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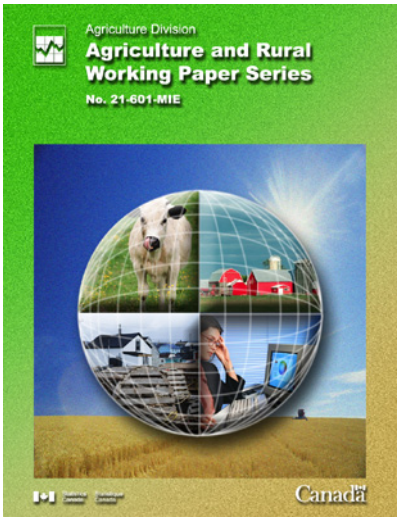
The Effect of FDI on Agriculture and Food Trade: An Empirical Analysis

1987-2001

by W.H. Furtan and J.J. Holzman

Agriculture Division
Jean Talon Building, 12th floor, Ottawa, K1A 0T6

Telephone: 1 800-465-1991



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Prepared by
W.H. Furtan and J.J. Holzman
University of Saskatchewan, Saskatoon

Statistics Canada, Agriculture Division
Jean Talon Building, 12th floor
Tunney's Pasture
Ottawa, Ontario K1A 0T6

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Note of appreciation: Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

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Introduction

The most spectacular manifestation of globalization, which has occurred since 1990, is the increase in foreign direct investment (FDI). In 2001, world FDI (outward flows) amounted to US$ 735 billion, which is 2.3% of world GDP, 10% of the goods and services exports, and 11% of the gross fixed capital formation of the world economies (OECD). This trade in capital has resulted in increased economic integration for those countries and sectors engaged in FDI.

One of the major planks of Canadian agricultural policy is the expansion of agricultural and food exports. Growth in exports is believed by the government of Canada to lead to a growth in farm income.[1] In Canada, increased exports are most often associated with an economic environment of low trade protection, high levels of public and private sector investment in research and development, and a favorable exchange rate with one's major trading partners. What has not been considered in the policy debate is the relationship between trade and FDI. This report examines three trade and FDI relationships between Canada and the United States. First, we determine the impact of U.S FDI on growth in Canadian agriculture and food exports to the United States. Second, we examine the role FDI plays in determining Canadian agriculture and food imports from the United States. This allows us to measure the impact that U.S FDI has on U.S exports. Finally, we examine the effect of FDI on total agriculture and food trade between Canada and the United States.

Multinational corporations (MNCs) are central to any discussion of economic integration of the United States and Canadian agriculture and food sector because they play a large role in agricultural trade and capital investment. First, approximately 90% of Canada's total trade involves at least one MNC (Trefler, 2001). A comparable figure has never been estimated for the agricultural and food trade, however, we expect that the percentage of trade associated with MNCs is large. Second, most if not all FDI in the Canadian agriculture and food sector is made by MNCs. A detailed study of FDI in Canada, by Hejazi and Safarian, demonstrated just how important inward FDI has been to the growth in the Canadian economy. The actual investment made by MNCs in the Canadian agriculture and food sector is collected but it is not published as it would compromise the confidentiality of firms providing the data.

1. Given the level of subsidy or tariff protection afforded some sectors of agriculture any increase in trade, which is due to market liberalisation, may at first lower the combined market income and government transfers for farmers.

The United States and Canada are each other's largest trading partners, which also holds in the case of agriculture and food trade. In 2002, total trade between the United States and Canada was approximately US$ 2 billion per day (Statistics Canada). This trade relationship makes the Canada-United States border an interesting empirical example of the relationship between product trade and FDI in the agriculture and food sector for at least three reasons. First, the growth in trade has occurred at the same time as U.S. FDI has increased in the Canadian agriculture and food sector. Second, there are several on-going agricultural trade disputes between the two countries including, challenges to the Canadian Wheat Board and dumping charges brought against the tomato and beef industries. One might expect this type of trade action to reduce the level of trade between countries. Third, some parts of the agriculture sector in both Canada and the United States are highly protected from foreign competition through various trade measures. Some of these measures include tariffs on dairy products, sugar, health restrictions on meat products, and restrictions on the volume of Canadian wheat exported to the United States. Given the importance of the trade relationship between the two countries, the level of U.S. FDI in the Canadian agriculture and food sector, and the on-going trade disputes, this sector offers a prime opportunity to empirically test how product trade is related to FDI.

We use trade theory in developing an economic framework to examine the relationship between agriculture product trade and international capital movements. The relationship between product trade and FDI was not established in the early Ricardian or Heckscher-Ohlin trade theory. Mundell (1957) was one of the first economists to address the issue of trade in goods and services and international capital movements. Mundell (1957) demonstrated, within the Heckscher-Ohlin framework, that product trade and international capital movements are substitutes. Later Schmitz and Helmberger (1972) expanded Mundell's model, through relaxing the assumption of factor immobility, identical production functions, and consumer preferences, to show that product trade and FDI could in fact be complements rather than substitutes.

A second trade theoretical approach, which can be used to explain the linkage between product trade and FDI is due to the work of Bhagwati (1985). Bhagwati (1985) drew a link between the actions of firms that undertake FDI and the setting of trade policy by foreign governments. In his view, MNCs invest in foreign countries with the intent of exporting from the host country as well as the desire to service the local market. Bhagwati's view was that firms might invest in a foreign country with the expectation that they will convince the host government to lower the level of trade protection. This phenomenon is called the 'quid pro quo' of FDI. One can extend Bhagwati's view to include the effect of FDI on the trade policy of the home country. If a firm makes an investment in a foreign country with the intent of exporting the production of the foreign plant back to the home country, they will lobby both the home and foreign government for policies that make the investment more profitable, such as reduced tariffs. Reducing tariffs will result in a higher level of trade and economic welfare for the firm making the investment.

The majority of empirical studies that measure the effect of FDI on the level of trade contemplate firms having access to final consumer demand, such as the case in the market for automobiles (Blonigen and Feenstra, 1996) and for industrial products (Goldberg and Klein, 1999). However, FDI also occurs for the purpose of securing raw and exporting semi-processed materials. In this case, firms are not only concerned with the size of the consumer market in the host country, but also the ability to export back to their home country raw or semi-processed products, which are inputs for another production process. This suggests that the total volume of trade between two countries maybe effected by FDI rather than just the exports.

United States FDI in the Canadian agriculture and food sector is an example of where investments are made with the intent of re-exporting product back to the home country. Canada has a small domestic market for agricultural and food products, but exports large quantities of primary and semi-processed agricultural products to the United States. Consider the Canadian cattle industry. All of the live cattle exports from Canada go to the United States. In addition, the processing of cattle in western Canada is dominated by two large United States based firms, Cargill Inc. and Iowa Beef Packers Inc., with the majority of the Canadian semi-processed beef (i.e., boxed-beef) exported to the United States market. In 2002, U.S. feeder cattle were moving into Canada to be processed with the semi-processed product re-exported to the United States. Once in the United States this product can be re-exported or consumed domestically. This is an industry where the FDI by U.S. companies in Canada affects the total volume of cattle trade and meat trade.

