Overview of the Determinants in Canadian Exports Of Fresh and Processed Fruit and Vegetables to the U.S.

By Ingrid M. Diaz

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Introduction

In January 1, 1994 the United States, Mexico, and Canada signed the North American Free Trade Agreement creating a trilateral trade block. NAFTA exceeded the results given by its predecessor the Canada-United States Free Trade Agreement; from which NAFTA was going to finalize what it was supposed to do; to phase out most agricultural tariffs between Canada and the United States by January 1998.
NAFTA consists of three bilateral agreements; which were meant to break most trade barriers between these three countries. Some of the main dates are the following:

- January 1994- Elimination of Mexican tariffs on US Sorghum, certain citrus fruits, fresh strawberries, and seasonal tariffs on oranges.
- January 1998- Elimination of leftover CUSFTA tariffs
- January 2003- Completion of US-Mexico nine-year transition period
- January 2008- Completion of US-Mexico 14 year transition period. (1)

The inception of NAFTA resulted in very favorable outcomes; US agricultural exports to NAFTA countries increased considerably between 1993 and 2003, while exports to the world also increased. During this period, the exports of vegetables and preparations increased 90 percent; North America has become an important component for the United States' exports of agricultural products, for which Canada has replaced Japan (since 2002) for being the largest importer of American agriculture. (1)
All three countries are very large producers consumers and traders of horticultural products, for which they accounted for 19 percent of world horticultural exports from 1999-2001. (4) Therefore, as much as there were gains in the North American market, there were gains in the exports of processed fruits and vegetables to the world market; some results are in the following tables:

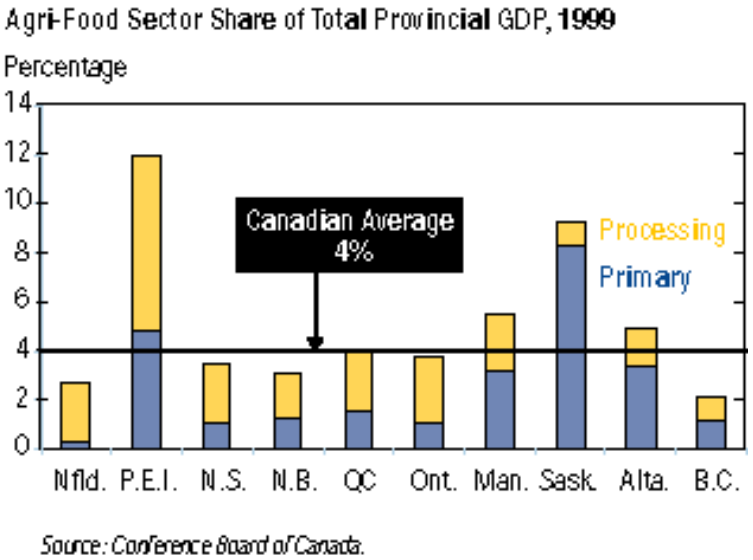
Increase in Exports of Fruits and Vegetables From 1993 to 2003		
	NAFTA	WORLD
US Exports	93%	39%
Exports Veg	90%	
Can Exports	149%(MEX)	

Increase in Exports of Processed Fruits and Vegetables			
	World	East Asia	EU
1991-2001	$1.4B	26%	11%

Even though NAFTA seems to have contributed a great deal in the exports of the respective countries, there are other factors to consider. Some of the factors contributing are the exchange rate; which capture the strength of the underlying currencies, growth in the Real GDP of the importing country, the consumer price indexes of the importing and exporting countries and the level of production of the given good.

