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Abstract

We investigate how economic integration in North America has altered the pattern of foreign direct investment (FDI) to and from Canada. The theoretical analysis suggests that while the Canadian-U.S. free trade agreement should generate less FDI, the addition of Mexico in the North American Free Trade Agreement (NAFTA) produces the opposite effect. The fall in trade costs results in investment diversion from the U.S. and Canada, yet lower fixed costs may increase FDI even in those countries via an increased incentive to locate production facilities abroad rather than only domestically. Using a difference-in-differences estimator, we find that U.S. FDI in Canada as well as Canadian FDI in the U.S. have expanded disproportionately since NAFTA, suggesting that the latter effect dominates.

Keywords: Foreign Direct Investment, Multinationals, NAFTA, Canada.

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1 Introduction

A salient feature of international economic relations is the recent proliferation of regional integration schemes. The European Union (EU) has expanded its membership into Eastern Europe while at the same time continuing its move towards "deep" integration. Many developing countries in Asia and South America have pursued economic integration amongst themselves (ASEAN, Mercosur) or have sought free trade agreements with other developed countries or blocs, such as the EU or the United States. In North America, the 1989 Canada-U.S. Free Trade Agreement (CUSFTA) was followed quickly by the inclusion of Mexico into a North American Free Trade Agreement (NAFTA). The latter had been unique at the time as it combined two advanced developed with a developing country, a phenomenon dubbed the 'new regionalism' by Ethier (1998).

The ever increasing web of integration schemes has important effects on international economic interactions. Traditionally, the analysis of such agreements has focused on their impact on trade flows as they potentially lead to both trade creation (between the partners in the agreement) and trade diversion (from countries now outside of the agreement). However, economic integration and its coincident reduction in trade barriers also alter the incentives for firms when making their location decisions. Motta and Norman (1996) show that economic integration may increase the incentive of firms from countries outside of the agreement to locate in the lowest cost country inside the free trade area (FTA). But they also show that firms from inside the FTA benefit from the increased market size due to increased economies of scale. Tekin-Koru and Waldkirch (2007) show that in the case of NAFTA the latter effect dominates the former with respect to foreign direct investment (FDI) in Mexico.

A corollary of increased FDI in the low-cost country is its diversion from the other countries which become relatively less attractive locations. This would be true for FDI originating in FTA partners as well as from outside the FTA. For NAFTA, this would mean a decline in FDI in both Canada and the U.S. However, trade agreements not only reduce trade, but also investment costs. NAFTA's chapter 11 contains specific investment provisions that are largely geared toward guaranteeing foreign investors the same treatment as domestic investors. These provisions go further than those contained in the earlier CUSFTA, which in turn relaxed Canadian rules governing foreign investment. They can be viewed as essentially reducing the initial, fixed cost of foreign investment. These lower costs in turn raise the incentive for firms that may not have been engaged abroad before to consider foreign production locations. Thus, it becomes an empirical question whether the foreign investment diversion or the FDI creation effect dominates for countries within an agreement that are not the low-cost location.

This paper's focus is on studying the effect of NAFTA on Canadian inward and outward investment. Of primary interest is investment in and from the partner countries, although the effect on investment from countries outside of the agreement is investigated as well.[1] In doing so, we also need to take into consideration that Canada had entered into CUSFTA only five years prior to NAFTA. This implies that trade as well as investment costs between Canada and the United States were lowered before these were lowered in Mexico. Consequently, we analyze a two-step reduction in these costs in our theoretical model and generate predictions for the differential effects these reductions have for Canadian FDI.

We use a three-country model similar to Grossman et al. (2006). In contrast to them, we model one large Northern country and two small countries, one in the North and one in the South, and then analyze the effect of regional integration on firms' location decisions. The model predicts that economic integration between the two Northern countries only with no decline in investment costs results in decreased FDI due to a decline in the incentive for tariff-jumping. When the Southern country is added with not only a decline in trade costs but also declines in investment costs, FDI

[1] We do not consider Mexico's outward FDI since it is negligible and data on early years are largely missing.

in the entire region by the member countries increases. First, medium productivity Northern firms switch from using the other Northern country to using the South as an export platform, especially in components production. Second, even though there is a decline in FDI in Northern countries by low productivity firms due to lower trade costs, lower investment costs make investing in these high cost countries attractive for medium and high productivity firms, particularly in assembly. Since the level of production by low productivity firms is small due to their inefficiency, the negative diversion effect is dominated by the positive FDI creation effect and investment in the region as a whole rises.

The empirical analysis uses aggregate FDI data from 1980 to 2002 and covers the largest feasible sample of bilateral FDI. Unfortunately, we have no firm level information and likewise, industry level information that would at a minimum cover Mexico, Canada and the U.S. is not available on a comparable basis for this time period. Still, we believe that how economic integration of this kind, first the traditional North-North, then the new North-South, affects small Northern countries in the aggregate is of interest to academics and policy makers alike and has not been studied sufficiently. As far as the effect of NAFTA on FDI is concerned, most existing studies either focus on Mexico alone, such as Waldkirch (2003) or Cuevas et al. (2005), or the U.S. and Mexico, ignoring Canada, such as our companion paper (Tekin-Koru and Waldkirch 2007). Hejazi and Pauly (2005) examine the effect of NAFTA on Canada, although they use a simple gravity framework and analyze U.S. outward FDI and OECD bilateral inward FDI separately, making their results not strictly comparable to ours, as we discuss in more detail below.

We find that since the start of economic integration in North America, Canadian FDI in the U.S. and U.S. FDI in Canada has increased by more than what can be explained by the usual determinants of FDI such as market size, factor cost differences or exchange rates and relative to the rise in FDI elsewhere. Due to the relative short time period that only CUSFTA was in effect before the addition of Mexico, it is difficult to separately identify the effects of the different stages of integration. Still, these results suggest that overall, the investment cost lowering effect of integration dominates the investment diverting one from lowering trade barriers and adding a low-cost country. There is some, albeit weak, evidence that Canadian FDI in Mexico has not been positively affected by NAFTA, despite an increase in the absolute amount of FDI that can be observed after 1994. This may be due to fixed costs in the South remaining high relative to market size, which adversely affects the location decision of firms in the smaller Northern country.

We also find robust evidence that the FDI-increasing effect among Northern NAFTA countries does not apply to non-NAFTA FDI in Canada, which is negatively affected, suggesting a diversion effect for this type of FDI. Still, overall our results suggest that adding low-cost countries to existing agreements among industrialized countries, such as the EU's eastward expansion, does not imply reduced FDI in the original countries, not even the smaller ones, from partner countries. While FDI in the new members is likely to increase, such a rise need not come at the expense of FDI in existing members but rather, the total increase in FDI in the region benefits all countries, at least as far as intra-regional FDI is concerned.

We do emphasize that our results appear to be very robust. We carefully correct for both country-pair specific autocorrelation as well as heteroscedasticity in our econometric analysis. We use skill data drawn from the International Labor Organization (ILO) as, for example, Carr et al. (2001), but also the updated schooling data from Barro and Lee as, for example, Blonigen et al. (2003). The results are also robust to the consideration of an "announcement effect" since both CUSFTA and NAFTA were anticipated before their formal inception.

The paper proceeds as follows. The next section reviews the evolution of Canadian FDI policies. The following section discusses the theoretical implications of our three-country model on the location choice of firms. The following section presents the empirical model which is designed to allow testing of the main hypotheses generated by the theory. After a discussion of our econometric approach and the data, the empirical results are presented, followed by concluding remarks.

2 Canadian FDI Policies

Globerman and Shapiro (1999) provide a nice overview of foreign investment policies in Canada. The first major change occurred in the Foreign Investment Review Act (FIRA), which was enacted in 1973. It required a detailed review of new foreign investments in Canada, where foreign investors had to show that the investment would be of significant benefit to Canada in order to receive approval. These were significant additional burdens that should have affected FDI. In 1985, the Investment Canada Act relaxed these stringent review rules. In particular, greenfield investments in certain sectors were no longer subject to review at all. For many others, only a notification, no review was required.

While the Canada-U.S. FTA in 1989 further relaxed investment rules for investors in the partner country, it stopped short of according national treatment for all investments. In particular, investments exceeding a certain threshold, $CDN 150 million at the time, still required a review.

NAFTA, going into effect in January of 1994, went much further than CUSFTA with respect to FDI regulations. It contains a provision to grant national treatment to foreign investors from partner countries. In addition, it codifies the most favored nation principle in that signatory states must be accorded at least the same favorable treatment as any other country. NAFTA does allow the use of 'negative lists', the exclusion of certain sectors from liberalization. However, even this can be argued to foster transparency as exceptions are made explicit and are not subject to an approval process that may potentially deny any investment in any sector. In practice, the major exceptions were financial services and culture and media.[2] Thus, it seems reasonable to argue

[2] For a detailed discussion of NAFTA's investment provision, see Graham and Wilkie (1994).

that it took until NAFTA for foreign investment regulations to be relaxed substantially enough for investment costs to fall significantly.[3]

There are also a few sector-specific policies that could affect FDI. Chief among them are the U.S.-Canada Automotive Products Trade Agreement of 1965 (Autopact) and the National Energy Program of 1980 (NEP). The Autopact not only reduced trade barriers in assembled cars and car parts, but also mandated production capacity shares of U.S. automakers in Canada, thus raising FDI in this sector, although well before the FTA and NAFTA and the beginning of our sample period. The NEP affects mainly oil and gas exploration, giving preference to Canadian firms, thus reducing FDI. However, these restrictions were also eased in the wake of NAFTA.

3 The Theoretical Model and Hypotheses

In this section we present a variation of the three-country model of Grossman, Helpman and Szeidl (2006) -from now on GHS. They examine the location strategies of heterogeneous multinational firms in a three-country setting and do not consider economic integration effects, so we extend and re-interpret their model for our case.