The purpose of this paper is to investigate the relationship between the level of United States - Canada agricultural product trade and U.S. FDI into the Canadian agriculture and food sector. We use FDI as well as other economic variables, such as the exchange rate, to explain product trade rather than Ricardian or Heckscher-Ohlin trade theory. We have two hypotheses. Our first hypothesis is that the level of agricultural trade is positively related to the level of FDI, i.e. trade and FDI are complements. To our knowledge no one has examined the impact of US FDI on Canada-US agricultural and food trade. Our second hypothesis is that the level of agricultural trade is endogenously determined with the level of FDI. The only study we know, which has examined the question of endogeneity is Martinet, Cornell, and Koo (2002).

To test the two hypotheses we construct a panel data set of Canada-U.S trade and FDI in six agriculture and food sectors (3 digit SIC code level), over the period of 1987 to 2001. The United States is treated as one country, which exports and imports products in all six SIC codes and makes FDI in the six code sectors. In addition, we develop a data set of other economic variables, such as exchange rates, GDP levels, and government R&D expenditures.

Based on the econometric results we do not reject the two hypotheses. First, we do not reject the hypothesis that agriculture product trade and FDI are complements. We find that product trade and FDI are complements for all SIC codes. As U.S. FDI increases in a sector the level of trade between Canada and the United States increases. Second, we do not reject the hypothesis that agricultural trade and FDI are endogenously determined in the economy.

The major limitation of this paper is that data on FDI is limited. What is available is reported in terms of net year-end capital positions or the accumulated net stock of FDI since 1987 when the data was first collected and not gross flows between firms. Finally, we were not able to separate merger and acquisition FDI from Greenfield FDI. Therefore, our results are only a first indication of the relationship between trade and FDI. More definitive results will have to wait a more comprehensive data source.

Literature

Literature related to modeling the relationship between trade flows and capital movements can be sorted into at least two groups. First, there is the work, which looks at total trade flows and FDI. Goldberg and Klein (1999) model the relationship between total trade flows and FDI, and test their hypothesis using data from a number of South American countries. They report that trade and FDI are complements in most sectors. Second, Marchant, Cornell, and Koo (2002) develop a model, which focuses on the relationship between a countries export and the sales of foreign affiliate firms (as a proxy for FDI). They too find support for the hypothesis that trade and FDI are compliments.

The two aforementioned models are different in both their theoretical framework and the data they use to test the hypothesis, which flow from their model. The Goldberg and Klein model follows from the Mundell, and Schmitz and Helmberger papers. Their model is estimated on a sector basis and shows that capital movements may be compliments or substitutes with total product trade depending on the sector in question. Correspondingly, when Goldberg and Klein estimate their model they use the change in total product trade and FDI. Marchant, Cornell, and Koo follow the model suggested by Bajo-Rubio and Sosvilla-Rivero. This theoretical model starts with the assumption that MNC exhibit cost minimization behavior when they decide to make foreign investments. In this case, the model predicts that exports and foreign affiliate sales are compliments.

Another body of literature focuses on the relationship between FDI and the formation of trade policy (Bhagwati, 1985; Grossman and Helpman, 1996; and Blonigen and Feenstra, 1996). Bhagwati (1985) drew the link between the action of firms, which make foreign direct investments and the action of governments in setting trade and investment policy. Governments make trade-offs between the contributions of special interest groups and total economy welfare when setting the level of trade protection. Bhagwati hypothesized that firms invest in a foreign country and then try to influence trade policy in the host country. This phenomenon was called the ‘quid pro quo of FDI’. Grossman and Helpman develop a model, in which the level of trade protection offered to a sector is a function of the quantity of FDI in the same sector. The Grossman-Helpman model is built on the idea that special interest groups lobby for protection from governments. Finally, Blonigen and Feenstra develop a model, which links FDI and the level of trade. They examine the question of tariff jumping and the quid pro quo hypothesis using data from Japanese investments in the US automobile sector.

To date little research has been conducted on the relationship between trade and FDI in the Canadian agriculture and food industry. Agriculture is an industry that has traditionally been highly protected by tariffs and non-tariff barriers. Thomsen and Woolcock (1993) claim that one of the reasons for the tension in agricultural trade relations is because of the low level of FDI in the industry. Table 1 shows the real dollar value of U.S FDI to Canada for each of the major industries in the Canadian economy. U.S FDI in the agriculture and food industry accounted for approximately 3.3 to 5.4 percent of the total Canadian inward FDI over the period of 1992-2001.

Apart from the potential complimentary relationship between FDI and trade, there are additional factors to consider when examining the benefits of FDI. This includes the equity capital resources that are provided by foreign companies. The capital flows provided by foreign firms can be used to increase the quantity of value added production in the sector. For example, large U.S. based firms such as Cargill Inc. and IBP INC. have made significant investments to expand the Canadian cattle processing industry. The agriculture and food industry has the opportunity to expand into new production enterprises such as bio-fuels, specialty crop processing, and insensitive livestock operations. In order to take advantage of these opportunities a number of capital resources are required, which includes foreign investment.

As discussed by Marchant there are several economic and political factors that can either enhance or detract from foreign investment opportunities in the agriculture and food sector. Factors that have a positive influence on investment include the size of the host country market, per capita GDP, GDP growth, cultural similarities between the home and host country, natural resource availability, a favorable exchange rate, and the labor productivity of the sector. Government regulations such as corporate taxes and foreign ownership restrictions will have a negative impact on the level of FDI in a sector. The level of economic and political risk in a country is also an important factor when foreign firms are deciding on the location of their foreign investment. Firms will be looking for investment opportunities in countries that have economic and political stability. Gopinath, Pick and Vasavada (1998), using a profit maximizing model of multinational agribusiness firms, estimate the impact of exchange rate fluctuations, the level of domestic support, and the investment costs on the sales of U.S. foreign affiliates. They find that the level of domestic support, as measured by producer subsidy equivalents, negatively impacts sales of the foreign affiliates.

The relative importance each variable has when a firm is making an investment decision depends on the purpose of the investment. If the investment is intended to source raw or semi-processed products back to the home country, variables such as natural resource availability, border policies, and transportation systems are important. If investment is undertaken to expand into new markets, the size of the host market, per capita GDP, and GDP growth rates become more important.

THEORETICAL MODEL

The theoretical model used in this paper follows the work of Mundell, Schmitz and Helmberger, and Goldberg and Klein. Suppose we have two countries of different size (country 1 is large than country 2). The demand for the final product is d_1 and d_2 in the respective countries (see figure 1). The aggregate demand for the product is D_1. We assume that country 1 has the required investment fund, which is not mobile or transferable to country 2. The supply of the investment fund is S_1.