Canadian Horticulture

The agricultural food sector in Canada is one of the key drivers in the Canadian economy, providing one of seven jobs. The Agri-food sector provided 8.3 percent of total Canadian GDP in 2000. In particular, the agri-food sector plays a vital role in the Prairie Provinces for which Saskatchewan and Prince Edward Island are the provinces that most depend on it, accounting for 14% of total provincial GDP in P.E.I. (2)
The largest customer for Canadian agriculture exports is the United States for which the main producer is the province of Ontario, followed by British Columbia and Quebec; the same can be said for the U.S. for which Canada is the main importer of fresh fruits and vegetables, accounting for 50%. The most important vegetable crops in terms of value added in Canada are tomatoes and potatoes and in term of fruits; it is the exports of fresh apples, valued at $54 Million in 2000. In 2008, The U.S covered 75.7% of fruit products exports, Japan was the second importer of fruit products, comprising 3.75%, and the other importers in descending order are the U.K, Netherlands, Germany, France, China, Belgium, Taiwan and Australia. In the vegetable exports the U.S. has 95 percent market share, second place is the U.K. with 0.7 the third is Japan, France, Mexico, Trinidad and Tobago, Norway, Sweden, Netherlands, and Germany.
This paper tries to explore the development and the main components of Canadian exports of Fresh fruits and vegetables to the United States the drivers behind them and the effects of NAFTA.



Source: Conference Board of Canada.

Recent Canadian Horticultural Production

During 2009, farmers planted 555,470 acres in fruits and vegetables, up 1.1% from 2008. Production of fruits and vegetables increased 4.6% with most of this increase in lettuce, which was up 34.9%, carrots 32.5% and onions 30.6%. Sweet corn, the largest vegetable crop, accounted for more than 20% of the 258,492 acres of vegetables planted during 2009. Farmers had 296,978 acres in fruit in 2009. The largest percentage was for Blueberries at 55.1%, followed by apples at 16.8% and grapes at 9.7%. Fruit sales were

$685 million for farmers, down 8.8% from 2008.
During 2009 vegetable farmers earned $773 million, up 17.8% or $117 million from 2008. This increase was driven by sales gains in the fresh market; carrots increased 26.0%, lettuce 51.6 and corn 23.6%. Three-quarters of vegetables sales came from the fresh market.

Fruit production in 2009 was unchanged, except for the production of cranberries, which rose 19.3%, while blueberries rose by 7.9%.
Ontario and Quebec accounted for more than 80% of sales of vegetables. The majority of fruit sales came from three provinces: British Columbia (36.2%), Ontario (32.2%) and Quebec (22.2%). (6)

American Consumption Patterns:

The U.S has had changes in the general population consumption, which has affected Canada's export of fresh fruits and vegetables. There are several key factors in the rise of the imports of fresh fruits and vegetable. The U.S. Import regimen is a large contributor where U.S. agricultural tariffs average 12 percent compared to the global average of 62 percent. The nominal trade-weighed value of the dollar against other currencies rose 20 percent from 1991-2001. The U.S population grew from $253 Million in 1991 to $280 million in 2001, as well as an increase in the GDP per capita from $24,000 to $35,000 in 2001. And the changes in consumer preferences for healthier lifestyles, is evident both in Canada and in the States where per capita use of fresh fruits and vegetables grew 19 percent from 1982 to 1997, this also has affected the trade in wines. (5)
American per capita consumption totaled around 723 pounds in 2001

Even though Canada's exports to the United States has increased in large amounts specialization plays a vital role, Canada specializing more on the vegetable section and Mexico with tropical fruits, and south America with temperate fruits all which have risen considerably, therefore there should be a substitutability factor in the Canadian exports function. (5)
The divisions of fruit imports to the U.S. are the following:

- Temperate fruit imports, which have high seasonal patterns peaking in the late fall, Chile and Mexico accounted for 34 and 30 percent, in 2000. Grape imports from Chile and Mexico have risen 82 percent in 1995 to 2000.
- Tropical fruits from Central and South America account for the frozen and fresh fruit, however some parts of this market such as citrus and melons have competition with the domestic suppliers but the consumption growth has far outpaced the domestic production. (5)

Vegetable imports however are less specialized and are currently dominated by Mexico, with an average 69 percent share, however there is too much of a rise in American consumption that there has been growth in exports in this category for both Canada and Mexico. There are the seasonal aspects to consider also, Mexico providing imports between December and April such as squash, peppers, tomatoes and cucumbers. Canada has 15 percent share of this market.