Economic integration will affect both trade (tariff and transportation) costs and the fixed costs of establishing operations abroad. The former is a standard feature of trade agreements and formalized in specific reductions of both tariffs and non-tariff barriers. The latter may result as a consequence of loosening regulations governing foreign investment as described in the previous section. Thus, we model both, which generates interesting hypotheses regarding the FDI effects of CUSFTA and NAFTA with respect to the location decisions of U.S. and Canadian firms.

In this model, firms choose between domestic production and undertaking foreign direct in-

[3] For a dissenting view see Buckley et al. (2007) who argue that the fundamental policy environment did not change since the 1989 treaty, although they do acknowledge a potential effect on FDI stemming from the expanded geographic area of NAFTA.

vestment to save either production or trading costs. Assembly activities, which result in finished products, and intermediate activities, which result in inputs used in assembly, are differentiated.

Consumption. Households consume $J+1$ products produced by J differentiated goods sectors and one homogeneous good sector. Consumers share identical preferences which can be represented as

$$U = x_0 + \sum_{j=1}^{J} \frac{1}{\mu_j \alpha_j^{\alpha_j}} X_j^{\mu_j}, \qquad 0 < \mu_j < 1 \tag{1}$$

where x_0 is the consumption of the homogeneous good and $X_j^{\mu_j}$ is an index of consumption of the differentiated goods produced by industry $j \in \{1, ...J\}$. This index is a CES aggregate of amounts of different varieties consumed.[4]

Markets. There are three markets: Canada (C), the U.S. (U) and Mexico (M). Firms in the Northern countries are more productive than those in the Southern country in the homogeneous good production. Therefore, Northern country wages are higher than the Southern country ones. Formally, $w^C = w^U = 1 > w^M = w$, where w^ℓ is the wage rate in country ℓ. The homogeneous good is produced in all three countries in equilibrium and taken to be the numeraire. The sizes of these markets for the differentiated products are different. Let M^ℓ be the number of households in country ℓ that consume differentiated products. We assume that $M^C = M^M < M^U$. We further assume that producers of differentiated goods are from the Northern countries and they must locate their headquarter activities at home, following Tekin-Koru and Waldkirch (2007). Different from them we allow for a market in Mexico for the goods produced by multinationals.

Demand. The demand in market ℓ is given by

$$x^\ell = \alpha^{-\alpha/(1-\alpha)} M^\ell (X^\ell)^{(\mu-\alpha)/(1-\alpha)} (p^\ell)^{-1/(1-\alpha)} \tag{2}$$

[4] $Xj = \left[\int_0^{n_j} x_j(i)^{\alpha_j} d_i \right]^{x_j(i)}$, where $0 < \alpha_j < 1$, $x_j(i)$ is the consumption of the i^{th} variety of industry j and n_j is the number of varieties in that industry. Given equation (1), the elasticity of substitution within j is $1/1-\alpha_j$. We assume that $\alpha_j > \mu_j$, in other words, there is a higher degree of substitution within industry than among industries.

where X^ℓ is an aggregate consumption index for varieties in the industry in country ℓ, and p^ℓ is the price charged in country ℓ.

Production. Productivity levels in industry j are independent draws from the cumulative distribution function $G_j(\theta)$. A firm's production function in industry j is $\theta F_j(m, a)$, where m is the intermediate goods -or components- used in the production of the final good and a is the level of assembly activity. $F_j(\cdot)$ is an increasing and concave function with constant returns to scale. The elasticity of substitution between the intermediate goods production m and the assembly activity a is less than 1.

Production Costs. Let $c_j(p_m, p_a)$ be the unit cost function dual to $F_j(m, a)$, where p_m and p_a are the effective prices (inclusive of delivery costs) of intermediate goods and assembly activity, respectively. Thus, $c_j(p_m, p_a)/\theta$ is the per-unit variable cost of production for a firm with productivity θ. A firm that chooses to produce intermediate goods in a different location from its headquarters bears a fixed cost of g_j units of home labor. On the other hand, if the assembly activity is undertaken in a different place than the headquarters, the firm incurs a fixed cost of f_j units of home labor. These fixed costs are assumed to be independent of the foreign location. That is, a U.S. firm does not bear a different fixed cost when it chooses to produce its intermediates (assembly activity) in Mexico rather than Canada. Since 1 unit of m requires 1 unit of local labor in the place where intermediates are produced and 1 unit of a requires 1 unit of local labor in the assembly location, Mexico enjoys a comparative advantage in the production of both components and final goods relative to the production of the homogeneous good.

Trade Costs. Iceberg trade costs could apply to both intermediate and final goods. We will, however, focus on costly final goods trade only.[5] A firm in industry j must ship $t_j \geq 1$ units of the final good to deliver one unit of that good to the final consumption destination. A firm with

[5] See GHS for a brief treatment of costly intermediate goods trade.

headquarters in $C(U)$ will never produce the intermediates in $U(C)$. Such a firm would instead produce the intermediates in M, ship them costlessly to the assembly plant and thus achieve lower variable costs while incurring the same fixed costs. Moreover, there is no justification for a firm to produce the intermediates in two locations due to the costless shipping of these goods. Therefore, the production of intermediates will be realized either in $C(U)$ or M but not both.

Given the full structure of the model, it is now easy to calculate the variable costs of a firm in industry j that opts for different location strategies. For example, a Canadian firm with productivity θ that wants to deliver final goods to consumers in the U.S. can produce and assemble the good in Canada and pay $t_j c_j(1,1)/\theta$ per unit, whereas it would pay $t_j c_j(w,w)/\theta$ per unit to conduct all its operations in Mexico. Another possibility for this Canadian firm is to produce the components in Mexico and perform the assembly in the U.S. and thus pay $t_j c_j(w,1)/\theta$ per unit.

Operating Profits. For any strategy with a fixed cost of k and unit variable cost of c/θ the maximized operating profits are

$$\pi = (1-\alpha)\overline{Y}\Theta c^{-\alpha/(1-\alpha)} - k \tag{3}$$

where $\Theta = \theta^{\alpha/(1-\alpha)}$ is a transformed measure of productivity and $\overline{Y} \equiv \Sigma M^{\ell}(X^{\ell})^{(\mu-\alpha)/(1-\alpha)}$ is the size of the entire region's demand. We shall assume that $Y^C = Y^M < Y^U$, i.e., the U.S. is the large country among all three, and the share of Mexican or Canadian demand in the region's demand is $\sigma/2 = Y^C/\overline{Y} = Y^M/\overline{Y}$ where $\sigma \in (0,1)$.[6]

3.1 Pre-CUSFTA

We begin our analysis with a regime of relatively high trade costs (inclusive of tariff and transportation costs) and high fixed costs of FDI among all three countries, which is a good approximation of

[6]Different from GHS we assume that Mexico and Canada are of equal size and smaller than the U.S. This assumption simplifies the analysis without affecting the major conclusions described below. Moreover, Canadian and Mexican GDP are not very different. For example, purchasing power adjusted GDP in 2006 was \$1.27 trillion in Mexico and \$1.20 trillion in Canada, according to the World Bank's World Development Indicators.

the time before CUSFTA.[7] We concentrate on firms in a particular industry j, and to reduce the clutter in the notation we drop the subscript j from now on. We assume that

$$t^H > \frac{c(w,1)}{c(w,w)} \tag{4}$$

where t^H denotes a high level of trade costs. We will use superscript $H(L)$ to denote the high(low) level of a variable from now on. When trade costs are this high, the lowest cost of serving any market is assembling the final product in the consumption location to conserve the shipping costs including tariffs. To see this, notice that if intermediates are produced in M and assembled in $C(U)$, the unit variable cost of serving $C(U)$ is at most $c(w,1)$. However, the unit variable cost of serving the same market from a plant in M is at least $tc(w,w)$ which is obviously higher given inequality (2).

Next, observe that if the intermediates are produced in $C(U)$, the cost of serving $C(U)$ from an assembly plant there is at most $c(1,1)$, whereas serving $C(U)$ from an assembly plant in $U(C)$ is at least $tc(1,1)$ and from an assembly plant in M is at least $tc(1,w)$. As long as $c(w,1)/c(w,w) > c(1,1)/c(1,w)$[8], inequality (2) also satisfies $tc(1,w) > c(1,1)$. Therefore, each market is served at the lowest cost through assembly in the same market. No firm will choose to assemble in one foreign location only and export to both home and the other country. In other words, export platform FDI as analyzed in Ekholm et al. (2003) is not a possibility in this high trade cost regime.

This leaves us with a total of eight *potential* location strategies: home or Mexican production of intermediate goods with assembly either in home, or in home and in Mexico, or in home and in the other Northern country or in all three countries.

Next, we compare the operating profits under these alternative strategies. Since we assume asymmetry between the two Northern countries, different from GHS we have to consider two sub-

[7] This is a case we use as our benchmark and corresponds to the high trade costs scenario of GHS.

[8] $c(w,1)/c(w,w) > c(1,1)/c(1,w)$ holds if and only if $\log c(p_m,p_a)$ is submodular. When the elasticity of substitution between m and a is less than one, as we have assumed, the submodularity is guaranteed.

cases within each regime; one for Canada and one for the U.S. as the source of FDI. The maximum attainable profits for all dominant strategies in each regime for each firm are given in Table 1.

The set of possible location strategies when a C firm invests involves six elements: $\{C, C\}$, $\{C, UC\}$, $\{C, UCM\}$, $\{M, C\}$, $\{M, UC\}$, and $\{M, UCM\}$. The first element in brackets is the location of components production and the second one is (are) the location(s) of assembly. Notice that no C firm will use M as an export platform to U in this high trade cost regime since that strategy is dominated by assembling in C and U as long as the size of market U in the region is greater than 1/3.

The left panel of Figure 1 shows the combinations of fixed costs of FDI in components, g and productivity levels, Θ that give rise to different optimal location strategies for a Canadian firm in the pre-CUSFTA regime. The lines in the figure represent the boundaries between regions with different optimal location strategies. In the region $\{M, C\}$, for example, components are produced in M and shipped costlessly to C for assembly. The final product is consumed locally and also exported to M and U. The figure is drawn for a particular value of fixed costs of FDI in assembly, f. When f changes, the boundaries between the regions shift.[9] FDI in assembly takes place to the right of the dashed lines in the figure.