Given that the investment funds are only available in country 1 and aggregate demand is D_1, the total quantity of the product produced is y_2. Given the production function for y, which is not shown in figure 1, the aggregate demand for investment funds is shown in figure 1 as DD_1. The total quantity of y produced is y_2 of which y_1y_2 is exported to country 2.[2] With this level of production the equilibrium product price is P_{y0} and the price of capital is P_{x0}.

2. In this model, we ignore transportation costs plus any other transaction costs between the two countries.

Now suppose we allow for capital in the form of foreign direct investment to move from country 1 to country 2. We assume that this occurs because the capital earns a higher return in country 2 than it did in country 1. This may occur for a number of reasons such as, some input in country 2 is provided at a lower cost than in country 1. If the production function is sufficiently different in country 2 from country 1, we can derive an excess supply function of capital funds shown as IS_2.

The aggregate demand for capital has shifted outward to DD_2 in country 2, which a direct result of the increased production efficiency in country 2. In this case, the total output of y is produced in country 2. The level of output increases from y_2 before the FDI, to y_4 after the FDI. The quantity traded also increases from y_2y_1 to y_4y_3. The equilibrium input price is P_{x1} and output price P_{y1}.

The results shown in figure 1 are extreme in that all the production of y moves from country 1 to country 2 because of the difference in the production functions. The volume of trade has increased because of the increased production efficiency and the mobility of capital. The price of the output has fallen and the input price risen, which are results we would expect from the increased production efficiency and the mobility of the FDI.

There are two additional points pertinent to this paper, which can be extracted from figure 1. First, the quantity of product traded is endogenously determined with the level of FDI. For any given level of production efficiency in the two countries, the greater the mobility of capital the higher the volume of trade. Second, as the economies grow and the domestic demand curves for the output (i.e. d_1 and d_2) shift outward, larger quantities of product trade and FDI are observed.

To develop a mathematical model of the relationship between trade and FDI we follow Goldberg and Klein (1999) with a few modifications. Suppose we have one country which produces two goods, *A* and *B*. The goods are produced with capital *K* i.e. FDI, and the total domestic labour *L* ($L_A + L_B = L$). Domestic capital is assumed to be sector specific and a perfect substitute for FDI. The production of goods can be expressed as:

$$A = f(K_A, L_A)$$
$$B = g(K_B, L_B).$$

Partial derivatives (f_L, g_L) are positive, (f_K, g_K) positive, (f_{LK}, g_{LK}) positive, and (f_{LL}, f_{KK}, g_{LL}, g_{KK}) negative. Given we have full employment in the labor market we write,

$$w/p_A = f_L$$
$$w/p_B = g_L .$$

We can now totally differentiate the first order conditions, and dividing through by the marginal product of labor get,

$$\frac{dw}{w} - \frac{dp_A}{p_A} = \left(\frac{f_{LL}}{f_L}\right)dL_A + \left(\frac{f_{LK}}{f_L}\right)dK_A$$

$$\frac{dw}{w} - \frac{dp_B}{p_B} = \left(\frac{g_{LL}}{g_L}\right) dL_B + \left(\frac{g_{LK}}{g_L}\right) dK_B .$$

Because we have a fixed amount of labor in the economy, which is not traded

$$dL_A = -dL_B$$

and solving out we get,

$$dL_A = \left(\frac{f_{LK} g_L}{Z}\right) dK_A - \left(\frac{g_{LK} f_L}{Z}\right) dK_B + \left(\frac{f_L g_L}{Z}\right)\left[\frac{dp_A}{p_A} - \frac{dp_B}{p_B}\right]$$
$$dL_B = \left(\frac{f_L g_{LK}}{Z}\right) dK_B - \left(\frac{f_{LK} g_L}{Z}\right) dK_A + \left(\frac{f_L g_L}{Z}\right)\left[\frac{dp_B}{p_B} - \frac{dp_A}{p_A}\right]$$

where $Z = -\left(f_{LL} g_L + g_{LL} f_L\right) > 0$. We know from the production functions that

$$dA = f_K dK_A + f_L dL_A$$
$$dB = g_K dK_B + g_L dL_B .$$

Substituting for dL_A *and* dL_B in the above equations we obtain,

$$dA = \frac{f_L^2 g_L}{Z}\left[\frac{dp_A}{p_A} - \frac{dp_B}{p_B}\right] + \left(f_K + \frac{f_{LK} g_L f_L}{Z}\right) dK_A - \frac{f_L^2 g_{LK}}{Z} dK_B$$
$$dB = \frac{g_L^2 f_L}{Z}\left[\frac{dp_B}{p_B} - \frac{dp_A}{p_A}\right] + \left(g_K + \frac{g_{LK} g_L f_L}{Z}\right) dK_B - \frac{g_L^2 f_{LK}}{Z} dK_A$$

The owners of capital i.e. FDI, will move capital to countries were it is secure and were a profit on the capital can be earned. The FDI used in the host country is $K_A + K_B = K$, where the excess supply function of FDI can be written as:

$$K = h(\pi, R, t, TR, PS),$$

where π is the return on capital, *R* is the productivity of the sector, *t* is the tax rate, *TR* is the trade which represents the openness of the sector, and *PS* is the political stability of the country. Total differentiating the excess supply function for capital we obtain

$$dK = h_\pi d\pi + h_R dR + h_t dt + h_{TR} dTR + h_{PS} dPS$$

where, $h_\pi > 0, h_R > 0, h_t > 0, h_{TR} > 0, h_{PS} > 0$.

We are now able to estimate an equation were the change in production is endogenously determined with the level of FDI.

Empirical model

To estimate the relationship between trade and FDI we develop a two-stage least squares (2SLS) regression model. The use of a 2SLS regression is required when there are independent variables in the regression equation that are correlated with the error term, commonly referred to as endogenous variables (Angrist and Krueger, 2001). Irwin and Tervio (2000) provide an example of this problem when they examine the impact of trade on GDP. In this case, trade is an endogenous variable because high-income countries have better infrastructure that is conducive to trade. Therefore, it is not a clear whether trade raises GDP or whether counties with high incomes engage in more trade. This is similar to problem of determining the relationship between trade and FDI.

The empirical model developed in this paper focuses on the trade and investment relationship between Canada and the United States.[3] If we ignore the potential endogenous variable problem the relationship between trade and FDI is estimated as follows.

$$(1)\quad T_j = \delta_0 + \delta_1 (FDI_j) + \delta_2 (EXC) + \delta_3 (GDP) + \mu,$$

where: T_j is the level of trade between Canada and the United States in sector *j*, *FDI* is the observed level of U.S FDI into Canadian sector *j*, *EXC* is the exchange rate between Canada and the United States, and *GDP* is the United States Gross Domestic Product. U.S GDP is not an endogenous variable because agriculture and food trade accounts for a very small portion of their total GDP.