Trade Agreements: CUSFTA and NAFTA

CUSFTA was signed on October 4, 1988 and since then Canada's share of American imports has risen and "even thought US tariffs are typically low trade appears to be quite sensitive to even small trade preferences (9). Article 401 in the CUSFTA will be reviewed, it covers tariff elimination and the other section will be 408 Export taxes, and Article 701 on Agricultural Products; even thought all the provisions are important we must understand the mechanisms behind any increase in Canadian trade. Article 401 states the deletion of import tariffs on category A B and C Goods and includes the provision of custom duties on goods, which were suspended of the duty on October 3, 1987. With regards to taxes Article 408 stated that neither party introduce any tax or charge on the export of any good to the other party unless such tax is already included for domestic consumption. Article 701 is on Agricultural Subsidies; the basis was to eliminate any subsidy that might distort agricultural trade. Last is Article 702 on the Special Provisions of Fresh Fruits and Vegetables (stating any temporary duty not exceed the lesser of the Most Favored nation rate) and 703 on the Market access for agriculture; which states both parties work together to reduce or eliminate import barriers. (7)
Even though the trade effects under CUSFTA are not comparable to NAFTA, NAFTA's success would not have been the same had CUSFTA not function.

NAFTA is the largest trade pact aside from the European Union, and contains provision that go beyond the typical free trade pact, which include the manipulation of tariffs. It includes provisions on how to regulate investment transportation and financial services, intellectual property, government purchasing, competition policies and the temporary entry of business people. (9) Article 302 under NAFTA is the Tariff elimination stating that none of the three parties would increase any duties. Agriculture is covered in Article 7 stating the elimination of further export subsidies (705) and Creating an Advisory Committee on Private commercial Disputes regarding Agricultural Goods and the relevance of the adherence to the GATT agreement for the three parties. (8)

Policy Regulations and the marketing of fruits and vegetables under NAFTA and Dispute Settlement

None of the three countries provides any price support programs to the agriculture of fresh fruits and vegetables. However, in Canada, the agricultural sector is very organized; the government provides associations and marketing boards such as the BC tree Fruits, The Ontario Vegetable Grower's Marketing Board, etc provided in StatsCan. The U.S. and Mexico provide preferential water allocations to this industry, the U.S. also provides federal crop insurance. All three countries have strict rules and guidelines with respect to standardized product grades and standards. (4) However there are differences in the marketing, for example the U.S. the USDA's marketing services administers marketing orders to crop producers for some fruits vegetable and specialty crops. In Mexico, the marketing is more traditional, where there are many small farmers who sell to the retailers and wholesalers. (4)
There have been trade disputes among the NAFTA countries, among them the tomato disputes between the U.S. and Mexico. In 1996, the U.S. department of Commerce

initiated an anti- dumping investigation due to the Florida tomato industry claiming Mexico was selling tomatoes below fair market value. Eventually the investigation was suspended; the solution was to establish a seasonal reference price, however the agreement had been suspended and then re-enacted again with two differences in 2002. (10)
Even though there are still some differences in the way the agricultural sectors work, there are mostly benefits to be seen from CUSFTA and subsequently NAFTA.

The Model

The Model of interest involves analyzing the components affecting the Exports of Fresh Fruits and Vegetables and preparations in Canada.
Exports Function - The components for the Exports of Canada's Fresh Fruit and Vegetables to the U.S. (Exports FF&V)

- CPI of FF&V in Canada = X_{cpic}
- CPI of FF&V U.S.= X_{cpiu}
- U.S. Real GDP= X_{gdpu}
- U.S/CAN Exchange Rate= X_{us}
- NAFTA= X_{NAFTA}
- Time= X_{time}
- Exports (-1)= $X_{x\,(-1)}$

$$\text{Exports} = f(X_{cpic}, X_{cpiu}, X_{gdpu}, X_{us}, X_{NAFTA}, X_{time}, X_{x\,(-1)}) \qquad (1)$$
$$\qquad\qquad -\quad +\quad +\quad +\quad +\quad +\quad +$$

X_{cpic} = Consumer Price Index of fresh fruits and vegetables in Canada in time t
X_{cpiu} = Consumer Price Index of fresh fruits and vegetables in the U.S. in time t
X_{gdpu} = Real Gross Domestic Product for the U.S. in time t
X_{us} = Canada U.S exchange rate in Canadian dollars
X_{NAFTA} = NAFTA dummy variable valid from 1994 to 2009
X_{time} = Time variable
$X_{x\,(-1)}$ = Exports of fruits and vegetables lagged one period