For all positive values of g, firms with low productivity conduct all their production activities at home and export the final product to the U.S. and Mexico. The level of output produced by these firms is relatively small because the variable cost savings through FDI do not compensate for the high fixed costs of FDI. Firms with intermediate levels of productivity may engage in FDI in components or in assembly depending upon the size of g. They will engage in intra-firm trade besides exporting final output from Canada or from an export platform in the U.S. Notice

[9] We followed the details provided in the appendix of GHS in the construction of these boundaries. The idea is simple. The boundary between $\{M, C\}$ and $\{M, UC\}$, for example, is defined by the values that g takes for each Θ value when $\pi_{M,C} = \pi_{M,UC}$. In this particular case, the boundary is vertical because both strategies involve FDI in components and thus the boundary does not depend on g. Detailed calculations of our boundaries and their shifts in different regimes are available upon request.

that high trade costs and the bigger size of the U.S. market encourage firms to undertake FDI in assembly there rather than the low cost but small Mexico. Firms with high productivity levels go for complete globalization in which they set up assembly plants in all three countries and thus engage in horizontal FDI in all three countries.

The set of possible location strategies when the investing firm is from U involves six elements: $\{U,U\}$, $\{U,UM\}$, $\{U,UCM\}$, $\{M,U\}$, $\{M,UM\}$, and $\{M,UCM\}$. Observe that, different from the previous case, no U firm will use C as an export platform to M since M is the low cost location with the same size market as C and the same level of FDI fixed costs.

The right panel of Figure 1 depicts the different possible location strategies when the investing firm is from the U.S. The intersection points of the boundaries in the U.S. case are drawn exactly the same as the Canadian case for convenience. The productivity levels corresponding to the intersection points can be different from the Canadian case, although the ordering of these productivity levels and thus the intuition are not. This is true for all three regimes discussed in this paper.

As in the case of a Canadian firm, the low productivity firms prefer not to engage in FDI in assembly and high productivity firms conduct horizontal FDI in all markets. Firms with intermediate productivity levels originating from the U.S., on the other hand, have their assembly line set up in Mexico rather than Canada.

3.2 CUSFTA

In this subsection we concentrate on the case where trade costs between only the two Northern countries are reduced, reflecting the drop in tariff barriers between Canada and the U.S., while those barriers between Mexico and the two Northern countries remain high. We also assume no decline in the fixed costs of investing in this regime. In particular,

$$\frac{c(1,1)}{c(1,w)} < t^L < \frac{c(w,1)}{c(w,w)} \tag{5}$$

$$t^H > \frac{c(w,1)}{c(w,w)} \tag{6}$$

where t^L is the reduced trade costs between C and U and t^H is the high trade costs between M and the other two countries.[10] We assume that the relative decline in trade costs are bounded both from below and above to ensure a moderate level of decline.[11]

In this scenario there are again six location strategies to consider. The difference between the optimal location strategies in pre-CUSFTA and CUSFTA regimes for Canada and thus our first three testable hypotheses can be derived by comparing Figures 1 and 2. All hypotheses are formulated with respect to aggregate FDI, even though the model is one of heterogeneous firms. This is because we only have comparable economy-wide data for the three NAFTA countries as well as FDI in and between all other countries which serve as our control group (for details, see the next section).

Hypothesis 1 *Canadian FDI in the U.S. declines after CUSFTA.*

Compare the left panels of Figures 1 and 2. High productivity Canadian firms continue to produce and sell close to the customers and maintain their investments in the U.S. Low productivity firms continue to produce at home and export to the other two countries as before but now they are able to expand their production to export more to the U.S. due to the lower trade costs. Notice that region $\{C, C\}$ increases in size. The medium productivity firms, on the other hand, behave much more differently. Observe that regions $\{C, UC\}$ and $\{M, UC\}$ shrink in size. Trade costs are low enough for the firms at the lower end of the medium productivity range to invest in the home country and export, rather than to invest in the assembly line in the U.S. Given the same level of

[10] Inequality (5) corresponds to the moderate transport case of GHS. Since CUSFTA reduced tariff barriers but not necessarily transportation costs, we opt for not using their low transport cost scenario.

[11] In particular, $\frac{C(1,1)}{C(1,w)} < \frac{T^H}{T^L} < \frac{T^H T^L(1-\sigma)+T^L\sigma/2-T^{H(1-\sigma)}}{T^H T^L\sigma/2}$.

production costs in Canada and the U.S., now they are able to avoid fixed costs of assembly in the U.S. In other words, the need for tariff-jumping FDI declines after CUSFTA.

Hypothesis 2 *Canadian FDI in Mexico declines after CUSFTA.*

High productivity Canadian firms continue to produce and sell close to the customers and maintain their investments in Mexico. Observe that FDI in components in Mexico by low and medium level productivity Canadian firms decline after CUSFTA. Due to lower trade costs, Canadian firms are less able to justify the fixed costs of components production and thus reduce their FDI in components in Mexico. That is why we observe a shrinkage in the size of the regions $\{M, C\}$ and $\{M, UC\}$.

Hypothesis 3 *U.S. FDI declines in Canada after CUSFTA.*

Examine the right panels of Figures 1 and 2. The behavior of low and low-end medium productivity U.S. firms is very similar to the behavior of Canadian firms. They increase their production of components and assembly in the home country and export to the entire region to benefit from low trade costs. Therefore, the size of region $\{U, U\}$ increases. The low-end medium productivity firms reduce their assembly activity in Mexico once used to supply Canada and instead invest in the U.S. and export to Canada, while the rest of the medium productivity firms continue to use Mexico as an export platform.

3.3 NAFTA

In this subsection, we analyze changes in the optimal location strategies when trade costs between all three countries are as low as indicated in inequality (5). Moreover, we also assume a decline in the fixed costs of both components production and assembly of the final products as a reasonable approximation of NAFTA.

In the NAFTA regime there are only five location strategies to consider. The set of possible location strategies when a C firm invests are $\{C, C\}$, $\{C, CM\}$, $\{C, UCM\}$, $\{M, C\}$, and $\{M, M\}$, whereas for a U firm they are $\{U, U\}$, $\{U, UM\}$, $\{U, UCM\}$, $\{M, U\}$, and $\{M, M\}$.[12] The difference between the optimal location strategies in CUSFTA and NAFTA regimes and thus our remaining testable hypotheses can be derived by comparing Figures 2 and 3 which are depicted for low trade and fixed costs.

Hypothesis 4 *Canadian FDI in the U.S. increases after NAFTA.*

Even though there is a decline in Canadian FDI in the U.S. by low-end medium productivity firms due to declining trade costs, the decline in the fixed costs of assembly, f, increases Canadian FDI in the U.S. considerably by the remaining medium productivity and also high productivity firms. Furthermore, if the decline in f is much more pronounced than the decline in g, then assembly activity in all countries will go up. This can be shown as a huge downward shift of the positively sloped boundary between $\{C, UCM\}$ and $\{M, M\}$. Thus, $\{C, UCM\}$ may even become the only optimal choice for all medium and high productivity firms.

Hypothesis 5 *Canadian FDI in Mexico increases after NAFTA.*

Examine the left panels of Figures 2 and 3. As the trade costs between Canada and Mexico decrease, even low productivity firms start assembling in Mexico. Notice that region $\{C, UC\}$ is replaced by region $\{C, CM\}$, that is, medium productivity firms stop using the U.S. as an export platform and start using Mexico as one. Some of the other medium productivity firms, on the other hand, engage in full horizontal FDI in all countries, which was not a possibility before.

As g goes down, components production in Mexico by a majority of Canadian firms increases. Observe that regions $\{M, UC\}$ and $\{M, UCM\}$ are replaced by region $\{M, M\}$. When a Canadian

[12] $\{M, M\}$ dominates $\{M, UC\}$, $\{M, UM\}$ and $\{M, UCM\}$ under NAFTA.

firm invests in performing any activity in low-cost Mexico, such FDI reduces its unit costs, which raises the output level, and therefore increases the return to performing other production activities in Mexico. Reduced trade costs coupled with low levels of fixed costs in components make being close to the final consumers redundant. Notice that more firms with lesser productivity engage in FDI in assembly as well when g is low.

Hypothesis 6 *U.S. FDI in Canada increases after NAFTA.*

Compare the right panels of Figure 2 and 3. U.S. FDI in Canada compared to Canadian FDI in the U.S. increases even more since there is no decline in U.S. FDI in Canada at all. Any decline in the fixed costs of assembly, f, increases U.S. FDI in Canada considerably by medium and high productivity firms. As in the case of Canada, if the decline in f is more pronounced than the decline in g, then $\{U, UCM\}$ may become the only optimal choice for all medium and high productivity U.S. firms.

4 The Empirical Model

Our empirical strategy is to examine the effects of CUSFTA and NAFTA on inward and outward Canadian FDI by employing a difference-in-differences estimator which attributes only changes relative to a control group to the agreements. In addition, to avoid spurious correlations as much as possible, we include an array of control variables drawn from the existing literature on the determinants of foreign direct investment such as Brainard (1997), Markusen (1997, 2002), Carr et al. (2001), Markusen and Maskus (2002) and Blonigen et al. (2003).

We first outline the difference-in-differences estimation. Specifically, let

$$FDI_{ijt} = \alpha + \sum_{k=1}^{2} \beta_k d_{rk} + \sum_{l=1}^{4} \gamma_l d_{hl} + \sum_{k=1}^{2} \sum_{l=1}^{4} \delta_{kl} \left(d_{rk} \cdot d_{hl} \right) \tag{7}$$

where FDI_{ijt} is FDI in host country i from source country j at time t; rk denotes the regime ($k = 1$ for CUSFTA, $k = 2$ for NAFTA) and hl denotes host-type, to be explained below. d_{r1} is a dichotomous variable that is equal to one if the regime is CUSFTA (from 1989 on) and d_{r2} equals one if the regime is NAFTA (1994 and later); both are zero otherwise.[13] Note that specifying the regimes in this manner is consistent with CUSFTA remaining in effect through the addition of Mexico in NAFTA, where the NAFTA dummy then only represents the effect of that addition, not the effect of the entire three-country FTA.