If the variable FDI_j is correlated with the error term the use of an OLS regression would provide biased and inconsistent estimates of β_1.[4] To solve this problem we develop a 2SLS regression model. As the name suggests, there are two separate stages involved in a 2SLS regression. In the first stage, an OLS regression is performed on the endogenous variable (i.e. FDI_j). The endogenous variable is regressed on a set of instruments. The regression equation is used to calculate predicted values for the endogenous variable. In the second stage, we replace the observed values for the endogenous variable FDI_j with the predicated values obtained from the first stage regression.

In the first stage of our model, we regress the reported levels of FDI on the following instruments. These variables were chosen as instruments because they are consistent with the FDI literature.[5]

$$(2)\ FDI_j = \beta_0 + \beta_1 (EXC) + B_2 (GDP) + \beta_3 (RD_j) + \varepsilon,$$

3. In 2001, approximately 73 percent of Canada's total trade in the Agriculture and Food industry was with the United States.

4. A Hausman test is used to determine whether there is in fact an endogenous relationship between trade and FDI.

5. Our initial specification also included Canadian GDP, Canadian immigration rates, and Canadian interest rates as instrumental variables. Immigration rates were calculated in two ways. First, as the total number of immigrants entering Canada per year. Second, the total number of immigrants was indexed by the 50 year average immigration rate for Canada. Canadian GDP was not included in the final specification because of a high correlation with the U.S GDP variable.

where: *FDI* is the value of U.S FDI in Canadian sector *j*, EXC is the value of the U.S dollar compared to the Canadian dollar, GDP is the United States Gross Domestic Product, RD_j is the amount of research and development expenditures made by the Canadian government in sector *j*.

In the second stage, we replace the recorded FDI values with the predicted values obtained from equation 2. We now estimate the relationship between trade and FDI as follows:

$$(3)\quad T_j = \gamma_0 + \gamma_1 (\hat{FDI}_j) + \gamma_2 (EXC) + \gamma_3 (GDP) + v,$$

where: T_j is the level of trade between Canada and the U.S in sector *j*, $\hat{FDI}_j$ is the predicted level of FDI in sector *j*. The 2SLS coefficient (γ_1) can be compared to the OLS coefficient (δ_1) to obtain information about the direction and level of bias of the OLS estimate.

Data

A panel data set was used to estimate the two-stage least squares regression model. The panel data set consists of six cross sections and fifteen years of data (1987 to 2001). The six cross sections represent individual sectors in the Canadian agriculture and food industry. The sectors are aggregated at the 3-digit Standard Industry Classification (SIC) level. The six cross sections include grain and oil seed crops, grain and oil seed products processing, fruit and vegetables, meat and poultry, dairy products, and other food products farming and processing.

Canadian trade and FDI data was obtained from Statistics Canada. The trade data includes the value of Canadian exports to the United States and the value of Canadian imports from the United States for each 3 digit SIC code. Figure 2 shows the real dollar value of Canadian exports and imports for the years 1987 to 2001 (aggregate of the six SIC codes). Figure 3 provides a summary of the average real dollar value of Canadian exports and imports for each individual SIC code.

The inward FDI data represents the total capital positions or capital stock into Canada from the United States since 1987, the beginning of the time series. FDI data is recorded as the change in the accumulated capital stock as opposed to a measure of capital flows. The FDI data was obtained from Statistics Canada's confidential micro files and therefore can not be reported. To provide an illustration of the level of U.S FDI in the agriculture and food industry we obtained FDI data from the United States Department of Commerce. Figure 4 shows the level of U.S FDI into the Canadian and Mexican agriculture and food industry for the period of 1987 to 2001. U.S FDI to Mexico was included to provide a comparison of Canada's closest competitor for U.S capital resources. Based on figure 4, we see that U.S investment into Mexico has grown at a faster pace compared to FDI into Canada over the time period of the study.

Data for the remainder of the variables in the regression model were obtained from Statistics Canada, the United States Department of Commerce, and the Bank of Canada. Data was not available for these variables at the 3 digit SIC level, therefore aggregate industry data was used.

Results

We first estimate the OLS regression model (see equation 1), which provides an estimate of the impact of FDI, exchange rates, and U.S GDP on trade flows in the Canadian agriculture and food industry. The OLS regression is estimated using three different data sets for trade between Canada and the United States. First, we estimate equation 1 using total trade as the dependant variable. Total trade represents the value of Canadian exports to the United States plus the value of Canadian imports from the United States. Second, we use the value of Canadian exports to the United States as the dependant variable. Third, we estimate equation 1 with the value of Canadian imports from the United States as the dependant variable.

The results of the OLS regression indicate that FDI has a positive effect on total trade, total exports, and total imports between Canada and the United States (see table 2). This result indicates there is a complimentary relationship between trade and FDI. We also find that U.S GDP has a positive effect on total trade, exports and imports, which is the expected result as the two countries are each other's largest trading partners. As the U.S economy grows they will engage in more trade with Canada. Increasing the value of the U.S dollar compared to the Canadian dollar has a positive effect on total trade and total exports. As expected, an increase in the value of the US dollar had a negative impact on Canadian imports from the United States.

To test the hypothesis that FDI is an endogenous variable we perform a Hausman test on the OLS regression equation. Based on this test, at a 75% confidence level we cannot reject the hypothesis that FDI is an endogenously determined variable in the total trade and total export regression. The Hausman test on the total import regression equation provided less convincing statistical results (see *p*-value in table 2).

To correct for the endogenous variable problem we estimate the 2SLS regression model (see table 3). The predicted level of FDI has a positive effect on total trade, exports, and imports between Canada and the United States. A comparison of the OLS and 2SLS estimates indicates there is little difference between the FDI coefficients from the two regression techniques. The 2SLS regression does provide a slightly lower coefficient estimate for FDI suggesting there may be some upward bias in the OLS estimates. Given the positive sign on the FDI variable in both the OLS and 2SLS regression, we can not reject the hypothesis that product trade and FDI are compliments.

To determine the responsiveness of trade to each of the independent variables in the regression equation we calculate the mean elasticity values. Table 4 provides a summary of the OLS regression elasticity estimates for the total industry equation (i.e. based on the entire panel data set) and the elasticity values for each individual SIC code. The total industry elasticity estimates for the OLS regression are presented in column one of table 4. The industry elasticity estimates show that a one percent increase in U.S FDI increases total trade by approximately .4 percent, total exports by .2 percent, and total imports by .6 percent. This result indicates that Canadian imports are more responsive to FDI than Canadian exports. Assuming the elasticity values remain constant, further increases in FDI will increase Canadian exports, but reduce Canada's net trade position with the United States.