Exports of Fruits and Vegetables (including preparations) are to be positively influenced to the consumer price index of fresh fruits and vegetables in the U.S.; and negatively related with the price index for fresh fruits and vegetables in Canada. Exports are also supposed to be positively related to American GDP, as the purchasing power of Americans will increase. Exports are also supposed to be positively related to the exchange rate since as the American dollar becomes more expensive, the purchasing power of U.S. importers is to increase. The NAFTA is expected to have positive influence over exports therefore a NAFTA dummy variable is included into the regression since it is expected to have a large statistical influence on exports. There

should be a positive time trend with respect to exports. Exports are expected to be positively related to exports lagged one period to capture dynamic effects, since this is time series data. Canada overlaps with some exports in certain categories such as temperate climate produce, although in some categories there is some form of specialization, for example, Canada specializes in white corn exports to the U.S. (mainly for consumption) whereas Mexico specializes in the more hard industrial type of corn (for feeds). There are also seasonal factors to consider but will not be included in this model.

The Data, Empirical Specification and Estimation Technique

Yearly data was used for the empirical estimation from 1970 to 2009. Exports of Fruits and vegetables includes fresh fruits, fresh vegetables and preparation, these include concentrated fruit preparations, dried fruits, canned fruits and vegetables, etc. These were found in the American website USDA and these are measured in thousands of U.S. dollars. The data for the consumer price indexes in Canada for fresh fruits and vegetables was found separately for each category therefore the values are the average of the CPI for fresh fruits and the CPI for fresh vegetables, this was measured in Canadian dollars. The consumer price indexes for the fresh produce are appropriate as the indexes since the fresh produce are inputs for the prepared produce. The consumer price index for fresh fruits and vegetables in the U.S. was used for the purpose of capturing the dynamics of price changes in acquiring fresh produce, they will likely increase their imports from Canada since as domestic prices rise, they will substitute for canned and imported produce. However, for both countries the CPI's seem to increase at the same steady rate. The data for this was monthly data; the values in the regression are the average during the given years in U.S dollars. Real GDP in the U.S. is measured in Billions of U.S dollars and is expected to play a large role in the model. The exchange rate is a very important variable in term of contracts as most of the time the contracts are made for future periods since the goods are agricultural. Depending on the exchange rate the U.S. importers will decide to make their purchases, as the appreciation of the American dollar will increase their purchasing power.

Results

Equation 1 was solved using ordinary least squares. The result is posted in Table I; expressed by regression number seven. The regression has and R squared of .995 with an F-statistic of 1101 and a Durbin Watson of 1.7, which is not exactly two but would still be considered a good number. However, none of the other variables showed any statistical significance other than U.S real GDP and exports lagged one period.

Other attempts were made at trying to express exports of fresh fruits, vegetables and preparations as functions of the other variables. The next expressions that were found to have some importance were equation number 10, with DW 0.98 has the exchange rate lagged 1 period as a dependent variable. This expression showed some statistical significance with the intercept and time, however none with the exchange rate or the

NAFTA dummy. The expression that showed statistical significance for NAFTA was number eight with a t-statistic of 2.15, however GDP was not included and no other variables other than exports lagged one period showed any statistical significance, the DW was 1.7, which shows there are time trends that are still not captured in the expression, however a 1.7 for DW is still a good number.

Conclusion

In conclusion, trying to find the statistical significance of the NAFTA variable is more complicated than imagined. However there were only forty samples, which limits the results. There are other reasons why the other variables showed no statistical significance like seasonal patterns, the export data was yearly and perhaps the exchange rate has more of seasonal effects on exports, therefore seasonal dummies might have been appropriate, however it was difficult to find monthly data on some variables. The conclusive remark is that NAFTA has nonetheless increased trade in the region in a much superior manner that CUSFTA. The 8^{th} regression is the most compatible with the research in the sense that fresh food has inelastic demand, i.e., GDP shouldn't have pronounced effects and the fact that NAFTA has significance in trade and exports lagged one period might have a significance in the sense that trading partners usually make contracts from one year to the next.