$d_{h1} - d_{h4}$ are dichotomous variables, one for each of four host-source types. Let d_{h1} equal one if the U.S. hosts Canadian FDI. Let d_{h2} equal one if Mexico is the host country to Canadian FDI. Let d_{h3} equal one if Canada is the host country to FDI from the U.S., and finally, let d_{h4} equal one if Canada is the host to FDI from any non-NAFTA country. We add this last host-source type -even though it is not formally treated in our theoretical model- for completeness, so that we cover all FDI relationships involving Canada. We would expect a negative effect of both CUSFTA and NAFTA on this FDI as the agreements make the U.S. (due to lowered trade costs for exporting to Canada) and Mexico (due to the lower trade and investment costs) more attractive locations for non-North American firms.

The estimated impact of CUSFTA and NAFTA, respectively, for a particular host-source relationship is then given by the δ_{kl}'s, the difference-in-differences estimators. Since there are four such relationships and two regimes to consider, there are a total of eight coefficients. For example, δ_{11} gives the difference-in-differences effect of CUSFTA on Canadian FDI in the U.S.; δ_{22} gives the effect of NAFTA on Canadian FDI in Mexico.

In order to see why the δ's are of central interest, note that α is the baseline effect for observations that are pre-CUSFTA and NAFTA ($d_{r1} = d_{r2} = 0$) and are not of a (future) NAFTA host ($d_{hl} = 0$

[13] As a robustness check, we vary the starting point of both CUSFTA and NAFTA in consideration of a possible announcement effect.

$\forall\ l$). Then, $\alpha + \beta_k$ is the effect of CUSFTA/NAFTA on non-NAFTA hosts. The simple difference, i.e. the "CUSFTA-" or "NAFTA-effect" is therefore given by β_1 and β_2, respectively. For host type l, the pre- and post-NAFTA effects (and similarly for CUSFTA only) on FDI are given by $\alpha + \gamma_l$ and $\alpha + \beta_2 + \gamma_l + \delta_{2l}$, respectively, with the difference, the "NAFTA-effect", being $\beta_2 + \delta_{2l}$. Hence, the difference-in-differences estimate is given by δ_{2l}. While the signs, magnitudes and significance levels of the δ_{kl}'s are going to be of central interest, we will also report the simple difference results.

Two comments on the use of the difference-in-differences estimator are in order before we proceed to the other controls included in the empirical model. First, since the effects of NAFTA that we identify here are all relative to a control group, the identity of the control group matters. We use the largest control group possible, which includes all bilateral FDI relationships outside of NAFTA.[14] These include U.S. and Canadian outward FDI, although its omission does not affect the results.[15] The second issue pertains to econometric problems in the use of the difference-in-differences estimator as detailed in Bertrand et al. (2004). We discuss how we address these in the next section.

For other control variables to include in the empirical model, we appeal to the standard FDI literature. There has been some discussion in the literature about various nonlinear and non-monotonic relationships between FDI and its determinants (see, for example, Carr et al. (2001, 2003), Blonigen et al. (2003) and Braconier et al. (2005)).[16] Since these are not of particular interest here, we use a simple specification as our base, augmenting the model with the following

[14] We deal with inward U.S. and inward Mexican FDI other than from Canada in the same manner as described above, by including appropriate dichotomous variables, but in the interest of clutter and as we have explored these issues in more depth in our companion paper (Tekin-Koru and Waldkirch 2007), we omit the associated coefficients from our presentation of the results below.

[15] Hejazi and Pauly (2005) analyze the effect of NAFTA on U.S. FDI in Canada in a sample of outward U.S. FDI only. In their analysis of inward FDI, using bilateral OECD data, they do not control explicitly for the U.S. , but only include a North America dummy and no interactions of that dummy with NAFTA or CUSFTA dummies.

[16] For a detailed discussion of the knowledge-capital model and its empirical implementation, see Markusen's (2002) book.

controls:

$$FDI = f\begin{pmatrix} GDP\ Host, GDP\ Source, Skill\ Host, Skill\ Source, \\ \textit{Real Exchange Rate, Host Openness}, Source\ Openness, Distance \end{pmatrix} \tag{8}$$

The coefficients on the first two terms, *GDP Host* and *GDP Source*, are expected to be positive as larger market size of both the sending and the receiving country positively affect the scale of foreign production. The next two terms, *Skill Host* and *Skill Source*, which are defined as the share of skilled workers in the economy, proxy for a country's endowments with skilled labor. The literature suggests that countries better endowed with skilled labor are more likely to be headquarter countries of multinational firms, but since even for relatively unskilled labor intensive production processes some skilled labor is needed and we observe most FDI between similar countries, the coefficients on both skill variables are expected to be positive. The real exchange rate, measured as an index, has been found to matter by some studies on the determinants of FDI (Froot and Stein, 1991; Blonigen, 1997; Goldberg and Klein, 1997), although its sign can be ambiguous. On the one hand, a higher real exchange rate of a potential source country makes investment abroad (in foreign currency) less costly. On the other hand, revenue received in foreign currency is worth less in home currency, which investors presumably want at some point. If the former dominates, a positive sign is expected, if the latter, a negative one.

Source country and host country trade costs are measured by the ratio of exports plus imports to GDP, an often used measure for the trade openness of a country. It is used over others because it is available for the entire sample period.[17] The sign on host country trade costs may be positive or negative. A negative sign would be consistent with the tariff-jumping argument whereby greater openness reduces the incentive to produce abroad. A positive sign is consistent with vertical integration as lower trade costs increase the incentive to ship intermediate goods abroad for final

[17] Endogeneity may be a concern with this openness measure. However, other measures such as an index from the Global Competitiveness Report are highly correlated with any measure of investment cost. In any case, omitting the openness variables does not change the qualitative results.

assembly taking place there. As source country trade costs increase the cost of shipping either intermediates or final goods back home, a positive sign is expected. Finally, distance is measured as the distance between country capitals. Its sign is theoretically ambiguous since it can proxy for both trade and investment costs. It is included since it usually performs well in gravity-type models.

We should note that ascribing the effects that we find solely to CUSFTA or NAFTA is clearly problematic as other events during the time period that we are looking at may affect the pattern of FDI as well and we have only limited ways to control for those. For example, in addition to NAFTA, Mexico joined the OECD in 1994, but more importantly, the peso crisis in late 1994, early 1995 led to a steep real depreciation of the peso and a fall in GDP, followed by a real appreciation in the years afterwards. Our GDP and exchange controls may not sufficiently control for the extent of the crisis and its effect on foreign investors. However, by employing a difference-in-differences estimator, we do control for the worldwide rising trend in FDI over the sample period, whatever its cause.

5 Econometric Considerations and Data

5.1 Econometric Considerations

The data are in panel form and preliminary tests indicated that both autocorrelation and heteroscedasticity were present. Therefore, we use a panel data model (Prais-Winsten regression) with panel corrected standard errors. We report results from regressions where the autocorrelation coefficient is assumed to be different for each observational unit (country pair). The variance-covariance matrix is computed under the assumption that the disturbances are heteroscedastic and contemporaneously correlated across units, where each pair of cross-sectional units has their own covariance.

For each element in the covariance matrix, all available observations that are common to the two units contributing to the covariance are used to compute it, given that the panel is unbalanced.[18]

We have an unbalanced panel because not all data are available for all years of the sample period. We apply the following rules. Since we are primarily interested in the effects of CUSFTA and NAFTA, we need a sufficiently long time series. In our base specification, we chose a minimum of 14 observations for each country pair. In order to implement the correction for autocorrelation, no gaps in the data are allowed. Hence, when there is a gap, we limit ourselves to using post-gap information. In other words, if 1983 is available, 1984 is missing, and 1985 onwards is available, the data for this country-pair start in 1985. One of the robustness checks uses a larger number of observations, although a minimum of five must still be imposed in order to allow for the computation of the autocorrelation coefficients for all country pairs.

Bertrand et al. (2004) point out that ignoring serial correlation in difference-in-differences estimation can lead to severely biased standard errors. While we account for the problem by estimating a first-order autocorrelation coefficient, we also use one of the techniques they suggest which works well for samples of more than 20 observational units (we have at least 178 country pairs). It requires estimating standard errors while allowing for an arbitrary covariance structure between time periods, using a generalized White-like formula. This estimator of the variance-covariance matrix is consistent as the number of country pairs tends to infinity.

5.2 Data

FDI data come from three sources. U.S. inward and outward FDI data come from the standard source used in most studies of U.S. FDI, the Bureau of Economic Analysis (BEA). These data are described in detail elsewhere. Mexican FDI data come from the Mexican National Statistical

[18] We also ran the regressions under the assumption of a common AR coefficient, which resulted in no qualitative changes in the difference-in-differences results.

Institute (INEGI). These are FDI stocks in Mexico from 1980 on, published in U.S. dollars. The data distinguish ten source countries throughout the sample period. They account for about 90 percent of total FDI in Mexico. Since 1994, more source country and especially industry detail is available, but since we need sufficient pre-1994 data, we cannot use the additional detail in this study. No industry or additional source country detail is available retroactively for the time before NAFTA. The third data source, used for all other countries, including Canadian FDI in countries other than the U.S. and Mexico, is the OECD's International Direct Investment Statistics, which publishes FDI data in U.S. dollars. In the empirical analysis, all nominal values are converted to real dollars using the U.S. producer price index for capital equipment.[19]

For most of the countries in the sample, FDI rose modestly during the 1980s and rose much more substantially during the 1990s. Within North America, the United States is the most important host country of Canadian FDI and the most important source of both Canadian and Mexican inward FDI. Figure 4 illustrates the evolution of real Canadian inward and outward (in the U.S. and Mexico) FDI. Note the different scale for Mexico (on the right), illustrating that the magnitude of FDI in Mexico is dwarfed by FDI in the U.S.