The elasticity estimates for the individual SIC codes range from .019 to 1.6 for the total trade regression equation. Trade in the dairy industry is by far the most responsive to an increase in FDI. In the dairy sector, a one percent increase in FDI results in a .9 percent increase in exports and a 2.4 percent increase in total imports. This result occurs because of the high levels of protection afforded to the dairy sector, which limits trade and FDI opportunities in the sector. Therefore, a removal of the barriers to trade and investment would result in a large increase in trade for the sector, in particular the amount of imports from the US.

The grain, oilseed, and livestock sectors are three important sectors of the western Canadian agriculture industry. The main similarity between these sectors is their reliance on export markets for growth opportunities. The elasticity estimates for the grain and oilseed sector show that a one percent increase in FDI will increase total trade by approximately .45 percent and total exports by approximately .2 percent. For the meat and poultry sector, a one percent increase in FDI increases total trade by .019 percent and total exports by .009 percent. Although they are not large changes, the elasticity estimates do indicate that increasing FDI will have the desired effect of increasing trade opportunities for the sector.

There are two interesting results obtained from the industry exchange rate elasticity estimates. First, we find that increasing the value of the U.S dollar by one percent has approximately a one percent increase in Canadian exports, which is the expected result for a small economy. Second, we see that Canadian exports are more responsive to changes in the exchange rate than Canadian imports. Increasing the value of the US dollar relative to the Canadian dollar will increase total trade in the Canadian agriculture and food industry. Therefore, government policies that encourage an appreciation in the value of the Canadian dollar will have a negative impact on total trade in the agriculture and food industry.

Elasticity estimates for the U.S GDP variable show that trade in the Canadian agriculture and food sector is heavily dependent on growth in the U.S economy. A one percent increase in U.S GDP increases total trade by 2.3 percent, total exports by 2.7 percent, and total imports by 1.98 percent. Trade opportunities in the U.S market will be one the major sources of growth for the Canadian agriculture and food industries. This result further illustrates the importance of factors such as FDI that enhance access to the U.S market.

The elasticity estimates for the 2SLS regression model are presented in table 5. The elasticity estimates for the 2SLS model are similar to the OLS elasticity estimates. The 2SLS elasticity estimate on the predicted FDI variable is slightly more inelastic than the OLS estimate. The exchange rate and U.S GDP variable are more elastic in the 2SLS regression model. The policy implications do not change from using either the OLS or 2SLS regression results.

Policy discussion

There is little disagreement over the potential benefits of FDI to a growing economy (OECD). With capital investment come new technology, business connections, and an expansion of the economy. However, the benefits of FDI do not automatically occur, and are not uniform across all regions and sectors. Policies and institutions matter. International experience has shown that governments need to go beyond traditional liberal FDI policies. More attention needs to be given to providing regulatory and institutional framework, which is conducive to FDI as well as domestic investment opportunities. Some of the regulatory and institutional issues include the prevalence of the rule of law, good corporate governance, transparent government administrative practices, sound competition policy, and the protection of labor rights and the environment.

In this report we demonstrated that FDI has positive effect on the level of agriculture and food trade. Thus, we conclude that if Canada wants to increase the level of trade, open policies towards FDI are important. Canada does have a preponderance of natural resources, such as water, land, and energy, which enhances the ability to produce primary agriculture products. The expansion of agriculture and food trade opportunities requires capital, technology, and international business connections. It is the second list, which Canada does not have in excess. FDI can serve as a ready supply of such inputs.

In predicting the level of FDI by sector, we found that the most important variable was the level of public research and development (R&D) expenditures in the sector. Investment in R&D is essential for the creation of new innovations. If a sector is to grow and compete internationally it must be innovative. FDI is attracted to those sectors where innovation is occurring. The R&D variable in the predicted FDI equation is picking up this effect.

Agriculture and food research is an important policy if Canada wants to continue to attract FDI into the agriculture and food sector. The food sector is large in Canada in terms of employment and as a percentage of Gross Domestic Product. The primary agriculture sector has declined in size, but is still important in supplying raw agricultural products to the processing sector. It is important that all governments continue to provide long term-balanced research funding to both the primary production and food sector of the industry.

A second important variable in attracting FDI is good corporate governance and the rule of law. These two variables are not the same, but both relate to government policy. Corporate governance is currently receiving a lot of attention, due in large part to accounting scandals in the United States. However, the changes, which are being made in the governance of the Toronto Stock Exchange will help make for better corporate governance. Increasing the transparency and accountability of a stock exchange will attract new foreign firms to become members of the stock exchange and through that mechanism raise capital for further investment in the country.

The rule of law is very important in encouraging in coming FDI. This can be a problem when governments seek to aid certain sectors of the economy. In the past, governments have changed the rules after firms have made investments. For example, Canada has a set regulation on the criteria to approve new crop varieties. In 2003, the government of Canada is faced with the decision to approve a new GM wheat variety developed by Monsanto. If the current rules are applied the variety will either pass or fail on the scientific criteria, which the firm knew at the time of investment. If the government yields to public pressure and blocks the approval the company may feel Canada is not a secure place to make long term scientific investments.

A third important factor in explaining the location of FDI is the degree of openness of the economy. Economies or sectors, which are closed because of government policy, will not attract FDI. In this study, we found the dairy sector to have very low levels of FDI, which is a result of the supply management policy. Because of the high level of protection through production controls and high import tariffs on over quota milk, dairy exports and FDI are very low. Since the final ruling of the World Trade Organization in 2003, the Canadian dairy sector exports have been reduced at a time when most producers would like to expand exports (WTO).

One major advantage, which Canada has in attracting FDI, is its proximity to the United States and the NAFTA Firms prefer to have access to large markets for just-in-time delivery opportunities. Canada should do all it can to minimize the costs, both in time and fees, for businesses to get their products across the U.S. border. Canada needs to examine the possibility of harmonizing its food security regulations with the United States as a means to provide more and lower cost access to the U.S. market. Any policy, which moves in this direction, will attract FDI and enhance trade.

Two variables we found to be insignificant in explaining FDI are the differential wage rate and the tax rate between the United States and Canada. Labor is mobile in western Canada and most wage differentials reflect differences in productive capacity. The supply of skilled labor is often more of a constraint to FDI than is the wage rate. Tax rates also reflect services provided rather than a simple cost to firms. These results are consistent with other studies, which show the wage rate and tax rate are not the primary reason in explaining the location of firms.

Conclusions

The relationship between trade and FDI in the Canadian agriculture and food industry is a new area of study. We find support for the view that there is a complimentary relationship between product trade and FDI. The reason for the complimentary relationship can be a combination of two factors. First, because of the role of MNC in making FDI, economies of scale may be achieved when these large firms trade between two countries. Second, some ‘quid pro quo’ affect may be occurring in those sectors, which have high levels of economic protection.