Technical Appendix

CHART I

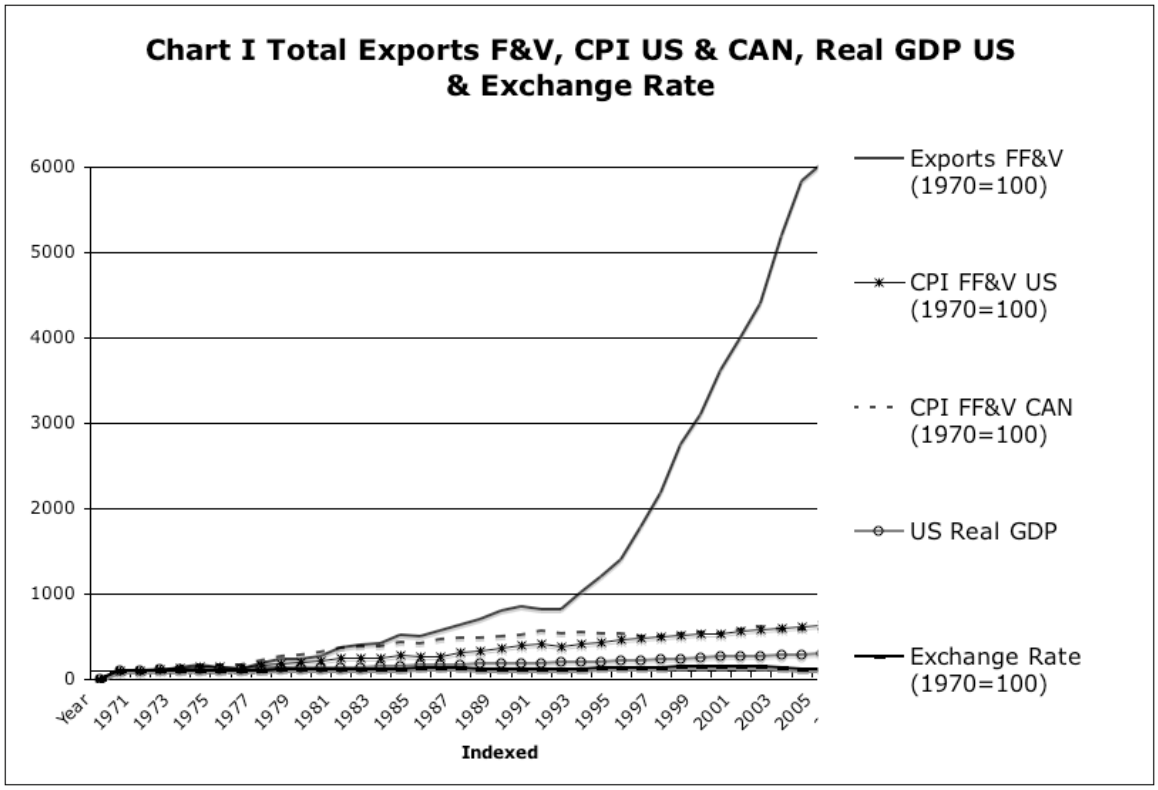


Table I

Dependent Variable Exports FF & V	Intercept	Time	DUMNAFTA	CPI FFVCAN	CPI FFVUS	CPI USCAN	CPI CANUS	US Real GDP	Exchange Rate	Exchange(-1)	Exports(-1)	F-Stat	R^2	DW
EQ 01	-2042865	-99559	192067.7				1057941	666	-1162166			197	0.967	0.60
t value	-3.9489	-5.04	1.132238				1.7713	8.04	-4.471909					
Std Error	517324.7	19730	169635.5				597261	82.79	259881.21					
EQ 02	-152448.9	2225.34							122481		1.0211	1535	0.994	1.60
t-value	-1.428	0.6956							1.099		23.35			
Std Error	106730	3198.78							111390		0.0437			
EQ 03	-458178.9	-16600.29						111.3995			0.87753	3054	0.994	2.30
t-value	-2.9117	-2.07						2.71			16.92			
Std Error	157356.7	8016.91						41.04			0.0518			
EQ 04	-59373.26	-1688.58					-203273.9	10.92122	117402.2		1.049712	3055	0.975	2.58
t-value	-0.328128	-0.2333					-1.8409	0.2681	1.787		19.98			
Std Error	180945.3	7236.33					110415	40.722	65696		0.052555			
EQ 05	-652067		-2131.54	-3736.23	-354.17			34.01			0.881502	1488	0.995	1.91
t-value	-3.9383		-0.0405	-2.3047	-0.3029			3.9			19.37			
Std Error	165570		52507	1621.069	1169			8.72			0.045			
EQ 06	-46855804	23740.92	-62327.5	-7005.01	338.02				157.6969		0.9	951	0.99	1.84
t-value	-1.289	1.822	-0.7311	-2.3683	0.1942				1.188		16.54			
Std Error	25610496	13028.8	85243.49	2957.705	1740.014				132654.5		0.054667			
EQ 07	41871056	-21585.92	-12548.49	-1473.18	71.091			157.96	18232		0.81614	1101	0.995	1.89
t-value	1.244	-1.257	-0.167	-0.4912	0.047			3.49	0.15		15.28			
Std Error	33649473	17159.43	74754	2999.11	1499.8			45.257	120983		0.053			
EQ 08	-330.272	3034.43	19232.37			96552.78			116628.7		0.96019	1053	0.99	1.73
t-value	-1.3117	0.9386	0.256			1.35133			0.8726		20.377			
Std Error	250623	3232.82	74911.5			71407.78			133654.3		0.0471			
EQ-09	-74959.4	351.71	93259.46						54093		1.0003	1271	0.993	1.67
t-value	-0.1211	0.11	2.15						0.48		23.41			
Std Error	6187936	3166	43310						110676		0.04			
