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Impact of NAFTA on U.S. Corn Trade

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Abstract

The objective of this paper is to assess the impact of NAFTA vis-a-vis other domestic and environmental forces in corn trading between U.S. and Mexico, and between U.S. and Canada. Pre- and post-NAFTA comparison indicates that there has been a significant increase in corn trade in the post-NAFTA era. Regressive analysis could not provide conclusive evidence that such increase was solely due to NAFTA. economic crisis of severe drought in Mexico, domestic policy reforms such as cut in government's price support and withdrawal of ban on feeding corn to livestock may have contributed in the increased volume of corn trade in the post-NAFTA era.

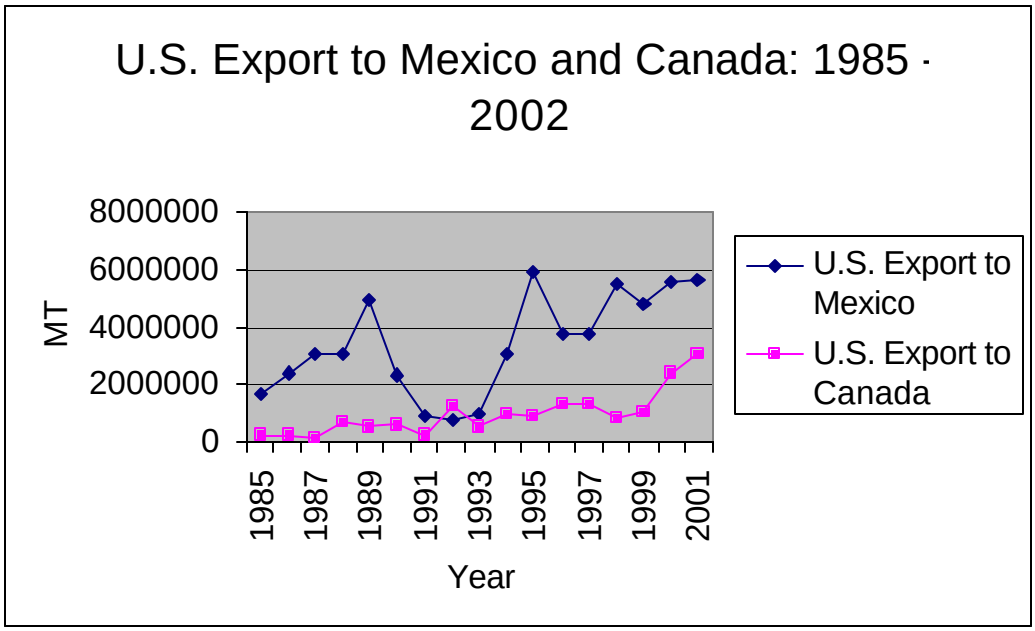
Key Words: NAFTA, Tariff barriers, Tariff-rate Quota, labor-output coefficients, Real exchange rate, Dummy variable.

Introduction

In an effort to create a free-trade zone among the North American countries, trade negotiations among the United States, Canada, and Mexico, known as the North American Free Trade Agreement (NAFTA), were implemented on January 1, 1994. The agreement wiped out the trade barriers (import tariffs), non-tariff barriers (import quotas, licensing schemes), and technical barriers to trade completely or phased them out over a 5 to 15-year period (Rosson, et. al., 1999). For Canada, NAFTA was a mere extension of U.S. - Canada Free Trade Agreement (CFTA) of January 1, 1989 to which new trade agreements with Mexico were added.

Time series data for the period 1994 - 2001 (Figure 1) indicates that corn traded between the USA and Mexico and between the USA and Canada has increased substantially since the implementation of the NAFTA agreement. While NAFTA provided for an immediate elimination of all tariffs on corn trade with Canada, it eliminated tariffs more slowly in case of Mexico because of its political and social importance in the country. The agreement converted Mexico's ongoing tariff system into a tariff-rate quota system to be phased out over fifteen years. Although it allowed a tariff free quota of 2.5 million metric tons of corn with increase of 3 percent per annum to enter Mexico, the quota was exceeded by 3.0 million tons in 1996 due to a shortage in crop production caused by drought. In fact, no tariff has been imposed since 1994 (when quota exceeded the free quota) because of the impact it may have on tortilla prices (Nadal, 2000).