There is modest support for the notion that the level of FDI and the quantity of total product trade are endogenous. Economies that are more open grow faster, which is further indication of the endogenous relationship. Because increased growth is associated with an increase in exports, providing an environment to encourage FDI is desirable from an economic perspective.

The largest percentage of Canada’s agriculture trade and investment is with the United States. Recent policy decisions by the United States government to make its borders more secure from bio-terrorism and increased food security are of concern to the Canadian agriculture and food industry. If Canadian exports to the United States are hindered through higher border costs this will slow the growth of the industry. Securing open access to the U.S market is perhaps the most important agriculture and food policy, which can be pursued by the government of Canada. One way to pursue this objective is to encourage U.S FDI in the industry.

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Table 1: U.S FDI into Canada by Industry (millions of U.S dollars)

Year	All Industries	Agriculture and Food Products	Petroleum	Manufac-turing	Wholesale Trade	Finance, Insurance and Real Estate	Services	Other Industry	% FDI in Agriculture and Food Products
1992	68,690	3,172	8,133	29,567	6,076	13,655	2,857	5,229	4.62%
1993	68,889	3,592	8,560	29,286	6,879	12,339	3,117	5,287	5.21%
1994	72,059	3,904	10,095	29,101	6,665	13,907	3,155	5,612	5.42%
1995	79,220	4,268	9,369	33,450	7,011	15,865	3,447	6,578	5.39%
1996	83,731	3,986	9,468	35,862	6,627	18,412	3,713	6,807	4.76%
1997	89,056	4,285	9,813	36,641	6,761	21,661	3,966	7,554	4.81%
1998	89,599	4,548	11,206	32,409	6,824	23,231	4,533	8,787	5.08%
1999	100,492	5,234	14,109	34,722	7,441	29,013	4,791	7,919	5.21%
2000	112,797	4,783	16,165	39,673	8,419	34,591	5,538	7,701	4.24%
2001	119,033	3,963	20,338	42,033	8,690	35,322	5,592	7,925	3.33%

Source: United States Department of Commerce

Table 2: OLS Regression Results for Canadian Agriculture and Food Trade

		Dependant Variable	
	Total Trade	Canadian Exports	Canadian Imports
Constant	-3.28E+09**	-2.51E+09**	-9.73E+08*
	(1.06E+09)	(8.04E+08)	(4.49E+08)
U.S FDI	1.04**	0.31**	0.73**
	(0.16)	(0.11)	(0.07)
Exchange Rate	5.04E+08	6.77E+08	-1.49E+08
	(1.56E+09)	(1.19E+09)	(6.63E+08)
U.S GDP	0.0005*	0.0003*	0.0002*
	(0.0002)	(0.0001)	(0.00008)
N	90	90	90
R^2	0.54	0.42	0.66
Adjusted R^2	0.53	0.39	0.65
F Statistic	33.9	16.8	56
Hausman (p-value)	0.26	0.23	0.43

Standard Errors in parenthesis. * indicates significant at the 5 percent level and ** indicates significance at the 1 percent level.

Table 3: 2SLS Regression Results for Canadian Agriculture and Food Trade

		Dependant Variable	
	Total Trade	Canadian Exports	Canadian Imports
Constant	-3.29E+09**	-2.32E+09**	-9.77E+08*
	(1.09E+09)	(6.91E+08)	(4.77E+08)
Predicted U.S FDI	.99**	0.27*	0.72**
	(0.17)	(0.11)	(0.07)
Exchange Rate	5.26E+08	6.69E+08	-1.43E+08
	(1.61E+09)	(1.02E+09)	(7.03E+08)
U.S GDP	0.0005*	0.0003*	0.0002*
	(0.0002)	(0.0001)	(0.00009)
N	90	90	90
R^2	0.51	0.40	0.62
Adjusted R^2	0.49	0.38	0.61
F Statistic	29.9	19.3	46.5

Standard Errors in parenthesis. * indicates significant at the 5 percent level and ** indicates significance at the 1 percent level.

Table 4: OLS Regression Elasticity Estimates

	SIC Code						
	Industry	Grain & Oilseed Crops	Grain & Oilseed Processing	Fruit & Vegetable	Meat & Poultry	Dairy Products	Other Food Products
Total Trade							
U.S FDI	0.416	0.470	0.381	0.567	0.019	1.605	0.613
Exchange Rate	0.435	0.642	0.358	0.586	0.298	4.991	0.236
U.S GDP	2.265	3.344	1.868	3.053	1.554	26.007	1.228
Total Exports							
U.S FDI	0.232	0.192	0.219	0.488	0.009	0.895	0.402
Exchange Rate	1.101	1.188	0.937	2.286	0.624	12.624	0.702
U.S GDP	2.717	2.931	2.312	5.640	1.540	31.152	1.731
Total Imports							
U.S FDI	0.622	1.215	0.552	0.611	0.037	2.408	0.789
Exchange Rate	-0.272	-0.694	-0.218	-0.264	-0.246	-3.132	-0.127
U.S GDP	1.981	5.059	1.587	1.926	1.792	22.828	0.925

Table 5: 2SLS Regression Elasticity Estimates

	SIC Code						
	Industry	Grain & Oilseed Crops	Grain & Oilseed Processing	Fruit & Vegetable	Meat & Poultry	Dairy Products	Other Food Products
Total Trade							
Predicted U.S FDI	0.398	0.450	0.364	0.543	0.018	1.536	0.586
Exchange Rate	0.454	0.670	0.374	0.612	0.311	5.209	0.246
U.S GDP	2.274	3.357	1.875	3.065	1.560	26.110	1.232
Total Exports							
Predicted U.S FDI	0.207	0.171	0.195	0.434	0.008	0.796	0.358
Exchange Rate	1.088	1.174	0.926	2.259	0.617	12.475	0.693
U.S GDP	2.522	2.721	2.146	5.235	1.430	28.913	1.607
Total Imports							
Predicted U.S FDI	0.610	1.193	0.542	0.600	0.036	2.363	0.774
Exchange Rate	-0.261	-0.666	-0.209	-0.254	-0.236	-3.006	-0.122
U.S GDP	1.981	5.059	1.587	1.926	1.792	22.828	0.925

