trade patterns between the U.S., Canada, and Mexico are predicted to shift as the principle of comparative advantage alters inter-industry and intra-industry trade flows.[2] In competitive markets producing homogenous goods, shifts in inter-industry trade patterns result from high cost producers in one country exiting the market after losing import price protection from low cost foreign producers. Intra-industry trade is associated with monopolistic markets. In monopolistic markets, competing firms produce differentiated products which are close substitutes. International competition forces monopolistic firms to specialize in the production of fewer varieties of a particular type of good and to take advantage of economies of scale by narrowing production lines. As trade barriers are eliminated, shifts in intra-industry trade patterns result from specialization in production and economies of scale.

NAFTA's potential economic consequences have received considerable attention (eg. Fatemi and Salvatore (1994); Klein and Salvatore (1995)). Our focus is on the effect NAFTA has had on the international exchange of agricultural food products with respect to intra-industry and inter-industry trade. We have constructed an intra-industry trade index for the years 1990 and 1995 based on the seminal work of Grubel and Lloyd (1975). OECD *Standard International Trade Classification* (SITC) data was acquired for selected agricultural food product groups. NAFTA bilateral exchange patterns for these agricultural food products are analyzed to determine if trade volume has increased and to identify product groups which are primarily inter or intra-industry.

[2] Intra-industry trade involves the international exchange of differentiated products of the same industry or broad product group. Inter-industry trade refers to international exchange of unrelated goods. Lancaster (1980) argues that even in the case of intra-industry trade, "comparative advantage is somewhere in the background." Salvatore (1995: p.163) concludes that "inter-industry trade reflects natural comparative advantage while intra-industry trade reflects acquired comparative advantage."

Previous documentary studies (Roberts (1995), Neff et al. (1996)) which examined U.S. agricultural trade with the NAFTA region (Canada and Mexico combined) concluded that there is substantial evidence of intra-industry trade in food products. In contrast, we find that U.S. trade with Canada is dominated by intra-industry trade, but U.S. and Canadian trade with Mexico is dominated by inter-industry trade for the selected group of food products in our study. While Mexican intra-industry trade in food products has increased with its NAFTA partners since the implementation of NAFTA, in relative terms, it has been minimal compared to the substantial growth in intra-industry trade between the U.S. and Canada.

2. LITERATURE REVIEW

The literature on intra-industry trade (IIT) grew out of the empirical findings of Balassa (1966) and Grubel (1967). These authors investigated the affect on trade among EEC countries resulting from increased economic integration of Western Europe in the late 1950s and early 1960s. Their findings were surprising because trade expansion was primarily intra- rather than inter-industry for manufactured goods. The expansion of European intra-industry trade was contrary to traditional neoclassical trade theory which explains trade patterns resulting from differences in factor endowments among trading partners. According to traditional trade theory, trade expansion in Europe should have been dominated by inter-industry trade.

The expansion of intra-industry relative to inter-industry trade in Europe provided the catalyst for the development of a strand in the international trade literature that has come to be known as the "New Trade Theory." The theoretical underpinnings of this literature are based on monopolistic competition, product differentiation, economies of scale in production, consumer demand for variety, and similarity in consumer preferences.

Trade models based on these economic concepts provide a theoretical explanation for the rapid post-WWII expansion of intra-industry trade in manufactured goods among industrial countries.[3]

Product differentiation as a basis for trade is intertwined with the assumptions concerning the structure of consumer preferences. The literature on this issue defines products as being either horizontally differentiated or vertically differentiated. These alternative assumptions refer to the supposition that consumer utility increases as product variety or the range of product quality increases. In the case of horizontally differentiated products, differentiation is based on product attribute mix (color, style, etc.). Vertically differentiated products refer to consumers differentiating between goods based on quality levels.

A number of sectors in the processed foods industry exhibit attributes associated with a monopolistic market structure (see Ruppel et al. 1996). Alternatively, agricultural products which undergo little processing and are regarded as a homogenous product may be viewed by the consumer as a vertically differentiated product. A example would be beef (fresh, chilled, frozen). Mexican consumers consider American beef to be of superior quality to domestically produced beef, and American beef commands a premium in Mexico relative to domestically produced beef.