Unlike Canada, Mexico's inclusion of corn in NAFTA had an important bearing from the country's social and economic perspectives. Corn contributed significantly to its economy in


U.S. Export to Mexico and Canada: 1985 - 2002
8000000
6000000
4000000
2000000
0
MT
1985
1987
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1993
1995
1997
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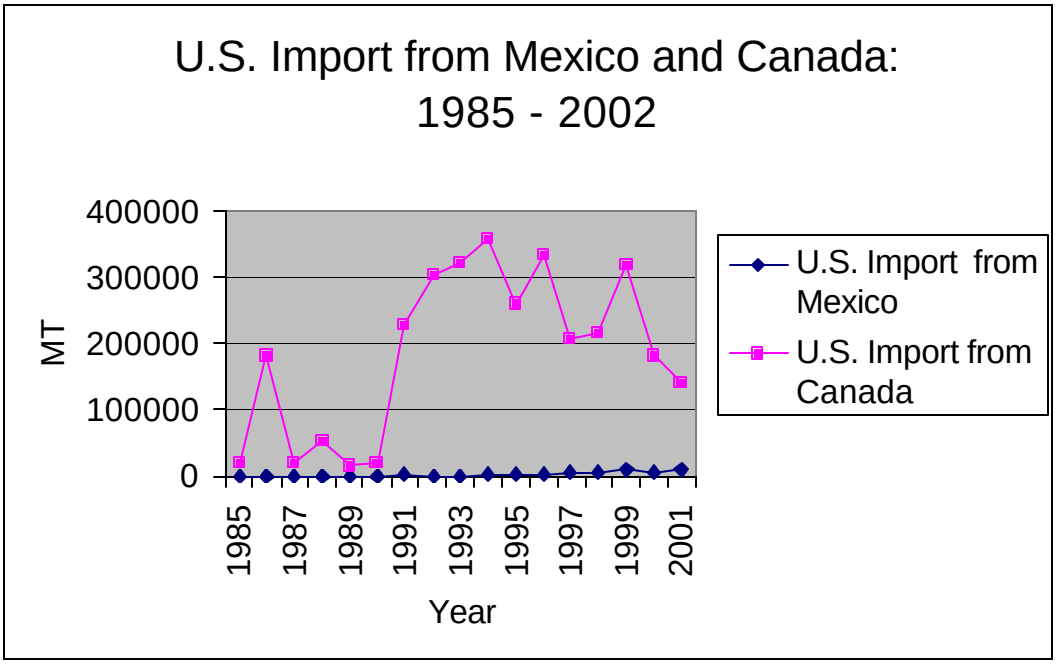
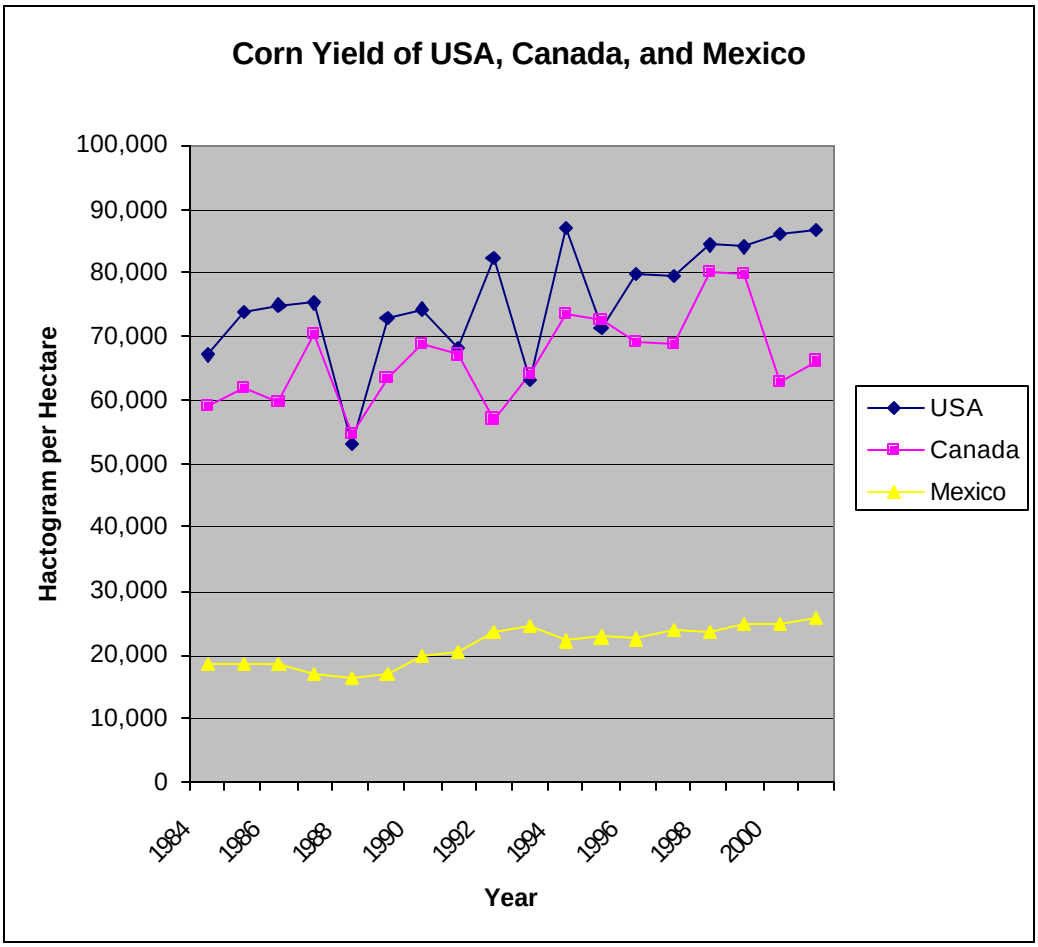
U.S. Export to Mexico
U.S. Export to Canada