Figure 1: Trade with and without Foreign Direct Investment

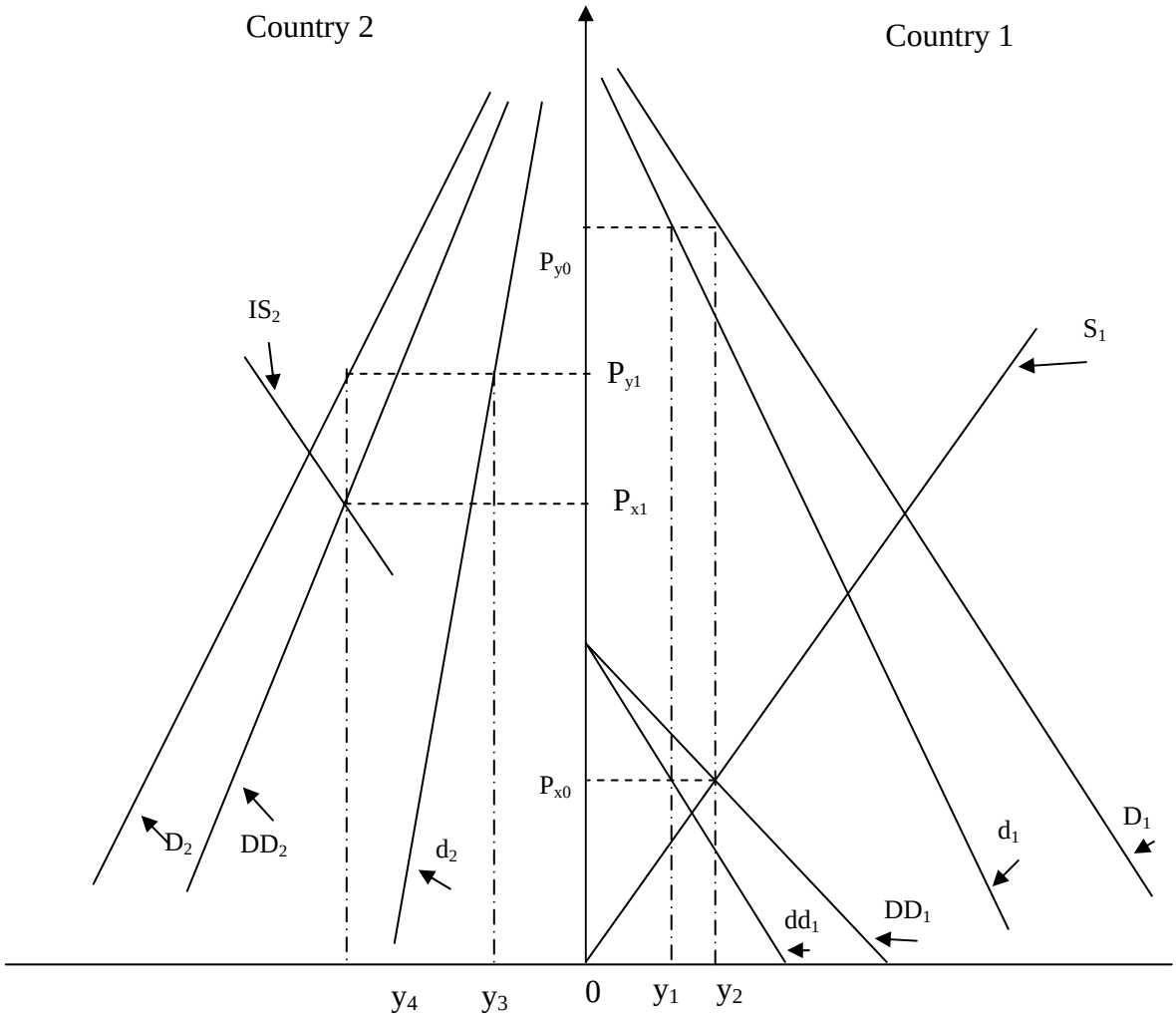
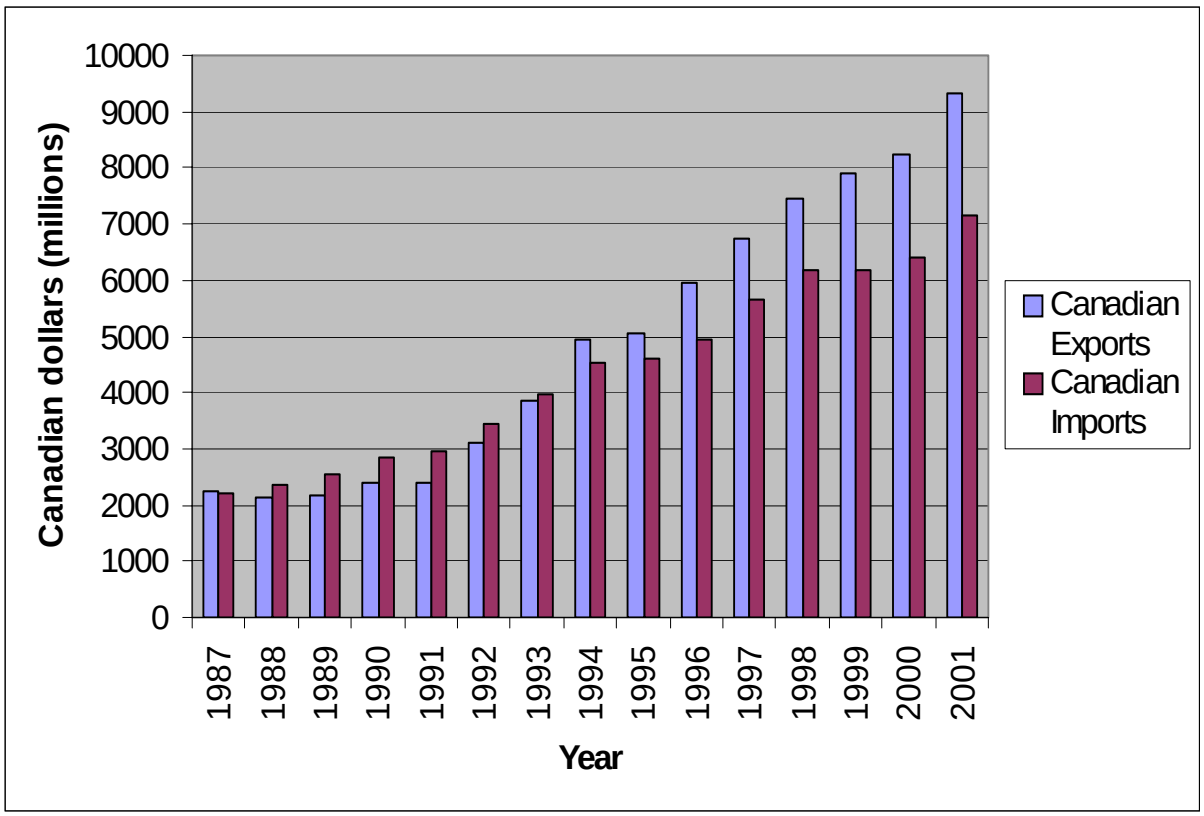
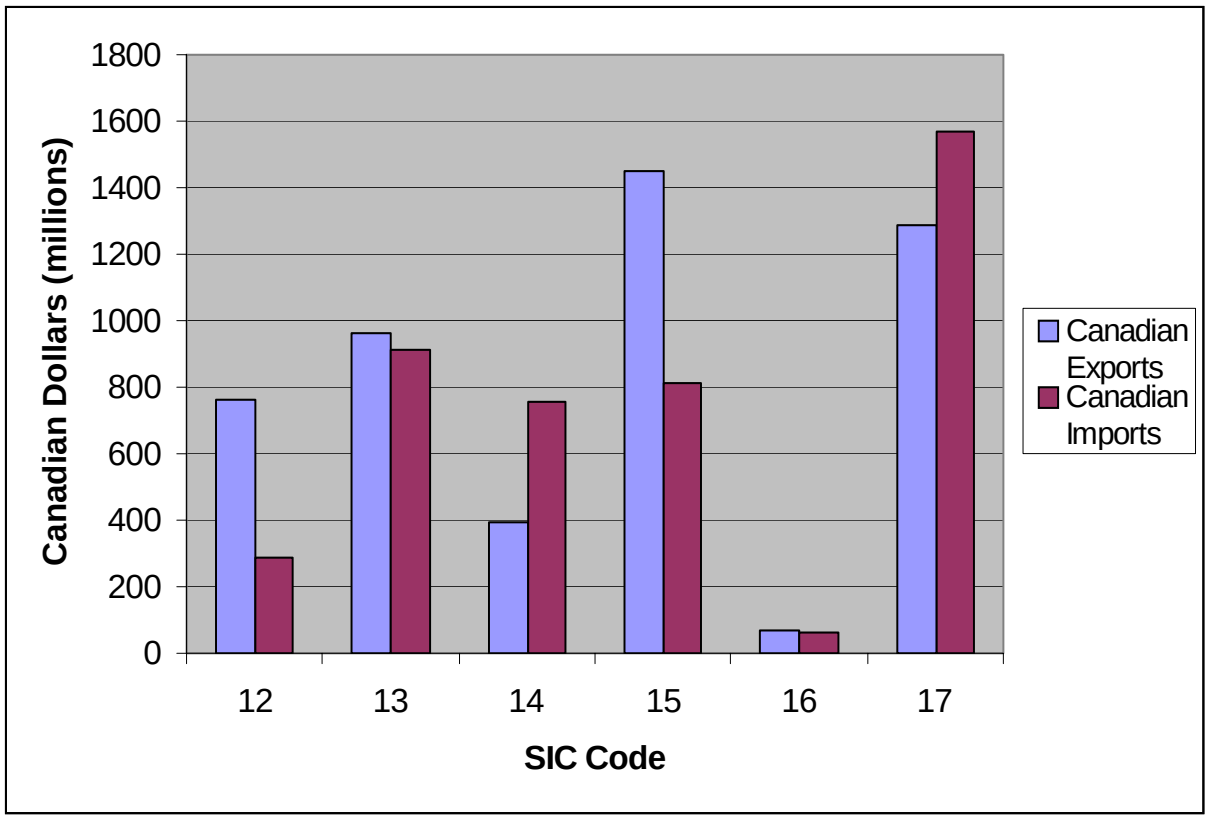