Control variable data also come from standard sources. We use PPP-adjusted GDP data from the Penn World Tables (6.2). Trade data come from the same source. An important control variable in many studies is skill. The two most common sources of skill data are the International Labor Organization (ILO) and the Barro/Lee data on schooling. We use both in our analysis to ensure the robustness of our results. The ILO data measure the number of workers in a particular occupation and characterize some as skilled, some as unskilled, employing the skill definitions from Carr et al. (2001). A country's skill level then is represented by the share of skilled workers. We fill in missing

[19] FDI among many OECD countries is often available twice as both an OECD source and an OECD host country report their inward and outward FDI. Inspection of such cases reveals that the numbers do not match. For the results reported below, we pick the numbers reported by the host country, but note that the results are largely robust to picking source country FDI instead.

data using a linear trend between non-missing years. For just a few countries, additional years are filled in using the growth rate of the skilled labor share between non-missing years. Alternatively, we use the Barro/Lee data on years of schooling. These are available only in five-year intervals, though for a larger number of countries than the ILO data, and we fill in missing values using a linear trend as well.[20]

Table 2 contains summary statistics for our basic sample with a minimum of 14 observations per country pair as well as for the larger sample where only a minimum of five observations are required. It is of note that mean FDI far exceeds median FDI, indicating that it is skewed towards a smaller number of countries. Host countries tend to be larger than source countries, but the latter have a higher share of skilled labor than the former. Note that expanding the sample lowers average FDI and GDP, but substantially raises openness and the real exchange rate. Since the additional countries are small, they tend to have higher degrees of openness, as is typical when measured by the share of trade in GDP. Moreover, their currencies tend to depreciate significantly over time.

6 Results

Tables 3 - 6 report the results. Tables 2 (using ILO skill data) and 4 (using Barro/Lee education data) show regression results for the control variables and some of the coefficients on the dichotomous variables, for a variety of specifications. Tables 4 and 6 present the simple difference and the difference-in-differences estimation results, which are of central interest.

The basic sample contains only source-host country pairs for which we have at least 14 observations. Specification (3) in Table 3 includes country pairs with fewer observations, which increases the sample size from 3,317 to 7,357 observations. However, many of the newly included country pairs still have twelve or 13 observations. Specification (4) accounts for a possible announcement

[20] Filling in missing values with repeated values from prior or future years does not change the results.

effect by starting the CUSFTA and NAFTA regime dummies in 1987 and 1992, respectively, rather than 1989 or 1994.[21] Specification (5) computes an arbitrary variance-covariance matrix as suggested by Bertrand et al. (2004) in order to address potential bias in the difference-in-differences estimation.

The first specification is one that only includes the dichotomous variables needed for the difference-in-differences estimation without any controls. The significantly positive and large coefficients on both dummies indicating U.S. FDI in Canada and Canadian FDI in the U.S. illustrate that even before NAFTA and CUSFTA, bilateral FDI between these countries was unusually high. Interestingly, however, this result only holds up for inward Canadian FDI from the U.S., not Canadian FDI in the U.S., once we include additional controls in column (2), and that is also robust across the other specifications in the table. Almost all control variables are highly statistically significant and have the expected signs. Market size, both of the host and the source, has a positive effect on FDI, as does the share of skilled workers in the economy. This illustrates that multinationals from large countries with abundant skilled labor tend to dominate. The real exchange rate is not significantly different from zero in any specification, indicating that it does not tend to affect FDI at such an aggregate level. Host and source country openness are statistically significant (except in column (5)). The positive coefficient on host openness is in contrast to the tariff-jumping argument, but supports the vertical integration hypothesis. The negative sign on source country openness, however, is not consistent with expectations. Finally, distance is a deterrent of FDI.

Table 4 shows the results of the effects of CUSFTA and NAFTA, both in absolute terms and relative to the evolution of FDI elsewhere in the world (the difference-in-differences estimator). The order of host type results follows the order of the hypotheses from the theoretical section, with the addition of non-NAFTA countries' FDI in Canada. Note that the statistical significance of

[21] Dating the announcement effect to 1988 and 1993 makes little difference to the results.

the results with respect to a particular host type and regime is very robust across specifications. This is also true for the simple difference and the difference-in-differences results. However, the magnitudes of the coefficients, which represent millions of dollars since the estimation is in levels, do differ somewhat and we put these differences in perspective below.

Recall that the theory predicts that the fall in trade costs due to CUSFTA should lower intra-agreement FDI as well as Canadian FDI in Mexico. However, only Canadian FDI in Mexico is shown to be significantly negatively affected, though consistently so across specifications. Intra-CUSFTA FDI is only marginally significant in specification (5), though with an unexpected positive sign. Thus, we can confirm one of the three hypotheses for CUSFTA only.

The effect of the agreement on other countries' FDI in Canada is strongly negative and very robust across specifications. This suggests that with easier access to the Canadian market from the U.S., FDI may have been re-oriented to the U.S., with its far larger market.

With respect to the addition of Mexico to the existing CUSFTA agreement (NAFTA), the theory predicts a positive effect for intra-agreement FDI among all countries. The results are mixed, however. Canadian FDI in the U.S. as well as U.S. FDI in Canada have positive coefficients across all specifications, but they are only marginally significant in a few of the Prais-Winsten regressions, although strongly significant, and much larger, when we compute an arbitrary VCE instead. Thus, there is evidence that lower investment costs expanded FDI generally as they make foreign engagement more attractive and that this effect dominates the reduced incentive for tariff-jumping.

In order to get a sense of the total economic effect, we can relate the estimated effect of both CUSFTA and NAFTA to the level of FDI reached by the end of our sample period (2002). For U.S. FDI in Canada, the range is from about 20 to 30 percent, a considerable effect. That is, the model suggests that 20 to 30 percent of the 2002 FDI stock has resulted from the two agreements.[22] For Canadian FDI in the U.S., the effect is even larger, ranging from 28.6 to nearly 40 percent, depending on specification. We caution, however, that while all coefficients are positive, statistical significance is not always achieved.

The negative impact on Canadian FDI in Mexico found under CUSFTA only is confirmed for NAFTA to some extent, though note that only one of the difference-in-differences results that includes control variables is statistically significant, It is the one that considers a possible announcement effect, which effectively includes two CUSFTA-only years. Still, the result is somewhat puzzling as it is not only contrary to theoretical expectations, but also in stark contrast to the evolution of the absolute amount of FDI, which rose substantially after 1994. However, if we compare its magnitude to that of, for example, Canadian FDI in the U.S., it is much smaller. The estimated effect is also unreasonably large in magnitude, on the order of more than 90 up to over 200 percent of 2002 FDI.

As did CUSFTA, NAFTA is robustly shown to have had a negative effect on other countries' FDI in Canada, which is statistically significant in every specification. Putting the estimated coefficients in relation to 2002 FDI, the agreements resulted in a 10 to over 22 percent lower amount. This is consistent with the hypothesis that for other countries, access to the Canadian market from either the U.S. or Mexico has been greatly facilitated with the lower trade costs, provided rules of origin are satisfied. The additional reduction in investment costs in Mexico in particular reinforces this investment diversion away from Canada.[23]

Despite some differences in the magnitude of the estimated effects, the qualitative results are

[22] Note that the model appears to be doing well in predicting FDI. The correlation between actual and predicted FDI stocks is in the neighborhood of 0.55, statistically significant at the one percent level. Blonigen and Davies (2004) find that in their data, the residuals are unreasonably large and differ systematically between rich and poor countries. Our residuals appear to be of reasonable size and do not differ in any systematic way.

[23] In contrast, Hejazi and Pauly (2005) find a negative effect of NAFTA on U.S. FDI in Canada and no effect (see the statistically insignificant coefficients for Canada) for other countries' FDI in Canada. However, as discussed above, due to their differences in methodology and sample, their results are not strictly comparable to ours.

similar across our different specifications except in the NAFTA cases for bilateral Canadian-U.S. FDI when we allow for an arbitrary variance-covariance matrix, where the coefficients are much larger. Even though this method worked well for Bertrand et al.'s (2004) data, it may not be the case here. For example, consider the average estimated autocorrelation in regressions (1) through (4). It is about 0.85, much higher than in Bertrand et al.'s data, where the true autocorrelation is comparable to our estimated one in magnitude. Moreover, they do not allow for individual (in our case: country-pair specific) autocorrelation coefficients, but impose a common one. Thus, we maintain that our Prais-Winsten methodology is appropriate and yields good results.

We perform one more important robustness check by re-estimating the model using the Barro/Lee education data rather than the ILO skill data. Results are presented in Tables 5 and 6, which contain the same specifications as Tables 3 and 4, without the "no controls" one of course. The signs and significance levels of all control variables are virtually the same, including the coefficients on the Barro/Lee education measures. Turning to the CUSFTA and NAFTA effects, we note that virtually all results hold up qualitatively. There are some differences in the magnitudes of the coefficients, though they do not appear to systematically differ in one direction or the other and not by much.

In summary, we find that there is ample evidence that North American economic integration first with CUSFTA and then including Mexico in NAFTA has affected FDI both in and from Canada, the small Northern country in the agreements. The effect is positive for intra-NAFTA FDI except that Canadian FDI in Mexico is negatively affected. Although other countries' FDI in Canada has also fallen relative to general trends and what is to be expected from the evolution of the traditional determinants of FDI, the results suggest that economic integration with low-cost countries need not strictly divert FDI away from a small higher-cost member country.

7 Conclusion

This paper has investigated the effect of North American integration on Canadian foreign direct investment (FDI), both inward and outward. The empirical results suggest that CUSFTA alone did not have a positive effect, perhaps because it was quickly followed by the inclusion of Mexico into NAFTA. The larger agreement is found to have had a positive effect on Canadian FDI in the U.S. and Canadian inward FDI from the U.S., though a negative effect on other countries' FDI in Canada and Canadian FDI in Mexico. The results are consistent with a theory of trade agreements lowering not just trade, but investment costs, which results in greater foreign engagement of some firms, sufficient to generate a positive effect in aggregate data.