U.S. Import from Mexico and Canada: 1985 - 2002
400000
300000
200000
100000
0
MT
1985
1987
1989
1991
1993
1995
1997
1999
2001
Year
U.S. Import from Mexico
U.S. Import from Canada

terms of employment, land utilization, and its share in the total value of agriculture, but showed enormous disparity in terms of labor/output coefficients and yields (Figure 2) with corn production in the United States and Canada. Corn in the United States can be produced at about 40% of the cost of production in Mexico, and average yield varies from 1.8 tons per hectare in Mexico to 8 tons per hectare in the U.S. (Raghavan, 2000). Corn is an important source of livelihood in Mexico, providing employment to over 3 million producers, constituting 8 percent of the Mexican people and 40 percent of the total population working in the agricultural sector (Nadal, 2002).

The United States is the world's largest corn exporter. In the year 2001, its top corn export markets were Japan ($1.3 billion), Mexico ($567 million), Taiwan ($473 million), Egypt ($398 million), and Korea ($277 million). In the same year the top importing country was Canada ($13 million), followed by Mexico ($4 million) (USDA., FAS, 2002). Most of the U.S. corn that is traded is yellow corn used for livestock feed. White corns are produced in an insignificant amount mostly on contract basis which are sold at a premium to yellow corn. Most of the demand for white corn comes from Mexico (Boland, Dhuyvetter, Marshall, 2000). The corn growers of Mexico are largely engaged in the production of white corn. There is a price difference between white and yellow corn, white corn being priced 25 percent higher in the international market. NAFTA, however, treats both of these varieties as the same commodity (Nadal, 2002). In Canada, about 90 percent of corn produced goes to livestock feed use and the remaining for ethanol production (ERS/USDA, 2002).

Although there has been a dramatic increase in corn trade between the U.S. and Mexico and between the U.S. and Canada since 1994, assessment of NAFTA's contribution to this growth is difficult to measure. The impact of multiple factors, such as a series of severe



droughts, domestic policy reforms, and environmental forces affecting the price, demand and supply conditions in each trading country might have affected such enormous growth. (Jack, 1999).

Objectives of the Study

The objective of this study is to assess the role of NAFTA vis-à-vis other domestic and environmental forces in corn trading between U.S. and Mexico, and between U.S. and Canada.