A number of empirical studies have tested the hypotheses associated with the intra-industry trade literature. Greenway and Milner (1986) provide an excellent discussion of

[3] Contributors to the theoretical literature include Gray (1973), Grubel and Lloyd (1975), Lancaster (1980), Falvey (1981), Helpman (1981), Brander and Krugman (1983), and Krugman (1979, 1980, 1981). For an extensive discussion of this literature see Helpman and Krugman (1985) or Greenway and Milner (1986).

this empirical work, concluding that support for the testable hypotheses developed in the IIT literature can be found in the documentary and econometric studies on IIT.[4]

In the empirical literature on intra-industry trade, the measurement technique most commonly used to determine the magnitude of intra-industry trade is the Grubel and Lloyd (1975) Index of Intra-Industry Trade:

$$1. \quad B_i = 1 - \frac{|X_i - M_i|}{X_i + M_i} \ ,$$

where B_i is the Grubel-Lloyd measure of intra-industry trade for industry i, X_i is the country's exports in industry i, and M_i is the country's imports in industry i. This measure of intra-industry trade reaches its maximum of one when exports equal imports and its minimum of zero when either exports or imports equal zero.[5] However, the IIT literature stresses that B_i may become a biased measure of IIT if there is an aggregate trade imbalance.[6]

Unbalanced bilateral U.S. trade with NAFTA countries and with the rest of the world (ROW) persisted during the 1990-95 time period. Table 1 provides summary statistics which shows the U.S. running a relatively large trade deficit with its NAFTA

[4] Examples include Pagoulatos and Sorensen (1975), Greenway and Milner (1984), Tharakan (1984), and Balassa (1986).

[5] There have been a number of other intra-industry index measures proposed, such as the Glejser et al. (1982) index. See Greenway and Milner (1986) for a review of this and other alternative IIT measures.

[6] For a discussion of the possible consequences of an aggregate trade imbalance on the measurement of IIT see Greenway and Milner (1986).

partners and the rest of the world in 1990 and 1995.

TABLE 1. Summary of U.S. bilateral trade (in billion US $).

	U.S. and Canada			U.S. and Mexico			U.S. and ROW 1/		
	1990	1995	Change	1990	1995	Change	1990	1995	Change
U.S. Export of All Products	78.2	113.3	44.8%	27.5	44.9	63.4%	268.9	388.3	44.4%
U.S. Import of All Products	93.8	148.3	58.1%	30.8	62.8	103.9%	392.4	559.8	42.7%
U.S. Total Trade in All Products	172.0	261.6	52.1%	58.3	107.7	84.8%	661.2	948.2	43.4%
U.S. Trade Balance in All Products	-15.6	-35.0	124.9%	-3.3	-17.9	438.1%	-123.5	-171.5	38.9%

1/ ROW = World - U.S. - Canada -Mexico.

In the case of an aggregate trade imbalance, Grubel and Lloyd (1975) suggest the following adjustment to the index measure given in eq. 1,

$$2. \quad b_{ijk} = 1 - \frac{\left| \frac{X_{ijk}}{X_{jk}} - \frac{M_{ijk}}{M_{jk}} \right|}{\frac{X_{ijk}}{X_{jk}} + \frac{M_{ijk}}{M_{jk}}},$$

where b_{ijk} is the adjusted Grubel-Lloyd measure of intra-industry trade for industry i for two-way trade between countries j and k. The notation X_{ijk} and M_{ijk} denote exports and imports, respectively, for industry i in trade between countries j and k. X_{jk} and M_{jk} denote total exports and imports in all products, respectively, between countries j and k. This measure of IIT approaches its maximum of one when exports and imports are equal, and its minimum of zero when either exports or imports approach a value of zero.

3. DATA AND METHODOLOGY

For this study, we chose OECD's SITC Revision 3 data. This study covers 23 agricultural food product groups which included meat, meat products, dairy products, grain and cereal products, processed fruits and vegetables, and other related food products associated with livestock, grain, and vegetable production in the U.S.

Following the work of McCorriston and Sheldon (1991), an adjusted Grubel-Lloyd intra-industry trade index (eq.2) is constructed for agricultural food product trade for selected SITC categories. Bilateral trade patterns for the U.S., Canada, Mexico, and U.S. trade with the rest of the world are documented using three-digit SITC data for the years 1990 and 1995.[7] Using the constructed index, we identify trade in SITC categories as being either intra-industry or inter-industry.