To our knowledge, this is the first paper that combines U.S., Mexican and bilateral OECD FDI data to analyze the effect of NAFTA on Canada. Together with the results from our companion paper, which found substantial increases in the wake of NAFTA of U.S. FDI in Mexico and no positive effect on non-NAFTA FDI in either the U.S. or Mexico, we obtain a comprehensive picture of how North American integration with its coincident reduction in investment costs affects FDI in the region. Clearly, it encourages intra-regional FDI, although to the detriment of third-country FDI.

The results are robust to different econometric specifications, the nature of the data and the sample. More importantly, while we cannot claim to cleanly isolate a CUSFTA or NAFTA effect given that it is impossible to control for all other events that occur during this time period, the nature of a difference-in-differences estimation and an attempt to control at least for the commonly recognized determinants of FDI make us feel confident about the results.

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Table 1: Maximum Profits for a Canadian and a U.S. Firm in Different Regimes

Pre-CUSFTA Regime	
Canadian Firm	U.S. Firm
$\pi_{C,C} = (1-\alpha)\overline{Y}\Theta\left[\frac{1+\frac{\sigma}{2}(T^H-1)}{T^H C(1,1)}\right]$	$\pi_{U,U} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H(1-\sigma)+\sigma}{T^H C(1,1)}\right]$
$\pi_{M,C} = (1-\alpha)\overline{Y}\Theta\left[\frac{1+\frac{\sigma}{2}(T^H-1)}{T^H C(w,1)}\right] - g^H$	$\pi_{M,U} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H(1-\sigma)+\sigma}{T^H C(w,1)}\right] - g^H$
$\pi_{C,UC} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H-\frac{\sigma}{2}(T^H-1)}{T^H C(1,1)}\right] - f^H$	$\pi_{U,UM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\sigma}{C(1,1)} + \frac{\frac{\sigma}{2}(1+T^H)}{T^H C(1,w)}\right] - f^H$
$\pi_{M,UC} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H-\frac{\sigma}{2}(T^H-1)}{T^H C(w,1)}\right] - (f^H+g^H)$	$\pi_{M,UM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\sigma}{C(w,1)} + \frac{\frac{\sigma}{2}(1+T^H)}{T^H C(w,w)}\right] - (f^H+g^H)$
$\pi_{C,UCM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\frac{\sigma}{2}}{C(1,1)} + \frac{\frac{\sigma}{2}}{C(1,w)}\right] - 2f^H$	$\pi_{U,UCM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\frac{\sigma}{2}}{C(1,1)} + \frac{\frac{\sigma}{2}}{C(1,w)}\right] - 2f^H$
$\pi_{M,UCM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\frac{\sigma}{2}}{C(w,1)} + \frac{\frac{\sigma}{2}}{C(w,w)}\right] - 2f^H - g^H$	$\pi_{M,UCM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\frac{\sigma}{2}}{C(w,1)} + \frac{\frac{\sigma}{2}}{C(w,w)}\right] - 2f^H - g^H$
CUSFTA Regime	
Canadian Firm	U.S. Firm
$\pi_{C,C} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H T^L\frac{\sigma}{2}+T^L(1-\sigma)+T^H\frac{\sigma}{2}}{T^H T^L C(1,1)}\right]$	$\pi_{U,U} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H T^L(1-\sigma)+\frac{\sigma}{2}(T^H+T^L)}{T^H T^L C(1,1)}\right]$
$\pi_{M,C} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H T^L\frac{\sigma}{2}+T^L(1-\sigma)+T^H\frac{\sigma}{2}}{T^H T^L C(w,1)}\right] - g^H$	$\pi_{M,U} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H T^L(1-\sigma)+\frac{\sigma}{2}(T^H+T^L)}{T^H T^L C(w,1)}\right] - g^H$
$\pi_{C,UC} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H(1-\frac{\sigma}{2})+\frac{\sigma}{2}}{T^H C(1,1)}\right] - f^H$	$\pi_{U,UC} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H(1-\frac{\sigma}{2})+\frac{\sigma}{2}}{T^H C(1,1)}\right] - f^H$
$\pi_{M,UC} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H(1-\frac{\sigma}{2})+\frac{\sigma}{2}}{T^H C(w,1)}\right] - (f^H+g^H)$	$\pi_{M,UC} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^H(1-\frac{\sigma}{2})+\frac{\sigma}{2}}{T^H C(w,1)}\right] - (f^H+g^H)$
$\pi_{C,UCM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\frac{\sigma}{2}}{C(1,1)} + \frac{\frac{\sigma}{2}}{C(1,w)}\right] - 2f^H$	$\pi_{U,UCM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\frac{\sigma}{2}}{C(1,1)} + \frac{\frac{\sigma}{2}}{C(1,w)}\right] - 2f^H$
$\pi_{M,UCM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\frac{\sigma}{2}}{C(w,1)} + \frac{\frac{\sigma}{2}}{C(w,w)}\right] - 2f^H - g^H$	$\pi_{M,UCM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\frac{\sigma}{2}}{C(w,1)} + \frac{\frac{\sigma}{2}}{C(w,w)}\right] - 2f^H - g^H$
NAFTA Regime	
Canadian Firm	U.S. Firm
$\pi_{C,C} = (1-\alpha)\overline{Y}\Theta\left[\frac{1+\frac{\sigma}{2}(T^L-1)}{T^L C(1,1)}\right]$	$\pi_{U,U} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^L(1-\sigma)+\sigma}{T^L C(1,1)}\right]$
$\pi_{M,C} = (1-\alpha)\overline{Y}\Theta\left[\frac{1+\frac{\sigma}{2}(T^L-1)}{T^L C(w,1)}\right] - g^L$	$\pi_{M,U} = (1-\alpha)\overline{Y}\Theta\left[\frac{T^L(1-\sigma)+\sigma}{T^L C(w,1)}\right] - g^L$
$\pi_{M,M} = (1-\alpha)\overline{Y}\Theta\left[\frac{1+\frac{\sigma}{2}(T^L-1)}{T^L C(w,w)}\right] - (f^L+g^L)$	$\pi_{M,M} = (1-\alpha)\overline{Y}\Theta\left[\frac{(1-\sigma)+\frac{\sigma}{2}(1+T^L)}{T^L C(w,w)}\right] - (f^L+g^L)$
$\pi_{C,CM} = (1-\alpha)\overline{Y}\Theta\left[\frac{\frac{\sigma}{2}}{C(1,1)} + \frac{(1-\sigma)+T^L\frac{\sigma}{2}}{T^L C(1,w)}\right] - f^L$	$\pi_{U,UM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\sigma}{C(1,1)} + \frac{\frac{\sigma}{2}(1+T^L)}{T^L C(1,w)}\right] - f^L$
$\pi_{C,UCM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\frac{\sigma}{2}}{C(1,1)} + \frac{\frac{\sigma}{2}}{C(1,w)}\right] - 2f^L$	$\pi_{U,UCM} = (1-\alpha)\overline{Y}\Theta\left[\frac{1-\frac{\sigma}{2}}{C(1,1)} + \frac{\frac{\sigma}{2}}{C(1,w)}\right] - 2f^L$

Note: $C(p_m, p_a) \equiv c(p_m, p_a)^{\alpha/(1-\alpha)}$ and $T^H = (t^H)^{\alpha/(1-\alpha)}$ and $T^L = (t^L)^{\alpha/(1-\alpha)}$ are transformed measures of the unit and trade costs, respectively.

Table 2: Summary Statistics

	14+ observations			5+ observations		
Regressor	Mean	Median	S.D.	Mean	Median	S.D.
FDI ('000 $)	7,856	986.0	22,262	4,132	247.0	15,515
GDP Host (mill. $)	2,064	626.2	2,892	1,336	366.5	2,392
GDP Source (mill. $)	1,579	642.7	2,388	1,152	308.1	2,140
Skill Host - ILO (share)	0.258	0.285	0.102	0.261	0.285	0.103
Skill Source - ILO (share)	0.280	0.298	0.096	0.287	0.306	0.101
Skill Host - Barro/Lee (years)	8.384	8.483	2.635	8.333	8.684	2.577
Skill Source - Barro/Lee (years)	8.795	9.007	2.265	8.289	8.706	2.615
Real Exchange Rate (index)	99.64	99.01	35.14	126.9	100.0	897.9
Host Openness (%)	59.70	44.22	60.73	72.07	59.02	64.18
Source Openness (%)	60.20	50.58	50.59	73.27	62.22	58.23
Distance (km)	7,205	6,855	4,705	7,088	6,923	4,888
CUSFTA	0.268	0	0.443	0.197	0	0.398
NAFTA	0.469	0	0.499	0.676	1	0.468
UShostCan	0.007	0	0.083	0.003	0	0.056
MexhostCan	0.007	0	0.083	0.003	0	0.056
CanhostUS	0.006	0	0.079	0.003	0	0.053
CanhostOther	0.061	0	0.239	0.040	0	0.196

Notes:
CUSFTA and NAFTA are indicator variables for the CUSFTA only (1989-93) and NAFTA (1994 on) time periods.
UShostCan, *MexhostCan*, *CanhostUS* and *CanhostOther* are indicator variables for the four host types discussed in the text, where Can = Canada, US = United States, Mex = Mexico and other = countries other than Mexico and the United States.