EQ 10	53972178	-22756	20489					156.5		66718	0.85	1665	0.996	1.98
t-value	4.16	-4.17	0.56					4.08		0.76	16.12			
Std Error	12970191	6648	36558					38.28		87067	0.05			

Number of observations:40
DUMNAFTA has value of 0 from 1970-1993 and Value of 1 from 1994 onward
F-statistic results are valid with 99% and 95% Confidence Intervals.

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Data Source Variable	Definition	Source	Mean	Max	Min
Exports of FF & V	Exports of Fruits and Vedgeteables to U.S. In thousands of U.S. dollars	Department of Commerce, US Census Bureau, Foreign Trade Statistics. http://www.fas.usda.gov/gats/default.aspx	629,585	2,462,047	29,122
CPI FFV CAN	Consumer Price Index of Fresh fruits in Canada in Canadian dollars	Table 3260021-Consumer Price Index (CPI), 2005 basket annually (2002=100) Jan 1970 to Jan 2009 V41693309 Canada, Fresh fruit (2002=100)	70.71	107.60	14.00
	CPI of fresh vedgeteables in Canada in Canadian dollars	Table 3260021-Consumer Price Index (CPI), 2005 basket annually (2002=100) V41693319 Canada; Fresh Vedgeteables (2002=100)	68.02	105.80	17.70
CPI FFVUS	CPI Fresh fruits and vedgeteables in U.S. in U.S. Dollars basket, monthly	CPI: U.S. City Average ; Fresh Fruits and Vedgeteables 1982-84=100; NSA http://www.economagic.com/em-cgi/data.exe/blscu/ CUUR0000SAF113	147.74	278.93	40.31
U.S. Real GDP	U.S. Real Gross Domestic Product in Billions of 2005 U.S. dollars	http://www.measuringworth.org/datasets/usgdp/result.php Louis Johnston Departemnt of Economics College of Saint Benedict , Saint John's University Samuel H. Williamson Department of economics, Miami Univ.	8,295.00	133,312.00	4,269.90
US/CAN Exchange Rate	The cost of purchasing one U.S dollar in Canadian currency	Table 1760064 Foreign exchange rates in Canadian dollars monthly dollars V37426 Canada; Unites States dollar, noon spot rate, average, CANSIM	1.23	1.57	0.98

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