There are a number of caveats associated with the reliability of international trade data (see Morgenstern 1965). With respect to empirical work on intra-industry trade the caveat raised most often is the aggregation problem. The aggregation problem refers to commodity or industry classification categories being too broadly defined. This results in unrelated goods being lumped into one category and creating the appearance of two-way trade when trade is actually one-way.

Greenway and Milner (1986, pp. 59-79) provide an extensive discussion of this issue and state, "a degree of professional consensus does exist in regard to the three-digit of the SITC as a reasonable, initial approximation of an industry; a great many researchers have conducted documentary and econometric research at this level of disaggregation."

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[7] Hart and Mcdonald (1992) conducted a bilateral documentary study of pre-NAFTA trade patterns using 1962-87 SITC (Rev.1) three-digit data for all product categories. SITC (Rev.1) data for agricultural products suffers from aggregation problems in several product categories e.g. at the three-digit level, SITC category O11 (meat: fresh, frozen, chilled) lumps beef, pork, and poultry together.

They conclude that the aggregation problem at the SITC three-digit level cannot be dismissed, but the problem is not great enough to be the sole explanation for empirical evidence of intra-industry trade in previous studies.

4. ESTIMATES FOR INTRA-INDUSTRY TRADE IN AG FOOD PRODUCTS

The structure of bilateral trade for NAFTA countries and their trade with the rest of world is documented according to the nature of trade for the selected group of agricultural food products for 1990 and 1995 (Table 2). The information on the structure of bilateral trade is based on SITC three-digit category estimates using the adjusted Grubel-Lloyd index measure. Index values falling within the range of: 1) 0 to .25 are classified as product categories with strong inter-industry trade tendencies; 2) .26 to .50 are classified as product categories with weak inter-industry trade tendencies; 3) .51 to .75 are classified as product categories with weak intra-industry trade tendencies; and 4) .76 to 1.0 are classified as product categories with strong intra-industry trade tendencies.

In Table 2, a shift in the pattern of NAFTA bilateral trade or NAFTA & ROW trade for a particular SITC three-digit category from 1990 to 1995 is denoted with a single (intra to inter) or double (inter to intra) asterisk. A strengthening or weakening in a specific pattern of bilateral trade for a particular SITC three-digit category from 1990 to 1995 is denoted with a plus or minus.

Table 3 provides summary statistics on 1990 and 1995 bilateral trade flows for selected agricultural food products based on SITC three-digit data. With respect to overall trade, the U.S. ran a trade deficit with its NAFTA partners and the ROW in 1990 and 1995 (Table 1). In contrast, the U.S. experienced a trade surplus in agricultural food products

TABLE 2. Selected agricultural products categorized by level of intra-industry trade for year 1990, and 1995.