Table 3: Regression Results: ILO Skill Data

Regressor	(1) No Controls	(2) 14+ obs.	(3) 5+ obs.	(4) Announce-ment Effect	(5) Arbitrary VCE
GDP Host		5.700***	5.468***	5.564***	5.717***
		(1.125)	(0.585)	(1.085)	(1.790)
GDP Source		4.366***	2.774***	4.305***	2.708***
		(0.473)	(0.319)	(0.463)	(0.866)
Skill Host		47,476***	23,761***	45,430***	23,948**
		(9,650)	(3,159)	(9,183)	(9,965)
Skill Source		37,136***	19,759***	36,174***	36,710**
		(8,787)	(3,405)	(8,829)	(15,042)
Real Exchange Rate		0.355	0.0004	1.462	-25.15
		(4.786)	(0.019)	(4.932)	(16.11)
Host Openness		17.15***	10.68***	16.91**	6.367
		(6.502)	(1.835)	(7.008)	(8.664)
Source Openness		-32.38*	-12.46***	-32.58*	-25.17
		(18.44)	(3.807)	(18.78)	(19.57)
Distance		-0.782***	-0.289***	-0.788***	-0.305*
		(0.169)	(0.046)	(0.168)	(0.161)
CUSFTA (β_1)	-1,121	-669.5	-83.76	-337.8	-1,418
	(987.2)	(1,023)	(924.6)	(1,294)	(923.6)
NAFTA (β_2)	-662.2	-673.3	-468.3	-608.2	-2,478**
	(988.4)	(1,020)	(496.5)	(1,039)	(1,090)
UShostCan (γ_1)	28,331***	-8,215	-4,663	-6,825	-10,032
	(7,419)	(8,997)	(7,503)	(10,272)	(9,213)
MexhostCan (γ_2)	-618.9	5,251***	1,217	5,211***	2,771
	(1,446)	(1,674)	(1,144)	(1,835)	(1,808)
CanhostUS (γ_3)	68,005***	36,910***	49,511***	37,383***	45,808***
	(7,406)	(6,762)	(6,918)	(8,177)	(4,622)
CanhostOther (γ_4)	-3,212**	556.0	-1,162	402.4	1,785
	(1,481)	(1,369)	(1,108)	(1,660)	(1,968)
Number of obs.	3,317	3,317	7,357	3,317	3,317
R^2	0.21	0.34	0.27	0.31	0.31
Average autocorr.	0.872	0.852	0.859	0.852	N/A

Notes:
Standard errors in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. All regressions include a constant, a time trend and dummies for non-NAFTA country FDI in the U.S. and Mexico and U.S. FDI in Mexico as well as the their interactions with CUSFTA and NAFTA dummies (not reported).
The δ-coefficients (the difference-in-differences estimators) are reported in Table 4, along with the simple difference results.
Regressions (1)-(4) correct for first-order autocorrelation where autocorrelation coefficients are estimated separately for each country pair. Covariances vary across country pairs. See the text for details. Regression (5) computes an arbitrary variance-covariance matrix.
All regressions except (3) contain at least 14 observations for each country pair.
In Regression (4), the CUSFTA and NAFTA dummies are set equal to one starting in 1987 and 1992, respectively

Table 4: CUSFTA and NAFTA Effects, ILO Skill Data

	(1) No Controls	(2) 14+ obs.	(3) 5+ obs.	(4) Announce-ment Effect	(5) Arbitrary VCE
CUSFTA					
Simple Difference	11,052	5,493	8,295	6,777	2,567
UShostCan $(\beta_1 + \delta_{11})$	(7,939)	(6,969)	(7,248)	(7,060)	(3,045)
Difference-in-differences	12,174	6,162	8,379	7,115	3,985
UShostCan (δ_{11})	(8,011)	(6,944)	(6,975)	(7,215)	(2,958)
Simple Difference	-5,876***	-5,666***	-2,203***	-4,435***	-6,266***
MexhostCan $(\beta_1 + \delta_{12})$	(1,493)	(1,178)	(564.3)	(1,166)	(1,688)
Difference-in-differences	-4,755***	-4,997***	-2,119**	-4,097***	-4,848***
MexhostCan (δ_{12})	(1,521)	(1,285)	(901.4)	(1,471)	(1,173)
Simple Difference	10,225	5,112	9,529	9,391	3,546*
CanhostUS $(\beta_1 + \delta_{13})$	(8,060)	(7,434)	(8,086)	(7,638)	(1,967)
Difference-in-Differences	11,347	5,782	9,613	9,729	4,963**
CanhostUS (δ_{13})	(7,809)	(7,042)	(7,545)	(7,425)	(2,040)
Simple Difference	-4,026***	-4,560***	-1,858***	-3,283**	-4,371***
CanhostOther $(\beta_1 + \delta_{14})$	(1,422)	(1,173)	(440.8)	(1,375)	(1,476)
Difference-in-Differences	-2,905*	-3,891***	-1,775*	-2,945**	-2,953**
CanhostOther (δ_{14})	(1,555)	(1,288)	(1,021)	(1,447)	(1,351)
NAFTA					
Simple difference	13,182*	8,845	10,646	5,113	22,277***
UShostCan $(\beta_2 + \delta_{21})$	(7,939)	(6,970)	(7,238)	(6,974)	(3,499)
Difference-in-differences	13,845*	9,518	11,114	5,722	24,755***
UShostCan (δ_{21})	(8,015)	(6,941)	(7,310)	(7,012)	(3,300)
Simple difference	-4,333***	-2,602**	-243.1	-3,545***	-2,392**
MexhostCan $(\beta_2 + \delta_{22})$	(1,527)	(1,239)	(566.8)	(1,303)	(1,211)
Difference-in-differences	-3,671**	-1,348	225.2	-2,937**	86.49
MexhostCan (δ_{22})	(1,563)	(1,733)	(584.1)	(1,385)	(866.6)
Simple difference	13,183*	9,865	13,546*	3,077	21,832***
CanhostUS $(\beta_2 + \delta_{23})$	(7,880)	(7,275)	(7,846)	(7,301)	(1,906)
Difference-in-differences	13,846*	10,538	14,014*	3,685	24,310***
CanhostUS (δ_{23})	(7,599)	(6,834)	(7,731)	(6,921)	(3,464)
Simple difference	-5,328***	-3,415***	-1,322***	-3,553***	-5,140***
CanhostOther $(\beta_2 + \delta_{24})$	(1,510)	(1,074)	(428.4)	(1,327)	(1,394)
Difference-in-differences	-4,665***	-2,742**	-853.6*	-2,945**	-2,662***
CanhostOther (δ_{24})	(1,616)	(1,221)	(479.5)	(1,351)	(901.9)

Notes: Standard errors in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. Results derived from the regressions in Table 2.

Table 5: Regression Results: Barro/Lee Education Data

Regressor	(1) 14+ obs.	(2) 5+ obs.	(3) Announce-ment Effect	(4) Arbitrary VCE
GDP Host	5.481***	4.330***	5.287***	5.316***
	(1.001)	(0.415)	(0.960)	(1.345)
GDP Source	4.206***	1.924***	4.155***	2.573***
	(0.443)	(0.216)	(0.434)	(0.764)
Skill Host (Barro/Lee)	1,680***	1,068***	1,655***	786.7**
	(467.4)	(167.5)	(452.5)	(321.2)
Skill Source (Barro/Lee)	1,200***	746.1***	1,212***	1,036***
	(251.4)	(119.9)	(265.1)	(324.7)
Real Exchange Rate	-2.138	0.0004	-1.315	-23.53*
	(3.518)	(0.0005)	(3.615)	(14.01)
Host Openness	28.20***	18.15***	25.87***	11.64*
	(9.143)	(2.054)	(8.647)	(6.642)
Source Openness	-8.101	-8.301**	-10.01	-6.863
	(12.25)	(3.909)	(12.87)	(14.99)
Distance	-1.193***	-0.615***	-1.192***	-0.585***
	(0.220)	(0.093)	(0.220)	(0.160)
CUSFTA (β_1)	-649.1	-216.5	-467.2	-1,559**
	(916.3)	(863.6)	(1,183)	(693.3)
NAFTA (β_2)	-464.3	-340.4	-604.4	-2,018**
	(847.0)	(346.2)	(849.9)	(816.3)
UShostCan (γ_1)	-15,182*	-4,059	-13,062	-12,781*
	(9,226)	(7,534)	(10,559)	(7,667)
MexhostCan (γ_2)	1,758	-229.3	2,156	116.0
	(1,316)	(1,165)	(1,520)	(1,344)
CanhostUS (γ_3)	30,997***	49,058***	31,990***	42,020***
	(7,122)	(7,068)	(8,506)	(4,780)
CanhostOther (γ_4)	-2,140	-2,434**	-1,727	876.6
	(1,979)	(1,242)	(1,874)	(1,969)
Number of obs.	4,419	10,289	4,419	4,419
R^2	0.31	0.24	0.29	0.30
Average autocorr.	0.852	0.862	0.852	N/A

Notes:
Standard errors in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. All regressions include a constant, a time trend and dummies for non-NAFTA country FDI in the U.S. and Mexico and U.S. FDI in Mexico as well as the their interactions with CUSFTA and NAFTA dummies (not reported).
The δ-coefficients (the difference-in-differences estimators) are reported in Table 6, along with the simple difference results.
Regressions (1)-(3) correct for first-order autocorrelation where autocorrelation coefficients are estimated separately for each country pair. Covariances vary across country pairs. See the text for details. Regression (4) computes an arbitrary variance-covariance matrix.
All regressions except (2) contain at least 14 observations for each country pair.
In Regression (3), the CUSFTA and NAFTA dummies are set equal to one starting in 1987 and 1992, respectively