Figure 2: Canadian and U.S Trade in the Agriculture and Food Sector



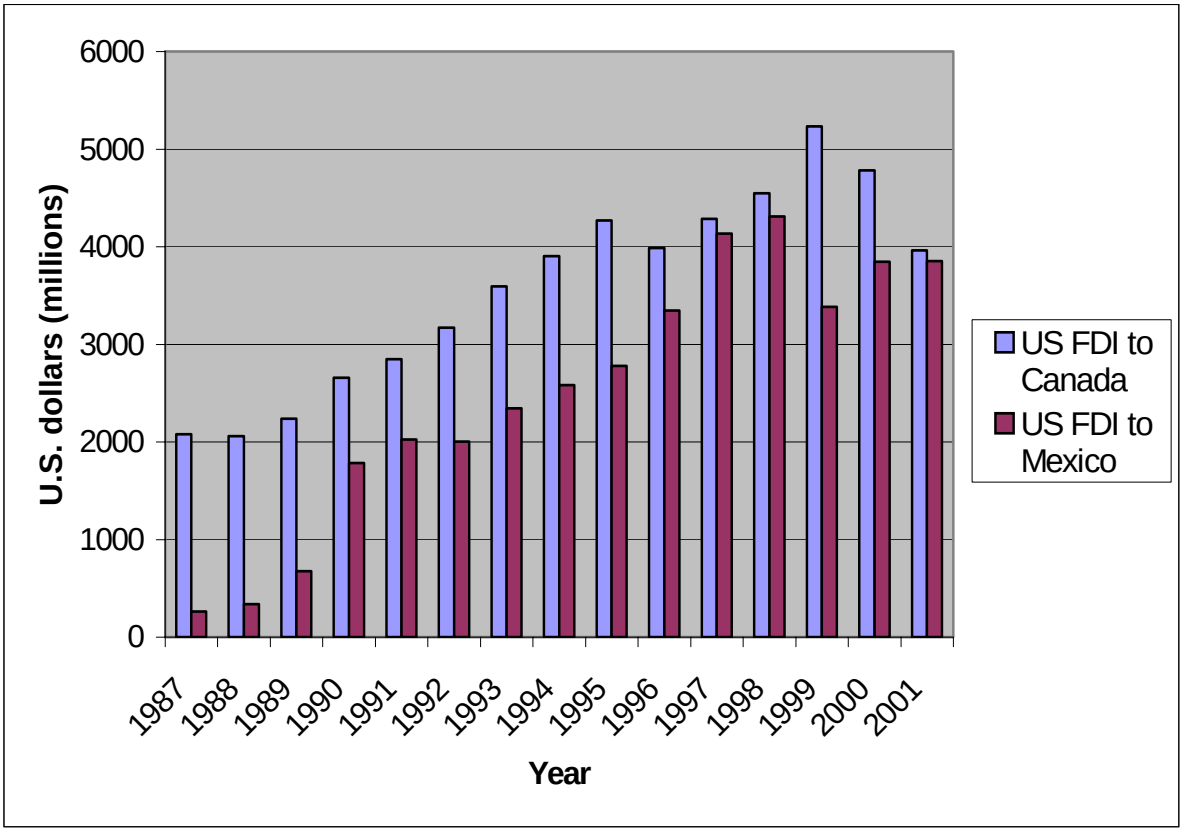
Source: Statistics Canada

Figure 3: Canada and U.S Trade by SIC Code



Note: SIC code 12 is grain and oilseed crops, 13 is grain and oilseed processing, 14 is fruit and vegetables, 15 meat and poultry, 16 is dairy products, and 17 is other food products.
Source: Statistics Canada

Figure 4: U.S Outward FDI in the Agriculture and Food Sector



Source: United States Department of Commerce

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