	U.S. and Canada		U.S. and Mexico		Canada and Mexico		U.S. and ROW		Canada and ROW		Mexico and ROW	
SITC CODE	1990	1995	1990	1995	1990	1995	1990	1995	1990	1995	1990	1995
LIVESTOCK PRODUCTS:												
011 Meat of bovine animals	W-INTRA	S-INTRA +	S-INTER	S-INTER	S-INTER	S-INTER	S-INTRA	W-INTER *	S-INTER	W-INTRA **	W-INTRA	W-INTER *
012 Other meat and edible meat offal	W-INTER	W-INTRA **	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	W-INTER	S-INTER +	W-INTER	W-INTRA **
016 Meat, edible offal, salted, dried	W-INTER	W-INTER	S-INTER	S-INTER	--	S-INTER	W-INTRA	W-INTER *	S-INTER	S-INTER	S-INTER	W-INTER -
017 Meat, edible offal, preserved, n.e.s.	W-INTRA	W-INTRA	S-INTER	S-INTER	S-INTER	S-INTER	W-INTER	S-INTRA **	S-INTRA	W-INTRA -	S-INTER	W-INTER -
DAIRY PRODUCTS:												
022 Milk products (not butter & cheese)	S-INTRA	W-INTER *	S-INTER	S-INTER	S-INTER	S-INTER	W-INTER	S-INTER +	W-INTER	W-INTER	S-INTER	S-INTER
023 Butter and other fats from milk	W-INTER	S-INTER +	S-INTER	S-INTER	--	--	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER
024 Cheese and curd	S-INTRA	S-INTRA	S-INTER	S-INTER	--	--	S-INTER	W-INTER -	W-INTRA	W-INTRA	S-INTER	S-INTER
EGGS:												
025 Birds' eggs, and eggs	W-INTRA	W-INTER *	S-INTER	S-INTER	S-INTER	--	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	W-INTER -
GRAINS:												
041 Wheat (including spelt)	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER
042 Rice	S-INTER	S-INTER	S-INTER	S-INTER	--	--	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	W-INTER -
043 Barley, unmilled	S-INTER	S-INTER	S-INTER	S-INTER	--	--	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	--
044 Maize (not sweet corn), unmilled	S-INTER	W-INTER -	S-INTER	S-INTER	--	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER
045 Other cereals, unmilled	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	W-INTRA **
CEREAL PRODUCTS:												
046 Meal and flour of wheat	W-INTRA	W-INTER *	S-INTER	S-INTER	--	--	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER	S-INTER
047 Other cereal meals and flour	S-INTER	W-INTER -	S-INTER	W-INTER -	S-INTER	S-INTER	S-INTER	S-INTER	S-INTRA	W-INTER *	S-INTRA	S-INTER *
048 Other cereal preparations	S-INTRA	S-INTRA	S-INTRA	S-INTRA	S-INTER	S-INTER	S-INTRA	S-INTRA	S-INTRA	S-INTRA	W-INTER	W-INTER
FRUITS & VEGETABLES:												
056 Vegetables, prepared, preserved	W-INTRA	W-INTRA	W-INTER	W-INTER	S-INTER	W-INTRA **	S-INTRA	W-INTRA -	W-INTRA	S-INTRA +	S-INTRA	W-INTER *
058 Fruit, preserved, & preparations	W-INTER	S-INTRA **	S-INTER	S-INTER	S-INTER	S-INTER	S-INTRA	S-INTRA	W-INTRA	W-INTRA	W-INTRA	S-INTRA +
OTHER PRODUCTS:												
061 Sugar, molasses and honey	S-INTRA	S-INTRA	S-INTER	W-INTRA **	S-INTER	S-INTER	W-INTER	W-INTRA **	S-INTER	S-INTER	S-INTER	S-INTER
062 Sugar confectionery	W-INTRA	S-INTRA +	W-INTRA	W-INTER *	S-INTER	S-INTER	W-INTER	W-INTRA **	S-INTER	W-INTER -	W-INTRA	W-INTER *
081 Feeding stuff for animals	W-INTRA	W-INTRA	S-INTER	S-INTER	W-INTER	S-INTER +	S-INTER	S-INTER	W-INTER	W-INTER	S-INTER	S-INTER
091 Margarine and shortening	S-INTRA	W-INTER *	S-INTER	S-INTER	--	--	S-INTER	S-INTER	W-INTRA	W-INTRA	S-INTER	S-INTER
098 Other edible products	W-INTER	W-INTRA **	S-INTRA	W-INTER *	S-INTRA	W-INTER *	W-INTER	W-INTER	W-INTRA	S-INTRA +	S-INTRA	S-INTRA

1/ Industry Categories: S-INTER (Strong Inter-industry, GL Index 0.0 to 0.25), W-INTER (Weak Inter-industry, GL Indx 0.26-0.50), W-INTRA (Weak Intra-industry, GL Index 0.51-0.75), S-INTRA (Strong Intra-industry, GL Index 0.76-1.0), and -- (GL Index can't be computed due to lack of recorded trade).

***/ Shift in Patterns from Intra-industry to Inter-industry (i.e. from two way to one way).**

****/ Shift in Patterns from Inter-industry to Intra-industry (i.e. from one way to two way).**

-/ Weakening of the bilatteral trade pattern.

+/ Strengthening of the bilatteral trade pattern.

TABLE 3. Summary of U.S. bilateral Intra-industry trade in selected food products (in billion US$).