Method of the Study

To accomplish the objective of this study, similar method of pre- and post-NAFTA comparisons of trade volume and regression analysis of Colyer (2001) was followed. To determine the impact of NAFTA on trade with Mexico and Canada, two sets of regression models, Complete and partial, for each country were developed. For the complete model, volume of export/import is used as a dependent variable, and real exchange rate, per capita income, a dummy variable (to represent post-NAFTA trade, 1986-1993 = 0, 1994-2001 = 1), and a time trend variable were used as explanatory variables. For the partial model, only trend and dummy variables (1986-1993 = 0, 1994-2001 = 1) were used as independent variables. In addition, to determine the impact of domestic policy reforms (reduction in price supports for corn, withdrawal of prohibition against feeding corn to livestock, and allowing more import due to severe droughts) in Mexico, another set of models were developed by replacing the NAFTA dummy variable with a new dummy variable (1986–1994 = 0, 1995–2001 = 1) in both the partial and complete models. For Canada, there was no need to develop another set of models by replacing the policy reform dummy variable. Each model was estimated by the Ordinary Least Square Multiple regression procedure. All the models are shown in the Annexure I.

The Data

Secondary time series annual Export and Import data for U.S.A., Canada, and Mexico covering the years 1986 - 2001 were electronically acquired from the FAO database. The year 1986 was considered as the starting point of the data series to maintain a balance number of eight years in between pre and post NAFTA periods. The data for the real per capita income and exchange rate were acquired from the World Bank data base.

Analysis and Findings

The findings of the pre- and post- NAFTA comparisons of U.S. export to Mexico, U.S. import from Mexico, U.S. export to Canada, and U.S. import from Canada are presented in the Table 1. This comparison indicates that there has been a substantial increase in the volume of U.S. corn trade in the post-NAFTA era. Whereas U.S export to Mexico averaged 4741408 MT in the post-NAFTA period which is 107 percent increase, its export to Canada averaged

Table: Pre- and post-NAFTA comparison of Corn Trade

Trade	Avg. Pre-NAFTA (MT)	Avg. Post-NAFTA (MT)	Difference (MT)	Calculated t Value	Prob. of t
U.S. Export to Mexico	2288500	4741408	2452908	3.227	.015
U.S. Export to Canada	514200	1439441	925241	3.766	.007
U.S. import from Mexico	968	6000	5032	4.351	.003
U.S. import from Canada	142780	251651	108871	1.803	0.114

1439441 MT with a 180 percent increase. The U.S. import from Mexico and Canada increased by 5032 MT and 108871 MT respectively in the post-NAFTA era. The differences were statistically

significant in all cases except for U.S. import from Canada. U.S. increased import from Mexico largely constituted the white variety of corn which are produced predominantly by the Mexican producers. The limited production of white variety by the U.S. corn growers may have contributed such increased import from Mexico.

The regression results are summarized in the Table 2. In the partial models (trend, NAFTA dummy, and trend, policy reform as independent variables) of U.S. exports to Mexico, the signs of the NAFTA and policy reform dummy variable coefficients were positive and statistically significant at 5 percent. In the partial model of U.S. imports from Mexico, neither NAFTA nor policy reform dummy variables were found significant. There the trend variable was found significant at 1 percent. In another model of U.S. exports to Canada, the trend variable was statistically significant at 1 percent level of significance. The NAFTA dummy variable was not significant in any of the complete models (trend, NAFTA dummy, exchange rate, per capita GDP as independent variables). In both complete models of U.S exports to Mexico, neither the NAFTA dummy variable nor the policy reform variable were significant. GDP per capita was significant in both these models at 5 percent. In the complete model of U.S. imports from Canada, the trend variable was statistically significant at one percent, although this variable was not significant in the complete model of U.S. exports to Canada. In both the complete models of U.S. exports and imports to Canada, the NAFTA dummy coefficient did not show a positive sign and was not statistically significant.