Table 6: CUSFTA and NAFTA Effects, Barro/Lee Education Data

	(1) 14+ obs.	(2) 5+ obs.	(3) Announce-ment Effect	(4) Arbitrary VCE
CUSFTA				
Simple Difference	7,655	10,572	7,426	5,688***
$UShostCan$ $(\beta_1 + \delta_{11})$	(6,913)	(7,545)	(7,059)	(1,957)
Difference-in-differences	8,304	10,789	7,893	7,247***
$UShostCan$ (δ_{11})	(6,990)	(7,313)	(7,293)	(1,869)
Simple Difference	-5,520***	-2,347***	-4,645***	-4,647***
$MexhostCan$ $(\beta_1 + \delta_{12})$	(1,295)	(563.2)	(1,232)	(988.2)
Difference-in-differences	-4,871***	-2,131**	-4,178***	-3,088***
$MexhostCan$ (δ_{12})	(1,399)	(917.6)	(1,503)	(750.2)
Simple Difference	7,702	11,594	10,014	5,358***
$CanhostUS$ $(\beta_1 + \delta_{13})$	(7,278)	(8,255)	(7,560)	(1,261)
Difference-in-Differences	8,351	11,811	10,481	6,916***
$CanhostUS$ (δ_{13})	(6,952)	(7,759)	(7,424)	(1,210)
Simple Difference	-1,590	-333.2	-1,882*	-2,756**
$CanhostOther$ $(\beta_1 + \delta_{14})$	(1,034)	(608.0)	(1,045)	(1,088)
Difference-in-Differences	-970.8	-116.7	-1,415	-1,197
$CanhostOther$ (δ_{14})	(1,039)	(912.2)	(1,091)	(920.2)
NAFTA				
Simple difference	8,701	11,936	5,608	22,408***
$UShostCan$ $(\beta_2 + \delta_{21})$	(6,895)	(7,551)	(6,947)	(2,931)
Difference-in-differences	9,165	12,276	6,213	24,426***
$UShostCan$ (δ_{21})	(7,041)	(7,678)	(7,162)	(2,654)
Simple difference	-3,933***	-763.4	-4,848***	-3,233***
$MexhostCan$ $(\beta_2 + \delta_{22})$	(1,331)	(557.6)	(1,360)	(1,057)
Difference-in-differences	-3,469**	-422.9	-4,244***	-1,215*
$MexhostCan$ (δ_{22})	(1,400)	(546.9)	(1,445)	(630.2)
Simple difference	9,515	14,290*	3,416	21,892***
$CanhostUS$ $(\beta_2 + \delta_{23})$	(7,052)	(8,006)	(7,124)	(1,693)
Difference-in-differences	9,979	14,630*	4,020	23,910***
$CanhostUS$ (δ_{23})	(6,772)	(7,952)	(6,916)	(1,485)
Simple difference	-2,442**	-958.6**	-2,370**	-3,994***
$CanhostOther$ $(\beta_2 + \delta_{24})$	(1,107)	(480.3)	(1,127)	(1,100)
Difference-in-differences	-1,976*	-618.2	-1,766*	-1,975**
$CanhostOther$ (δ_{24})	(1,067)	(461.2)	(1,059)	(863.2)

Notes: Standard errors in parentheses. *, **, *** denote significance at the 10%, 5%, and 1% level, respectively. Results derived from the regressions in Table 4.

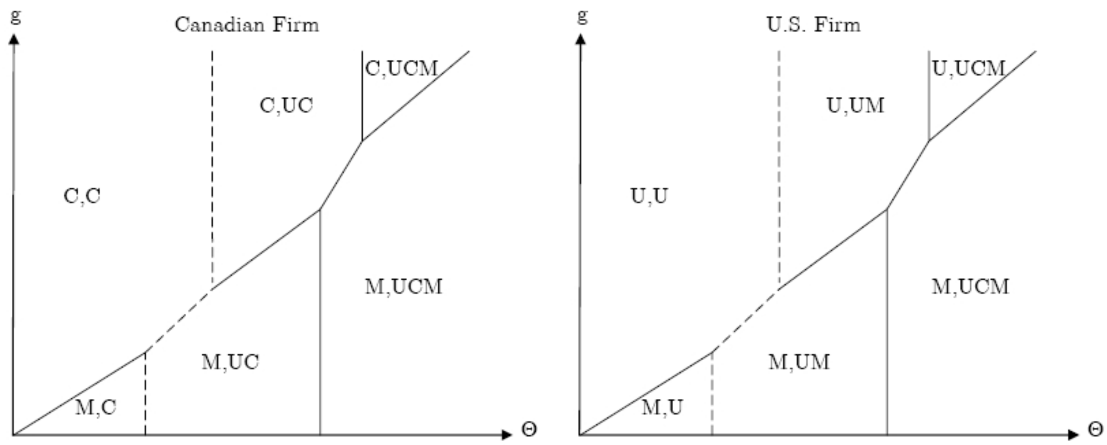

Figure 1: Pre-CUSFTA integration strategies

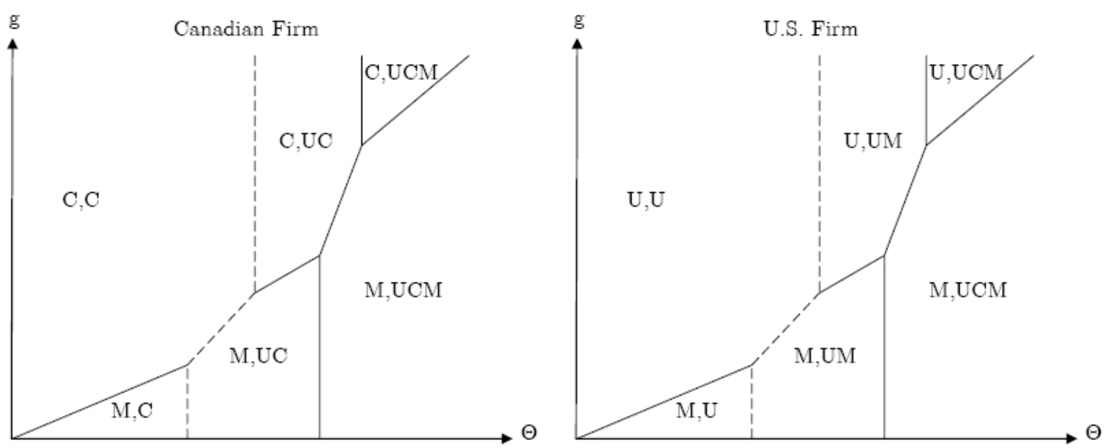

Figure 2: CUSFTA integration strategies

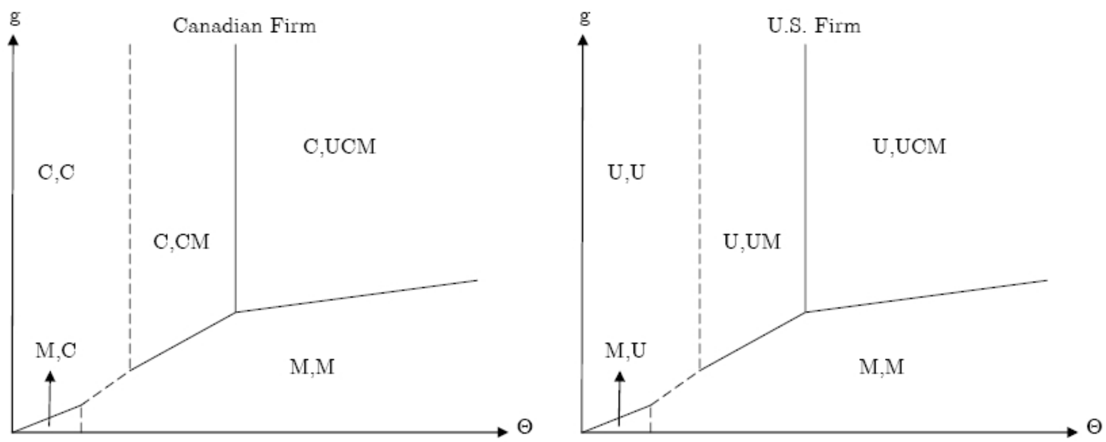

Figure 3: NAFTA integration strategies

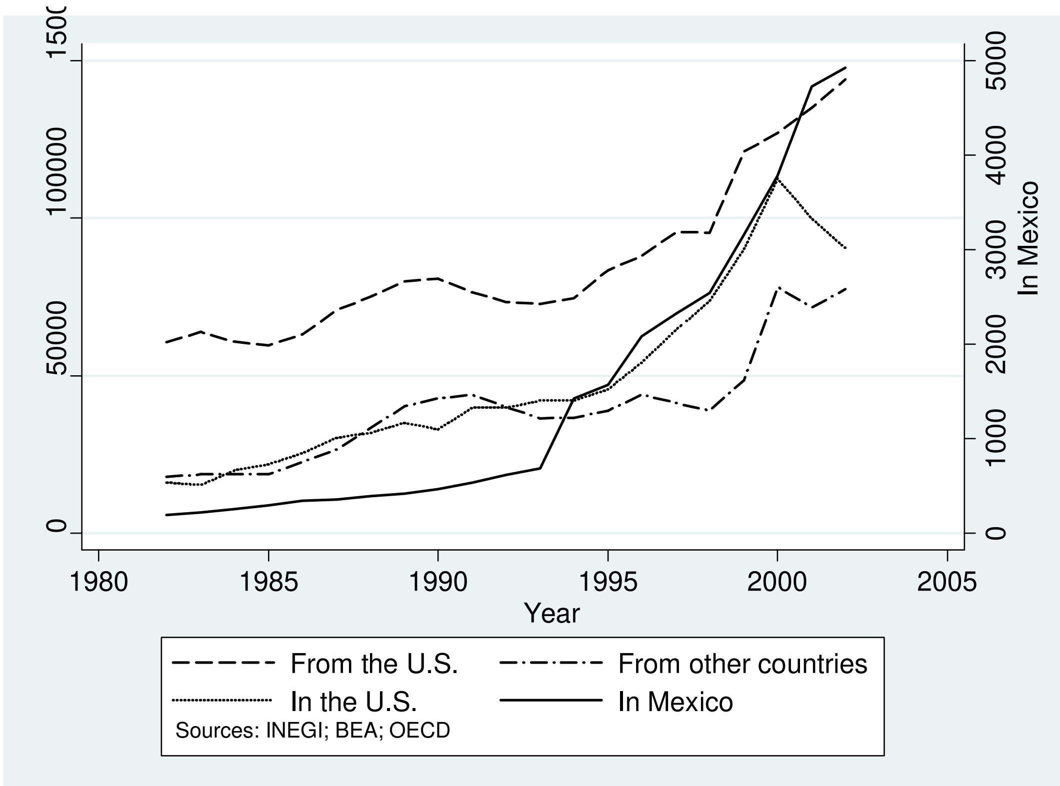

Figure 4: Canadian Inward and Outward Real FDI Stock, $millions