	U.S. and Canada			U.S. and Mexico			U.S. and ROW 1/		
	1990	1995	Change	1990	1995	Change	1990	1995	Change
U.S. Export of Food Products	1.76	2.74	56.1%	1.59	1.90	19.1%	18.80	26.41	40.5%
U.S. Import of Food Products	1.57	2.97	88.7%	0.23	0.44	86.3%	6.42	6.10	-5.0%
U.S. Total Trade in Food Prod.	3.33	5.71	71.5%	1.83	2.33	27.7%	25.22	32.51	28.9%
U.S. Trade Balance in Food Prod.	0.18	-0.23	-227.1%	1.36	1.46	7.5%	12.38	20.31	64.1%
Intra-industry Trade in Food Prod.	1.26	4.20	232.6%	0.18	0.24	31.1%	5.22	3.50	-33.0%
Intra-industry Trade in Food Prod. (as % of Trade in Food Prod.)	37.9%	73.6%	93.9%	9.9%	10.1%	2.7%	20.7%	10.8%	-48.0%

1/ ROW = World - U.S. - Canada - Mexico.

in 1990 and 1995 (Table 3). Total U.S. trade in these selected food products increased from 29.7 billion dollars in 1990 to 40.5 billion dollars in 1995.

A careful review of Tables 2 and 3 reveals a change in U.S. trade patterns for agricultural food products for 1995 relative to 1990. The U.S. pattern of trade for food products with Mexico and the ROW during this period became increasing more inter-industry in nature, and the U.S. trade surplus and dollar value of trade in these products increased sharply. In the case of U.S. bilateral food product trade with Canada, the trade pattern became increasingly more intra-industry and the value of intra-industry trade increased dramatically relative to inter-industry trade.

Intra-industry trade is documented in 11 of 23 SITC three-digit food product categories for U.S. and Canadian bilateral trade in 1995. Intra-industry trade increased (in dollar value) as a percentage of total trade in agricultural food products from 37.9% to

73.6%. As shown in Table 2, U.S. and Canadian IIT is concentrated in food product groups where processing is more intensive (SITC #011, 024, 056,058, 062) relative to food product groups where processing is minimal (SITC #041, 042, 043, 044, 045).

In contrast to the U.S. and Canadian trade pattern, the U.S. and Mexican and U.S. & ROW trade patterns are dominated by one-way trade. Table 2 indicates that in 1995, the pattern of inter-industry trade is documented in 17 of 23 SITC three-digit food product categories and 21 of 23 SITC three-digit categories for U.S. trade with the ROW and Mexico, respectively. As the trade statistics in Table 3 show, the total dollar value of intra-industry trade between the U.S. and the ROW as a percentage of total trade in agricultural food products declined from 21% in 1990 to 10.7% in 1995. In the case of U.S. intra-industry trade with Mexico, the dollar value as a percentage of total trade in food products increased slightly from 9.9% in 1990 to 10.1% in 1995.

4. SUMMARY

Documentary evidence presented in this study indicates an increase in bilateral intra-industry trade in food products for NAFTA countries for 1995 relative to 1990. Intra-industry trade is higher for food product groups where greater processing is involved. However, inter-industry trade dominated U.S. trade patterns in bulk commodities which require little processing.

NAFTA bilateral intra-industry trade in food products has increased since the passage of the NAFTA agreement. The increase in IIT has been higher for U.S. and Canadian bilateral trade relative to Mexico's bilateral trade with NAFTA partners. This finding is consistent with the predictions found in the IIT literature since the U.S. and Canadian economies and populations have more in common than with Mexico, a lesser developed country.

Several earlier documentary studies (Roberts, Neff et al.), examined U.S. regional trade with NAFTA countries and concluded that there is substantial evidence of intra-industry trade in food products. In contrast, we find that U.S. trade with Canada is dominated by intra-industry trade, but U.S. and Canadian trade with Mexico is dominated by inter-industry trade for the selected group of food products in our study. While Mexican intra-industry trade in food products has increased with its NAFTA partners since the implementation of NAFTA, in relative terms, it has been minimal compared to the substantial growth in intra-industry between the U.S. and Canada.

U.S. intra-industry trade in food products as a percentage of the total dollar value of food product trade with the ROW declined dramatically from 1990 to 1995. Two plausible explanations for the absolute decline in the total dollar value of U.S. intra-industry trade in food products with the rest of the world are: 1) America's absolute advantage in the production of this particular group of food products has increased, and 2) intra-industry trade shifted to Canada and Mexico because of regional trade liberalization (NAFTA).

In conclusion, the study reveals that NAFTA has strengthened the pre-NAFTA trading relationships for agricultural food products that existed between NAFTA countries. While total trade value has increased substantially, there has been only a limited number of commodities which experienced a reversal in trade pattern. The most surprising finding was the decline in the percentage value in intra-industry trade between the U.S. and the rest of the world while the absolute value of total trade in agricultural food products increased substantially.

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