Table 2: Regression Results for U.S. Trade with Mexico and Canada

Trade	Constant	Trend	NAFTA Dummy	Policy Reform Dummy	Real Exchange Rate	Real GDP Per Capita	R^2	D.W.
U.S. Export to Mexico (Partial)	2558164	-59925	2932309*				53%	1.40
U.S. Export to Mexico (Partial)	2867679	-98733		3397737*			60%	1.42
U.S. Import from Mexico (Partial)	-2315	729**	-804				76%	0.84
U.S. Import from Mexico (Partial)	-1618	533**		1303			77%	0.87
U.S. Export to Canada (Partial)	-203180	159418**	-350102				62%	1.42
U.S. Import from Canada (Partial)	116292	5886	61782				24%	0.88
U.S. Export to Mexico (Full)	-8325591	220104	1008324		1016511	1211	65%	1.35
U.S. Export to Mexico (Full)	-8305316	160852		1277091	890603	1556	64%	1.38
U.S. Import from Mexico (Full)	-43943	40	-1553		461	1.9*	91%	2.60
U.S. Import from Mexico (Full)	-45733	-128		-716	315	2*	90%	2.45
U.S. Export to Canada (Full)	-5701520	80992	-346145		394307	266	70%	1.69
U.S. Import from Canada (Full)	2776068	71392**	-37758		421245	-159**	75%	2.28

* = Significance at 5% level

** = Significance at 1% level

Conclusion

The pre- and post- NAFTA comparison indicates that the corn trade volume between U.S.-Mexico and U.S - Canada has increased significantly in the post-NAFTA era. The regression analysis does not provide conclusive evidence that such substantial increase in the post-NAFTA era was due to trade liberalization through the NAFTA agreement. Although the NAFTA dummy variable was positive and significant in the U.S.-Mexico export model, the policy reform dummy variable was also found positive and significant in the same export model when it replaced the NAFTA dummy variable. Again, in the U.S. - Mexico import model, the time trend coefficient was found statistically significant. Also, in the complete model of U.S.-Canada imports, time trend was the significant variable. The NAFTA dummy was not found significant in any of the complete models of U.S. - Mexico and U.S.- Canada corn trade. The Economic crises, such as a severe drought in Mexico in which the country imported twice as much corn as the original tariff-free quota under NAFTA agreement, the reduction in the government's high price supports in order to bring the corn price in line with U.S. and world prices, and also the government's withdrawal of official ban on feeding corn to livestock, may have contributed significantly to the post-NAFTA growth in the corn trade between U.S. and Mexico.

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Annexure I
Partial Model (NAFTA Impact)
U.S. versus Mexico

U.S. Export to Mexico = f(trend, NAFTA Dummy), Dummy: 1986 - 1993 = 0, 1994 - 2001 = 1

U.S. Import from Mexico= f(trend, NAFTA Dummy), Dummy: 1986 - 1993 = 0, 1994 - 2001 = 1

Partial Model (Policy Reform Impact)
U.S. versus Mexico

U.S. Export to Mexico = f(trend, Policy Reform Dummy), Dummy: 1986 - 1994 = 0, 1995 - 2001 = 1

U.S. Import from Mexico = f(trend, Policy Reform Dummy), Dummy: 1986 - 1994 = 0, 1995 - 2001 = 1

Partial Model (NAFTA Impact)
U.S. versus Canada

U.S. Export to Canada = f(trend, NAFTA Dummy), Dummy: 1986 - 1993 = 0, 1994 - 2001 = 1

U.S. Import from Canada= f(trend, NAFTA Dummy), Dummy: 1986 - 1993 = 0, 1994 - 2001 = 1

Complete Model (NAFTA Impact)
U.S. versus Mexico

U.S. Export to Mexico = f(trend, NAFTA Dummy, real exchange rate, real GDP per capita),

Dummy: 1986 - 1993 = 0, 1994 - 2001 = 1

U.S. Import from Mexico = f(trend, NAFTA Dummy, real exchange rate, real GDP per capita),

Dummy: 1986 - 1993 = 0, 1994 - 2001 = 1

Complete Model (Policy Reform Impact)
U.S. versus Mexico

U.S. Export to Mexico = f(trend, NAFTA Dummy, real exchange rate, real GDP per capita),

Dummy: 1986 - 1994 = 0, 1995 - 2001 = 1

U.S. Import from Mexico = f(trend, NAFTA Dummy, real exchange rate, real GDP per capita),

Dummy: 1986 - 1994 = 0, 1995 - 2001 = 1

Complete Model (NAFTA Impact)
U.S. versus Canada

U.S. Export to Canada = f(trend, NAFTA Dummy, real exchange rate, real GDP per capita),

Dummy: 1986 - 1993 = 0, 1994 - 2001 = 1

U.S. Import from Canada = f(trend, NAFTA Dummy, real exchange rate, real GDP per capita),

Dummy: 1986 - 1993 = 0, 1994 - 2001 = 1